



# Concrete Pipe **News**

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**On the Cover:**

Concrete pipe installed in sequence with deliveries because there was little room to store pipe on site.

Photo: JMB Construction



American Concrete Pipe Association

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# Editorial

## ACPA's Project Achievement Award Recognizes the Best of the Best of DOT Concrete Pipe and Box Projects



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

ACPA introduced the Project Achievement Award in 2008 to acknowledge the creativity of State Departments of Transportation and industry leaders involved in the design and construction of innovative projects utilizing precast concrete pipe or boxes. Six of the past 7 award-winners graced the cover of the summer issue of [Concrete Pipe News](#)<sup>1</sup>. The 2014 winner (precast boxes used for a triple cell culvert near Osage, Iowa) was published in the fall Issue of Concrete Pipe News, before it was entered into the competition. ACPA is very proud of its producer and associate members who supplied the pipe, boxes and components for these outstanding DOT projects.

ACPA members know that there is far more at stake in supplying concrete pipe and boxes from sustainable enterprises for any project. Concrete pipe and boxes are used for constructing resilient infrastructure systems that have huge long-term impacts on local economies, environment and community. The award-winning DOT projects were designed to accommodate economic and urban growth, provide efficient

transportation systems to sustain and build the world's greatest economy, advance the technology for building culverts and storm sewers, solve environmental challenges including the consequences of climate change, and ensure public health and safety.

ACPA's "DOT Award" is significant because it spotlights technology, science and thorough engineering. The award owes much of its value to the wisdom of Congressmen and Congresswomen who allowed many changes to [MAP 21](#)<sup>2</sup> in 2012 stemming from expiring SAFETEA-LU legislation. Especially critical to the award was rewording of Section 1525 in MAP 21 that provides states with complete autonomy in the selection of culvert material types for use on federal aid projects. And, the science of more than a hundred years of concrete pipe installations was reinforced in March of this year by the National Cooperative Highway Research Program that published the results of [Project 20-07, Task 316](#)<sup>3</sup>, confirming that the Indirect Design Method is conservative, and that the Direct Design Method can be extremely conservative for certain design conditions.

It is time to look ahead to innovative projects that are being completed now, or about to be completed before year-end. The 2015 Award should not be taken lightly. It is the only one that pays attention solely to the nation's critical buried infrastructure owned by state Departments of Transportation. Congratulations to our winners!

### LINKS

1. [www.concrete-pipe.org/pages/cpnews.html](http://www.concrete-pipe.org/pages/cpnews.html)
2. [www.concrete-pipe.org/map21.html](http://www.concrete-pipe.org/map21.html)
3. <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3196>



# Concrete Pipe Specified for San Francisco's Cesar Chavez Sewer System Improvement Project

By Anita Simpson, President

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With technical and editorial support from:

- San Francisco Department of Public Works  
Contact: Wallis Lee, Project Engineer, wallis.lee@sfdpw.org
- San Francisco Water, Power and Sewer | Services of the San Francisco Public Utilities Commission  
Contact: Maureen Barry, SSIP Communications Manager, mbarry@sfgwater.org or Bessie B Tam, Project Manager, btam@sfgwater.org

On February 25, 2004, torrential rain and flash flooding, that exceeded the 100-year return storm design, occurred in various parts of San Francisco and San Mateo County causing extensive damage to residences and businesses in San Francisco. The San Francisco Public Utilities Commission (SFPUC), who owns and operates the combined sewer system, initiated a project to increase the sewer system capacity in various areas, including the Mission District. The [Cesar Chavez Sewer System Improvement Project](#)<sup>1</sup> (Cesar Chavez Sewer Project) was designed with reinforced concrete pipe (RCP) to increase the hydraulic capacity of the combined sewer system and reduce the risk of potential flooding in the areas surrounding Cesar Chavez and Mission Streets.

The alignment of Cesar Chavez Street had geological and hydrological challenges because the street used to be part of Islais Creek until it was filled. Most of the sewers under the street were constructed within the past 80 to 120 years, and many are egg-shaped concrete and brick. As part of the Cesar Chavez Sewer Project, the existing sewer was lined, and auxiliary RCP sewers installed to increase the combined sewer capacity. San Francisco Department of Public Works (SFPDW) prepared the design for SFPUC and specified concrete pipe primarily because the alignment of the new sewer was characterized by a high water table, and [flotation](#)<sup>2</sup> would have been a problem with alternate pipe materials. Approximately 6,000 feet of 72-inch and 84-inch diameter RCP was supplied by [Piranha Pipe & Precast](#)<sup>3</sup>.

A section of the new sewer had to be constructed under a busy intersection at Cesar Chavez and Mission Streets and over the [BART](#)<sup>4</sup> subway line. The challenge was to install the 84-inch diameter pipeline in a way that would not cause major reconstruction of existing utilities, or the subway. Lining a tunnel with [jacked precast concrete pipe](#)<sup>5</sup> was the specified construction method. The jacking pipe was produced with a steel band around the bell. The top of the tunnel had to be below a depth of approximately 20 feet to avoid the existing utilities, and the bottom of the tunnel had to be at least 6 feet above the top of the subway structure. Engineers were concerned that an open cut installation might cause the water table under the subway to push upward into any trench work. That might have caused movement in the foundation of the subway tunnel.

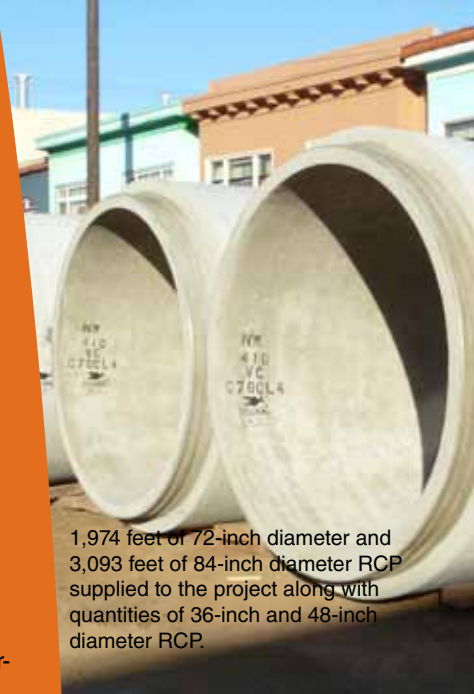
During construction, RCP pipes were installed in sequence with consecutive deliveries due to the lack of space to store the large-diameter pipes on site. A crane with a long boom lowered the large diameter pipes into the trenches and jacking pit, soon after it was being delivered. As part of the contract requirements, SFPDW staff observed production and D-Load testing at the Piranha facility. The Cesar Chavez Sewer Project began in June 2011 and substantial completion was achieved by March 2013. The installation contractor was JMB Construction Inc. Owner of the project is the SFPUC, and design and construction management services were provided by the SFPDW. Both departments are part of the City and County of San Francisco.

## Project Team:

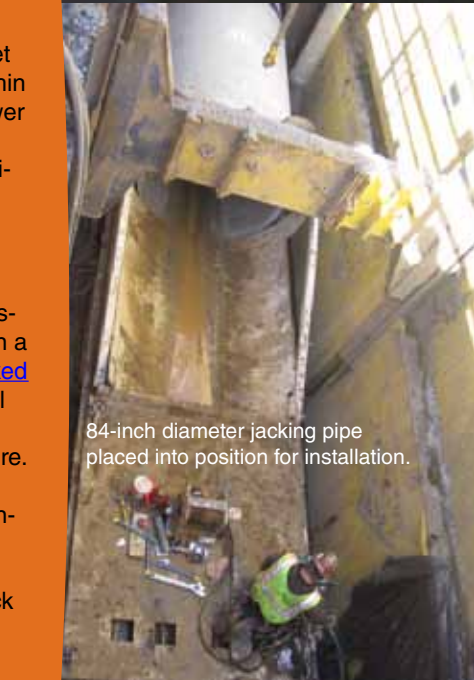
Bessie Tam, Project Manager (SFPUC)  
Wallis Lee, Engineering Group Lead (SFPDW)  
Louis Douglas, Project Engineer (SFPDW)  
John Helmuth, Engineering Support (SFPDW)  
Keanway Kyi, Construction Manager (SFPDW)  
Alfredo Tio, Resident Engineer (SFPDW)  
Melinda Hesper, Office Engineer and Inspector (SFPDW)

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2. [www.concrete-pipe.org/pdfdd/DD\\_22M.pdf](http://www.concrete-pipe.org/pdfdd/DD_22M.pdf)
3. [www.piranhapipe.com](http://www.piranhapipe.com)
4. [www.bart.gov/about](http://www.bart.gov/about)
5. [www.concrete-pipe.org/pdfdd/DD4\\_JackingPipe.pdf](http://www.concrete-pipe.org/pdfdd/DD4_JackingPipe.pdf)



1,974 feet of 72-inch diameter and 3,093 feet of 84-inch diameter RCP supplied to the project along with quantities of 36-inch and 48-inch diameter RCP.



84-inch diameter jacking pipe placed into position for installation.



Installed 72-inch diameter and 84-inch diameter RCP being installed in forms for a junction box.

Photos: SFPDW

96-inch diameter Class 5 jacking pipe delivered to Hwy 206 job site.

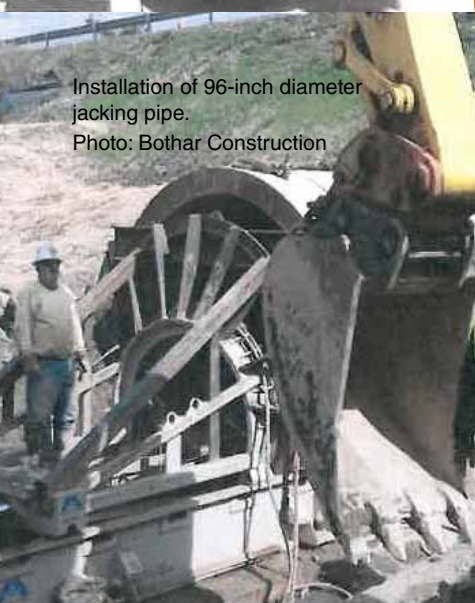


Photo: Oldcastle Precast



View inside 96-inch diameter Class 5 jacking pipe.

Photo: Oldcastle Precast



Installation of 96-inch diameter jacking pipe.

Photo: Bothar Construction

## Jacking 96-inch Concrete Pipe the Only Option for NYSDOT

By Samantha Nolen, Sales Assistant  
Oldcastle Precast  
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Highway 206 is a state highway in the Southern Tier of New York that runs through some lightly populated regions along the state's southern border from Central New York to the Catskills. On June 19, 2007, [a flash flood](#)<sup>1</sup> along the Beaverkill River and some nearby tributaries along NY 206 near the highway's east end took several lives. Sections of road were washed out and an 8-mile portion of NY 206 was closed. The highway reopened to through traffic on November 16, 2007.

The [New York State Department of Transportation](#)<sup>2</sup> (NYSDOT) is implementing a program of culvert replacements, as are many DOTs throughout the U.S.A. In particular, culverts along Highway 206 in Broome, Schoharie and Tioga Counties were scheduled for replacement because of, among other things, changing environmental conditions that might lead to more flash floods. One of the culverts needing replacement was in the Town of Triangle in Broome County. A larger diameter precast concrete culvert was specified to increase the rate of flow from wetlands to a creek that flowed under Highway 206. The existing 48-inch diameter culvert pipe could no longer accommodate flows during heavy rainfall. The replacement culvert was 37 meters of 96-inch diameter reinforced concrete pipe that would be jacked under Highway 206.

[Jacking](#)<sup>3</sup> the pipe was the best option because there was deep fill over the alignment of the culvert and steep slopes that left no room for phased construction necessary for a traditional trench installation. In addition, there were no available detour routes in the vicinity of the project site.

The contract to jack the pipe was awarded to [Bothar Construction](#)<sup>4</sup> on May 17, 2012. The contractor worked with NYSDOT and [Oldcastle Precast](#)<sup>5</sup> in Folsom New Jersey to supply the 96-inch diameter Class 5 pipe, each piece weighing over 13 tons. Only one unit of pipe could be loaded on a truck for each delivery to the site. Every unit of pipe was fitted at the plant with a 12-inch steel band around the bell. The band is placed on the bell to prevent damage caused by jacking forces. Oldcastle produced a "pusher pipe" used in association with the jacking equipment to facilitate the push of each unit of pipe into place under the highway.

Installation of the culvert was a slow process. The slope of the highway embankments, pipe size and weight of each unit were challenges for the contractor because the jacking sites had to be constructed on both rises of the highway embankment and stabilized to handle the size and weight of the pipe. Excessive rainfall during construction was an additional challenge, since ground conditions around the jacking operation became unstable. Over a year following award of the contract, the complex construction project was completed on November 29, 2013 with successful installation of the 96-inch culvert.

### LINKS

1. [www.nytimes.com/2007/06/21/nyregion/21flood.html?\\_r=0](http://www.nytimes.com/2007/06/21/nyregion/21flood.html?_r=0)
2. [www.dot.ny.gov/index](http://www.dot.ny.gov/index)
3. [www.concrete-pipe.org/pdfdd/DD4\\_JackingPipe.pdf](http://www.concrete-pipe.org/pdfdd/DD4_JackingPipe.pdf)
4. [www.botharconst.com](http://www.botharconst.com)
5. [www.oldcastleprecast.com/plants/nepipe/Pages/default.aspx](http://www.oldcastleprecast.com/plants/nepipe/Pages/default.aspx)

### Learn More About Buried Infrastructure

- Keyword Search on American Concrete Pipe Association Website (jacking, storm water, culvert, flood, climate) [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 [www.concrete-pipe.org/pages/cpnews.html](http://www.concrete-pipe.org/pages/cpnews.html)

# Microtunneling Concrete Pipe Separates Storm and Sanitary Sewers at Downtown Split in Columbus

By Donald Lepley, P.E., Senior Technical Services Manager  
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The [Ohio Department of Transportation](#)<sup>1</sup> (ODOT) selected [microtunneling](#)<sup>2</sup> as the method for separating storm and sanitary sewers on a major interchange replacement project in Columbus. The I-70/I-71 South Innerbelt Corridor in downtown Columbus, known locally as the “[downtown split](#)”, is one of the busiest and most vital sections of highway in the region. The first phase covered a 1.8 miles at the I-71/670 junction. The project was a complete removal and replacement of the interchange.

Maintaining traffic flow in the congested downtown area was the greatest challenge. The open cut method for separating the sewers was not an option, so 5,400 feet of 54-inch diameter reinforced concrete pipe (RCP) storm sewer was installed using an Akkerman SL60 microtunneling boring machine (MTBM) through a mix of residential and commercial areas. The tunneling was divided into five separate tunnel runs under the I-71/670 freeway system. The longest drive was 1,030 feet. The microtunnel contractor, [Super Excavators](#)<sup>4</sup> used by-pass pumping to divert sanitary sewer flows.

Class 4 RCP was designed for the loads that the pipe would have to carry during the handling, microtunneling, and long-term loading over the next 100-plus years of service. The pipe design followed the steel reinforcement detailed in [ASTM C-76](#)<sup>5</sup> while incorporating a 6000 psi minimum concrete compressive strength, and the introduction of a steel bell band. The steel bell band is a cold rolled steel band manufactured integrally with the pipe serving to maximize the compressive force of the concrete while being jacked and subjected to axial loads.

Super Excavators began microtunneling on October 10, 2011 and completed the installation on June 30, 2012 - nine months later. The 5,400 feet of 54-inch diameter pipe was tunneled in five stages. Working from a series of shafts constructed along the tunnel alignment, the mining operation worked in one direction and then following the completion of one phase would turn the equipment in the shaft and begin work in the opposite direction. This technique minimized the number of work shafts that needed to be protected from traffic at all times.

The Akkerman SL60 MTBM was well suited to the ground conditions experienced on the project. Throughout the 5,400 feet, groundwater was present creating the need for a pipe joint capable of limiting infiltration during microtunneling and post installation. [Hanson Pipe & Precast](#)<sup>6</sup> used the classic [O-Ring style rubber gasket joint](#)<sup>7</sup> which is a reliable and proven joint design. Groundwater was controlled in the tunnel zone by utilizing the Akkerman slurry microtunnel machine which has the capabilities of matching the groundwater pressure and maintaining a relatively dry work environment. Soils included soft sands, stiff clays, wet sands, and wet sands with cobbles and boulders. As the microtunneling activity was completed at each shaft, a new shaft was constructed and prepared for microtunneling, while the last shaft backfilled.

[Kokosing Construction Company](#)<sup>8</sup>, the prime contractor, selected Super Excavators as the sub-contractor to build the \$6.12M microtunneled storm sewer with reinforced concrete pipe supplied by Hanson Pipe & Precast located in Columbus Ohio.

## LINKS

1. [www.dot.state.oh.us/pages/home.aspx](http://www.dot.state.oh.us/pages/home.aspx)
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3. [www.dot.state.oh.us/projects/7071/Pages/default.aspx](http://www.dot.state.oh.us/projects/7071/Pages/default.aspx)
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5. <http://www.astm.org/Standards/C76.htm>
6. [www.hansonpipeandprecast.com/english/index.php](http://www.hansonpipeandprecast.com/english/index.php)
7. [www.concrete-pipe.org/epipe/ConcretePipeJoints-epipe07-124.pdf](http://www.concrete-pipe.org/epipe/ConcretePipeJoints-epipe07-124.pdf)
8. [www.kokosing.biz/default.aspx](http://www.kokosing.biz/default.aspx)

## Learn More About Buried Infrastructure

- **Keyword Search on American Concrete Pipe Association Website** (jacking, stormwater, microtunnel, sewer) [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)
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Microtunneling job site. DOT I-670 / 71 Split Interchange Realignment – Super Excavators case study flyer.  
Photo: Courtesy Super Excavators - DOT I-670 / 71 Split Interchange Realignment pdf file

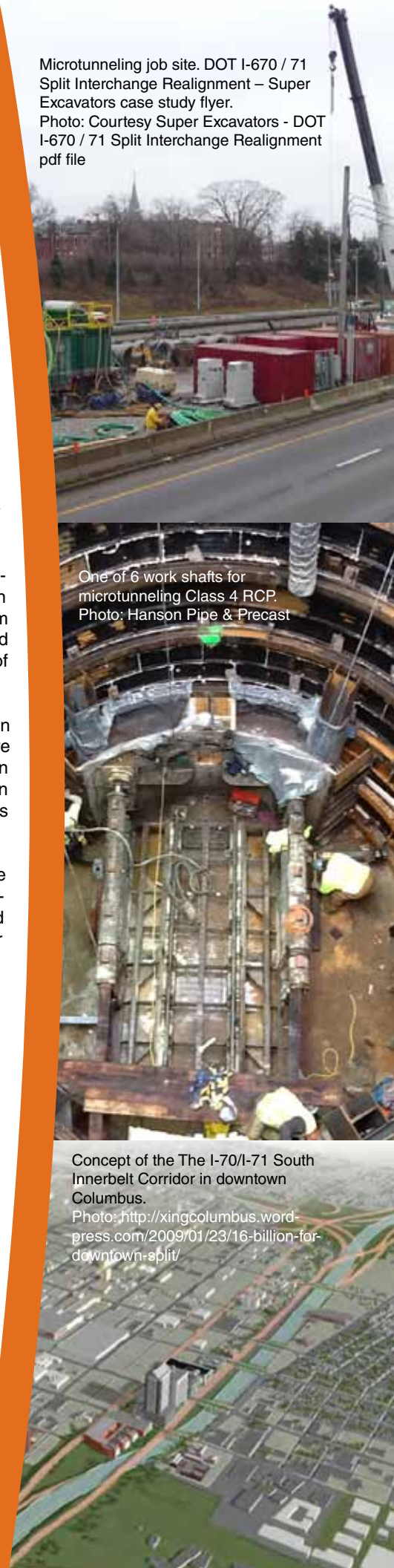


One of 6 work shafts for microtunneling Class 4 RCP.  
Photo: Hanson Pipe & Precast



Concept of the The I-70/I-71 South Innerbelt Corridor in downtown Columbus.

Photo: <http://xingcolumbus.wordpress.com/2009/01/23/16-billion-for-downtown-split/>



## Large Diameter Jacking Pipe for Blue Plains Influent Sewers Rehabilitation

By Mike Barna

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Large diameter concrete jacking pipe was specified for a section of the [Blue Plains Influent Sewers Rehabilitation project](#)<sup>1</sup> in Washington DC. The project includes rehabilitation and repairs for corrosion protection and/or structural repair for pipe segments of the East and West influent sewers; modifications to several structures and manholes; a structure at the Poplar Point Pumping Station; and flow control during construction. The Jessup MD facility of [Concrete Pipe & Precast, LLC](#)<sup>2</sup> supplied 33 units of 144-inch diameter reinforced concrete [jacking pipe](#)<sup>3</sup>.

The general procedure for jacking pipe involved the construction of a reaction shaft at the beginning of the tunnel and a reception shaft at the end. Soil is carefully excavated at the face of the tunnel and the pipeline system pushed into the excavation using powerful jacks. Manual excavation is the most common means, but microtunneling using tunnel boring machines (TBM) are frequently used for mechanical excavation on large projects and challenging alignments. A Herrenknecht EPB TBM mined the tunnel for the precast concrete pipe liner. The jacking pipe was supplied with steel bands to enhance the compressive force of the concrete while being jacked and subjected to axial loads.

Personnel at the Jessup facility designed the placement of the lifting rings to more easily handle the massive weight of each unit of jacking pipe. Loading was accomplished using four lifting rings while offloading by crane at the jobsite was accomplished with two, thereby placing the pipe unit in a position for lowering into the jacking pit.

Before rehabilitation, the brick and concrete sewer pipes ranged in age between 30 and 100 years. Sections of the pipe had deteriorated to expose the aggregate and reinforcing steel. The majority of the sewer lines being rehabilitated are located inside federal property, including Bolling Air Force Base and the Naval Research Laboratory. The cost of the project was projected to be 30 to \$40 million.

### LINKS

1. [www.dcwater.com/about/cip/cso.cfm](http://www.dcwater.com/about/cip/cso.cfm)
2. [www.concretepandp.com/](http://www.concretepandp.com/)
3. [www.concrete-pipe.org/pdfdd/DD4\\_JackingPipe.pdf](http://www.concrete-pipe.org/pdfdd/DD4_JackingPipe.pdf)

### Learn More About Buried Infrastructure

- Keyword Search on American Concrete Pipe Association Website (jacking, sanitary, joint) [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 [www.concrete-pipe.org/pages/cpnews.html](http://www.concrete-pipe.org/pages/cpnews.html)

Photos: Concrete Pipe & Precast, LLC




144-inch diameter jacking pipe offloaded with lift and roll lift ring arrangement.



144-inch diameter jacking pipe handled with lift and roll lift ring arrangement.



Installation of 96-inch diameter jacking pipe.



Installation of 11-foot x 7-foot x 148-foot precast concrete box culvert.

## Florida County Replaces Failing Steel Arch Culvert with Precast Concrete Boxes Using FDOT Standards

By David L. McClintock, P.E., Technical Resource Engineer  
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david.mcclintock@lehighhanson.com

Florida's Brevard County Public Works chose a [precast concrete box culvert](#)<sup>1</sup> to replace an existing 82-inch x 112-inch x 80-foot corrugated multi-plate steel arch culvert on Palm Bay Road. The steel arch structure had been in service for 33 years. Within that period the culvert had been extended 30 feet on each side with a similar size corrugated steel arch pipe to accommodate additional traffic lanes. Recognizing that time, money and service life were crucial factors in selecting a replacement structure, a precast concrete box culvert structure was specified.

When Brevard County saw signs of pavement failure, the inspectors noticed that the invert had deteriorated and the side walls had failed, signalling that the structure had reached the end of its 30 to 40-year service life. Complicating the decision to close the road and detour traffic was the location of the culvert at the intersection with Minton Road. This is a major intersection in Brevard County with 75,000 daily motorists traveling this retail/office district.

[Hanson Pipe and Precast](#)<sup>2</sup> and [Brevard County](#)<sup>3</sup> personnel were able to quickly size and order precast boxes for an 11-foot x 7-foot x 148-foot box culvert. The culvert was up sized to increase capacity. In addition, a precast concrete box structure was specified for speed of construction and a service life in excess of 100 years. Hanson designed and manufactured the boxes according to [Florida Department of Transportation \(FDOT\)](#)<sup>4</sup> Index 291 and 292 and the 2014 FDOT Standard Specifications for Road and Bridge Construction. The design was modified using [BoxCar](#)<sup>5</sup> software to facilitate the 7-foot rise dimension. To accommodate aggressive environmental characteristics of the site, Hanson used FDOT Class IV concrete and 3 inches of concrete cover over the reinforcing steel in the 10-inch thick top, bottom and sidewalls with 8-inch haunches. Seventeen, 8-foot internal box sections (20.7 tons each) were produced along with two, 4.6-foot long box end sections (11.9 tons each) with protruding rebar to facilitate cast-in-place concrete head-wall and wing wall construction. Design, approval, raw materials ordering and production were accelerated to meet the County's schedule.

To save time and money, Brevard County Public Works Department chose to install the culvert themselves, using an experienced culvert replacement crew. The County pre-constructed a wide, stable, dewatered and well compacted base on grade; rented a large overhead mobile crane to unload and set the box sections in place; and utilized a mechanical pipe/box puller to draw the sections together. Box sections were installed in an efficient and quality manner at about 20 minutes each with joint gaps of no more than 1/4-inch. The 19 box sections could have been delivered and installed in one day.


The Brevard County Public Works and Hanson Pipe and Precast team, along with several vendors, completed the project four weeks ahead of schedule at a cost of \$150,000 under budget.

### LINKS


1. [www.concrete-pipe.org/brochures/hydraulics.pdf](http://www.concrete-pipe.org/brochures/hydraulics.pdf)
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4. [www.dot.state.fl.us/agencyresources/mapsanddata.shtm](http://www.dot.state.fl.us/agencyresources/mapsanddata.shtm)
5. [www.concrete-pipe.org/pages/boxcar-info.html](http://www.concrete-pipe.org/pages/boxcar-info.html)

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- **Concrete Pipe News** [www.concrete-pipe.org/pages/cpnews.html](http://www.concrete-pipe.org/pages/cpnews.html)



Reinforcing assembly for poured-in-place wing walls while precast boxes installed.



Intersection re-opened to the public 4 weeks ahead of schedule.



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## NCHRP's Report for Direct and Indirect Design Methods

A report on the performance of Indirect Design and Direct Design procedures for structural design of reinforced concrete culverts, funded by NCHRP for AASHTO's Standing Committee on Highways was published on March 14, 2014. Tests revealed that the Indirect Design procedure leads to safe load capacity estimates, ranging from 54% to 81% of those observed in the buried pipe tests. Direct Design calculations for those tests were also safe, with calculated load capacity falling between 19% and 77% of the observed values. Direct Design estimates of expected moment arising from the effects of surface loads on shallow buried pipes were between 3 and 4 times higher than those calculated from strains measured during the experiments.

The report confirmed what decades of ACPA study had concluded. **The Indirect Design Method is conservative, and the Direct Design Method can be extremely conservative for certain design conditions.** To download a copy of the report, go to <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3196>.

Save this link [www.concrete-pipe.org/pages/cpnews.html](http://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.