# ENVIRONMENTAL ASSESSMENT

# TAINTER GATE CABLE REPLACEMENT
# LAKE RED ROCK
# MARION COUNTY, IOWA

## APPENDIX E

## CONSTRUCTION PROCEDURES FOR INSTALLATION OF THE BULKHEAD SYSTEM

# APPENDIX E

## Red Rock Dam – Lake Red Rock
## Des Moines River, Iowa
## New Tainter Gate Bulkhead System

The Lake Red Rock outlet control structure was designed and constructed with the lake water level at 725 feet. The outlet structure consists of five cable operated tainter gates with a sill elevation of 735 feet. There are four 1" diameter-lifting cables located at each side of the tainter gates to be used to raise (open) or lower (close) the tainter gates, as shown in Figures C1 and C2. The cable connection bracket, shown in Figure C3, is at an elevation of 735 feet. When the conservation pool was raised in the spring of 1992 to an elevation of 742 feet NGVD, several feet of the tainter gate lifting cables and brackets were permanently submerged. In order to maintain the conservation pool at 742 feet NGVD, the tainter gates must be kept in a closed position making inspection, maintenance, and repair of the tainter gates and the tainter gate lifting cables virtually impossible without a drawdown of the conservation pool.

An alternative to a conservation pool drawdown has been developed that would allow dewatering of an individual tainter gate bay. A traveling bulkhead system installed on a monorail or bi-rail could be moved to each gate bay as required. Periodic inspections and routine maintenance, repair and replacement of the tainter gates and cables would be performed without the need for a drawdown. A traveling bulkhead system allows for one bulkhead to be moved from one gate bay to another via a monorail. A system of this type is used by the Little Rock District at Beaver Dam. A similar system was also installed at the new Table Rock Auxiliary spillway. The bulkhead can be stored on the dam in a secure location and there is relatively low maintenance with this type of system.

A construction contractor would install a traveling bulkhead system. At this time, it is believed that a pool drawdown will not be required to install this new bulkhead system. The bulkhead system will consist of a steel bulkhead that travels along two steel rail beams located on the outlet structure above the tainter gate bays via a trolley. Girders attached to the outlet structure bridge piers will support the beams. The existing sluice gate bulkhead (smaller than the tainter gate bulkhead) will also run on a trolley on the same rail beams as the tainter gate bulkhead and would continue to be stored on the opposite side of the outlet works.

Work will begin with site mobilization. The contractor will set up a staging area for his equipment and vehicles and to store materials for construction. The contractor may also have a field office trailer located in the staging area. The contractor will need a variety of equipment including heavy trucks, trailers, 140-ton crane, field office trailer, workboat, and floating work platform. The work force will include semi-skilled laborers, truck drivers, equipment operators and other specialized workers, foreman and supervisors. There will be a variety of subcontractors involved including the bulkhead manufacturer, electrical and mechanical subcontractors, steel fabricators, and surveyors.

The contractor will start construction with demolition of the existing sluice gate bulkhead trolley system. The system consists of a trolley with hoist and a monorail that runs the distance between

the 5 tainter gates, approximately 269 feet. The monorail is an I-beam that must be removed in pieces. Bolts holding the rail will need to be cut with a torch. There will be a total of 11 pieces of rail that will need to be lowered by crane to a floating barge below for transport to the staging area for later disposal by the contractor.

The contractor will need to remove existing riprap on the slope adjacent to the outlet works to allow the removal of earth material on the slope. This will allow space for the new bulkhead system to move across the outlet structure to each tainter gate and then to the storage position at the side of the tainter gates. The volume of removal will be a slender channel up the slope next to the concrete monolith of the outlet works. Removal in areas that are underwater could be accomplished using a dragline or clamshell from above. The riprap removed will be stock piled and placed back in the slender channel once the required amount of earth material has been removed. The stockpile location will be at the maintenance yard by the reservoir office or other government designated area. Equipment to accomplish this task includes a crane with a dragline and bucket, heavy-haul trucks, and dump trucks.

Installation of the new bulkhead system will involve removal and replacement of pavement on the bridge above the outlet structure, attachment of the trolley beam support girders on the outside of the outlet structure in front of the gate bays, attachment of an access platform, attachment of gate bulkhead hoists and trolley system, electrical work, delivery and attachment of the bulkhead, and reinstallation of the sluice gate bulkhead system. Painting of some steel structures will also be required.

Removal and replacement of pavement on the bridge above the outlet structure is required to allow access to the bridge piers below. The steel girder support system for the trolley rail beams will be attached to the piers and must be bolted in from above. Pavement removal will be accomplished by saw cutting. The contractor will remove the concrete using dump trucks to a staging area for later disposal. Anchor holes will have to be drilled into the pier structure in preparation for bolting the girders down. Once the girders are set in place using a crane, the areas in which concrete has been removed will be patched with new reinforced concrete. Pavement removal and installation of the support girders will be accomplished such that there is a minimum amount of disruption to any traffic that may be crossing the bridge above the outlet structure. There may be some periods in which traffic will have to be stopped along the bridge or regulated to only one lane.

Once the support girders on the bridge piers are installed, the trolley beams will be installed. There are two beams that run parallel to each other for the length of the outlet structure above the tainter gate bays. The beams will be in sections and will need to be installed section by section, with a total of 16 sections. Equipment needed to accomplish this step in the installation includes a floating work platform, workboat, 140-ton crane, and barge.

Construction and installation of the access platform, trolley hoist system, and bulkheads (tainter gate and sluice gate) will be completed after the trolley beams are secure. Painting of the structural steel support system including the trolley beams and the access platform will be needed. An inorganic zinc primer will be applied by spraying followed by an intermediate and

then a topcoat. Equipment needed to accomplish construction and installation is similar to that for the trolley beams.

Once the system has been installed, the contractor will need to test the system to ensure the bulkheads operate properly. The contractor will remove his equipment, field office trailer and clean up his staging area to the same condition in which it was received.

The bulkhead system will allow one gate bay to be dewatered at a time for inspection and maintenance. When required, the tainter gate cables could be replaced one gate at a time with the bulkhead system in place without the need for a drawdown of the conservation pool as is needed now. Cable replacement would be accomplished in a manner similar to that previously described for cable replacement during a drawdown. Exceptions would be that only one gate would be done at a time so that the contractor would not have to have multiple crews working. The contractor could be allowed much more time to complete the work, reducing the cost of replacement.