Flotilla of Equipment used by Treviicos/Rodio JV to install Deep Cut-Off at Walter F. George Dam. Powerhouse and Spillway

Treviicos Rodio JV using Wirth Reverse Circulation Drill Rig to install Secant Wall Piles for Walter F. George Dam Deep Cut-Off
The Deep Cut-Off at the Walter F. George Dam

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INTRODUCTION

The Walter F. George lock and dam was constructed on the Chattahoochee River between 1955 and 1963 with the double function of improving navigation and generating power. Its 82 ft. by 450 ft. (25m x 137m) lock can accommodate large barge traffic and its four generating units with a plant capacity of 150 MW have an average energy output of 453,000 MWH. The dam consists of a 1,496 ft. (456m) long concrete structure housing the spillway, a non overflow portion, the power units and two earthen wing dams extending to the Georgia and Alabama sides, respectively 5,810 feet and 6,130 feet long (1770m and 1868m).

As soon as the reservoir was impounded it became apparent that excessive seepage was occurring. From 1962 to 1985 a series of remedial works was performed using several techniques, but the problems continued under the dam, jeopardizing its generating potential and possibly undermining its stability.

Finally, the decision was made to construct a deep cut-off primarily under the concrete portion of the dam to remedy the problem.

PROCUREMENT

On July 5th, 2001 best and final offers were solicited by the Corps of Engineers (COE) for the construction of a deep cut-off to be built in front of the concrete portion of the dam from the bottom of the lake and tied into it. The cut-off had to cross an existing lock structure and an underwater retaining wall, as well as the remnants of a steel coffer cell left in place from the initial construction.

The specifications required that the wall be built with a minimum thickness of 24" (600mm) and that it extended from the bottom of the lake to elevation -5 (1.52m) into the Providence formation, an impervious layer. The land portions of the wall were on average 208 feet (63.4m) deep, the marine portion started from up to 90 feet (27m) of water and continued through different rock formations for another 100 feet (30m).

Contractors were invited to propose their own method of constructing the cut-off and offers would be evaluated using several criteria, including technical, economical, organizational and experience.

Three proposals were received and on August 14, 2001 an award was made to the Joint Venture (JV) of Trevicos and Rodio.
JV'S PROPOSED CONSTRUCTION METHOD

Trevicco-Rodio proposed to do the marine portion of the work with secant piles, using water as drilling fluid, while the land portion would be a slurry wall done by hydromill, using bentonite as a stabilizing fluid.

The proposal contemplated a preliminary drilling and grouting campaign in order to verify ground conditions and to fill any large voids which could disrupt the orderly progress of the work.

After the completion of the drilling and grouting, the work would be performed in a series of operations as follows:

1. Cleaning the Lake Bottom and Constructing a Working Apron

The purpose of the apron installation was to create a zone, upstream of the dam monolith, free of obstruction and consisting of solid, homogeneous material forming the working surface used to install the cutoff wall and, ultimately, the cap beam connecting the cut-off to the dam.

2. Installing Casing Templates Tied to the Concrete Dam

Whenever possible, guide beams and templates were installed and secured to the concrete dam structures. The main beam was mounted on the props fixed to the fenders of the dam. Its position and alignment was checked using reference points previously installed on the dam during the initial survey.

When it was impossible to attach the template to the dam, temporary piles were driven to support the original or a modified template. The templates were used to install and drive the temporary casing into the apron.

3. Drilling and Concreting Piles

The primary tool used to construct the secant pile diaphragm wall was a WIRTH PBA 612 Reverse Circulation Drill Rig. The 50-inch (1270mm) secant piles, spaced 33 inches (838mm) center to center, formed the cut-off wall. The piles were installed in a sequence of primaries and secondaries, in which the secondary piles were drilled between the two adjacent primary piles.

The piles were installed to form a continuous wall, of the minimum thickness of 24 inches (600mm), from the lakebed to El – 5 MSL (~1.52m), into the Providence formation.

Phase I - Primary Piles Installation

Phase II – Secondary Piles Installation

4. Constructing the Slurry Wall

The slurry wall was built by primary and secondary panels using a Soletanche H12000 series Hydromill. The primary panel was formed by single or multiple bites with a total excavation length of 8 to 24 feet (2.4 to 7.3m). The secondary panels overlapping the primaries were a single 8-foot (2.4m) bite.

The de-sanding plant was a Sotres-450 consisting of a series of vibrating screens and cyclones capable of screening all the cutting sizes with a capacity of 500 cu. yd. (382 m$^3$) per hour.

5. Constructing the Cut-Off Through the Lock Structure

The crossing of the lock structure was accomplished by using a combination of Hydromill and secant pile techniques.

www.ConstructionWebLinks.com

Website of Thelen Reid & Priest LLP

Through e-mails received on the subject “Construction Business Bulletin”, we have become aware of this interesting website, which features links to numerous organizations, and contains useful current news items and information on construction, business, safety and legal topics, plus useful tools, project databases, a construction calendar, business bulletins and a construction bulletin board, to which readers can post items.

The website is a service of Thelen Reid & Priest LLP, a law firm with extensive experience in construction industry issues. The site is readily searchable.

We recommend this site as “Worth a Good Look.”
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WIRTH Reverse Circulation Rig
6. Constructing the Permanent Concrete Cap Tying the Cut-Off to the Dam

The construction of the cap beam was done upon completion of the cut-off installation. Depending on the cut-off wall’s position and the apron elevation, a portion, or all, of the engineered backfilling between the cut-off wall and the dam was removed in order to install the cap beam.

Before pouring the 3000 p.s.i. (20 Mpa) concrete of the cap beam, the surfaces of the monoliths and of the cut-off wall were cleaned to insure a proper joint.

CHANGES

It is inevitable that in a job of such complexity, situations will arise requiring changes in the original scope of work. In some cases they are caused by changed conditions, in others by value engineering proposals, while in some other cases they involve additional work.

This contract had examples of all three cases, and the challenge was to integrate those changes in the schedule in order to minimize their impact in terms of both cost and time.

This can be best accomplished if the need for those changes is recognized, evaluated and contractually resolved in a timely fashion; in this respect an effective “partnering” atmosphere is critical in moving the process along.

We can proudly say that both the Corps and the JV worked hard to make partnering a reality on this project, and that, as a result, all necessary changes were dealt with expeditiously and in a mutually satisfactory manner.

The partnering and cooperation effort was used not only to overcome the unexpected but also to develop alternate solutions with associated savings for all parties involved. This was the case in the Value Engineering Proposal for the open water disposal. The VECP proposed the modification of the contract for the disposal of the 50,000 y.c. (38,000 m$^3$) of combined dredge and drill spoil. The open water disposal was selected in lieu of an up-land facility, resulting in substantial savings shared between the JV and the COE.

LESSONS LEARNED

• Pre Bid Preparation

By assembling a large team of experts the JV was able to explore different technical solutions, compare them by cost and reliability and consequently hone into the best possible approach. This exhaustive preliminary work had the additional benefit of comforting the JV that it had the right price when it became known that our competitor’s proposals were considerably higher. Since the job was performed in line with the JV’s expectations and completed six months ahead of schedule, it proved that, in design-build contracts, wide swings in prices reflect different solutions to the problem, not mistakes or greed.

• Preliminary Investigation

By conducting the exploratory campaign previously described, the JV gained vital information, which allowed it to plan the work ahead, even when confronted with situations at variance from what the contract documents, showed. It reinforces the truism that advance information is relatively cheap to acquire and it pays for itself many times over in avoiding or mitigating delays and extra costs during the performance of the work.

• Partnering

Much has been said about it that does not need repeating; it must be stressed, though, that partnering is both an attitude and a commitment and that it needs to be continuously reinforced. On this project both the Corps and the contractor committed themselves to make it work. It directly facilitated the resolution of the various issues caused by changed conditions, contract modifications and value engineering proposals by staging negotiations in an atmosphere of mutual trust and respect.

• Project monitoring

By the creation of a management committee drawn from the partners and by appointing an executive in charge, the JV was able to follow closely the progress of the job and to marshal quickly additional resources and expertise when required. This allowed for timely evaluation, study and implementation of procedures at variance from what was anticipated in the original proposal.

CONCLUSIONS

The construction of a deep underwater cut-off had never been attempted before and its successful completion will open new possibilities to Engineers and Owners on how to deal with difficult underwater seepage problems.

Although the completion ahead of schedule and under budget of a job of this difficulty and magnitude is a remarkable feat, the project team’s greatest and proudest achievement consists in the fact that “the project, performed during a six day work week, operating 24 hours a day, was successfully completed without a lost-time accident” as stated in Resolution 53 EX, introduced by the Honorable Gerald Greene and adopted May 6th, 2004 by the United States’ House of Representatives.
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