

The Big Push

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Rinker Materials Concrete Pipe Division¹ (Roanoke and Sealy plants) was selected by Trinity Infrastructure² to supply reinforced concrete pipe, precast concrete boxes, and various other precast concrete products on the LBJ Express Project³ in Dallas. This project will accommodate population growth for next three decades by nearly doubling the capacity on the LBJ Freeway, through the addition of up to six new express toll lanes on I-635 and four on IH-35.

Rinker Materials was selected because it is a leading producer of precast concrete pipe and boxes in the USA, and a supplier that could meet Trinity's aggressive timeline. The average daily traffic where IH-35E intersects with IH-635 is approximately 270,000 vehicles, so open cut installations for culverts was not an option. Installation by jacking was required.

One of the project highlights was the jacking⁴ of boxes underneath IH-35E (Segment 1B of the Project). Precast box jacking is the process of installing a continuous string of box sections by jacking against a reaction block in the launch pit. A.R. Daniel Construction, Inc.⁵ was selected for the jacking operation because they specialize in trenchless construction. Art Daniel assisted Rinker with the design of the boxes in accordance with ASTM C1577-11a⁶ and HL93 Live Load⁷. Rinker supplied box sections for three triple-barrel culverts.

Culvert #707-1 is a 9-foot x 5-foot structure that required one push for 276 feet, a second push for 270 feet and a third for 264 feet for a total of 810 feet under earth cover that ranged from 2 to 20 feet. Culvert #707-2 is a 9-foot x 5-foot structure that required one push for 102 feet and a second for 108 feet for a total of 318 feet under 3 to 10 feet of earth. Culvert #707-3 is a 10-foot x 5-foot structure that required three pushes of 150 feet each over a distance of 450 feet under 2 to 15 feet of earth. All of these boxes had a lay length of 6.04 feet. The maximum allowable jacking force for the 9-foot x 5-foot run was 1,400 tons, and 2,000 tons for the 10-foot x 5-foot run. The boxes were produced with an additional outer bell and spigot shoulder reinforcement cage that was 12 inches wide. Additional joint cushion material was applied to the bell end of the box to minimize damage due to the jacking force. Two-inch threaded grout/lube ports were fabricated into the boxes. During jacking, bentonite slurry was pumped through the sidewall ports to fill the annulus between the box and the soil that is created by pushing the slightly oversized shield or cutting ring at the leading edge of the culvert. Slurry fills the annulus and further reduces frictional resistance between the box sections and soil.

The big push was completed without disrupting traffic. Construction began in spring of 2011 and is scheduled to conclude by late 2015.

LINKS

1. www.rinkerpipe.com/default.shtml
2. <http://lbjexpress.com/partners.asp>
3. <http://lbjexpress.com/>
4. www.concrete-pipe.org/pdf/DD_4.pdf
5. www.danielcs.com/
6. www.astm.org/Standards/C1577.htm
7. www.inti.gob.ar/cirsoc/pdf/puentes_hormigon/1-bridgedesign_manual_LRFD2009_TEXAS.pdf

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- **Keyword Search on American Concrete Pipe Association Website**
(jacking, boxes, culvert, installation)
www.concrete-pipe.org
- **Concrete Pipe Design Manual**
www.concrete-pipe.org/pages/design-manual.html
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Photos: A.R. Daniel Construction, Inc.



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Jacking against a reaction block in the launch pit.