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On the Cover:

Project Achievement Award Winner, CSAH 21, MnDOT. Construction of precast concrete box culvert for storm water and pedestrian/wildlife crossing.

Editorial

You Want Innovation? Visit Your Local Concrete Pipe Producer and See It for Yourself...

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

Generations X and Y must be constantly reminded about the value of concrete pipe and precast boxes[1], that begins at the concrete pipe plant. The first thing that is obvious in a modern pipe plant is the preponderance of safety and health precautions implemented by employees to meet modern production requirements. The shift in production technology is to robotic plants[2], characterized by hoppers passing almost silently on overhead tracks; machines placing pallets, cores, reinforcement, and jackets; moving floors; multiple-diameter pipe being produced simultaneously from a single pipe plant; hard and soft walled curing rooms; mechanical arms; and devices preparing pipe for cleaning and labelling, while it is moved in stages to the yard. Robots and automated systems produce pipe with exacting tolerances in mix design, shape, and strength.

There are ASTM, AASHTO and CSA Standards for concrete pipe joints and gaskets[3]. The versatility of joints allows the designer to match project requirements with an appropriate joint and seal. Soil-tight and water-tight joints have the ability to accommodate lateral or longitudinal movement with options that include mortar, flexible joint sealants, rubber gaskets and external sealing bands. ASTM Standards for admixtures[4] help reduce the cost of concrete construction, help achieve certain properties in concrete more effectively than by other means, and maintain the quality of concrete during the stages of mixing, transporting, placing, and curing in adverse weather conditions. Innovation in mix design and equipment allows a wide range of pipe sizes[5]. Concrete pipe can be produced from 4 to 144 inches in diameter. Four-inch concrete pipe is rarely produced, but many producers supply 12-inch diameter pipe. Concrete pipe can be supplied as either reinforced[6] or non reinforced[7] using mixes that have strength and durability properties that give choices to designers.

The ACPA administers the QCast Plant Certification[8] to continue the advancement of quality in the precast concrete pipe industry. QCast is available for the certification of many different products, including storm sewer pipe and manholes, sanitary sewer pipe and manholes and boxes. When quality pipe is shipped to the job site, proper installation is paramount. Standard Installations[9] is one of the most recent advancements in the use of concrete pipe. These were developed to replace the historical A, B, C, and D beddings used since the 1930s in the indirect design method.

European research[10] suggests that in general, the environmental load of a concrete sewer system can be regarded as comparable to clay and more environmentally sound than PVC, HDPE and PP sewer systems. The American concrete pipe industry works with applied science, materials, machinery and products that are innovative in every way. Concrete pipe producers invest heavily in the future of the concrete pipe industry. It is important for the next generations of America's specifiers, regulators, designers, and contractors to appreciate the time-tested value of concrete pipe. Visit a concrete pipe plant to see innovation at work.

More info here.

LINKS

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3. http://www.concrete-pipe.org/pdf/2009%2007%20epipe%20e-07-124%20Concrete%20Pipe%20joints%20brochure%20format%20highrez.pdf
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10. http://www.concretepipes.co.uk/documents/CPSABrochureINTRONLCAstudy.pdf

2011 Project Achievement Award Winner

The Versatility of Concrete Pipe and Boxes Spotlighted on Minnesota Highway Project

By Richard J. Langguth, Sales-Marketing
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A section of CSAH 21[1], south of Minneapolis St. Paul is a showcase for the versatility of concrete pipe and boxes in the context of complex environmental considerations and increased dead load cover of an existing concrete sanitary sewer. Concrete pipe and boxes were specified for standard and specialized applications in the final phase of the 20-year plan to extend the Scott County arterial roadway. Underground construction included large diameter reinforced concrete pipe (RCP) for a sanitary sewer bypass, and 12-inch to 60-inch concrete pipe for storm sewers, and culverts. Precast boxes were used for pedestrian and wildlife crossings. A stream crossing that called for a low flow, smaller box culvert beside a larger box culvert at a higher elevation had a special design. The two adjacent culverts have a dual purpose of channelling high volume spring flows, but the larger culvert provides passage for pedestrians and wildlife during the rest of the year. Cretex Concrete Products[2] of Maple Grove shipped 32,300 feet of 12-inch to 60-inch diameter RCP, 700 feet of reinforced concrete arch pipe, 186 feet of boxes for pedestrian and wildlife passes, 516 feet of (8-foot x 8-foot) precast boxes, 470 feet of (14-foot x 7-foot) precast boxes, 364 feet of (12-foot x 10-foot) precast boxes, and 550 manhole and inlet structures of various sizes.

The cost effectiveness of designing with concrete was demonstrated with the use of 60-inch diameter, 4000-D RCP casing pipe to re-align an existing 42-inch diameter RCP sanitary sewer interceptor line under a 37-foot embankment. When the dead load of the cover was increased from 15 to 37 feet, the new load exceeded the structural capacity of the existing sanitary sewer that had been installed in 1974. The 42-inch pipe was slid inside the 60-inch pipe to complete the new alignment and connect with the existing sewer on either side of the highway without any interruption to flow. The original 42-inch RCP was not lined or produced with any interior protective coating. Sections of the excavated pipeline were delivered to Cretex where they were inspected and tested. The company reported that the tests showed that there was no degradation of the pipe over the 37-year service life.

RCP and precast boxes reduced the timeframe for work in environmentally sensitive areas and stream beds. The project required 18 separate permits from seven government agencies, as well as project approval from the Mdewakanton Sioux, the cities of Minneapolis and St. Paul, Mn-DOT[3], and Scott County. The owners of the project are Scott County and Mn/DOT. The Engineer was WSB & Associates[4] of Minneapolis. The Contractor was Enebak Construction Company[5] of Northfield, Minnesota.

AWARD SUBMISSION: To view the original document, click here.

LINKS

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2. http://www.cretexconcreteproducts.com
3. http://www.dot.state.mn.us/
4. http://www.wsbeng.com
5. http://www.enebak.com

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  (Durability, performance, culverts, RCP, sanitary, storm.)
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Box culverts being constructed at different grades.

Pipe and box outfall under increased load embankment.

Section of 37-year-old RCP sanitary sewer pipeline inspected and tested.

Photos: Richard J. Langguth

Perforated RCP being placed along footing of concrete wall.

Installation of 15-inch diameter perforated RCP.

Installation of large diameter reinforced concrete pipe.

Miles of RCP Used on NJDOTs Route 52 Causeway

By George Hand II
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Almost 3.5 miles of reinforced concrete pipe of various sizes were used on the replacement of the severely deteriorated Rt. 52 Causeway, also known as the World War Memorial Bridge[1]. The 1933 causeway included two moveable-span bridges and two fixed span bridges that became inefficient to carry automobiles from Somers Point to Ocean City, New Jersey. Significant repair would be required for the moveable-span bridges. The multifaceted project would include reconstruction of Rt. 52 through Somers Point, the elimination of the Somers Point Circle and significant changes to the transition on the Ocean City side. Michael Baker Corporation (Baker)[2] was awarded the design contract in 2002, as New Jersey completed its environmental impact studies.

Replacement of the causeway would be the single largest project in dollars let by NJDOT[3] with the engineer's estimate of over $400M divided into two separate construction contracts. Contract A1, was awarded in June 2006 to George Harms Construction, Inc.[4], one of New Jersey's heavy highway contractors who began construction in mid-July (06). The Phase 2 Contract B, was awarded to the joint venture of G.A. & F.C. Wagman, Inc.[5] and R.E. Pierson Construction Co., Inc[6], New Jersey-based heavy highway contractors.

Reinforced concrete pipe (RCP)[7] was suppied from the Folsom plant of Oldcastle Precast, Inc.[8] for both Contract A1 and Contract B. Oldcastle had a logistic advantage with its Folsom plant being located about 30 miles from the jobsite. The project incorporated many different sizes of concrete pipe from round to elliptical, as well as perforated. Contract A1, which includes nearly 3,000 ft of 15-inch diameter perforated pipe, used much of the pipe for an underdrain on the three island crossings. Contract B required significantly more piping because of the complete reconstruction of the roads entering and leaving Ocean City and Somers Point. The Phase 2 contract used nearly 16,000 feet of RCP.

Materials used for the 2.6 mile crossing include over 18,000 feet of reinforced concrete pipe, 8,000 tons of rebar, 47 miles of electrical cable and millions of tons of concrete. Included in the crossing were pedestrian and bicycle paths, fishing piers, boat ramps, parking, and a vistor center—something for just about everyone.

LINKS

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3. http://www.state.nj.us/transportation
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5. http://www.wagman.com/gafc
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Photos: George Hand II, Oldcastle Precast, Inc.

RCP Adds Value to Ohio's Largest Investment of Stimulus Funds – The Nelsonville Bypass

By David L. McClintock, P.E.
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Concrete pipe[1] is being used extensively on the four-lane, 8.5-mile bypass around Nelsonville Ohio, located on U.S. 33 about 70 miles southeast of Columbus. Construction of the bypass was needed because U.S. 33 narrowed from four lanes when it reached Nelsonville. With 1,700 trucks using the route each day to reach the state capitals on either end, state officials said it is one of the busiest truck routes in Ohio. When completed in June 2013, the four-lane highway will run from Columbus to Athens, Ohio.

Construction on Phase I of the Nelsonville Bypass[2] (a $22 million non-stimulus project) was completed in the summer of 2009. Phase II (awarded at $45.2 million) focused on the construction of 3.16 miles of new four-lane highway and paving of 4.56 miles of roadway, along with West Interchange Road. Phase III (awarded for $92.2 million) consists of 3.87 miles of new four-lane highway, 1.63 miles of a new State Route 78 connection to US 33, a half-mile of new connection to State Route 691, and construction of the east interchange and Hocking River Bridge. The Ohio Department of Transportation[3] (ODOT) is investing up to $150 million in funds from the American Recovery and Reinvestment Act for construction of the final two phases.

ODOT used reinforced concrete pipe (RCP) for 28 culverts and other pipelines comprised of 14,345 feet of RCP, and 2,804 joints totalling 35,325 tons of concrete on all three phases. The largest culvert was on Phase 3. It was a 326 foot, 144-inch diameter installation under 40 feet of fill at its deepest point. The longest culvert was installed in Phase 1. It was a 770-foot, 120-inch diameter installation under a maximum 71 feet of fill. The deepest culvert was an 84-inch diameter installation that extended 776 feet under 99 feet of fill at its deepest.

Thirteen deep fill applications required specially designed heavy wall RCP that included 42, 54, 60, 78, 84, 120 and 144-inch diameter pipe. All designs were tested by three-edge-bearing machine to 0.01-inch crack and ultimate design loads. The maximum single test load was 460,688 pounds.

Pipe design approval was the responsibility of the ODOT Central Office, Office of Structural Engineering, Roadway Hydraulics. Concrete pipe was supplied by the Columbus, Cleveland, and Pittsburgh plants of Rinker Materials-Concrete Pipe Division CEMEX[4]. The Columbus pipe plant in Delaware, OH supplied the pipe on Phase 1. Rinker's Cleveland pipe plant in Diamond, OH supplied pipe to Phases 2 and 3, and the 144-inch diameter RCP was supplied from Rinker's Pittsburgh plant in Oakdale, PA. The deep bury 60-inch diameter pipe used on Phase 1 had a 13.75-inch wall, the 78-inch diameter pipe had a 14.5-inch wall, and the 120-inch diameter (wet cast) pipe had a 20-inch wall. The 84-inch diameter pipe of Phase 3 had a 19.25-inch wall, and the 144-inch had a 14-inch wall.

Contractors included Kokosing Construction Company[5] for Phases 1 and 3. Beaver Excavating Company[6] was the contractor for Phase 2.

LINKS

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Deep fill applications required specially designed heavy wall RCP that included 42, 54, 60, 78, 84, 120 and 144-inch diameter pipe.

Photos: Courtesy of Rinker Materials-Concrete Pipe Division CEMEX

Road Improvements Employ Special Precast fittings and Standard RCP

By Ed Pentecost
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Concrete pipe producers often supply fittings to facilitate the construction of new storm and sanitary sewers. The widening of Cottman Avenue (SR6073) in Philadelphia is a Pennsylvania Department of Transportation[1] (PennDOT) project that utilized special fittings and standard reinforced concrete pipe[2]. All pipe and fittings were installed by Nello Construction Company[3], a sub contractor of Tony DePaul & Son[4].

Oldcastle Precast, Inc.[5] of Croydon, PA was contracted by Tony DePaul & Son to design, engineer and manufacture custom precast concrete pipe and fittings to replace the proposed junction chamber on a $30 million-plus project to reconstruct Interstate 95 at the Cottman Avenue Interchange in northeast Philadelphia. Cottman was lowered by 1 foot, 3 inches to increase clearance under the AMTRAK bridge west of State Road to 14 feet, 6 inches, so the road could accommodate most commercial vehicles. Cottman was re-designated as Route 73 east and westbound.

Oldcastle Precast manufactured 1,154 feet of precast concrete pipe for the new storm sewer line that included 352 feet of 48-inch diameter pipe, 472 feet of 54-inch diameter pipe and 330 feet of 84-inch diameter precast concrete pipe. In addition, Oldcastle Precast worked with DePaul to produce special precast concrete fittings for the sewer line. Their challenges included an 84-inch diameter concrete pipe bend, an 84-inch x 54-inch wye fitting, and two 84-inch x 15-inch diameter pipe fittings. The custom precast fittings for the sewer line eliminated the need for a poured-in-place concrete junction chamber, thereby allowing the work to be completed on schedule without undue dependence on good weather.

The existing poured-in-place junction chamber at Cottman Avenue and Tulip Street was 21 feet deep, 24 feet long and 13 feet wide. The skewed structure connected the 84-inch, 72-inch, and 54-inch diameter reinforced concrete pipe. The replacement precast 84-inch x 54-inch, 45 degree wye fitting was the most complicated and heaviest custom special designed by Oldcastle at its Croydon plant. Design of the fitting occurred as the 84-inch diameter pipe was being installed. This was done to ensure that the 45 degree bends would align correctly with the 72-inch diameter branch connection. Elimination of the junction chamber and replacement with the precast fitting was completed safely, on time and with savings for the client.

Financed with 90 percent federal and 10 percent state funds, the crews continue to work on the $31.9 million Interstate 95 - Cottman/Princeton Ramp project, and expect to complete Phase One in August 2011.

Transport of 84-inch x 54-inch, 45 degree wye fitting to replace poured-in-place junction chamber.

Precast 84-inch x 54-inch, 45 degree wye fitting.


84-inch diameter RCP bend.

LINKS

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3. http://www.nelloconstruction.com
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  (Storm, fitting, wye, PennDOT, award.)
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Photos: Ed Pentecost and Robert Bee, Oldcastle Precast, Inc., Croydon NJ

25-ton structure lowered into position.

Thru pin lifting device increased degree of safety.

Installation of precast concrete megabox section.

Megabox Provides Equestrian Crossing of Major Roadway

By Randy Wahlen, P.E.
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A 14-foot x 14-foot precast concrete megabox culvert was constructed under highway 1300 East, through Dimple Dell Nature Park, Utah to serve as a crossing for horseback riders, mountain bikers, hikers, and emergency vehicles. Before construction of the culvert, users of the 644-acre long park had to cross 1300 East (30,000 vehicles daily) to access facilities in the east and west. Designed to improve traffic safety, the "Dimple Dell Tunnel" is a cooperative project between the Utah Department of Transportation (UDOT)[1], Sandy City and Salt Lake County costing $30 million.

Precast megaboxes are those that are larger than the standard sizes in ASTM specifications (greater than 12 feet x 12 feet). The 14-foot x 14-foot boxes were designed using ACPA's BOXCAR[2] program. The design included "Thru Pipe" lifting devices which allowed the contractor to lift the concrete structure itself, rather than depending upon the integrity of a lifting pin within the concrete. This allowed the 25-ton structures to be handled with the highest degree of safety. A special Self Consolidating Concrete (SCC) mix design was used to produce a design strength of 5,000 psi in 7 hours. This design permitted two sections to be poured each day to meet the tight delivery schedule and lane closures. One lane in each direction was required to be kept open during construction. After half of the tunnel was constructed, a steel plate was then used as a bulkhead to excavate from the opposite side. Precast box sections were placed approximately 30 feet deep, using a new trench box shoring system that provides improved safety for excavations characteristic of the megabox.

The culvert is 156 feet long comprised of 26 box sections with 6-foot lay lengths, covered by 15 feet of fill. Sections of the culvert had to be slid under major waterlines that could not be taken out of service during installation. The waterlines were strapped to temporarily installed I-beams for structural support. Concrete skids coated with lubricant were used to control placement of the sections.

The tunnel is a critical link between open spaces that have been difficult to preserve. The invert was sand blasted so that a soil cover, placed to make the passage more comfortable for the hooves of horses, would adhere to the concrete surface and not spill from the lower end. Precast boxes[3] have a very smooth inside surface when delivered to job sites. Interior lighting for the tunnel was facilitated by an electrical conduit cast into the box sections. It was designed by URS[4], Ensign Engineering[5] and Project Engineering Consultants (PEC)[6], and constructed by Geneva Rock Products[7]. Owners are UDOT and Sandy City. Geneva Pipe[8], Salt Lake City supplied the precast boxes.

LINKS

Info Links

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4. http://www.urscorp.com
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6. http://www.pec.us.com
7. http://www.genevarock.com
8. http://www.genevapipe.com

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Photos: Courtesy of Geneva Pipe

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Pipe Jacking Keeps major Arterial Road Open

By Randy Wahlen, P.E.
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A new 66-inch diameter concrete storm sewer was constructed under the Mountain View Corridor[1] near Harriman City Utah by the jacking method[2] using 108 feet of Class V pipe with additional axial strength in 12-foot lengths. The pipe supplied by Oldcastle[3] was drycast with no bell design. By jacking the sewer under 13400 South there was no interruption to the flow of commuters from this high growth residential area. The cover over the pipe was approximately 30 feet, but as is typical with jacking pipe, axial stresses were more of a design consideration than the circumferential stresses.

Click Here for full article.

Info Links
1. http://www.udot.utah.gov/mountainview/
2. http://www.concrete-pipe.org/pdfs1/DD_4.pdf
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66-inch Class V jacking pipe.

Photos: Courtesy of Oldcastle Precast, Inc.

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