

# Concrete Pipe **News**



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**On the Cover:**

2013 Project Achievement Award Winner – Large Capacity Precast Concrete Box Culvert. See story on page 3.



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# Editorial

## Innovative Products Demand Greater Attention to Standards



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

Innovation does not always translate into better products and technology. Manufacturers of flexible pipe products can be expected to introduce new materials and product applications, as opportunities arise to fill gaps between changing public policy and product availability to meet technological needs. Engineers, however, must remain vigilant to protect the public interest from any system that endangers health and safety. This means constantly reviewing Standards when new flexible pipe products are introduced to be certain that claims of innovation do not violate explicit detail embodied in certified Standards.

ASTM D2321-11 is for use by designers, specifiers, installation contractors, regulatory agencies, owners, and inspection organizations who are involved in the construction of culverts and sewers that utilize flexible thermoplastic pipe. As with any

standard practice, modifications may be required for specific job conditions or for special local or regional conditions. A common conflict overlooked when specifying product for a drainage system application is the potential conflict between ASTM D2321 bedding and backfill requirements and specifications for the use of trench boxes in Occupational Health and Safety legislation.

Polypropylene (PP) conduit is one of the newest products being marketed for large diameter drainage pipe applications. Although promising performance beyond expectations, it may not meet existing Standards. In March 2011, The Virginia Center for Transportation Innovation and Research (VCTIR) published Final Report 11-R14 Evaluation of Polypropylene Drainage Pipe. The 11-R14 report, illustrates a relatively poor performance of a flexible pipe product. At less than three feet of backfill, under a low AADT (Annual Average Daily Traffic) road, and using quality No. 57 stone embedment (class I material per ASTM D2321), the PP pipe still deformed by as much as 4.5 percent. It should be noted that PP pipe generic design tables suggest that 30 to 48-inch diameter PP storm pipe can be installed to depths of 24 feet or deeper using similar backfill (compacted class I material). In the Virginia installations, even at such low loads and in such high quality embedment material, the PP pipe barely passed the industry standard 5% deformation rejection criterion.

Steel reinforced high density polyethylene (SRHDPE) pipe is being marketed for use in storm drainage systems throughout the United States and Canada. ASTM F2562 / F2562M – 08 covers its materials requirements. However, this specification merely defines the pipe material. It does not provide engineers, owners and contractors guidance as to how the product is to be designed or installed. AASHTO has recently adopted design and installation standards for this product. Yet, they are mostly based on previous experience with plastic and metal pipe designs and installations, and do little to address the composite nature of a pipe that relies on both. Without design and installation standards, it is virtually impossible for an engineer to determine what pipe strength is required for a given installation condition.

The engineer's duty of care to the public does not change. Vigilance remains the watchword when it comes to innovation in buried infrastructure.

### LINKS

- [www.concrete-pipe.org/epipe/ConcernsfromPPInstallations\\_ePipe018.pdf](http://www.concrete-pipe.org/epipe/ConcernsfromPPInstallations_ePipe018.pdf) Concerns Surface from Polypropylene Pipe Installations
- [www.concrete-pipe.org/epipe/SteelReinforcedHighDensityPolyethylenePipe-epipe003.pdf](http://www.concrete-pipe.org/epipe/SteelReinforcedHighDensityPolyethylenePipe-epipe003.pdf) Steel Reinforced High Density Polyethylene Pipe
- [www.astm.org/Standards/D2321.htm](http://www.astm.org/Standards/D2321.htm) ASTM D2321 - 11 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- [www.astm.org/Standards/F2562.htm](http://www.astm.org/Standards/F2562.htm) ASTM F2562 / F2562M - 08 Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage



# 2013 Project Achievement Award Winner

## Portland - Home of Michigan's Largest Lighted Pedestrian Tunnel

By John Washabaugh  
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Cyclist and walking enthusiasts in Portland enjoy the [Portland Riverwalk](#)<sup>1</sup> that passes along the Grand and Looking Glass Rivers. The southeast trail crosses beneath two interstate I-96 bridges, identified by the Michigan Department of Transportation (MDOT)<sup>2</sup> as being in need of rehabilitation. MDOT considered construction alternatives and their impacts on the bridges, which included maintaining mobility for over 30,000 vehicles per day.

MDOT's cost analysis revealed that rehabilitation of the two bridges was greater than removal and installation of a large capacity [precast concrete box culvert](#)<sup>3</sup>. The culvert would provide a tunnel under the interstate, maintain the functionality of the trail, and meet the needs of motorists in a cost-effective manner. A segmented precast concrete box culvert would limit impacts on the public and facilitate construction within one construction season. Assembly of the sections would be accomplished prior to demolition of the bridges. This solution allowed for scheduling the closure of the Portland Trail at a low use period during the winter and early spring.

A safety concern of the City required coordinated lighting for the full 270 feet, and MDOT required stringent quality control standards from the precast manufacturer that included a protective concrete surface coating to deter graffiti.

The culvert was sized with internal dimensions of 24 feet x 14 feet (span and rise). Each section, supplied by [Northern Concrete Pipe, Inc.](#)<sup>4</sup> weighed approximately 80,000 pounds, which is the gross vehicle load limit in neighboring states of Ohio and Indiana. The manufacturer met challenges of the size of the sections that included product handling, storage area requirements, and distribution of the 16-foot wide sections. The ceiling created by the existing bridge beams and the methods available to maneuver the box sections under the bridges were demanding situations met by the skills and experience of the contractor.

[Anlaan Corporation](#)<sup>5</sup> of Ferrysburg, Michigan was the prime contractor, while Kamminga and Roodvoets, Inc. of Grand Rapids assisted in the earthwork construction. Despite the mid-winter weather and site conditions the team coordinated delivery and installation of the culvert on schedule.

The design of the segments was based on 1.2 times the AASHTO LRFD bridge design specification [HL-93](#)<sup>6</sup> loading. The design tandem portion of the HL-93 load definition was replaced by a single 60 kip axle load before application of the 1.2 factor. The resulting load is designated HL-93 modified. Anlaan Corporation offered a value engineering proposal to MDOT that eliminated the cast-in-place end treatments by replacing them with precast sections at no additional cost. Competitive bidding, coupled with contractor innovations, provided a savings to MDOT of 8% less than the engineer's estimate. Reinforcing steel used for the boxes was purchased under "Buy America." All steel was certified as "melted and manufactured in America."

### LINKS

1. [www.trailink.com/trail/portland-riverwalk.aspx](http://www.trailink.com/trail/portland-riverwalk.aspx)
2. [www.michigan.gov/mdot](http://www.michigan.gov/mdot)
3. [www.concrete-pipe.org/pdf/installation\\_guide.pdf](http://www.concrete-pipe.org/pdf/installation_guide.pdf)
4. [www.ncp-inc.com/index.shtml](http://www.ncp-inc.com/index.shtml)
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(box, underpass, pedestrian, culvert, lighting)  
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- **Concrete Pipe Design Manual**  
[www.concrete-pipe.org/pages/design-manual.html](http://www.concrete-pipe.org/pages/design-manual.html)
- **Concrete Pipe News**  
[www.concrete-pipe.org/pages/cpnews.html](http://www.concrete-pipe.org/pages/cpnews.html)



Setting precast concrete box underneath bridge structure.



Each section weighed approximately 80,000 pounds.



## New Joint for New Culvert

By Ed Pentecost  
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It is noted by the [Transportation Research Board](#)<sup>1</sup> that approximately 22% of the U.S. bridge inventory is culverts. Much of the corrugated steel culvert inventory installed during and after the construction of the Interstate Highway System is in need of replacement. Many of the steel culverts and small bridges are being replaced with precast concrete structures.

In 2012, the Pennsylvania Department of Transportation ([PennDOT](#))<sup>2</sup> scheduled the replacement of a two-span steel pipe culvert that conveys a tributary of Wyomissing Creek under State Route (SR) 3020. The Mohnton Borough Bridge Replacement project in Berks County replaced the steel pipe culvert with a single barrel 90-inch diameter concrete pipe culvert. The roadway over the culvert has two 11-foot lanes and 4-foot shoulders over a distance of 475 feet. The length of the structure is 122 feet.

Although [Oldcastle Precast](#)<sup>3</sup> has extensive experience with manufacturing 66-inch and 90-inch diameter reinforced concrete pipe, the producer's staff was challenged to create a new joint for the 90-inch diameter concrete culvert. In collaboration with [CCJM Engineers](#)<sup>4</sup>, Oldcastle designed an innovative 90-inch baffle for the culvert [joints](#)<sup>5</sup>. In addition to the 90-inch pipe, Oldcastle supplied forty feet of 66-inch diameter concrete pipe with O-ring gaskets.

The applied science of concrete pipe joint design continues to advance. There are several types of joint systems that meet stringent industry and national standards for performance. The function of a pipeline generally determines the performance requirements of the pipe joints. Whether the purpose is to convey sanitary sewage, storm water, or convey a creek under a roadway, joints are designed so that when pipe units are joined, they will make a continuous line of pipe with an interior free from irregularities.

Joints can be designed to provide soil-tightness or water-tightness with the ability to accommodate lateral or longitudinal movement and strength to handle shear or vertical movement. Concrete pipe producers have developed joint designs that are resistance to infiltration of groundwater and backfill material; are resistance to exfiltration of sewage or storm water; have the ability to accommodate lateral or longitudinal movement; have the strength to handle shear or vertical movement; have characteristic pipeline continuity and a smooth flow line; allow infiltration of groundwater for subsurface drainage; and are easy to install.

The specially designed joints for the tributary of Wyomissing Creek under SR 3020 enhance the performance of the standard O-ring joints for the design life of the culvert and roadway. In total, Oldcastle Precast designed, engineered and shipped 120 feet of 90-inch and 66-inch RCP and 90-inch baffles to replace the steel pipe culverts that were deteriorated.

### LINKS


1. <http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3578>
2. [www.dot.state.pa.us/](http://www.dot.state.pa.us/)
3. [www.oldcastleprecast.com/Pages/default.aspx](http://www.oldcastleprecast.com/Pages/default.aspx)
4. [www.ccjm.com/](http://www.ccjm.com/)
5. [www.concrete-pipe.org/epipe/ConcretePipeJointsBrochureFormat-highrez-epipe07-124.pdf](http://www.concrete-pipe.org/epipe/ConcretePipeJointsBrochureFormat-highrez-epipe07-124.pdf)

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(joints, culvert, design)  
[www.concrete-pipe.org](http://www.concrete-pipe.org)
- **Concrete Pipe Design Manual**  
[www.concrete-pipe.org/pages/design-manual.html](http://www.concrete-pipe.org/pages/design-manual.html)
- **Concrete Pipe News**  
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An innovative 90-inch baffle for the culvert joints.



Replacement of a two-span steel pipe culvert with a single barrel 90-inch diameter concrete pipe culvert.



Installation of 90-inch diameter reinforced concrete pipe.



## Concrete Pipe Culverts Manufactured and Installed Under PennDOT's PAIDD Specification

By Robert Bee

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Oldcastle Precast<sup>1</sup> manufactured reinforced concrete pipe (RCP) to meet PennDOT's Manufacturing Specification for Reinforced Concrete Pipe. (Publication 280)<sup>2</sup>. This specification covers RCP to be used for conveyance of storm water. All PennDOT projects now come under the PAIDD, (Pennsylvania Installation Direct Design), designation. Instead of the ASTM class designations, the pipe is designed to meet the specific fill on top of the pipe. The installation specification was used on the storm water management portion of Section 721 of PennDOT's new Route 202 Parkway passage in Bucks County.

Publication 280 is a manufacturing and purchase specification that covers reinforced concrete pipe intended for the conveyance of sewage, industrial wastes and storm water and, for the construction of culverts. Manufacturers are required to submit a plant quality control program and concrete mix design(s) to PennDOT's structural materials engineer, Materials and Testing Division for review and approval.

Oldcastle Precast manufactured the 36-inch diameter Type A/S 20'-2' fill pipe which runs in the wetland area just south of Wells Rd. The Type A designation stands for Heavy Duty 100 year service life design. The S is for a standard type installation. The 20'-2' are the designs maximum and minimum fill height limits for this particular type pipe. The fill is calculated from the top of the pipe to the finished surface.

By using the PAIDD program, Oldcastle Precast was able to use less steel than a traditional ASTM Class 5 pipe, therefore saving the tax payers money. In addition, PennDOT projects require the Q-Cast<sup>3</sup> stamp of the American Concrete Pipe Association's quality program. The Q-Cast certification is part of Oldcastle Precast's PennDOT self-certification approval process.

The strength of concrete gradually increases over time, contributing to the durability and performance of culverts. The load-carrying capacity of precast concrete is derived from its own structural strength qualities and relies very little on the quality of the surrounding soils, thereby reducing significantly the chances of premature failure or any deformation impacting flow and volume calculations for the watershed. Reinforced concrete pipe can provide a service life in excess of 100 years. The reinforced concrete pipe was manufactured in a controlled plant environment, which contributes to the high quality and uniformity of precast concrete pipe.

By utilizing multiple runs of 36-inch diameter reinforced concrete pipe under the roadway, the post construction impact on the wetlands was kept to a minimum. Water can continue to travel freely and not pond on one side or other of the roadway. Reinforced concrete pipe is nontoxic, environmentally safe, and manufactured from natural materials.

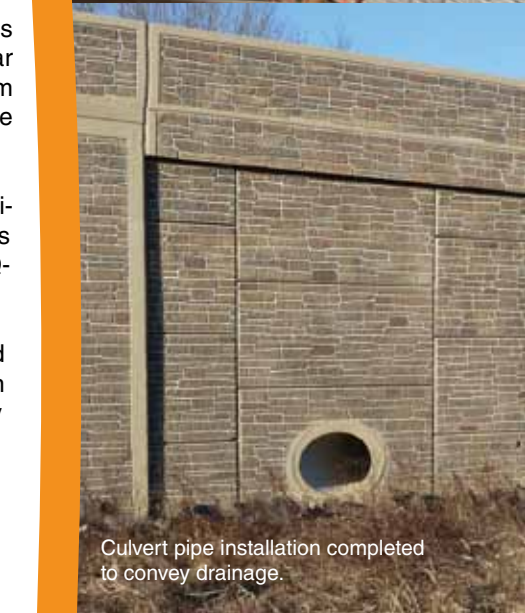
Product supplied by Oldcastle Precast included approximately 9,592 feet of reinforced concrete pipe in sizes ranging from 18 to 36-inch diameter, along with flared end pieces in sizes from 18 to 30-inch diameter. PennDOT's new 721 Parkway passage is a \$42 million, 3.4 mile section of US 202 located between Pickertown Rd and the RT 611 Bypass.

### LINKS

1. [www.oldcastleprecast.com/Pages/default.aspx](http://www.oldcastleprecast.com/Pages/default.aspx)
2. <ftp://ftp.dot.state.pa.us/public/PubsForms/Publications/Pub%20280.pdf>
3. [www.concrete-pipe.org/pages/qcast.html](http://www.concrete-pipe.org/pages/qcast.html)

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Culvert pipe installation completed to convey drainage.



RCP manufactured to meet PennDOT's Specification for RCP (Publication 280).

Photos: Robert Bee

## Precast Box Culvert Replaces Poured-in-Place Culvert

By Steve Bladholm

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[Hancock Concrete Products](#)<sup>1</sup> has been manufacturing box culverts for projects throughout the upper midwest since 1974. [Richland County](#)<sup>2</sup>, North Dakota experienced recurring flooding of County Road 16 during the spring runoff from the nearby Wild Rice River. An existing poured-in-place 11-foot x 8-foot box culvert was inadequate to handle the increased flow, which warranted the need for a larger structure. Richland County Engineer Tim Schulte and Consulting Engineer Damon DeVillers of [Interstate Engineering](#)<sup>3</sup> concluded that a short-span bridge would be too expensive to build and maintain. A double-cell box culvert was also dismissed because ice and debris would jam in the center wall, thereby creating the same situation they were trying to fix.

A single-span 23-foot x 10-foot precast box culvert was determined to be the best solution, and the project was bid through the [North Dakota Department of Transportation \(NDDOT\)](#)<sup>4</sup> with [Midwest Contracting](#)<sup>5</sup> being the successful bidder. Midwest installed the structure within a few days and the road was reopened on November 2, 2012.

Hancock is an innovator in the design and manufacture of precast box culverts. The company developed skewed end sections which allow shorter pipe lengths on non-perpendicular installations, as well as transitioning the ends into the side slope. The single-span 23-foot x 10-foot precast box culvert is the longest single-span structure made by the company.

With superior strength and durability, precast box culverts provide a versatile and economical alternative to a poured-in-place concrete bridge. They are available in multiple sizes and can be installed in single, twin cell or multi-line configurations. The box shape provides several uses including storm shelters, pedestrian walkways, and water retention systems. Precast box culverts are an economical and expedient alternative to either poured-in-place structures or bridges. This has become even more important given budgetary constraints and the need to keep roads open to commerce and motorists.

### LINKS

1. [www.hancockconcrete.com](http://www.hancockconcrete.com)
2. [www.co.richland.nd.us](http://www.co.richland.nd.us)
3. [www.interstateeng.com](http://www.interstateeng.com)
4. [www.dot.nd.gov](http://www.dot.nd.gov)
5. [www.mwcontracting.com](http://www.mwcontracting.com)

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Photos: Hancock Concrete Products, LLC



Longest single-span structure from Hancock Concrete Products.

23-foot x 10-foot precast box culvert to replace an undersized poured-in-place structure.



Precast concrete box culverts are fast to install, even in adverse field and weather conditions.





Specialty precast concrete pipe is produced with a special concrete mix.



Elliptical pipe designed to handle load weight of 30 feet of fill.

Specially designed heavy wall, 34-inch x 53-inch Type A/SH Shore Trench Box 30'-1.5' elliptical pipe.



## Custom Engineered Elliptical RCP for Deep Fill Installation

By Ed Pentecost

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Oldcastle Precast<sup>1</sup> supplied specialty reinforced concrete pipe (RCP) from its Croydon, PA facility in 2012 for the Milnor Street spur ramp's storm water drainage system, which is a portion of Pennsylvania Department of Transportation's (PennDOT)<sup>2</sup> \$30 million-plus I-95 Revive project. Oldcastle was contracted by Tony DePaul & Son<sup>3</sup> to supply custom engineered elliptical precast concrete pipe for the Milnor Street spur storm water drainage system.

The use of heavy wall, 34-inch x 53-inch Type A/SH Shore Trench Box 30'-1.5' Fill Design elliptical pipe met the challenge posed by the 30 feet of fill required at the ramp. With deep fills necessary in the ramp area, the precast concrete pipe had to be engineered to handle the load weight of 30 feet of fill compacted over the concrete pipe. The pipe had an outside diameter of 55 inches x 80 inches with an approximate weight of 20,000 lbs. each. The specialty precast concrete pipe is produced with a special concrete mix and added reinforcement to increase the strength and long-term performance for PennDOT specifications.

The hydraulic and structural characteristics of elliptical and arch shapes<sup>4</sup> offer advantages, under certain conditions, over the circular shape commonly used for sewer and culvert pipe. For minimum cover conditions, or where vertical clearance is limited by existing structures, horizontal elliptical and arch pipe are particularly suitable, since the vertical heights are less than the height of hydraulically equivalent circular sizes. Horizontal elliptical and arch pipe have greater flow capacity for the same depth of flow than most other structures of equivalent full capacity.

In a 2012 press release<sup>5</sup> by the American Concrete Pipe Association, concrete pipe was rated best among all pipe products. "Among specifiers, DOT/public agency officials and consultants, concrete pipe was rated best among all pipe products on several key criteria, including most durable (87.3 percent), easiest to design or specify (62.1 percent), least flammable (84.1 percent), least installation inspection required (54.5 percent), least installation sensitive (62.1 percent), and "greenest" (34.1 percent)."

The I-95 Revive project is a long-term, multi-phase infrastructure initiative to improve and rebuild the 51 miles of I-95 in Pennsylvania to meet the future transportation needs of the region and state. A portion of the I-95 Revive project involves the widening and rebuilding of the existing northbound on-ramp to include a spur ramp from Milnor Street. The spur ramp is designed to reduce the volume of commercial traffic on State Road and other roads on the west side of I-95 by accommodating the heavy vehicles that serve businesses between I-95 and the river. In addition, improvements are being made to the Milnor Street spur ramp's storm water drainage system.

### LINKS

1. [www.oldcastleprecast.com/Pages/default.aspx](http://www.oldcastleprecast.com/Pages/default.aspx)
2. [ftp://ftp.dot.state.pa.us/public/PubsForms/Publications/Pub%20280.pdf](http://ftp.dot.state.pa.us/public/PubsForms/Publications/Pub%20280.pdf)
3. [www.tonydepaul.com/](http://www.tonydepaul.com/)
4. [www.concrete-pipe.org/pdfdd/DD\\_6.pdf](http://www.concrete-pipe.org/pdfdd/DD_6.pdf)
5. [www.cenews.com/news-acpa\\_survey\\_concrete\\_pipe\\_rated\\_most\\_durable\\_by\\_dots\\_specifiers-1887.html](http://www.cenews.com/news-acpa_survey_concrete_pipe_rated_most_durable_by_dots_specifiers-1887.html)

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Photos: Oldcastle Precast, Inc.



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## Oliver Delery Receives Longfellow Award

The 2012 recipient of the Richard C. Longfellow Award was Oliver Delery, Louisiana Sales Manager at Hanson Pipe & Precast, LLC. His article, [\*“Language in MAP-21 guidance Endures Autonomy for States”\*](#)<sup>1</sup> was published in the Fall 2012 issue of Concrete Pipe News, Page 3. Section 1525 of SAFETEA-LU provides states with complete autonomy in the selection of culvert material types for use on federal aid projects.



Each year, a Concrete Pipe News author is honored with the award for an article that most effectively demonstrates innovative and effective use of concrete pipe. The award is presented in memory of Richard Longfellow who had an outstanding career with Cretex Companies, Inc. based in Elk River, Minnesota.

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