

# Marmet Lock Upstream Guard Wall Replacement

## Marmet Lock, West Virginia

**Owner:** USACE, Huntington District

**Description:** INCA Engineers, Inc., A Tetra Tech Company (INCA) prepared design memorandums and final plans and specifications for the upstream guard wall and upstream guide wall at the Marmet Lock, on the Kanahwa River. The first phase of the work consisted of preparing a screening level study of two alternatives in sufficient detail to determine a relative cost estimate for each alternative.

Each alternative consisted of post-tensioned box beams, spanning between stationary support structures. The alternatives considered two types of intermediate support structures. The first alternative consisted of concrete-filled sheet pile cells, founded on bedrock. The second alternative consisted of concrete-filled pier caps on twin 6-foot diameter concrete caissons, drilled into bedrock. A 31-foot diameter concrete-filled nose cell was located at the upstream end of each wall.

The design utilized lift-in construction methods. The guard wall and guide wall box beams were sized for the same lifting capacity. Flow skirts and pier caps were also designed with this consideration.

The guard wall extends approximately 990 feet upstream of the existing lock and was designed for barge impacts up to 1100 kips. It is comprised of eight 10 foot by 8 foot by 122 foot long girders, weighing 473 tons each, and supported on seven intermediate piers. Prestressed concrete panel flow skirts, attached to the river side of the girders, control the flow of currents for navigation.

The guide wall extends approximately 1,590 feet upstream of the new lock and is designed for barge impacts up to 710 kips. It is comprised of fifteen 10 foot by 10 foot by 105 foot long girders, weighing 482 tons each, and supported on fourteen intermediate piers.

The precast concrete beams were designed for an optional segmental construction to facilitate a smaller fabricator, handling, and transport. Pier cap beams were designed as precast shells to improve constructability and reduce on-site construction time. Finite element analysis was used for the design of the structure and foundation, including 3-D modeling using SAP 2000 for the girders and cap beam supports.



### Special Features:

- ▶ New navigation lock design
- ▶ Alternatives wall study
- ▶ Innovative in-the-wet construction
- ▶ Drilled shafts
- ▶ Long-span hollow-precast concrete beam design
- ▶ Sheet pile cell nose piers