TR-85-17

TRAVELER: R. V. Frisz, R. A. Crysdale, T. J. Isbester

SUBJECT: Travel to Platoro Dam to Investigate Reported Heavy Vibration in Outlet Works and Control Valves.

TRAVEL PERIOD: July 11-12, 1985.

PLACES VISITED: Platoro Dam, Platoro, Colorado.
TRAVEL REPORT

Code: D-253, D-430, D-1532   Date: July 29, 1985

To: Chief, Division of Electrical, Mechanical and Plant Design
   Chief, Division of Water, Land, and Technical Services
   Chief, Division of Research and Laboratory Services

From: R. V. Frisz, R. A. Crysdale, T. J. Isbester

Subject: Travel to Platoro Dam to Investigate Reported Heavy Vibration In Outlet Works and Control Valves

1. Travel period: July 11-12, 1985.

2. Places or offices visited: Platoro Dam, Platoro, Colorado.

3. Purpose of trip: To participate in site inspection of valving and conduits reported to be heavily vibrating.


4. Synopsis of trip: We discussed a test program which we felt would help identify a range of valve openings which would provide safe operation. Above these openings a shift in control is expected, accompanied by cavitation and vibration. As the 380 cfs discharge appeared to provide satisfactory operation, preliminary vibration measurements were recorded as reference values. After this, starting at 50% valve openings, data were recorded for 10% increments of valve openings. At near the completion of the 70% valve openings test, the vibration meter failed, eliminating test completion.

   Data were recorded at 9 principle locations upstream of the Y branch (Appendix Figure 1). No data were taken at the Y branch as it was encased in a large concrete block. The data taken for locations 4 through 9 were graphed (Appendix Figures 2 and 3). Locations 4 through 9 were determined to be the most severe.

   With the meter inoperative, observations were made with 90% balanced butterfly openings prior to unwatering the valves and conduit for inspection.

   Some cavitation erosion was apparent in the Y branch and at the manhole upstream from the Y branch. These eroded areas had been reported during previous inspections. The depth of erosion appeared to be minimal and amounted to surface roughness and removal of protective coating.
Some additional coating removal was noted along the invert of the conduit on the downstream end. These amounted to tiny spots randomly located and not associated with flow passage geometry.

The 4- by 5-foot guard gate sealed tightly. A buildup of material in a layer about 1/4-inch thick was found on the downstream side of the gate and coal-tar epoxy coating. Samples of the material were returned to Denver for determining content.

Chuck Fisher stated that outlet works control is being transferred from local to supervisory and that either the SOP must be modified to prevent operation in the rough ranges or that system evaluation must indicate operation in the rough range is safe structurally.

We left the dam at 5:15 p.m. and traveled to Alamosa where we spent the night. We left Alamosa at 8:35 a.m. and arrived at the Federal Center at 2:15 p.m. on July 12, 1985.

5. Conclusions:

a. With the present high reservoir head, cavitation is present in the conduit at the manhole and at the Y branch for balanced valve openings of 60% or greater. The sound intensity of the cavitation increased with valve openings above 60%.

b. The vibration amplitude increased with increasing valve opening (Appendix Figures 2 and 3). Failure of the vibration meter eliminated proper documentation of vibration amplitude for valve openings above 70%. Hand holding of the accelerometer probably had a significant effect in damping the magnitudes of vibration.

c. Additional measurements at openings greater than 70% would be beneficial in evaluating stress levels in the conduit. The vibration amplitude appeared to be greater than had been observed at other locations by the travelers.

d. An individual experienced in evaluation of conversion of vibratory displacements to stresses should visit the structure if future measurements are made.
Travelers: R. V. Frisz, R. A. Crysdale, T. J. Isbester

July 29, 1985

6. Action Correspondence Initiated: None.

Enclosures

Copy to: Regional Director, Amarillo, Texas, Attention: SW-400
Projects Superintendent, Albuquerque, New Mexico, Attention: 400
Chama Field Office, Chama, New Mexico, Attention: Chuck Fisher

Blind to: D-215
D-250
D-253
D-430
D-1500
D-1530
D-1532

RVFrisz:ksl:7-31-85:P-130/131/131A

Notes: 8-2-85

Chief, Division of Electrical, Mechanical and Plant Design

Notes: AUG 2 8 1985

for O.R.E. of Research and Laboratory Services
Appendix
Platoro Outlet Works
Vibration Tests
Left Side Centerline 56" Conduit

Figure 2
Platoro Outlet Works
Vibration Tests
Top Centerline 56" Conduit

Displacement Amplitude (Mils peak to peak)

Balanced Butterfly Opening %

Figure 3