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FLOAT-IN DAM - "In the Wet" Construction Methods

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EMERGING CONSTRUCTION TECHNOLOGIES

Civil - Construction Equipment & Methods

FLOAT-IN DAM - "IN THE WET" CONSTRUCTION METHODS

THE NEED

"In-the-Wet" construction methods use off-site prefabrication combined with lift-in or float-in of large precast segments onto pre-installed foundations. The segments are locked onto the foundations by underbase grouting and infilling of the segments with tremie concrete. These methods have included the innovative use of large precast units, floating structures and cofferdams, large barge crane installation, and deep foundation structures. "In-the-Wet" method would offer significant advantages over the traditional fixed cofferdam method, including substantial cost savings, shorter construction duration, reduced environmental impact, and greater construction safety.

THE TECHNOLOGY

Ben C. Gerwick, Inc. is teamed with Bergmann Associates of Rochester, New York, and D'Appolonia of Pittsburgh, Pennsylvania, to design a replacement for Dam 2 on the Monongahela River for the US Army Corps of Engineers. Braddock Dam, on the Monongahela River, has been designed to be built using float-in concrete shells, up to 333 ft. long, fabricated offsite, floated into place over pre-installed foundation caissons, set-down, grouted in-place, then infilled with concrete.

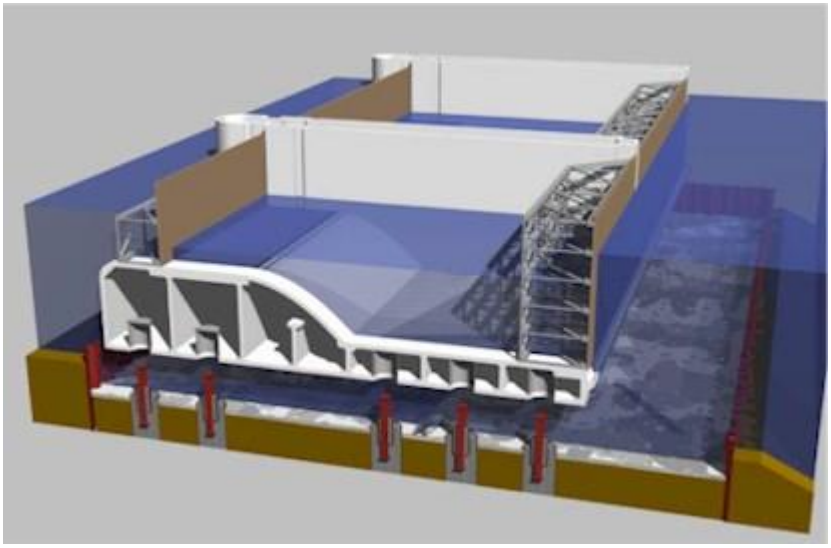

FIGURE 1 DAM LANDING PRE-INSTALLED CAISSONS

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The new dam will be a 600-foot long structure with four gate bays. The "In-the-Wet" construction plan calls for breaking the dam into two segments of 333-foot and 265-foot. The segments will be constructed as closed bottom boxes in a two level casting basin. The bottom of the boxes will be recessed for the pre-installed foundation caissons. As each segment is completed, it will be launched by flooding the basin and towed to the site for final outfitting. It will then be positioned over the foundation caissons with a mooring system mounted on the segment. Each segment will then be ballasted down onto 6 landing caissons and leveled with flat jacks. The pile tops and underbase will be grouted, and 8-foot of tremie concrete will be placed in the segment. Each segment will then be dewatered and the remainder of the dam including tainter gates will be completed in the dry. This "In-the-Wet" technology is expected to save $5 - $15 mil and reduce the construction time by one year. The final plans and specifications were completed in October of 1998. Construction is scheduled to be completed in 2002.

FIGURE 2 COMPLETED DAM IN OPERATION & VIEW OF HEAVY LIFT CRANE MOVING PRECAST ELEMENT

THE BENEFITS

This method offers several advantages over conventional "In-the-Dry" construction:

- Lower construction cost by transferring a significant amount of the work from out in the river to on land construction.
- Lower construction risk by transferring from a marine environment (subject to flooding and other risks) to an onshore precast facility.
- Shorter construction time by allowing the use of concurrent construction of foundations and fabrication of the precast shell.
- Less disruption to existing and on-going navigation operations at the site.
- Less environmental impact by transferring most of the work out of the river and on to shore where any potential environmental hazards can be contained.
- Less effect on river flow. (This can be critical during periods of high flow.)
- Higher quality through the use of precasting in a more controlled environment.

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STATUS

Ben C. Gerwick, Inc. is taking the lead in designing of the precast dam segments and developing the construction methods and procedures for:

- Casting and launching of the pre-cast dam segments,
- Transport, positioning and immersion of the segments on to the pre-installed foundations,
- Underbase grouting and tremie in-fill of the segments.

Gerwick has participated in numerous studies regarding the use of off-site prefabrication technology for inland waterways for the U.S. Army Corps of Engineers, including:

- Widening of Lock 4 on the Monogahela River for the Pittsburgh District
- Increasing lock capacity on the Ohio River Main Stem for the Louisville District
- Increasing lock capacity on the Upper Mississippi River for the St. Louis, St. Paul, and Rock Island Districts
- A new lock for Inner Harbor Navigation Canal, for the New Orleans District
- Numerous studies for the Waterways Experiment Station regarding such topics as heavy-lift equipment, tremie concrete technology, and precast concrete

BARRIERS

The float-in concept requires large cast and launch facilities that may not be readily available. This sometime results in the need for extensive site development in addition to the main construction site. (This can result in delays for environmental permitting and archeological investigations.) This type of construction typically requires extensive pre-planning for key activities such as the float-in and set down of the precast elements. The tolerances for pre-installation of the foundations are quite often higher than for normal construction.

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References

1. Ben C. Gerwick, Inc. http://www.gerwick.com
2. U.S. Army Corps of Engineering, Pittsburgh District - Lower Mon Project Factsheet

Reviewers

Peer reviewed as an emerging construction technology

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