

DIGEST

CONCRETE PRESSURE PIPE

Roberts County Wellfield Provides New Water Supply for Panhandle Residents

The panhandle of Texas can seem a barren and desolate place. The first Europeans to visit the area were probably the Spanish conquistadores, notably Francisco Coronado who crossed the area during the 1540's in his quest for the fabled Seven Cities of Gold. Coronado's men marveled at the flat terrain and, despairing of finding any landmarks, left crosses and stakes along their route in hopes that their return might be easier. The Spaniards called the area the *Llano Estacado*, or staked plains. It can be a dry and dusty place. Average annual rainfall is less than twenty-four inches and the locals say that most of it falls over just one or two nights. But beneath the land flows a vast underground river, the Ogalala aquifer. The Ogalala is a sandstone formation that extends from the panhandle up and into the Dakotas



Installation contractor, J.D. Stephens, installed 189,000 feet of AWWA C303 Bar-Wrapped Concrete Cylinder Pipe in the Roberts County Project.

and has been a major source of water for both domestic and agricultural use over the past several decades. Overuse of this resource has led to many predictions of its eventual demise; however, there are few alternatives. The flat land and scant rainfall, along with a virtual absence of rivers in the area, precludes the development of surface water.

In the mid 1960's, a plan was created to develop a reservoir site on the Canadian River, which rises in northeastern New Mexico and flows across Texas on its journey east. The United States Bureau of Reclamation (BuRec) took on this ambitious project to build not only the reservoir,

but also the aqueduct and pumping stations that would transport the water from the new Lake Meredith south from the High Plains, to the South Plains, and then on past Lubbock. The Texas Legislature authorized the cities in the region to form the Canadian River Municipal Water Authority (Authority) to operate and maintain the reservoir and the delivery system. From its headquarters at the reservoir site, the Authority oversees a network of over 300 miles of pipeline ranging in diameter from eight to ninety-six inches. The pipeline system provides a reliable source of drinking water for nearly a half million people in eleven Texas panhandle cities and towns

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Jetco Trencher can open an 8 foot trench in sand, clay or solid rock.

ranging in size from Lubbock and Amarillo, by far the two largest users, to O'Donnell, with a population of just over 1,100. Over the intervening years, this supply of water bore witness to the vision of the planners of the Canadian River system.

Others were also planning for the panhandle's future. Among those were the Southwestern Public Service Company (SPS), an investor owned electric utility. SPS had built a number of gas-fired power plants throughout the region, but was thinking of greater things.

Specifically, the utility planned for a nuclear power plant to serve the area. The site was found in Roberts County, north and east of Amarillo, the nearest population center. Since large quantities of water are required for cooling in nuclear power stations, SPS purchased a large tract of land planning to exploit the underlying Ogallala water. Then came the incident at Three Mile Island power plant and the subsequent collapse of the nuclear power industry in the United States.

Over the next several years, the site and the water below it remained essentially unused. Eventually, though, SPS began to realize that the water under the land might be more

valuable than the land itself. Texas groundwater law is based on the right to capture; that is, the water underlying the land is the property of the landowner. The law gives the landowner broad powers to the use of the water. Barring the existence of an underground water district, the landowner has few, if any, restrictions placed on withdrawals or use of the groundwater. The water can even be sold and transported out of the area. With that thought in mind, SPS began looking for a different type of customer.

The Authority was also looking for a new source of water. Lake Meredith had never met its projections for water quality, but now the water quality was becoming an issue. The quality problem had its source in a number of salt springs in eastern New Mexico. Working with the BuRec, the Authority began a program to collect the salt water from those springs and dispose of it through the use of deep injection wells. While the program was showing promise, it had a long way to go. Also, even if the flow from the salt springs were completely halted, it would take many years for the water quality to improve significantly, because of the deposition of salt in the river and lake beds. Soon the Authority and SPS

were discussing either a sale of water or a sale of land and water rights for the Roberts County tract.

The Authority eventually determined that its best interests would be served by purchasing all or a part of the SPS land and then developing the groundwater resource. The plan seemed simple enough: drill the required number of wells and then build a pipeline to a point on the aqueduct below Lake Meredith where the two waters would be combined. However, the execution of the plan was another matter altogether.

Neighboring landowners were less than excited at the prospect of water being withdrawn from their county to serve the Authority's customers. The response was to form an underground water district to regulate withdrawals from all wells in the area. The Authority found that the project was still feasible even with the withdrawal limits and pressed on. The battle was still not over, though. Opponents sought to delay or prevent the projects construction by raising the possibility that a species of minnow, the Arkansas River shiner, found in the Canadian River below Lake Meredith might suffer if the project went forward. When that effort failed, the opposition closely read the BuRec's project plan which called for the aqueduct system to transport surface water. They pointed out that the Roberts County water was groundwater, not surface water, and therefore, it could not be introduced into the aqueduct. This hurdle called for a legislative solution. The Texas Congressional delegation worked to secure passage of a special bill in the closing days of the session to allow the Authority to purchase the Lake Meredith system from the BuRec in a lump sum rather than continuing on the project payment schedule.

Engineering work was proceeding as the legal questions were settled. A joint venture of Fort Worth based



The joints are bonded and filled with grout immediately following the pipe laying operation.

Freese & Nichols and Lubbock based Parkhill, Smith & Cooper was selected to perform the work. Freese & Nichols took on the design of the transmission pipeline and pump station while Parkhill, Smith & Cooper worked on the wellfield and its piping. The plans called for a 54-inch diameter pipeline to run from the wellfield to the existing aqueduct where a junction structure would be constructed. Specifications permitted the contractor to use either AWWA C303 Bar-Wrapped Concrete Cylinder Pipe, AWWA C200 Steel Pipe, cement mortar lined and tape coated, or a combination of the two. The ability of the designer to match the AWWA C303 pipe's capabilities to the pipeline's requirements allowed the reduction of pipe design pressure by 25 psi increments, which created a significant savings in the lower

pressure classes by using AWWA C303 pipe.

The low bidder for the project, John D. Stephens, Inc., a Stone Mountain, Georgia, based contractor with significant experience in Texas, proposed a combination of pipe types using steel pipe in the higher pressure areas and AWWA C303 pipe in the lower pressure zones. As a result, the project was built with roughly one-third steel pipe and two-thirds Concrete Pressure Pipe. Stephens used an installation procedure that was similar to what was used in the firm's construction of the 157-mile long O.H. Ivie pipeline in the early 1990's. The pipe trench was excavated with a trencher and native material from the excavation was used for the backfill. A sheep's foot type roller mounted on a backhoe boom was used to compact the

material. The installation procedure again worked well on the Concrete Pressure Pipe which is somewhat stiffer than a comparable steel pipe and thus better able to withstand the compactive effort while remaining round. The contractor discovered that steel pipe under similar compactive efforts tended to go out-of-round and that the intensity of compaction had to be more closely monitored. Seven months after the bid opening for the 54-inch pipeline project, the Authority opened bids for the wellfield collection system. That project consisted of almost thirty-five miles of pipe ranging in diameter from eight to thirty inches. The low bidder for the wellfield was the Garney Companies, Inc. from Kansas City, Missouri. Garney will use almost 60,000 feet of AWWA C303 pipe

from 20-inches up through 30-inches in diameter.

American Concrete Pressure Pipe Association (ACPPA) member Hanson Pipe & Products, Inc., secured the order for the Concrete Pressure Pipe which was produced in its Lubbock, Texas plant. The Lubbock facility is certified under the ACPPA Compliance Audit Program for the production of AWWA C303 pipe. 💧

Contributed by Jimmy Doty

Hanson Pipe & Products, Inc.

Large PCCP; A Perfect Fit For A Small Town

Most people would expect a large diameter (>1200mm or 48-inch) Prestressed Concrete Cylinder Pipe (PCCP) to be installed in a major city, for a vast water system, not a small town. However, for the Town of Madoc, located north of Kingston, Ontario, large diameter PCCP fit perfectly. PCCP was incorporated into the manufacture of two in-line mixing chambers, known as Chlorine Contact Tanks (CCT).

Chlorine Contact Tanks employing PCCP were first introduced shortly after the drinking water section of the Ontario Ministry of the Environment issued a bulletin in 1987 regarding the chlorination of potable water supplies.

The Ministry guidelines required a chlorine residual of at least 0.5mg/l after 15 minutes of chlorine contact time. That generates a problem for towns and municipalities that obtain their potable water supplies from ground water sources. For situations where the well is near the distribution system, a means of obtaining 15



Prestressed Concrete Cylinder Pipe fabricated into a chlorine contact tank, an ideal solution to a common problem.

minutes of contact time must be assured.

The versatility and maintenance free characteristics of PCCP proved advantageous to the Town of Madoc and its consulting engineer in solving the chlorine contact time problem.

The Town of Madoc's existing water supply and distribution system is composed of two wells, a 1,250 cubic meter elevated storage tank, approximately 13 km of watermains and 500 service connections.

The original well was drilled in 1950, with a current maximum daily withdrawal rate of 1,400 cubic meters per day. A second well was drilled in 1982 and acts as a standby. The disinfection for each well is sodium hypochlorite.

Due to population growth experienced in the 1990's, maximum daily consumption exceeded the two-well capacity. The town's solution was to upgrade the original well. Upon further investigation, it was discovered that neither well site had chlorine contact tanks.

The minimum contact time available for the first customer was below one minute and lack of adequate contact time resulted in high chlorine

residuals at dwellings in the vicinity of the well sites.

Totten Sims Hubicki Associates (TSH) of Whitby, Ontario was hired as the consulting engineer to design CCTs for both well sites. Based on the available pump rate and minimum requirement of 15 minutes contact time, TSH's solution was two CCT's; a 1.8m diameter by 6.6m long tank, and a 1.5m diameter by 5.4m long tank. Both tanks included an access hatch and baffles to prevent short circuiting and ensure complete mixing.

The CCT's were designed and manufactured to AWWA C301 standards. Due to the owner's and consultant's confidence in PCCP, the CCT's were only specified as PCCP. That confidence is based on the superior characteristics of PCCP, including: design versatility; corrosion resistance; ease of installation; maintenance free long life.

Both tanks were manufactured and supplied by Lafarge Canada Inc. - Pressure Pipe Division and installed by Magnus Construction of Belleville. Both are in service today and performing just as they were designed. 🚰

Contributed by Gord Gajich

Lafarge Pressure Pipe

There are eight technical publications now available from the *American Concrete Pressure Pipe Association*. Subjects addressed in the series to date are:

Concrete Pressure Pipe for Corrosive Environments

Concrete Pressure Pipe for Sewer Applications

Fittings and Specials

Pipe on Aerial Spans and Pier Supports

Restrained Joints

Tapping of Concrete Pressure Pipe

Water and Sewage Treatment Plant Piping

Concrete Pressure Pipe in Tunneling Installations

For a free copy of these publications, log on to the *American Concrete Pressure Pipe Association* web site at www.acppa.org.