



## Gigantic T-REX Project Shapes Denver's Transportation Future No Bones About It – Concrete Pipe Is No Dinosaur!

Brian Schram, Rinker Materials, Hydro Conduit Division  
Denver, Colorado  
(303) 288-6677

When considering pipe performance and durability, concrete pipe is no dinosaur. Reinforced concrete pipe (RCP) and boxes continue to maintain their place in history as the most reliable product for storm and sanitary sewers in North America. In Colorado, RCP has always been the preferred choice among specifiers and designers, despite offers of lower prices by producers of thermoplastic drainage products. The largest and most ambitious design-build transportation project in the history of Colorado, known as T-REX, is providing the latest opportunity to test the confidence of specifiers and designers in precast concrete drainage products.

Metro Denver's Transportation Expansion Project (T-REX) is a \$1.67 billion combined freeway reconstruction and light-rail extension involving the simultaneous rehabilitation of 17 miles (27 kilometers) of I-25 and I-225 and construction of a light-rail extension and its 13 sta-

tions over a distance of 19 miles (almost 31 kilometers).

After the project began in the summer of 2001, the construction/design team Southeast Corridors Constructors (Kiewit Construction Co. and Parsons Transportation Group), approached Carter & Burgess (the project oversight engineer) about changing the storm sewer design from concrete pipe to alternate materials. The request was made to reduce project costs by specifying a pipe material that had a lower list price than concrete pipe. No consideration was given to the costs of premature replacement of alternate pipe products, bedding materials and labor costs, not to mention the hidden economic and social costs of premature roadway drainage repairs.

John Griffith, project manager, Carter & Burgess and Scott Leiker, hydraulics engineer, Colorado Department Of Transport (CDOT) Region 6 were charged with the task of mak-

ing recommendations to the overall T-REX project leaders on what type of piping materials should be used in various locations. They studied all aspects of pipe material characteristics including long-term strength and stiffness properties, hydraulics, service life, relative ease of installation, and the history of how the various pipe materials have performed in the region. Knowing concrete pipe's track record of performing well in harsh Colorado climatic conditions, and that it is used most often for CDOT storm sewer installations, Leiker and Griffith were confident in the specification of concrete pipe. In their evaluation, concrete pipe was held as the benchmark to which all other piping materials would be compared.

The final decision was made to allow only limited use of alternate materials in small diameters. Higher quality pipe bedding, tighter inspection, and deflection testing are being required where alternate materials are being used. Concrete pipe is the only pipe material permitted for installation under the mainline roadway. This is the result of the proven high performance level and extended service life characteristics of concrete pipe.

Griffith said that durability is a concern. "We know that concrete is good for a long time—much longer than anything else."

Once the project is complete, the underground storm drain system will be very difficult to access if repairs or replacement are needed. "We want the service life of the pipe to exceed the design life of the road," said Griffith.

The drainage improvements of T-REX represent no small element of the overall project.



*The installation crew gets ready for placement of the final section in grade transition box culvert line.*

Rapid residential and business growth has occurred over the past 40 years since the freeway was first built. Consequently, the existing system became woefully undersized and during the 1990s, flooding was serious enough to close the highway four times. In July 1998, I-25 had to be closed for several hours as it disappeared under four feet of water. Stranded motorists had to be rescued by boats.

The new drainage system is being designed and built to accommodate a 100-year storm. Many of the existing storm sewers will be relocated or removed to make way for the wid-



*Denver's T-REX Transportation Project includes 1,500 feet of precast concrete pipe that will be bored and jacked into position.*

ened roadways and light rail track bed. More than half the drainage budget will be used to replace the storm sewer in an area that is much more prone to flooding known as the Narrows.

The local supplier, Rinker Materials, Hydro Conduit Division, Denver, Colorado, is providing precast concrete pipe and boxes for the project. A long-time member of the American Concrete Pipe Association, Rinker Materials is delivering products to the contractor in a timely manner to avoid any construction delays. In all, 42,000 feet (almost 8 miles) of 18-inch to 90-inch diameter concrete pipe will be installed on the project. Of this quantity, 1500 feet will be bored and jacked. In addition, the project will require 14,000 feet (just over 2.5 miles) of precast boxes in sizes up to 12-foot x 8-foot (span and rise).

To meet the aggressive schedule (completion by 2006), new production equipment was purchased and equipment acquired from other Hydro Conduit plants across the country. Todd Milici, a Hydro Conduit representative, attends weekly project planning meetings to work out scheduling issues that occasionally arise on such a massive project. Geoff Parrington, production manager and Roger Sable, field coordinator also attend scheduling meetings and conduct site visits to assure timely delivery of product.

When buried drainage systems are critical components of a major transportation project, it is clear that designers prefer to specify concrete pipe because it has a tested and true performance history. On occasion, public works officials have unearthed ancient concrete pipe systems that are still functioning as first designed, with the same awe that an archeologist may express when discovering the remains of an historic creature or artifact.

In fact this has occurred on the T-REX project. Pipe that was installed with the original construction of I-25 in the late 1950s was removed to accommodate additional traffic lanes. The 44 year-old pipe was examined and tested. It was found to be in excellent condition. The excavated pipe, classified as Class I pipe, was D-load tested and was found to exceed the strength requirements of Class III pipe — and almost met the requirements of Class IV pipe! No visible signs of deterioration of

the pipe, inside or out, could be seen. The pipe was clearly ready for another 44 years of service — and beyond.

Today's pre-cast concrete pipe, manufactured with modern equipment, better materials and under stringent quality control methods, has the ability to last longer than pipe manufactured 50 years ago.

Indeed, the T-REX project demonstrates that concrete pipe is no dinosaur in the eyes of contemporary transportation, structural and hydraulics engineers. Manufacturers of some drainage products made of alternate materials may wonder if their time is limited, and extinction is a possibility. ☺

<b>Project:</b>	Transportation Expansion Project (T-REX), Denver, Colorado
<b>Partnership:</b>	Colorado Department of Transport (CDOT) Regional Transportation District (RTD) Federal Highway Administration (FHWA) Federal Transit Administration (FTA)
<b>Design-Build:</b>	Southeast Corridor Constructors Kiewit Construction Co., Littleton, Colorado Parsons Transportation Group, Denver, Colorado
<b>Management:</b>	T-REX Team CDOT RTD Carter & Burgess, Inc., Denver Colorado
<b>Quantities:</b>	42,000 feet of 18-inch to 90-inch diameter RCP 14,000 feet of precast boxes in sizes up to 12-foot x 8-foot (span and rise)
<b>Producer:</b>	Rinker Materials, Hydro Conduit Division Denver, Colorado Brian Schram

*Precast concrete box sections being positioned for installation as part of Denver's T-REX Transportation Project.*



Rinker Materials, Hydro Conduit Division has been manufacturing and supplying reinforced concrete pipe for the Denver area since 1964. The Denver plant manufactures round RCP and manholes up to 144-inch inside diameter, box culverts, flared end sections along with reinforced concrete elliptical and arch pipe. Florida-based Rinker Materials is a major supplier of construction materials, aggregates, and ready-mixed concrete throughout the United States. For more information on Rinker Materials, Hydro Conduit Division, visit [www.rinker.com](http://www.rinker.com).