

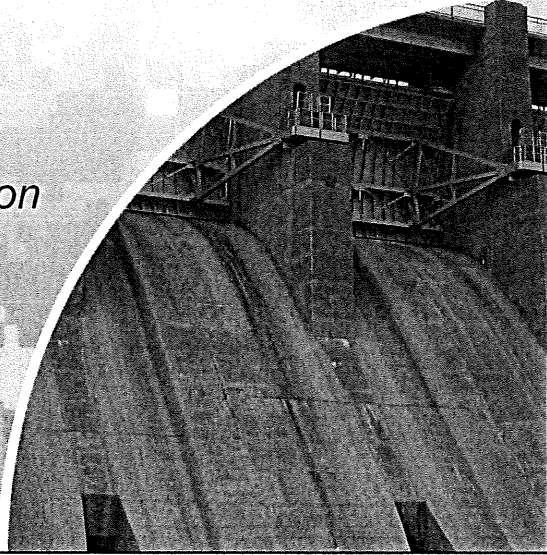
Harlan County Dam Tainter Gate & Irrigation Repairs

*John Grothaus,
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Kansas City District*

August 22, 2017



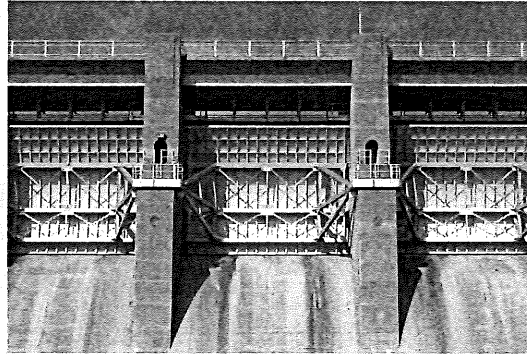
US Army Corps of Engineers
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Republican River Compact annual meeting

Presentation Outline

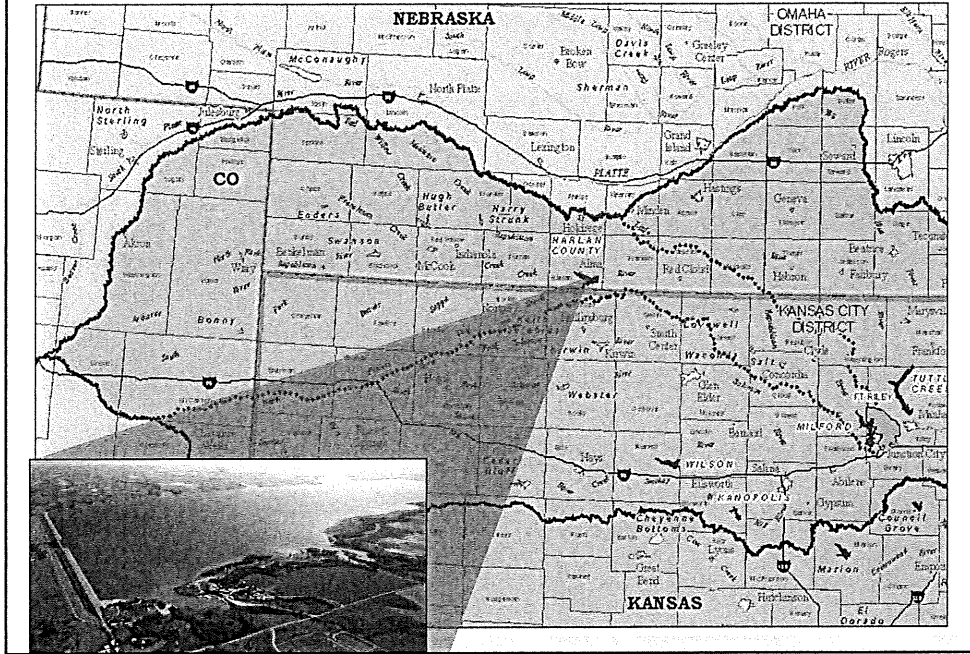
- Overview of Dam
- Dam Repairs
- Construction Status



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Harlan County Dam was designed and constructed by the Bureau of Reclamation
Note that it has 1/6 concrete volume of Hoover Dam

Harlan County Dam



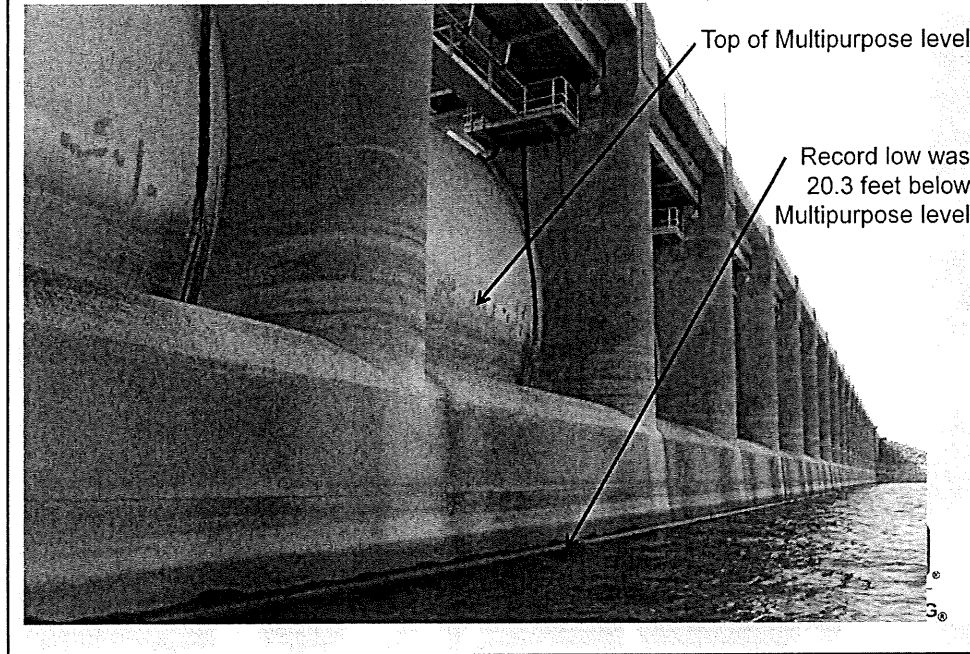
Location of Dam

Harlan County Dam



Harlan County Lake's dam is almost 12,000 ft long. Maximum height 107 feet with an 856 ft long spillway. The spillway is controlled by 18 spillway gates requiring retrofitting. Each tainter gates are 40 ft wide and about 30 ft tall. Note the long approach to the spillway and the steepness of the ogee.

Harlan County Dam



- Top of Multipurpose Pool (1945.73 after May 2001) / Normal water level is 2.5+ feet on gates
- Pool Level on 8/09/2017 was 1939.11 or 6.62 feet below multipurpose.
- Record High Pool: April 5, 1960: 1955.66
- Record Low Pool was 20.3 feet below normal pool – 1925.4 msl in Dec 2004.
- The dam was constructed without a dewater system. Therefore, the first phase of the repairs was constructing stoplogs, guides, support beams and the anchors & anchor pads on the face of the dam so that work can be accomplished during normal pool elevations.

Harlan County Dam

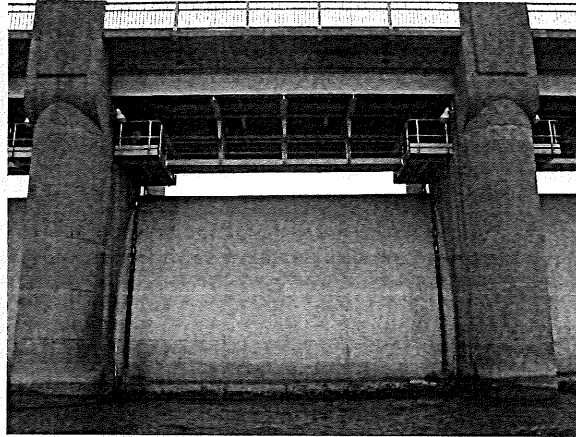
9 - Sluiceways

- Low/normal release
- 18 gates
- Each gate 5' x 8'
- 1 low flow bypass

2 - Irrigation conduits

18 - Tainter gates

- Flood control release
- Each 40' x 30'



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Water Management Features

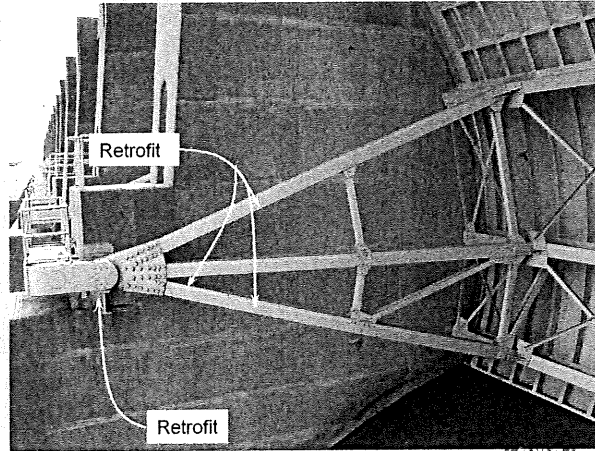
Harlan County Dam is equipped with nine 5 ft by 8 ft sluiceways, two irrigation conduits (Franklin Irrigation conduit is 5.5 feet diameter – north and Naponee Irrigation conduit is 2 feet 10 inch diameter), and eighteen 40 ft by 30 ft spillway gates on an 856 ft gated spillway. Construction was 1946 to 1952 – 62 years old.

All 18 spillway Tainter gates have been **restricted** due to issues with the **bearings, strut arms, lifting chains, and electrical controls**. Harlan County Dam is currently operating under an interim operating plan that has reduced the flood control pool by **54 percent**. The much needed repairs will allow the project to return to normal operations during floods.

Seven of 18 gates (Gates 3, 4, 6, 7, 8, 9 and 18) had sticking of the bearings, casing defects and cracking. (design problems). These gates were not exercised for routine cycling of the gates since this could cause more damage by scrapping grease off the bearing than benefit from promoting grease penetration.

Harlan County Dam Repairs

- ▶ Tainter Gate Stoplogs
- ▶ Tainter Gates
- ▶ Sluice Gates
- ▶ Irrigation Facilities



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Water Management Features / Repairs

All 18 spillway Tainter gates have been restricted due to issues with the bearings, strut arms, lifting chains, and electrical controls. The Harlan County Dam is currently operating under an interim operating plan that has reduced the flood control pool by 54 percent. The much needed repairs will allow the project to return to normal operations during floods.

Stoplogs were deployed during the construction so that the repairs can be made without lowering the lake level. The Corps of Engineers did not lower the lake water level for the purpose of making repairs to the gates. The construction is expected to take three and one half years. Some lane closures on the road across the dam will be necessary during the repairs. Lane closures will be minimized especially during the high traffic summer weekends.

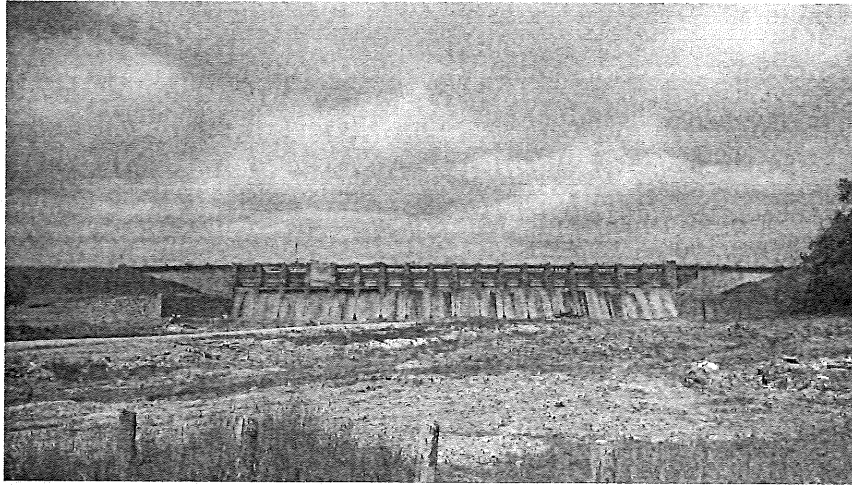
The structural repairs focused on the strut arms and bearing arm of the tainter gates. Cover plates were welded to the main strut arms. The struts were cut near the bearing arm. The bearing arms were replaced with a fabricated bearing arm, was welded back to the strut arms. To minimize the time the tainter gate was unsupported by the trunnion, the Contractor was required to field verify all dimensions of the bearing arm and fabricate new bearing arms prior to cutting the strut arms. The new arms were onsite before cutting the strut arms.

This is an isometric of the dam with 2 bays stoplogged. The Contractor for the tainter gate repair will be required to move the steel guides and support beams to the spillway bay to be rehabbed, and then place 8 stoplogs. The guides and support beam are attached to the dam by stainless steel anchors. The stoplogs, lifting beam, and water surcharge is estimated to be 18,000 lbs, which should be capable of being deployed from the bridge.

Stoplog installation in progress.

The structural repairs include replacement with new gate bearings, and reinforcement on the strut arms and bearing arms of the Tainter gates. Cover plates will be welded to the main strut arms.

Construction Status



June 2017 – Painting Tainter Gate 15. Media Blasting Painting Now
Completed on Gates 1-17. Structural Repairs Complete All Gates 1-18



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Stoplogs. Contract was awarded September 20, 2103 for the fabrication and installation of spillway stoplogs. All stoplogs (3 sets of eight), pier guides, support beams were in service on March 27, 2015.

Tainter Gate Repair Contract Scope: The \$27M effort includes: repairing, replacing and modifying structural steel components of the Tainter gates, replacing the existing trunnion and bearing assemblies with new components, replacing Tainter gate chains, pins and bulb seals, repairing and/or replacing electrical systems, and media blasting (lead paint removal) and painting gates and structural steel. Contract also includes sluice gate repairs and painting, as well as fabrication and installation of irrigation stoplogs. In addition, the contract was modified to add new irrigation intake trash racks and to provide for repairs to one Naponee irrigation slide gate, one Franklin irrigation slide gate, and two Franklin canal power house sluice gates, gate frames, and actuators.

Construction Status

Project is 87% Complete

Original & Current Required Completion is April 2018

Structural Repairs Complete on All 18 Tainter Gates

Media Blasting & Painting is Complete Bays 1-17

Repairs & Painting of Sluiceways 1-8 Complete, Sluice 9 work is Ongoing

New Electrical & Control work is Completed on Tainter Gates 1-9

Irrigation Conduit Repair/Replacement Contract is Complete

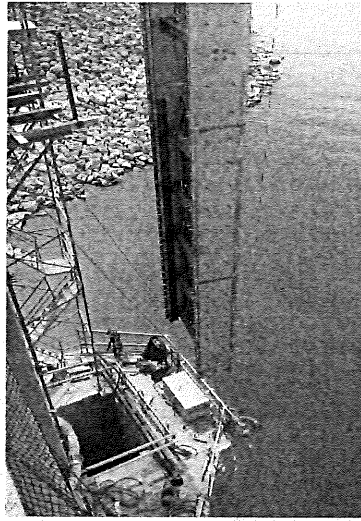


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Project is currently approximately 87% complete, and is on track to meet or complete ahead of the original April 2018 final completion date.

The Harlan County Tainter Gate Repair contractor (OCCI, Fulton, MO) mobilized in March 2015. To date, existing weld repair has been completed and new bearing arm/hub assemblies and strut arm cover plates have been installed on Tainter Gates 1-18. Gates 1 thru 17 along with their operating equipment and bridge steel have been media blasted (lead paint removed) and painted. New gate hoist chains have been installed on the completed gates and new electrical controls including brakes and limit switch installation has been completed on gates 1-9.

Media blasting and painting of Sluiceway 1 - 8 gates, equipment and liner has been completed along with repairs to the hydraulic cylinders. Sluice gates and components have been reinstalled and returned to service. Repairs to sluiceway #9 are currently ongoing and expected to be completed later this month.



Winter 2016/2017 – 700 LF of Naponee Irrigation Conduit Was Replaced & New Lined Slots for Irrigation Stoplogs and Trash Racks Were Constructed



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Irrigation facility improvements completed.

Remaining Work

Questions?



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All structural repairs have been completed and media blasting and painting of the final Tainter Gate is expected to be completed by mid-September. New electrical controls have been installed on gates 1-9 and electrical work on the remaining gates is ongoing and should be completed in late September or early October. The new irrigation trashracks have been fabricated and will be installed following irrigation season. The new irrigation stoplogs are currently being fabricated and are scheduled to be delivered late fall of this year. The contract also includes construction of a stoplog storage building which is scheduled to begin in September.

