Concrete Pipe News

"States shall have the autonomy to determine culvert and storm sewer material types to be included in the construction of a project on a Federal-aid highway."

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On the Cover: Local public agencies, with the approval of their State DOT, have the authority to determine culvert and storm sewer material types.

Editorial

The Calling...

Matt Childs, P.E., President
American Concrete Pipe Association

Some say that women and men are "called" to be an engineer. In 1907, Kipling wrote a poem called "The Sons of Martha." His inspiration came from Luke 10:38-42. Jesus visited Mary and Martha, the sisters of Lazarus, at their home. Mary sat at the feet of Jesus to hear him speak; Martha, worried about providing for her guest, complained to Jesus that Mary was not helping. Jesus chided her, and, in Kipling's poem, her descendants forever after are consigned to working in the background to help everyone else – the sons of Mary: *"The Sons of Mary seldom bother, for they have inherited that good part; But the Sons of Martha favour their Mother of the careful soul and the troubled heart And because she lost her temper once, and because she was rude to the Lord her Guest, Her Sons must wait upon Mary's Sons, world without end, reprieve, or rest. It is their care in all the ages to take the buffet and cushion the shock. It is their care that the gear engages; it is their care that the switches lock. It is their care that the wheels run truly; it is their care to embark and entrain, Tally, transport, and deliver duly the Sons of Mary by land and main."*

Engineers are called to a life of serving the public. They apply scientific principles to design, develop, and manufacture. They gaze into the future the best they can, based on science, experience, and a body of knowledge collected over the ages to leave legacy devices that endure for not one, but several generations to enjoy. It is fair to say that many engineers have never read Kipling's poem, and if they ever did, it no longer has a place in their daily toil.

It would appear that many engaged in the "invisible profession" care less about serving the public and more about using their good name, natural, and learned gifts to sell, promote, and devise ways and means to achieve excellence – generally a term equated with performance. It does not equate directly with serving the public good, but it can!

The success of the concrete pipe industry is based on centuries of knowledge and the application of science embedded in specifications and Standards that have key elements that can be tested and verified. Its engineers undergo continuous training and attend education programs of the American Concrete Pipe Association, and others, that remind them of the science associated with chemistry and physics in materials and structures. Sales/marketing, production, and design engineers know the products that they work and compete with, and strive to educate people who use and specify gravity pipe on the differing behaviors of rigid and flexible products. They pursue the quest for excellence, yet have a sense of their place in society as an engineer. They may have never read Kipling's famous poem, but their actions suggest that the pursuit of excellence can continue, while they "wait upon Mary's Sons, world without end, reprieve, or rest."

LINKS

- http://www.dailyprincetonian.com/2007/05/07/18407/, The Daily Princetonian, The Sons of Martha by Brian Kernighan, Columnist, published Monday, May 7, 2007.
- http://www.mindspring.com/~blackhart/The_Sons_of_Martha.html

Language in MAP-21 Guidance Endures Autonomy for States

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The new MAP-21 highway bill, effective October 1, 2012, streamlines many programs and provides numerous changes from the expiring SAFETEA-LU legislation. Identifying and understanding those changes can be rather tedious and time consuming. One new provision, however, is crystal clear. Section 1525 of the law provides states with complete autonomy in the selection of culvert material types for use on federal aid projects.

In posting the initial guidance documents for MAP-21, the FHWA addressed Section 1525 on its website. To learn more, go to http://www.fhwa.dot.gov/construction/cqit/culvert.cfm. The language is also included here:

The FHWA's policy for culvert and storm sewer material type selection is that State transportation departments and direct recipients of Federal-aid Highway construction funds shall have the autonomy to determine culvert and storm sewer material types to be included in Federal-aid highway construction projects.

On the website, there is a link to a memorandum that provides further guidance that states:

What is the significance of the word "autonomy" in Section 1525 of MAP-21?

The use of the word "autonomy" in this section gives the State departments of transportation (State DOTs) and other direct recipients the sole authority and discretion to make a decision regarding culvert and storm sewer material types without any input or approval from the FHWA.

How does Section 1525 apply to projects administered by local public agencies (LPAs)?

Local public agencies (LPAs), with the approval of their State DOT, will have the authority to determine culvert and storm sewer material types to be included in their Federal-aid highway construction projects.

This is good news for agencies that have experienced problems with less durable pipe, or pipe lacking the strength to be used under roadways or deep fills. Many engineers have tried materials other than concrete pipe and paid the price. An engineer can now use a proven pipe material based on his or her own experience. The memorandum also stipulates that federal projects must continue to comply with all applicable Federal requirements, including Buy America, culvert design standards in 23 CFR Part 625, and the restriction against the use of patented and proprietary products.

The American Concrete Pipe Association enthusiastically support this change. It puts the selection process, an engineering decision, back in the hands of the state DOT engineers where it belongs.

It is anticipated that a Notice of Proposed Rule Making (NPRM) will be published in the Federal Register during late October to early November 2012. A 30 day comment period will follow. The ACPA urges you to show your support of this important law by commenting on the NPRM at that time.

The ACPA is here to assist with any questions you have about concrete pipe as an integral part of your structurally sound and sustainable roadway systems.

18-inch concrete pipe replaces 12-year old HDPE pipe installation, September 15, 2011.

18-inch HDPE pipe was deformed one inch (5.5%) and had developed longitudinal cracks, Sept. 15, 2011.

Engineers' Considerations for Avoiding Flexible Pipe Problems

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On September 21, 2012, a sinkhole formed on McGregor Boulevard at Olmeda Way in Fort Myers, Florida revealing a collapsed 30-inch diameter, Type S wall high-density polyethylene (HDPE) storm pipe. The failure occurred nearly one year following the City's replacement of an 18-inch diameter Type S wall HDPE pipe with reinforced concrete pipe (RCP) along McGregor Boulevard near Stadler Drive. The HDPE storm sewer has reportedly been failing, since it was initially installed by the Florida Department of Transportation in approximately 1999. In-situ conditions appear typical for Florida storm sewer installations. Historically, the City of Fort Myers experiences conditions where the natural groundwater elevation fluctuates and is generally two to three feet above the pipe crown. Pipe depth is approximately six feet from the pipe crown to roadway surface.[1]

It appears that the asphalt pavement was "bridging" a large void that had eroded due to the failed 30-inch pipe. Upon excavation, samples of the failed 18-inch and 30-inch HDPE pipe showed signs of longitudinal cracking through the walls along the invert and obvert. Longitudinal cracks traversed the springline of the outer corrugations, and circumferential cracks were observed in the inner liner at the junction with the outer corrugation. The HDPE material of both failed pipes appeared brittle and the corrugations and bell could be easily manipulated by hand, suggesting the pipe's initial material properties may have diminished.[2]

Some may speculate that an HDPE pipe failure is simply the result of a poor installation, but there are often other factors that play a critical role.[2] While proper installation is critical for an HDPE pipe to structurally perform without exceeding a five percent deformation limit, it is also essential that professional engineers actively engage in the design, specification, and inspection of the flexible pipe installation.[3]

In the case of a separate pipe failure documented in *Greenfield Place Stormwater Investigation in Deerfield Township, Ohio*, the consulting engineer and HDPE pipe manufacturer apparently concluded that the contractor may have been responsible for HDPE pipe collapses.[4] However, in other failures, professional engineers had significantly more financial liability than the underground utility contractors. In the case of the INCA storm water and water main project in Boynton Beach, Florida, the contractor was awarded $1.2M from the consulting engineer in a legal dispute.[5,6] In the aftermath of the East Texas Fish Hatchery HDPE storm pipe failure, the consulting engineer settled for $3.3M in favor of the Texas Parks and Wildlife Department and the contractor.[7] The 2007 failure of corrugated HDPE storm pipe collapsed sections of the parking lot during construction of the Gateway Shoppes in Naples, Florida.[8] Subsequent litigation involving the developer, contractor, and engineer was not disposed until November 2010.[9]

As a general rule, flexible thermoplastic pipes are essentially liners that can lack the stiffness to support service loads unless properly installed within an engineered soil embedment. Strength certification of flexible pipe installations is a comprehensive process that should include engineering design for buoyancy, strain, deflection at service loads, and buckling resistance using long-term material properties, verification of geotechnical / groundwater conditions, actively managing proper installation, and post-installation inspection for deformation and other failure modes. Otherwise, the community, owners, contractors, and engineers are at risk.

1. On-site observations and discussions, Sept. 14 – 15, 2011.
2. On-site observations and discussions, September 24, 2012.
3. This example is noted only for illustration and discussion purposes. No opinion is offered as to any specific cause of the conditions noted in this example.
4. *Greenfield Place Stormwater Investigation, Deerfield Township, Ohio*, Report by Camp, Dresser, and McKee for the Deerfield Regional Storm Water District, May 2007.
5. Letter to Town of Golden Beach, Florida from Ric-Man Construction regarding Capital Improvement Program Project # 734-01, dated May 15, 2008.
6. Meeting with City of Boynton Beach, Florida, September 3, 2009.
7. HDPE Design and Construction: Lessons Learned from the East Texas Fish Hatchery Incident, American Concrete Pipe Association, Resource # e-011, April 2011, http://www.concrete-pipe.org/pages/epipe.html
8. Field observations at vicinity of Gateway Shoppes development in Naples, Florida, August 2007.
9. Uniform Case Number 112008CA0017320001XX, Collier County Clerk of the Circuit Court, Public Inquiry, http://apps.collierclerk.com/public_inquiry/Case.aspx?UCN=112008CA0017320001XX&CT=CV.

Low Head Pressure Pipe Relieves Devils Lake Flooding

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Cretex Concrete Products

Cretex Concrete Products of Maple Grove, Minnesota supplied 18,075 feet of 96-inch diameter B-75 low-head pressure pipe in a section of pipeline within a 5.5 mile alignment of the Devils Lake East End Outlet Project[1]. The pipeline was designed to utilize pumps on the upstream end, thereby creating pressures in some locations beyond standard C-76 concrete pipe design, therefore, the pipeline required low head pressure pipe. Although flooding was mitigated in the areas near and around the City of Devils Lake, North Dakota in 2000, more flood control measures were required. The 2011/12 project required the construction of a buried pipeline from East Devils Lake to the downstream side of Tolna Coulee. The outlet is capable of transferring 350 cubic feet per second from Devils Lake to the Sheyenne River.

Cretex[2] designed the pipe in accordance with ASTM C361 – 11 – *Standard Specification for Reinforced Concrete Low-Head Pressure Pipe*. But, provisions of the specifications for the project required that the pipe withstand an internal pressure of 120% of design for the 39 psi test, so this clause increased the pipe design requirements. Dry cast concrete was the process mainly used, although some wetcast was needed to provide additional production capacity. The pipe was produced with 4500 psi concrete strength; and tested according to ASTM C497 – 05 – *Standard Test Methods for Concrete Pipe, Manhole Sections*, *or Tile* for proof of design on one out of 100 pipes. Field testing of installed joints was according to ASTM C1103 - 03(2009) – *Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines* to confirm proper joint assembly. Numerous joint deflections were required to maintain the alignment. The method was to open a joint 3/8 of an inch to achieve the radius over many pipe units. The contractor was required to apply the C1103 test as each pipe was laid, and again after the pipe was backfilled. Cretex used its high-performance CX4 joint design, and was required to perform and furnish joint designs to meet the Bureau of Reclamation joint standards.

The project began in spring, 2011. Cretex produced 72-inch diameter pipe for testing and demonstrating the joint performance. After pipeline design changes occurred, the owner and engineer decided to use 96-inch diameter pipe, which went to bid, and produced under contract by Cretex. In addition, Cretex was responsible for drafting the piece layout, with bend start and end points; delivery and unloading of pipe into storage yards, or along the pipe trench and safe unloading to prevent damage to any joint; supply of an on-site representative; and facilitate a pre-installation training session for the contractor, along with production of a video for inclusion in the Cretex operations and maintenance manual. Cretex faced substantial penalties, if production and delivery was not completed by December 15, 2011.

The owner of the pipeline is North Dakota State Water Commission[3]. Bartlett & West[4] / AECOM[5] were the design engineers, and Garney Construction[6] the installation contractor. Pipe production began in mid-June, followed by full production in July. The final delivery of pipe occurred on October 26. Included was the supply of 1,275 feet of 96-inch diameter steel pipe for higher pressure areas. The steel pipe had access openings, pressure release valves, and fittings. The value of the pre-purchase pipe contract was $10.3 million.

Cretex was responsible for drafting the piece layout, with bend start and end points.

Cretex was responsible for delivery and unloading of pipe into storage yards, along trench and safe unloading to prevent damage.

Installation of 96-inch diameter B-75 low-head pressure pipe

LINKS

1. www.swc.state.nd.us/4dlink9/4dcgi/GetContentPDF/PB-2176/August%2017,%202011.pdf
2. www.iowaconcrete.com/
3. www.swc.state.nd.us/4dlink9/4dcgi/redirect/index.html
4. www.bartwest.com/
5. www.aecom.com/
6. www.garney.com/

Learn More About Buried infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (devils, pressure, corps, aquifer, flood)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

RCP With Liner the "Flexible" Choice for Deep Sanitary Sewers

By Matt Mueller, P.E. Sales Engineer
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Corrosive conditions in sanitary sewer installations are exacerbated in larger diameter sewers, due to low grades and low initial flow conditions. Such conditions were considered in Phases 3 and 4 of the North Gratiot Interceptor (NGI) project in Macomb County, Michigan, which includes over 45,000 feet of gravity and forcemain sanitary sewer. The NGI is being implemented by the office of the Macomb County Public Works Commissioner[1] to provide additional service capacity to Northeastern Macomb County.

The new interceptor serves over 20,000 properties and must incorporate design considerations which increase life expectancy and reduce maintenance costs. Phase 1 of the project consists of constructing approximately 13,000 feet of 66-inch diameter sewer. It receives flow from existing sewers and a future phase, then discharges at the end of an existing sewer tunnel constructed in the 1970s. Construction methods employed included tunneling, open cut and directional drilling, for the specific phase and the set of design/construction challenges such as deep bury, yielding wet soil, glacial till (hard pan), ground water, boulders, and trench stability.

After evaluating the requirements for Phases 3 and 4, plans specified reinforced concrete pipe (RCP), with a T-Lock PVC Liner to protect against diluted sulfuric acid (generated by hydrogen sulphide gas)[2] and extend the life of the pipeline for more than 70 years. RCP C76 CL V with a T-Lock PVC liner[3] (base bid) and dual wall PVC profile pipe (alternate bid) were specified on the plans. Each pipe material was to be bid at an installed cost. The owner selected the RCP option, at slightly higher installed costs on the merits of strength, durability, and corrosion resistance. The design engineers included laser profiling of all pipe. Both the engineer and the contractor expressed concerns with the flexible pipe system installed at depths in excess of 30 feet, and in constructability issues which required meeting the basic design challenges and passing the laser profiling specification.

The concrete pipe producer, Northern Concrete Pipe Inc., proposed the use of 16 foot lengths of "pre-bed" RCP C76 CLV with T-Lock PVC liner. The concrete pipe would best fit the 20-foot trench box in a deep bury condition, which helped expedite the installation effort for the contractor, eliminate 50% of the joints, include a corrosion resistant T-Lock liner, and most importantly, maintain superior haunch support inherent to the shape of the "pre-bed" pipe. By offering pre-bed pipe to expedite the project, the concrete pipe industry demonstrated its "flexibility" to efficiently solve design challenges faced by infrastructure owners and design engineers.

The project team was comprised of: Anthony V. Marrocco, Macomb County Public Works Commissioner; consulting engineering design firms - Anderson, Eckstein and Westrick (AEW), Huron Consultants, and Spalding DeDecker Associates (SDA); contractor - Pamar Enterprises Inc.

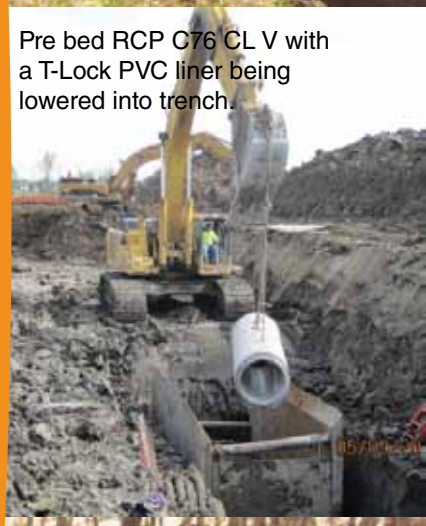
LINKS

1. www.macombcountymi.gov/publicworks/
2. www.concrete-pipe.org/pdf/Post_Install_Inspect_081011.pdf
3. www.concrete-pipe.org/pages/faqs.html

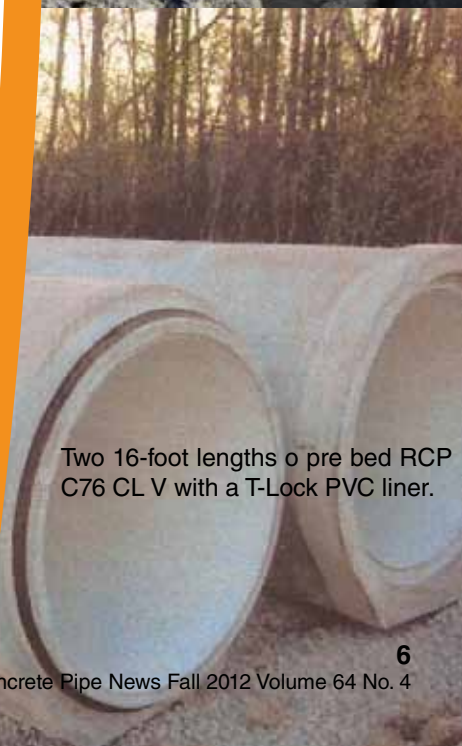
Learn More About Buried Infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (pre bed, reinforced concrete pipe, sulfur, gas, liner, service life, durability, sanitary)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

Track hoe supported by newly installed RCP.



Pre bed RCP C76 CL V with a T-Lock PVC liner being lowered into trench.



Two 16-foot lengths o pre bed RCP C76 CL V with a T-Lock PVC liner.

Precast concrete boxes supplied by Hanson Pipe & Precast for McLennan County IH-35 widening located near Waco, Texas.

Base Dimensions (W X L)	Minimum Inside Height	Incremen
3' x 3'	3'6"	3"
4' x 4'	4'6"	3"
3' x 5'	3'6"	3"
4' x 5'	4'6"	3"
5' x 5'	5'6"	3"
5' x 6'	6'6"	3"
6' x 6'	6'6"	3"
8' x 8'	8'6"	3"
48" round	2'6"	3"
60" round	3'6"	3"
72" round	4'6"	3"

The Standard reduces the number of different products from several hundred to 11.

Manholes such as this installed on TxDOT projects.

Continuous Standards and Specifications Development and Improvement is Job One for ACPA

It has been said or implied in previous Concrete Pipe News editorials[1] that the backbone of the concrete pipe industry is its product and material standards, supported by more Standards and specifications for testing, installation and inspection. The American Concrete Pipe Association producers and staff spent long hours over the past three years working on improvements to ASTM[2] and TxDOT[3] Standards that make a difference to the quality and subsequent durability of America's buried infrastructure.

In late 2011, ASTM released ASTM C1675 11 *Standard Practice for Installation of Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers* that covers the installation of precast reinforced concrete box sections cast monolithically. It is for the conveyance of storm water, industrial wastes and sewage, and for passageways. ACPA reviewed, contributed information, and commented on ASTM's documents in the preparation of this Standard. ASTM is a not-for-profit organization that provides a forum for the development and publication of voluntary consensus standards for materials, products, systems, and services. To purchase a copy, go to http://www.astm.org/Standards/C1675.htm.

In addition to ASTM, ACPA works closely with State Departments of Transportation in developing Standards to suit local needs. The Association has a long history working with TxDOT to have some of the best Standards and specifications for concrete pipe, boxes and manholes. TxDOT notes[4] there can be major energy losses (flow) in manholes resulting from friction within the pipe. Minor losses include those attributed to junctions, exits, bends in pipes, manholes, expansion and contraction, and appurtenances such as valves and meters. Minor losses in a storm drain system are usually insignificant. In a large system, however, their combined effect may be significant. You may minimize the hydraulic loss potential at junctions, bends, manholes, and confluences to some extent by careful design. Well-designed manholes and inlets, where there are no sharp or sudden transitions or impediments to the flow, cause virtually no significant losses.

After several months of work through 2011 and 2012 between TxDOT, ACPA staff and the Texas Concrete Pipe Association (TCPA), they all agreed to a program for a layout protocol, installation and inspection of precast concrete inlets and manholes. The TxDOT Inlet and Manhole Standard[5] standardizes the inlets and manholes that TxDOT uses. The Standard reduces the number of different products from several hundred to 11. In addition, the Standard reduces costs, normalizes expectations and improves installation. This Standard will be maintained by a joint task force comprised of personnel from TxDOT and the TCPA.

Seminars about the new TxDOT Standard are available at no charge from the Texas Concrete Pipe Association / American Concrete Pipe Association, 8445 Freeport Parkway, Suite 350, Irving, Texas 75063; Tel. 972-506-7216; info@concrete-pipe.org.

LINKS

1. www.concrete-pipe.org/magazine/2012wintercpnews.html (Page 2)
2. www.astm.org/
3. www.dot.state.tx.us/
4. http://onlinemanuals.txdot.gov/txdotmanuals/hyd/conduit_systems_energy_losses.htm
5. A Guide to the TxDOT Standard Inlet & Manhole Program (www.concrete-pipe.org/pdf/standard-installation.pdf)

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CAMPAIGN FOR EXCELLENCE

ACPA 2013 Pipe School

January 9 - 12, 2013 Indianapolis, Indiana

ACPA will be launching a "Campaign for Excellence" at the 2013 Pipe School, with 2.5 days of concrete pipe education and over 20 PDHs available. Join your counterparts from across the industry for schooling in the areas of sales and marketing, production, quality, safety, and engineering design.

New classes with new concepts presented in a new environment will make this a school to remember. Begin your personal Campaign for Excellence at this school and be a winner every time! Don't miss this opportunity to interact with some of the most experienced and knowledgeable instructors in North America.

The highlights of the school include:

DOT Panel: The Pipe School will feature a Panel Discussion, where we will have the opportunity to interact with DOT (State Department of Transportation) engineers and discover what they are looking for in our products and what leads them to the decisions regarding storm drainage products.

ACPA Quality School: This three day course includes all the tools that will make you a real asset to your company.

Politics in Transportation: ACPA Chairman Vince Bussio and Treasurer Rick Traylor will kick off the school discussing the new Highway Bill and how changes to this bill will affect your career.

ACPA P^3 Courses (RCP Technology and Effective Sales/Marketing): A new benefit at this year's school will be a kick off for P^3 training. By teaching a sampling of the courses and providing the opportunity to take some sample tests, you will be energized to complete the course.

In-Plant Hands-on Production Clinics: Two of the three days of sessions will be held in the Independent Concrete Pipe Company and Rinker Materials - Concrete Pipe Division CEMEX plants. This will allow attendees to see the equipment and direct questions to the instructors. You will be able to work through solutions alongside specialists in areas that include pipe making equipment, cage manufacturing, header and pallet maintenance, safety, vibration techniques and much more.

Save this link www.concrete-pipe.org/pages/cpnews.html to your favorites list to increase your knowledge about drainage applications and innovative ways to use precast reinforced concrete pipe and boxes to build structures that will last.