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On the Cover:

PII demonstration and plant tour at the Rinker Materials Concrete Pipe Division - CEMEX Frederick Maryland plant.

American Concrete Pipe Association

Editorial

If You Don't Have Standards Based on Applied Science and Validated Research, You have Nothing...

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

The backbone of the concrete pipe industry is its product and material standards, supported by more standards and specifications for testing, installation and inspection. Developed over three centuries (yes, that's right – three centuries – late 1800s, 1900s and now 2000s), specifiers and owners of concrete pipelines and culverts know what they are getting. Concrete pipe[1] and box mixes and the ingredients of any cement type are well known and tested many times over. The chemistry of aggregates and water for durable concrete has been studied and field tested well over 100 years. And the reinforcing steel and its chemistry are no less understood than the chemistry of cement. Because of this knowledge, we have lasting concrete pipelines and culverts that are still functioning after 100 years.

The question begs to be asked, what's going on with the premature failures[2] of corrugated steel and thermoplastic conduit products and materials used for gravity pipelines and culverts? Are their standards not based on applied science and validated research? Is the issue beyond standards for proper installation leading to structural performance and post installation inspection? Contractors are following standards and specifications, yet flexible pipeline and culvert failures continue. Has industry and manufacturers overlooked the chemistry of ingredients in resins and the mixes for thermoplastic pipelines, and thin walled steel conduits? Corrugated steel culverts rarely reach the end of the manufacturer's claimed service life in a high quality condition. Many do not come close to performing as expected. Thermoplastic gravity pipelines, especially HDPE[3] are costing manufacturers, design engineers, owners and contractors a lot of money in settlements to repair and compensate the public for new installations, which are often concrete.

Designers and specifiers (who are often the same team or person) are obligated to consider using the right product and material for a structure. If it is obvious that high performance is needed, why settle for a lesser product and material than concrete, if the industry Standard or manufacturer's leaves unanswered questions? Is the decision solely on price when a decades-long design is the first choice? The preponderance of installations using low-cost pipeline and culvert material would tend to make you believe that price is the determining factor, not science and time-tested Standards. Public policy favouring low bid contracts must exacerbate the low bid ethos resulting in cheap flexible pipelines and culverts with questionable performance[4].

The caution flags are flying; does anybody care? What's it going to take to bring the Standards of flexible conduit gravity products up to levels that give the same kind of assurance that concrete pipe enjoys? It is hard to believe that any public agency or manufacturer in America would not want gravity pipeline and culvert materials to perform for the design life of public and private sector projects. The time has passed for more voodoo science. Industry needs to know what it is that is resulting in the premature failures of flexible gravity pipelines and culverts. If the public sector cannot take the lead, industry is more than capable using alliances and partnerships with the best researchers and applied scientists in the world. We do not have to settle for a legacy of poorly performing infrastructure assets constructed of questionable products and materials.

LINKS

1. http://www.concrete-pipe.org/why.htm
2. http://www.concrete-pipe.org/brochures/collapse.pdf
3. http://www.concrete-pipe.org/epipe/HDPEPipeDesignandConstructionLessonsLearnedEastTexasFishHatcheryIncident_ePipe011.pdf
4. http://www.concrete-pipe.org/pdf/economiccosts.pdf
5. http://www.concrete-pipe.org/pdf/2006%2008%20KY%20OH%20Exec%20Summary%20final.pdf

Bridging The Technology Gap

Post Installation Inspection (PII) Demonstrations and Plant Tours Bridge Design Theory and Practice with Knowledge

Many municipalities require Pipeline Assessment and Certification Program (PACP)[1]-certified inspectors and condition assessment codes to be used for pipeline condition assessments. As more post installation inspection data is generated and presented to owners, engineers, and inspection professionals, the need to properly and quickly evaluate the issues in the inspection documents becomes critical.

Concrete pipe associations have taken the initiative to host post installation inspection demonstrations, combined with concrete pipe plant tours. A PII demonstration and plant tour in October sponsored by The Central Atlantic Precast Concrete Association (CAPCA)[2] at the Rinker Materials Concrete Pipe Division - CEMEX Frederick Maryland plant exemplified all that could be expected from a concrete pipe industry event. Once everyone was registered, introductions were made followed by three presentations.

- Post installation inspection and reinforced concrete pipe (RCP) evaluation procedures[3] by Al Hogan (ACPA).
- An introduction and overview of Robotic Video & Laser Profiling Analysis by Mead & Hunt.[4]
- A plant safety and tour overview by John Wohlfarth (Rinker Materials).

A "self-guided" 30-minute plant tour followed the presentations where attendees were guided along a route where they could observe the various stages of concrete pipe production. Viewing stations were set up to observe reinforcement cage production, cage delivery, pipe removal from the pre-kiln floor, rounding ring removal, the pipe production machine, pipe production cycle, removal of the pipe to kiln cars, tip out, deburring, stenciling, quality control, yarding, a three-edge bearing (3EB) test, and autogenous healing. Easy to read signs were posted at each station so that guests could view production and read about what they were observing.

At the autogenous healing display, four units of pipe that were intentionally cracked (to 0.01 inch and ultimate) a month earlier. They were displayed bell down on mastic sealant and filled with water. By the time of the October demonstration, the units were almost completely healed.

A 3EB test was conducted on a 60-inch diameter Class IV pipe. It was loaded to 0.01 inch crack (80,000 lbs), and then the loading was stopped. Guests were allowed to observe and measure the cracks. The pipe was then loaded to ultimate (120,000 lbs) and failure.

A demonstration of post installation inspection equipment used 36-inch diameter concrete pipe and 24-inch diameter HDPE conduit. The concrete pipe was characterized by induced cracks (dimes inserted to keep them open), and an open joint. The HDPE conduit was subjected to induced horizontal and vertical deflection. Laser profiling equipment showed deflection measurements, and a video micrometer recorded crack measurement and joint gaps.

ACPA has developed a PII demonstration tool kit that includes sample PowerPoint presentations, *How To* notes for key demonstration components, and plant tour suggestions. Member companies of the ACPA may approach ACPA staff for a copy of the tool kit, and assistance in planning for their own PII demonstration.

More info here

LINKS

1. http://www.nassco.org/training_edu/te_pacp_csv.html
2. http://www.capca-precast.org/
3. Contact a local ACPA concrete pipe producer to obtain a copy of the concrete pipe industry's *Post Installation Evaluation and Repair of Installed Reinforced Concrete Pipe.*
4. http://www.meadhunt.com/

Learn More About Buried infrastructure

- **Keyword Search on American Concrete Pipe Association Website**
  (installation, crack, inspection, laser, video)
  www.concrete-pipe.org
- **Concrete Pipe News**
  http://www.concrete-pipe.org/magazine/2011fallcpnews.html (Page 3)

Self-guided 30-minute plant tour.

Autogenous healing display.

Introduction and overview of robotic video and laser profiling analysis by Mead & Hunt.

Inspected RCP staged for installation.

36-inch diameter RCP installed to Standards with compaction to spring-line and finished grade.

Limited work space required 12 feet of excavated material to be placed over installed 36-inch diameter RCP.

Grove Street Outfall Project Improves Drainage Using Concrete Pipe

By Douglas J. Holdener, P.E.
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Palm Beach County, Florida improved the drainage along Grove Street in the Town of Haverhill by creating a drainage system comprised of various sizes of reinforced concrete pipe and catch basins to channel stormwater to the Lake Worth Drainage District L-4 Canal. The project[1] relieved flooding in the Briarwood neighborhood and portions of Haverhill. By improving the drainage with a new concrete storm sewer and construction of an outfall into the Mounts Botanical Garden to the south, surface drainage from the roadway pavement was improved, and the quality of the ecosystem of the garden enhanced.

The drainage improvements included installation of over 1,400 feet of 36-inch diameter ASTM C-76[2] Class III reinforced concrete pipe (RCP), over 650 feet of 30-inch diameter RCP, and over 750 feet of additional 15-inch, 18-inch, 24-inch diameter, and 19-inch x 30-inch catch basins. The concrete pipe[3] was provided by Rinker Materials Concrete Pipe Division – CEMEX[4]. Precast concrete manholes and drainage structures were provided by US Precast. The project was funded through the Federal Emergency Management Administration (FEMA) at a cost of $623,700, including contingency, staff costs, and testing. The FEMA grant covered 75% ($467,800). Alan Gerwig & Associates, Inc.[5] provided the design services. Construction testing services were performed for the County by Radise International[6], and Centerline Utilities was awarded the Grove Street Outfall.

During construction of the sewer, Evans Street remained open to allow residential property access by restricting the two-lane roadway to a single lane. Limited right-of-way restricted the work space and storage of excavated material. Therefore, excavated fill was piled atop the storm pipe installation as the pipe was installed. Consequently, approximately 10 to 12 feet of temporary embankment was loaded over 36-inch diameter concrete pipe.

The necessity of the temporary staging embankment causes one to question the ability of corrugated HDPE or PVC to withstand the forces of a temporary 12-foot embankment, without significantly deforming or cracking. The potential for damage to a thermoplastic conduit would be exacerbated without an engineer's attention to the installation design or with insufficient compaction and substandard backfill material not in compliance with ASTM D2321 - 11 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.[7]

Centerline Utilities performed a "textbook' installation of the RCP by properly compacting the pipe's bedding and backfill up to the haunches. Incidentally, compaction and backfill above the springline has a negligible effect on the structural performance of RCP. While the temporary staging of excavated material over the installed pipeline may have potentially damaged a flexible pipe[8], the contractor trusted it would not harm the concrete pipe system. The investment in RCP ensures a long-term value to Palm Beach County, the Town of Haverhill, and the residents and businesses of the community.

Photos: Douglas J. Holdener, P.E.

LINKS

Info Links

1. http://www.pbcgov.com/pubInf/Agenda/20101116/3c5.pdf
2. http://www.astm.org/Standards/C76.htm
3. http://www.concrete-pipe.org/pages/why.html
4. http://www.rinkerpipe.com/default.shtml
5. http://www.aga-engineering.com/
6. http://www.radise.net/
7. http://www.astm.org/Standards/D2321.htm
8. http://www.concrete-pipe.org/pdf/InstallationComparisonInspectorsContractors.pdf

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- **Keyword Search on American Concrete Pipe Association Website**
  (storm, stormwater, flexible, outfall, sewer, RCP)
  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

Precast Concrete Boxes Ideal for Just-In-Time Delivery

By Ted V. Price, General Manager - Georgia
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Concrete pipe and precast concrete boxes[1] are ideal drainage products for projects designed for environmentally sensitive areas, especially where residents and businesses are significantly affected by any prolonged construction associated with culverts and storm sewers. History has proved that precast structures tend to be constructed within short periods, and perform as designed for generations. A culvert replacement in Stockbridge, Georgia for the Henry County Department of Transportation demonstrates the ease of use of precast boxes in an environmentally sensitive area with limited road access, and the ability of concrete pipe producers to deliver product, just-in-time.

In May 2011, Rinker Materials Concrete Pipe Division – CEMEX[2] was selected by Henry County DOT[3] to provide precast boxes for the construction of triple-cell 48 foot culvert that would replace four, 48-inch diameter failed metal pipe culverts[4]. The project was within a residential neighborhood adjacent to a 5-acre pond. The only access in or out for about half of the residents was over the culverts that had failed.

Limits placed on access, due to the failed culvert and impassable road, coupled with the fact that there was very limited storage space for the 144 feet of 9-foot x 5-foot boxes, created several challenges for the DOT and Rinker Materials. The biggest challenge was working with the County and the local residents to stage the delivery of the boxes for installation while mitigating frustration and potential inconvenience for the residents, who would have to pass through the narrow project area during construction.

The Rinker team worked closely with the design engineer at Henry County DOT to deliver a design that would address the circumstances of the project. Production of the boxes began and ended in July. After they were produced, discussions between Henry County and Rinker took place to resolve the logistics for safety, minimal disruptions to traffic, and specific delivery times for installation. The County provided ongoing communication with the residents to set clear expectations. The County and Rinker provided the residents with unencumbered access in and out of the neighborhood during construction.

Once the logistics were finalized, Henry County DOT prepared the bedding for the box installation[5]. Then, on cue, Rinker delivered the first load at 9:30 AM on July 28. All the boxes were in place by 4 PM that afternoon. The Henry County DOT will use precast boxes for future projects due to quick installation and minimal disruption to local traffic.

LINKS

Info Links

1. http://www.concrete-pipe.org/pages/why.html
2. http://www.rinkerpipe.com/default.shtml
3. http://www.co.henry.ga.us/HCDOT/
4. http://www.concrete-pipe.org/pdf/economiccosts.pdf
5. http://www.concrete-pipe.org/pdf/installation_guide.pdf

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- **See Box Design Tab on Home Page**
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- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
  www.concrete-pipe.org/pages/cpnews.html

Culvert structure comprised of 9-foot x 5-foot precast concrete boxes.

Product arrives on site for immediate assembly to form culvert structure.


Completed triple cell 48-foot long precast concrete box culvert.

Photos: Ted P. Price, Rinker Materials Concrete Pipe Division – CEMEX

Box-A-Thon Introduces Largest Precast Box

By Mike Mula
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Benefits of precast concrete boxes[1] are speed and ease of installation under adverse field and weather conditions, and customized engineering. Where considerable capacity is required, multiple box sections can be placed side-by-side, or connected in rows to provide onsite stormwater detention for areas with outfall flow restrictions.

Principal Standards used for designing boxes include *ASTM C1433 - 10*[2] *Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers;* and *ASTM C1577 - 11a*[3] *Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers Designed According to AASHTO LRFD*. Precast box designs other than standard are available through American Concrete Pipe Association member companies.

The need for a tangential transition box in the middle of busy Charleston Boulevard located in the Northwest part of the Las Vegas Valley is an excellent account of the application of a unique box design. The Oakey Meadows Phase 2A contract called for cast-in-place transition structures, but such construction would disrupt commuter traffic for a prolonged period and be an inconvenience to the public and commerce.

Experienced Las Vegas Pipe[4] personnel devised a method of pre-casting an 18 foot long (23-foot x 8-foot to 18-foot x 8-foot) tangential transition in 5 separate segments, with the heaviest piece weighing approximately 34 tons. The 23-foot x 8-foot precast boxes were the largest ever produced using a drycast manufacturing method.

Plant personnel devised a method for pre-casting a unique transition connecting the 23-foot x 8-foot section to side-by-side 12-foot x 8-foot and 8-foot x 8-foot boxes. A one foot section on the groove end of the 23-foot x 8-foot box was hand formed to allow connection of the tongue end of a 12-foot x 8-foot box, as well as the tongue end of an 8-foot x 8-foot box. The solution allowed the contractor, Las Vegas Paving[5], to perform a “Box-A-Thon” on the weekend before the 2011 Labor Day long weekend.

A “Box-A-Thon” is a 24-hour, round-the-clock operation where the contractor excavates, grades, installs the precast boxes, backfills, and paves, thereby having minimal impact to commuter traffic, the travelling public, and commerce. Las Vegas Paving closed the road Friday evening, received and installed 18 feet of transition sections, 50 feet of 23-foot x 8-foot boxes, 8 feet of 8-foot x 8-foot boxes, and approximately 170 feet of beveled 12-foot x 8-foot boxes on a curved alignment. The roadway was opened on Sunday.

Las Vegas Pipe had delivered over ¾ mile of reinforced concrete MegaBox consisting of 17,000 tons of 18-foot x 9-foot (18 foot span x 9 foot rise), 19-foot x 7-foot, and 19-foot x 8-foot product for the City of Las Vegas’s Oakey Meadows Phase 1 project when Phase 2A was advertised. Phase 2A called for an additional 12,000 tons of 18-foot x 9-foot, 18-foot x 8-foot, 23-foot x 8-foot, 12-foot x 8-foot, and 7-foot x 6-foot reinforced concrete boxes.

LINKS

1. http://www.concrete-pipe.org/pdf/installation_guide.pdf
2. http://www.astm.org/Standards/C1433.htm
3. http://www.astm.org/Standards/C1577.htm
4. http://www.rinkerpipe.com/
5. http://www.lasvegaspaving.com/

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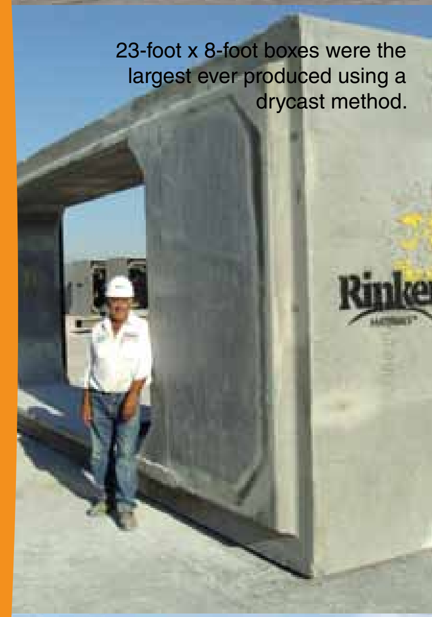
Crews work around the clock in a “Box-A-Thon” to construct a storm sewer.



23-foot x 8-foot boxes were the largest ever produced using a drycast method.


23-foot x 8-foot to 12-foot x 8-foot and 8-foot x 8-foot transition.

Photos: David Sterling and Mario Ramirez

Tag-line connected to anchor on center line of steps near base of manhole component at right angle to trench alignment.

Tag-line connected to base of manhole component under caution note.

Tag-lines Increase Manhole Installation Safety and Efficiencies

By Claire Cox
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Lafarge developed a system in 2010 that increased the safety of site personnel by keeping them 0.6m (2 feet) from manhole components during installation. A tag-line system, applicable to manholes 1500mm diameter and greater, and able to accommodate loads of 2,000kg and greater, is practical from manufacturing and installation perspectives. The gross weight is displayed at two locations on the outside of the barrel in sight of Swift-Lift pins, allowing the backhoe operator, and the person attaching the lifting clutches, to have an immediate awareness of the weight of the manhole component. Since the installation of manhole components centers on lining up the steps on the internal face of the barrel, having the ability to locate the center line without going near the component eliminates stationing a worker under a suspended load, and the use of an unsecured ladder.

All manhole components produced by Lafarge are supplied with the Swift Lift system. The problem with attaching tag-lines to lifting clutches is the lack of control over the physical forces when the load is suspended. The barrel acts as a pendulum when suspended, and the magnitude of its oscillation increases as it is being manoeuvred into position. The best location to neutralize these forces with a tag-line is at the bottom of the barrel, below the center of gravity.

Situating anchors directly opposite each other, within 12 inches of the bottom of the barrel is the optimal position. One anchor is located along the center line of the internal ladder. Because pipelines are installed at 90 degrees to the ladder, the ladder position would be parallel to the trench line. In standard, non cut or cored pieces, the second tag-line would be positioned 180 degrees from the first anchor. In special pieces with rough cut openings or large cored holes, the positioning of the second anchor would have to be placed in the least objectionable location. Where rough cuts impede the positioning of the second anchor at 180 degrees, the second anchor would be located in the optimum position, or not be included. The second tag-line may be looped or hooked onto the reinforcing wire exposed by the rough cuts. This would allow the component to be controlled from both sides.

A V-shaped steel utility anchor was chosen for its versatility and suitability in the manufacturing process. To highlight the fact that these anchors are not designed or provided for the purposes of lifting, a cautionary note reading "Not to be used for lifting" is painted in red above each anchor. The note continues, "It is the responsibility of the contractor to ensure that only the Swift-Lift pins provided at the top of the barrel are to be used for lifting."

Before acceptance of the system, the design was field tested using 1800mm diameter manhole components on a contractor's project. There were no issues with the tag-lines getting caught or impeding site personnel in any way and feedback from the installation team was exceptionally positive.

More info here

LINKS

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- Keyword Search on American Concrete Pipe Association Website (health, safety, installation)
  www.concrete-pipe.org
- **Concrete Pipe Design Manual**
  www.concrete-pipe.org/pages/design-manual.html
- **Concrete Pipe News**
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Photos: Lafarge Edmonton (Pipe)

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Plan Now to Submit a Project for the 2012 Project Achievement Award

The sixth Project Achievement Award Program will reward creativity and excellence in precast concrete pipe and box culvert design and installation. Any state DOT may enter the award program. State DOTs and ACPA members are invited to submit projects jointly or separately. ACPA members submitting projects separately must obtain the signature of the state DOT on their entry form.

The winning project will be based upon public involvement and education, use of new materials or large diameter concrete pipe, use of new technologies, innovation, complexity, cost effectiveness and environmental benefits. Projects may or may not involve all seven elements of the evaluation criteria.

Entry forms are due on March 1, 2012. Winners will be announced in May 2012 at the Awards presentation ceremony during the AASHTO Bridge and Structures Subcommittee meeting. The 2012 application is on the ACPA website.

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.