

LARGE DIAMETER PCCP REHABILITATION

Fayette Power Station, Lower Colorado

OVERVIEW

Lower Colorado River Authority (LCRA) owns and operates fossil and hydro power stations, manages the lower Colorado River and supplies water in Texas. LCRA's Fayette Power Station is a three-unit fossil power plant and two of their units use pre-stressed concrete cylinder pipe (PCCP) to deliver cooling water to the turbines. After conducting a condition assessment of their Unit 3 CW piping system, their site and corporate engineering team reviewed the results, which included a recommendation for maintaining the structural integrity of this critical asset. LCRA's engineering team then specified carbon fiber-reinforced polymer (CFRP) materials for CW piping rehabilitation as the technology that would most cost-effectively be able to provide a fully structural rehabilitation during a maintenance outage with limited access conditions.

The design of the 48-inch diameter and 120-inch diameter PCCP repair followed the procedure outlined in the AWWA C305 standard entitled "CFRP Renewal and Strengthening of PCCP". This document took over 10 years to develop and focuses on the inherent differences between the design and installation of CFRP systems over other technologies, including the high-strength, hand-applied nature of the system. The overall goal was to provide a standalone design that will last the next 50 years.



Tyfo® unidirectional carbon fiber being placed and oriented in the hoop direction on the 120-inch PCCP pipeline

"This being the first time LCRA utilized CFRP materials, our team didn't know what to expect. Fibrwrap Construction showed up at the site and were very professional with their equipment setup, especially their confined space plan implementation and equipment setup. After auditing several safety tailgate meetings at the beginning of the project, our management team was very impressed by the company's safety culture and relaxed the rest of the project. LCRA appreciates the professionalism of Fibrwrap's entire team..... from management, all the way through your crews."

**JD Killien, Project Engineer
LCRA**

Project Overview	
Project	LCRA - Fayette Power Station, Unit 3 - CW Pipe Rehab
Location	LaGrange, Texas
Pipe Length	160-ft
Pipe Size	48 inch and 120-inch PCCP
Installation Method	CFRP wet lay-up
Owner	Lower Colorado River Authority
Engineer	Fyfe Co. LLC
Contractor	Fibrwrap Construction

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PROJECT PROFILE: PIPELINE REHABILITATION TYFO® SYSTEM

OVERVIEW

Fibrwrap Construction was selected to perform the rehabilitation work. The scope of work included strengthening nine (10) segments of PCCP, including conducting the required surface preparation, end detailing, fiber installation, finish coat installation and all the required quality control measures. Both the return and supply cooling water lines had segments which required structural strengthening. The access limitations only allowed for man entry and ventilation on each end of the two 1,200-ft long segments of pipe.

The general installation procedure for the CFRP system went as follows:

1. Prepared the exposed concrete substrate to concrete surface profile.
2. Before the CFRP system is installed, prepared three 2 ft. x 2 ft. mockup areas in the pipeline with one layer of the CFRP system using the same surface preparation and installation methods to be used for the repair pipes per ASTM D4541.
3. Removed mortar lining at joint ends, at least 18 inches to the steel can, for proper termination of the CFRP system.
4. Installed CFRP layers in the hoop and longitudinal directions as required by the AWWA C305 design requirements.
5. Placed the hoop layers of the CFRP system in narrow widths as needed to conform to sloped surface in joint recess. Staggered the seams of the narrow hoop layers in subsequent layers.
6. During the repair of pipes, prepared at least one 2 ft. x 2 ft. witness panel (test panels) per day per work shift on a level surface using one layer of the CFRP system and the same material and techniques used for the fiber wrap installation in the above listed pipes.
7. After the installed CFRP system has become tack free, inspected all surfaces for voids, delaminations, wrinkles and raised fabric edges, and perform corrective actions.
8. Cured the CFRP system using curing schedule approved by the engineer. Pipeline can be refilled after the CFRP system completes at least 85% cure based on Barcol or Shore D hardness.
9. Final inspection and acceptance of work.

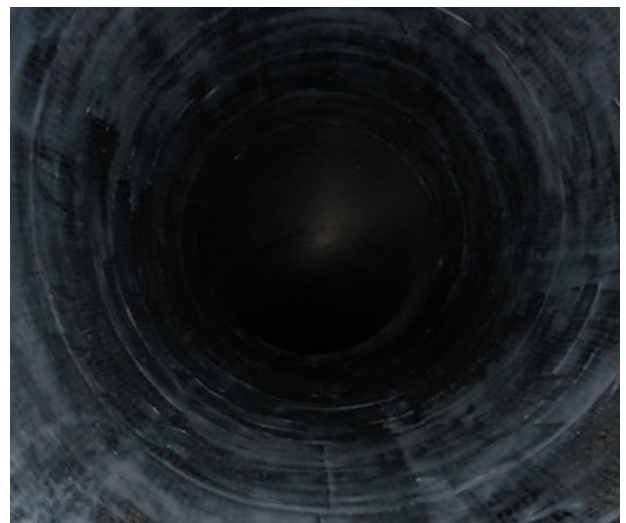
The project was completed on time and below budget and the customer was very pleased with Fibrwrap's confined space safety program. LCRA was very complimentary of Fibrwrap's performance in supplying, designing and installing the specified Fyfe® Tyfo® product within the aggressive outage schedule.



Tyfo(r) CFRP being placed in the hoop direction.



Scaffolding is used to provide work access to apply the Tyfo® CFRP product



Fully rehabilitated PCCP pipeline using Tyfo® CFRP

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