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On the Cover:

Triple run of 108-inch diameter reinforced concrete storm sewer pipe-lines in Omaha Nebraska.

Cover Photo: Rick Phillips, American Concrete Products Company

American **Concrete Pipe** Association

Editorial

Autonomy Under MAP-21 Means Greater Attention To Standard of Care for Engineers

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

If it wasn't so serious, you might joke; "Be careful what you wish for!" Engineers who worked long and hard with lawmakers to enact MAP-21 on July 6, 2012, however, should be pleased with the implications of the legislation. The *Moving Ahead For Progress in the 21st Century Act* (MAP-21), clearly states that "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" (Section 1525). Responsibility now lies with the engineer involved in State infrastructure design, specifications, value engineering, and construction to deliver a constructible project that meets the desired purpose, and protects the health, safety and welfare of the user.

Before making a final recommendation, or offer a professional opinion to a client, the engineer involved in a drainage pipeline project has several responsibilities. The engineer must ensure that life cycle costs are analyzed, the risks associated with the chosen pipe product are identified, and the client has to be informed about the short-term and long-term costs, as well as any other risks that may be identified during the selection of pipe material. *If a design is found to be faulty and there is injury to either property or to a person, and the engineer is found not to have met his/her standard of care, then the engineer is deemed negligent. This could result in not only monetary damages, but ultimately in the loss of the engineer's license. Additionally, the engineer may be criminally responsible for any deaths caused by poor engineering. While engineers are typically not legally trained, any engineer who stamps a drawing certifying that a design will meet the intended purpose of the contract should understand the concepts of standard of care, negligence and liability* (Pat Galloway, 2006).

ASTM D2321-09 states that the engineer is to verify and assure that the pipe installed according to this specification will provide long term, satisfactory performance. It is incumbent upon the product manufacturer, specifier, or engineer to verify and assure that the pipe specified for an intended application, when installed according to procedures outlined in ASTM D2321-09, will provide a long-term, satisfactory performance according to criteria established for that application. Engineers involved in pipeline and highway culvert projects must read and understand the most recent ASTM and AASHTO Standards. In addition, it is important for engineers to read the fine print in product publications of manufacturers. Fine print often distances products from warranties and liability, placing performance of product and material on the actions of the engineer and owner, especially the engineer's standard of care. The Order of the Engineer, as well as Professional Society Codes of Ethics and State Licensing Boards, define the engineer's role and responsibility.

MAP-21 is good legislation. It places the responsibility for delivering durable infrastructure squarely on the shoulders of the engineer and not elected representatives or pipe manufacturers. Giving engineers the autonomy to make the right choice was the right thing to do.

LINKS

- www.concrete-pipe.org/pdf/2006FallR&BStormwatersuppbyGallowaypipesreprint.pdf
  Read between the Pipes, by Dr. Patricia D. Galloway, Storm Water, Fall 2006
- www.concrete-pipe.org/epipe/ASTMD2321AFewofYourResponsibilities_ePipe013.pdf
  ASTM 2321 – A Few Of Your responsibilities (e-Pipe 012)

Sewer Separation Project Improves Water Quality and Accommodates Growth

By Rick Phillips
Manager of Business Development
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Concrete pipe is being used to install storm and sanitary sewers on the $15.8 million Nicholas Street Phase 1 Project[1] in Omaha, Nebraska. Three, 108-inch diameter storm sewers and one 24-inch diameter sanitary sewer are being extended west from Abbott Drive. An existing combined sewer on 11th Street was removed and replaced with a new storm and sanitary sewer, and a new sanitary sewer was constructed along Clark Street. The project had one railroad crossing where jack and bore methods[2] were required. All pipes were constructed with confined O-ring joints[3]. The project improves water quality in the Missouri River by removing a large volume of stormwater runoff from a combined sewer system, and increases storm sewer capacity in an underserved area.

The combined sewer on 11th Street was rebuilt as a new 42-inch to 72-inch diameter storm sewer system. The 24-inch sanitary sewer on Abbott Drive is designed to provide a separate sanitary sewer. Upon full extension, this sewer will allow the city to eliminate a sanitary pump station.

In general, all four pipelines were constructed in one trench. Type "A" rip-rap and geogrid were used to stabilized the bottom of the trench and 3-inch crushed limestone was used as pipe bedding material to the spring line of the pipe. The pipe bends were constructed using pre-cast 108-inch diameter bend sections. All of the ASTM C-361 O-ring joints were air-tested per ASTM Standards.

The 108-inch reinforced concrete pipe (RCP) was produced by a dry-cast production method in eight-foot lengths. One of the 108-inch diameter concrete pipelines extended for 1,385 feet. It was produced to ASTM Specification C-655 with a D-Load of 1350-D. The other two lines were produced to ASTM Specification C-361, B-25 and C-25 designs, running for 3,891 feet and 678 feet, respectively. A twin run of 108-inch RCP Class 5 bore travelled 114 feet under the railroad track.

The 108-inch diameter pipe was shipped one piece per load on drop deck trailers, and offloaded by Hawkins Construction Company[4] with a Manitowoc Crane. Completion of construction by a specific date added an important element to the project and placed additional responsibility on the pipe producer to maintain a rigorous production and shipping schedule.

The Owner of the project is the City of Omaha. Lamp Rynearson & Associates[5] provided design, construction administration and staking on the project, completing the project as a member of the City of Omaha's Combined Sewer Overflow Program Management Team. The Program Management Team included CH2M Hill[6] and HDR[7]. Hawkins Construction is the prime contractor. Thiele Geotech, Inc.[8] provided the geotechnical recommendations and material testing. Phase 1 is scheduled for a June 2013 completion, while the City's entire combined sewer overflow program is scheduled for completion in 2027.

Installing 108-inch diameter concrete pipe bends.

Photo: Dave McIvor, Lamp Rynearson & Associates

108-inch diameter concrete pipe emerging under roadway.

Photo: Rick Phillips, American Concrete Products Company

Crushed limestone was used as pipe bedding material to the spring line. Photo: Dave McIvor, Lamp Rynearson & Associates

LINKS

1. http://omahacso.com/projects/nicholasph1.html
2. www.concrete-pipe.org/pdfdd/DD_4.pdf
3. www.concrete-pipe.org/epipe/ConcretePipeJointsBrochureFormat-highrez-epipe07-124.pdf
4. www.hawkins1.com/main.html
5. www.lra-inc.com/
6. www.ch2m.com/corporate/
7. www.hdrinc.com/
8. www.thielegeotech.com/

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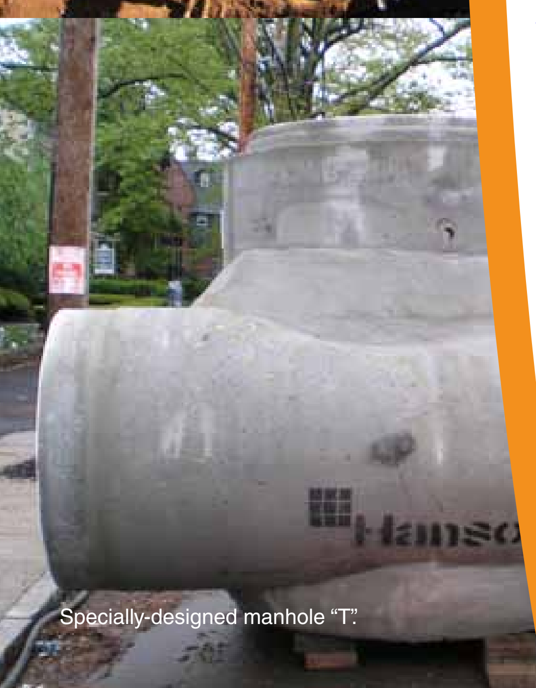
30-inch diameter diversion chamber.

Jacking pipe required because of shallow cover.



Specially-designed manhole “T”.

Life of Historic Sewer Extended with RCP

By Donald Lepley, P.E.
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A 60-inch diameter brick combined sewer built in the 1860s serving downtown New Haven and Yale University was separated, leaving the brick sewer to continue carrying a lower volume of sanitary sewage while storm water was redirected to a new 72-inch diameter reinforced concrete storm sewer. The brick sewer had collected storm water from building roof leaders, runoff from streets and parking lots, and about 120 acres of previously separated storm water from upstream areas. It required separation because it could no longer accommodate increased combined flows during heavy rain and snowfall.

The combined sewer separation project redirected all sewage from building sanitary sewer laterals into a new 36-inch reinforced concrete pipe (RCP)[1] sewer. All storm water is carried by the new 72-inch diameter concrete pipeline. The project required three parallel sewer pipelines installed in close proximity along Trumbull Street; a new 36-inch diameter RCP sanitary sewer, a new 72-inch diameter RCP storm sewer, and the existing 60-inch diameter brick sewer. Over a year prior to bidding and construction, the Meriden Connecticut-based engineering firm, Cardinal Engineering[2], contacted Hanson Pipe & Precast to discuss design feasibility and structure options for their aggressive project design needs.

Phase 1A of the Trumbull Street sewer separation project[3] included construction of approximately 3,200 feet of 36-inch to 72-inch diameter storm and sanitary sewers using the trenchless jacking method. In addition, the New Haven-based contractor, C.J. Fucci Construction Inc.[4], installed 2,500 feet of 15-inch to 24-inch diameter RCP storm sewers by open cut excavation, setting in place precast storm and sanitary sewer manholes, catch basins and other special structures, and performing surface restoration.

The jacking method[5] of installation was the preferred choice along Trumbull Street because of the need to avoid existing utilities and services, and to protect the root systems of legacy trees lining the busy thoroughfare.

M & P Pipe Jacking Corp. of Newington, Connecticut jacked the 36-inch and 72-inch diameter pipe side-by-side, with the smaller pipe slightly lower than the larger pipe and only 5 feet between their centerlines. The 72-inch diameter RCP and 60-inch brick sewer are typically separated by one to two feet. In one area near the intersection of Trumbull Street, Temple Street and Whitney Avenue, there was not enough space to install a single 72-inch diameter pipe, so twin 48-inch diameter pipes were installed. In some places there was only 2.5 feet of cover over the 72-inch pipe.

M & P jacked about 900 feet of 36-inch diameter RCP, 1,250 feet of 72-inch diameter RCP, and 520 feet of twin 48-inch diameter RCP. All RCP was manufactured by Hanson Pipe and Precast[6], supplied through VIP Supply Inc. of Clinton, Connecticut.

Archived Article published July 4, 2012
www.site-kconstructionzone.com/?p=7803

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2. www.cardinalengineers.com
3. www.gnhwpca.com/construction_alerts_3.aspx
4. www.cjfucci.com/
5. www.concrete-pipe.org/pdfdd/DD_4.pdf
6. www.hansonpipeandprecast.com/

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  (trenchless, jacking, sanitary, storm, brick)
  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

Photos: Dean Logee,
Hanson Pipe & Precast

Precast Box Underpass for Golf Carts and Maintenance Vehicles

By Mike Riddle
Product Marketing Manager
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The UDOT Design Team and Copper Hills Constructors worked with Geneva Pipe and Precast[1] to design a 264 foot, 18-foot x 12-foot precast box pedestrian underpass under the newly constructed Mountain View Corridor (SR-85) State freeway in northern Utah. Precast concrete was favored over cast-in-place due to the speed of installation and consistent quality characteristic of precast concrete installations.

The long awaited highway, on the west side of the Salt Lake valley, bisects the West Ridge Golf Course. An underpass was required to join two parts of the course. The box structure provides a tunnel for golf carts and maintenance equipment to pass under SR-85, thereby eliminating the danger of collisions with highway traffic.

The design required that the box structure support AASHTO HL-93 live load with cover of 3 feet 6 inches to 10 feet 8 inches. In addition, the culvert needed to be able to support construction loads created by a CAT-775 dump truck and a CAT-657 wheeled scraper. To accommodate these loads, a 14-inch top and bottom slab was required in each wet-cast box section. Each section was five feet long and weighed 58,000 pounds. Each section was shipped horizontally and then rotated upward by the contractor on site. To facilitate joining the box sections, the contractor placed a twelve-inch wide piece of Masonite® on the compacted base to keep the joints clean during installation. The contractor used dual heavy-duty come-along devices on the inside of the box structure to bring the sections together with just a half-inch gap.

As AASHTO required Load and Resistance Factor Design (LRFD) to become the standard for structures, updating the load rating criteria for structures has evolved to a Load and Resistance Factor Rating (LRFR) requirement. The load rating process has been updated to LRFR[2] such that if a check of the design load (HL-93) yields a satisfactory load rating, then the bridge owner can assume that the bridge will yield satisfactory load ratings for all AASHTO legal loads. While FHWA guidance requires load ratings on structures with spans greater than 20 feet, UDOT felt that this box culvert should be load rated due to its importance. Geneva Pipe went through an extensive design process to provide UDOT with the load rating calculations showing that this structure was designed to meet the latest standards. The ACPA is currently in the process of developing new software that will aid the user in calculating load ratings for the applications where spans are greater than 20 feet.

Wing walls were poured-in-place requiring forty yards of concrete per wall, due to the size of the walls. The contractor placed an asphalt wearing surface on the floor of the tunnel and electrical lighting for safety. John Bauer, project manager for Copper Hills Constructors, was pleased to see that the underpass was completed early, within five days.

LINKS

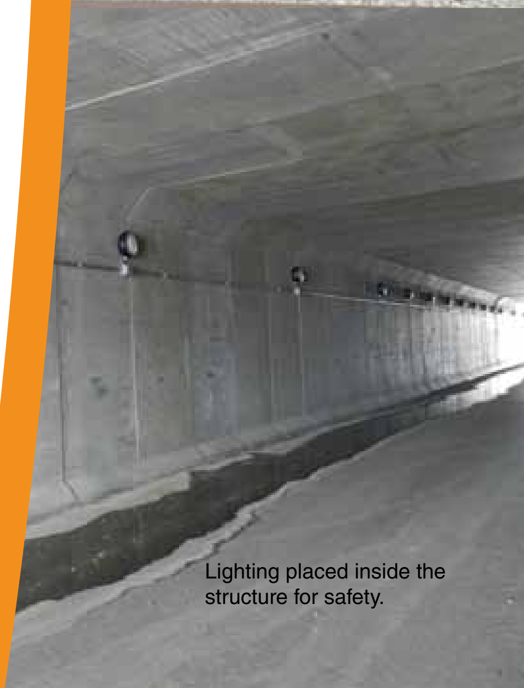
1. www.genevapipe.com
2. www.fhwa.dot.gov/publications/publicroads/05jul/09.cfm

Learn More About Buried infrastructure

- **Keyword Search on American Concrete Pipe Association Website** (box, pedestrian, Utah, underpass) 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

264 foot pedestrian and vehicular underpass under SR-85, Utah.

Masonite® placed on the compacted base to keep the joints clean.



Lighting placed inside the structure for safety.

Photos: Geneva Pipe & Precast

Four barrel storm drainage structure adjacent to dual barrel reinforced concrete box installation.

Mega Project Required Mega Boxes for Nevada Monsoons

By Mike Mula
Las Vegas Pipe
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The Tenaya – Decatur drainage project[1] in the northern portion of the Las Vegas Valley specified over 3 miles of reinforced concrete boxes (RCB) to accommodate seasonal monsoons. Mega boxes were used for 1.5 miles of a three mile segment. The mega box order consisted of 1,592 feet of dual barrel (15-foot x 9-foot) box; 736 feet of four barrel (13.5-foot x 10-foot) box; and, 732 feet of four barrel (13.5-feet x 9-foot) box sections. In addition, there was over 3.5 miles of reinforced concrete pipe (RCP) ranging in sizes from 18 to 66 inches.

The project is located in a fast growth area of Las Vegas. Completed upstream storm drain improvements channel monsoonal flows directly into the Teneya-Decatur drainage project. Cast in place box was an option for all of the RCB, but was mandatory for the sweeping four barrel 13.5-foot x 10-foot and 13.5-foot x 9-foot boxes due to hydraulic and flow equalization concerns.

The contractor's preference was to use precast boxes for the new box installations to not only expedite completion of the contract, but to construct an incrementally complete structure that could accommodate flood waters during a storm. Rinker Materials-Concrete Pipe Division of Cemex sales and engineering personnel worked with contractor Las Vegas Paving Corporation and the project's design engineer GC Wallace to mitigate the hydraulic concerns. Innovative design included the flow equalization openings across the four barrel drainage structure. This included providing a special treatment of the edges around the flow equalization openings to minimize the impact on the hydraulic flow.

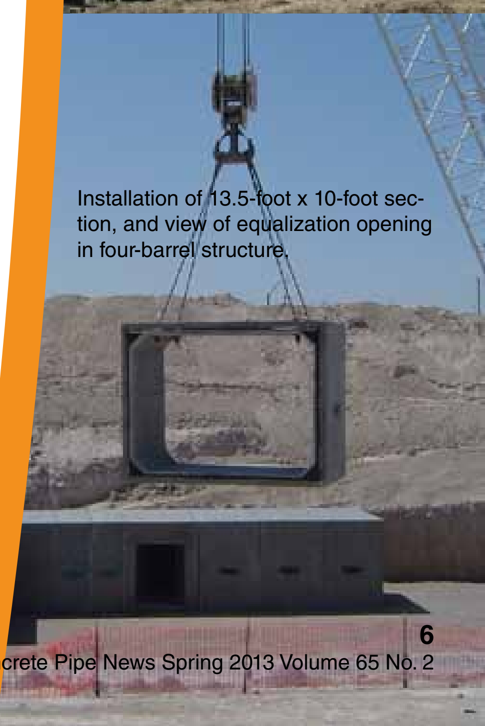
The mega box order consisted of 1,592 feet of dual barrel (15-foot x 9-foot) box; 736 feet of four barrel (13.5-foot x 10-foot) box; and, 732 feet of four barrel (13.5-feet x 9-foot) box sections.

Rinker received the final order for the RCP products and all of the RCB's from Las Vegas Paving in October 2011. The project was the largest phase of the I-215 beltway project that required more than $53 million of new drainage infrastructure.

"Mega Boxes" are RCBs with single cell spans greater than 12 feet. These monolithic precast boxes were designed according to ASTM C1433 - 10 Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers[2]. The Standard covers Interstate live loading for as much as 39 feet of earth cover. Flow equalization of deep cover (13.5-foot x 10-foot) box segments weighed approximately 40 tons each.

Rinker Materials-Concrete Pipe Division CEMEX[3] sales and engineering personnel worked with the contractor, Las Vegas Paving Corporation[4] and the project's Design Engineer, GC Wallace[5] to mitigate the hydraulic concerns. Innovative design included the flow equalization openings across the four barrel drainage structure. This included providing a special treatment of the edges around the flow equalization openings to minimize the impact on the hydraulic flow.

Rinker Materials shipped more than 50,000 tons of precast pipe and boxes to the project that is scheduled for completion in 2013.



Installation of 13.5-foot x 10-foot section, and view of equalization opening in four-barrel structure.

LINKS

1. www.clarkcountynv.gov/Depts/public_works/PW_Projects/Pages/215Beltway.aspx
2. www.astm.org/Standards/C1433.htm
3. www.rinkerpipe.com/default.shtml
4. www.lasvegaspaving.com/index.asp
5. www.gcwallace.com/AboutUs.asp

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Photos: Dave Sterling and Otto Nero


500 feet of HDPE replaced with RCP.


Deformed 60-inch HDPE pipe adjacent to retaining wall anchoring system.


60-inch RCP to replace HDPE pipe.

Port Canaveral Reinforces It's Storm Pipe Infrastructure

By Douglas J. Holdener, P.E.
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During summer 2012, a pothole and subsidence occurred in the employee parking lot of Cruise Terminal 10 at Port Canaveral, Florida. Canaveral Port Authority determined that a 400-feet run of 60-inch diameter high-density polyethylene (HDPE) storm pipe needed to be replaced with reinforced concrete pipe (RCP). On September 19, 2012, the Canaveral Port Authority Commission authorized a $325,000 increase to an existing Doug Wilson Enterprises[1] contract for the replacement. Doug Wilson Enterprises subcontracted with Renegade Underground, which purchased 60-inch ASTM C 76 Class III RCP from Rinker Materials Concrete Pipe Division[2].

The Canaveral Port Authority is among numerous other agencies burdened by thermoplastic pipe problems and hazards. The City of Fort Myers, Florida has experienced ongoing HDPE pipe failures and replacements from a McGregor Boulevard project[3] installed in 2000. In 2010 and 2011, HDPE pipe fires destroyed storm sewers in the Arizona communities of Tucson and Prescott[4], and a Texas Parks and Wildlife Department fish hatchery project[5] was significantly impacted by the failure and replacement of 11,000 feet of HDPE storm pipe in 2009. In July 2012, a 60-inch diameter polypropylene storm pipe succumbed to groundwater hydrostatic forces at the Port Columbus International Airport in Columbus, Ohio[6] and literally floated out of the ground.

The Canaveral project posed several challenges to overcome. The failed HDPE pipe was 12 feet deep to the top of the pipe, which necessitated a trench box. The parking lot was constructed on approximately 20 feet of dredged fill, supported by a retaining wall. The failed HDPE pipe ran in between re-bar tieback anchors for the retaining wall. The pipe installation was submerged in groundwater and is in a tidal fluctuating zone, which warranted extensive, continuous dewatering.

The HDPE pipe was installed approximately 10 years ago. Three other HDPE storm pipe runs in the Terminal 10 lot are being monitored to determine if mitigation is necessary. If needed, those HDPE runs will be replaced with RCP. Given the Port's problems with HDPE pipe, the Port will consider using RCP for all storm sewer installations.

LINKS

1. http://dougwilsongeneralcontractor.com
2. www.rinkerpipe.com/default.shtml
3. www.rinkerpipe.com/TechnicalInformation/CaseStudy/0779_001.pdf
4. www.concrete-pipe.org/epipe/TusconandPrescottFire_ePipe016.pdf
5. www.concrete-pipe.org/pdf/HDPEPipeDesignandConstructionLessonsLearnedEastTexasFishHatcheryIncident_ePipe011.pdf
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Photos: Douglas J. Holdener, P.E.

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ACPA Hydraulic App Available from the Apple Store is a Concrete Pipe Industry First

ACPA's Hydraulic Comparison App is available for download from Apple iTunes. The search word is "Compare Flow". It is also available for Android devices.

The app is a relatively simple one, and there are many enhancements that ACPA can make. At the moment, its primary use is to compare flow capacity of one type of pipe to another.

Get the app now by going to https://itunes.apple.com/us/app/compare-flow/id581217854?mt=8.

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By iENGINEERING Corporation

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.