Successful Design-Build WWTP Completed in Texas

54- and 72-inch CCFRPM pipe was installed by direct bury.

BROWNSVILLE, ON THE SOUTHERNMOST TIP of Texas and the northern bank of the Rio Grande, is across the border from Matamoros, Tamaulipas, Mexico. The Brownsville urban area is projected to become one of the fastest growing in the United States. The Port of Brownsville is a major economic hub for South Texas, where shipments arrive and depart to and from Mexico, several destinations in the United States and many other parts of the world.

The Robindale Wastewater Treatment Plant (WWTP) is owned by the Brownsville Public Utilities Board (BPUB) and is one of two WWTPs that serve the City. This WWTP was built in 1980 and in 1995 was expanded to ten million gallons a day (MGD) capacity. In 2010, the WWTP was nearing 75 percent treatment capacity and the BPUB needed to meet the demands of population growth. In addition, the Texas Commission on Environmental Quality (TCEQ) was encouraging more ammonia and chlorine control in the discharge. TCEQ mandated a reduction of the ammonia nitrogen levels through an amended discharge permit with a compliance date of November 6, 2013. Environmental Protection Agency (EPA) funds being partially used for this project had a utilization time constraint; therefore, BPUB decided to rehabilitate and expand the WWTP to 14.5 MGD using a progressive design-build method to meet the funding time schedule, achieve the ammonia nitrogen effluent discharge limitation by the compliance date and to ensure high quality effluent water through 2025.

According to BPUB, the Robindale WWTP expansion and rehabilitation is the first major public civil works, design-build wastewater project in Texas. One advantage of a design-build project is that work will be streamlined under a single contractor/design team from concept to completion, to save costs and ensure faster delivery. After being shortlisted based on their qualifications and later awarded the work based upon their project approach and qualifications, CH2M Hill, a global leader in consulting, design, design-build, operations and program management, was selected by BPUB as the At Risk Design-Builder.

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Pipe Requirements

The project included 54-inch and 72-inch centrifugally cast fiberglass reinforced polymer mortar (CCFRPM) pipe manufactured by Hobas Pipe USA. Both diameters were manufactured with a stiffness class of 72 psi and the pipe was installed by direct bury. The project also included several fittings custom manufactured of the same materials as the CCFRPM. They included elbows, tees and concentric reducers.

This Robindale WWTP completion was a progressive design-build project. This method of delivering infrastructure projects combines the owner's direct control over project concept (up to 30 percent design completion) and detailed design with the design-builder's innovation – and creates a single point of design-builder accountability. Its key advantages are: shifting early investment into project design, not procurement; shortened project schedule, potential or increased participation by the owner and capital budget management. "This project was a progressive design-build meaning we developed the design by gaining feedback and input from our construction team, design team and the owner and their agent and then submitted a final guaranteed maximum price based upon that design," said David Schoster of CH2M Hill, the project's preconstruction manager.

Fittings can be manufactured of the same corrosion resistant material as CCFRPM pipe.

Year of construction
2012 - 2014
Total length of pipe
400 feet
Diameter
54- and 72-inch
Stiffness class
72 psi
Installation method
Direct Bury
Application
WWTP
Client
Brownsville Public Utilities Board
Installer
Haskell Company
Advantages
Shallow burial depths, fittings, corrosion resistance

"Meeting the compliance deadline was the driving force compelling BPUB to design and build this project as quickly as possible. Another advantage of going with progressive design-build was to gain a better chance of designing the project to fit the budget. The design-build team was selected solely on qualifications," said Sergio Espinoza, senior engineer, water and wastewater engineering department, Brownsville Public Utilities Board.

The total project cost was $32,446,379 with approximately half of the project cost being EPA funded through the State and Tribal Assistance Grants program for water and wastewater infrastructure projects.

The maximum depth of the buried pipes was eight feet and the shallowest was one foot. Hobas could handle potentially high live loads due to traffic (HS-20) at the shallow covers. "We were required to utilize bedding sand beneath the pipe and select fill to an elevation one foot above the pipeline. The native soil consisted of expansive clays and required Haskell to wet the soil considerably to achieve the required compaction as well as moisture content," said Jason Plauche, project manager for the Haskell Company, installation subcontractor.

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Field Versatility

An expansion to an existing WWTP can be difficult to completely design ahead of time. Exact connections to existing structures sometimes are not known until the project is underway and the ground area around the structures is removed. "The Headworks required a field cut to align the pipe that received a PVC bypass line. Immediately outside of this structure was where the previously referenced elevation change occurred. Haskell utilized two stainless steel closures provided by Hobas to achieve the tie-in to the bypass line. Another interesting connection was where Haskell requested one flange-by-coupling piece of pipe be manufactured to tie into a flange in a 72-inch carbon steel piping system," said Plauche.

A 72-inch flange was manufactured to tie into a 72-inch steel flange.

"Due to the pipe's fixed outside diameter and a fixed inside diameter seal on the FWC couplings, field adjustments in length to the standard 20-foot pipe lengths are easily accomplished to connect to concrete structures or a fitting," explained Rene Garcia, engineering supervisor, Hobas Pipe USA.

"I found the Hobas sales staff and engineering group to be valuable team members regarding clarification of how Hobas systems would successfully transition into other systems (such as PVC and Carbon Steel). They provided fair pricing, delivery that met our expedited schedule, valuable engineering assistance, and onsite representation helping to leverage past successful installations in Haskell's favor," said Plauche.

Reliable Installation

The project design was 100 percent complete in July 2012, and construction began the following month. The construction completion date was July 24, 2014.

"Haskell was required to put together a detailed pipe testing plan and procedure for all mechanical assemblies on the project. Due to the complexity of installation and the fact that the pipe was installed in conjunction with C900 PVC, a visual water leakage test was required. Hobas pipelines were filled to the highest liquid level that the pipeline will be subjected to by allowing the water to reach high levels in the associated structures they were connected to," explained Plauche. All pipe passed the initial testing.

The Hobas field service representative played a key role during the installation process. There was an instance where significant elevation changes were required and two 45-degree Hobas fittings were installed in a relatively short distance. "The representative provided onsite services to leverage past installation experiences providing helpful insight during that particular installation," added Plauche.

According to the Water Design-Build Council, the flexibility of the design solution allows the improved plant effluent quality from the Robindale WWTP to be acceptable for reuse applications if some additional treatment is provided to make them conform with Texas Type 1 reclaimed water regulations. This allows BPUB to add reclaimed water treatment capacity to its system incrementally as both the volume of WWTP influent flow permits; and commercial/industrial users are identified, and pipeline conveyances to them are completed.