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TRAVEL REPORT TR-82-12

Donald L. Read, Thomas J. Isbester, Vern Yocom

SUBJECT: Inspection of Joes Valley High-Pressure Gate Repair

TRAVEL PERIOD: April 26 - 28, 1982

PLACES VISITED: Joes Valley Dam, Utah.

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BUREAU OF RECLAMATION
~~WATER AND POWER RESOURCES SERVICE~~
Engineering and Research Center
Denver, Colorado

TRAVEL REPORT

Code : D-252/D-1533/D-430 **Date:** May 18, 1982

To : Chief Design Engineer; Chief, Division of Research; and Chief, Division of O&M Technical Services

From : Donald L. Read, Thomas J. Isbester, Vern Yocom

Subject: Inspection of Joes Valley High-Pressure Gate Repair

1. **Travel period (dates):** April 26 - 28, 1982.

2. **Places or offices visited:** Joes Valley Dam, Utah.

3. **Purpose of trip (include reference to correspondence prompting travel):** The purpose of this trip was the inspection of the repair and modification of one side of the gate frame to eliminate cavitation and to determine its effectiveness and further action.

4. **Synopsis of trip:** We traveled to Salt Lake City the afternoon of April 26, 1982. The following morning we were met at 7:00 a.m. by Cliff Boyce and Ken Browning from the Regional Office. We were driven from Salt Lake City to Joes Valley Dam, where we met with Bob Azlan, Marv Bird, and Clyde Sherman. The downstream end of the outlet works had already been dewatered and scaffolding was in place for access to the regulating gates. We inspected the left gate first. The left side of the left vertical frame seat had been equipped with a 3/8- by 3/8-inch bar in the flow passage to produce a contraction in the flow at the downstream end of the slot with the expectation of aerating the flow and preventing cavitation cloud collapse along the downstream frame. The damaged areas in the left and right sides of the frame and in the invert were filled with epoxy and coated with a white waxy concrete curing compound. The right vertical frame seat was left as originally constructed to see if we could detect an advantage of the modified frame over the unmodified frame. Inspection revealed that the epoxy patch downstream of the left slot was still intact. There was no visible damage to the patch. On the right side, the epoxy patch was pulled from the eroded hole on the upstream end so that it flapped in the flow. There was no evidence of cavitation erosion on the patch; however, there was definitely evidence of low pressure in the area to pull the patch loose from the frame.

The sill of the left gate was damaged to a depth of about 1/16 inch. The damage began about 0.95 inches from the leading edge of the sill and extended about 1.68 inches downstream to the end of the sill. The damage extended laterally into the slot area. The vertical seats showed similar damage, however, the damage was heavier on the lower portion of the seats. The horizontal frame seat was also damaged to about the same extent.

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Travelers: D.L. Read, T.J. Isbester, and V. Yocom May 18, 1982

The right gate damage was found to be similar to the left gate. On either side, the downstream frame was eroded through the cast iron and into the concrete. Sill and seats damage matched that of the left side. The upstream wye branch and conduits to the gates were also inspected and found to be in good condition.

After the inspection the conduit was watered up. The leakage through both 2-foot 3-inch by 2-foot 3-inch gates was heavy, due to the cavitation erosion to the seats. The leakage across the horizontal seat at the top of the conduit was very heavy.

5. Conclusions:

a. The 3/8- by 3/8-inch bar attached to the left vertical seat bar of the left gate appeared to be effective in reducing the boundary erosion on the left side of the downstream frame. A 7/16- by 3/8-inch bar should be attached to the vertical seat bars to reduce the cavitation potential of both gates. The additional 1/16 inch will increase the contraction and improve the chances of aeration from the top of the jet to the floor.

b. The top seat leakage could effectively decrease the air supply available to the side walls. Small wedge-shaped deflectors attached to the top of the added bars will deflect the leakage over the top of the gate to the center of the flow passage and improve the potential for air to supply the jet contractions on the sides of both gates.

c. A filler plate on the downstream face located between the vertical leaf seat and horizontal leaf seat and extending down to the leaf casting blockout would be effective in reducing leakage over the top of the gate for openings up to about 65 percent gate opening.

d. The only effective method of repairing the cavitation damage to the sill and seat bars would be replacement. As the frames are embedded in concrete, the frame seats cannot be machined to a single plane after replacement.

e. Drawings should be revised to show the installation of the 7/16- by 3/8-inch bars on each vertical seat and the addition of the filler plate on the downstream face to reduce leakage over the top of the gates.

V. J. Yocom
T. J. Isbester
D.L. Read

Copy to: Regional Director, Salt Lake City, Utah, Attention: UC-400
Projects Manager, Provo, Utah

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Baxter-252 5-24-82
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NOTED: JUN 17 1982
E. M. Tomsic
FOR Chief Design Engineer

DLRead/TJIsbester:pm:5-18-82

Noted 6-18-82
E. R. Lewandowski
FOR Chief, Division of Research

NOTED 6/23/82
William H. Rust
Chief, Division of Chemical Services