

APPENDIX

U. S. NUCLEAR REGULATORY COMMISSION
REGION IV

Report: 50-313/82-06

Docket: 50-313

License: DPR-51

Licensee: Arkansas Power and Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Facility Name: Arkansas Nuclear One (ANO), Unit 1

Inspection at: ANO Site, Russellville, Arkansas

Inspection conducted: March 31 - April 2, 1982

Inspector: D. M. Hunnicutt
for D. P. Tomlinson, Reactor Inspector, Engineering Section

4/28/82
Date

Reviewed: D. M. Hunnicutt
for R. E. Hall, Chief, Reactor Project Section C

4/28/82
Date

Approved: D. M. Hunnicutt
D. M. Hunnicutt, Chief, Engineering Section

4/28/82
Date

Inspection Summary

Inspection conducted March 31 - April 2, 1982 (Report 50-313/82-06)

Areas Inspected: Special, unannounced inspection of the nondestructive examination of four high pressure injection nozzles. This inspection involved 15 inspector-hours by one NRC inspector.

Results: Within the area inspected, no violations or deviations were identified.

DETAILS

1. Persons Contacted

Arkansas Power and Light Company (AP&L)

J. P. O'Hanlon, Plant Manager
E. C. Ewing, Production Engineering Superintendent

Babcock and Wilcox (B&W)

T. Scott, Resident Engineer
G. Navratil, Field Operations Supervisor
D. Neal, Radiographer

2. Observation of Nondestructive Examination of HPI Nozzles

The Region IV office was notified by AP&L that because of failures reported at similar reactor plants a thorough nondestructive examination of all four high pressure injection (HPI) nozzles was to be performed. The examination, consisting of radiographic, ultrasonic, and liquid penetrant inspections, was begun on March 31 and completed on April 2, 1982. All of the inspection was performed by B&W personnel.

Each of the four nozzles was radiographed by using a film holder containing three different speed films so that the multiple material thicknesses could be effectively examined from a single exposure of each area. Each nozzle was fully inspected by the two radiographic exposures (shots). The first shot was taken from above the nozzle and a second was from the side of the nozzle (0° and 90° exposures). By selecting the film from each shot that exhibited the most desirable density in the various areas of interest, it was possible to inspect the thermal sleeve rolled area, the safe-end to nozzle weld, the upstream retaining lugs, and the general condition of the thermal sleeve, the safe-end, and the nozzle.

The NRC inspector reviewed a total of 24 radiographs (3 film per shot, 2 shots on each 4 nozzles) and noted the following conditions:

Nozzle "A"

The four upstream retaining lugs were missing and the thermal sleeve had moved axially approximately one inch and covered the area where the lugs should have been. The wall thickness of the thermal sleeve in the rolled area inside the safe-end appears to have been reduced to about one-half of the original dimension and a 360° gap then existed between the thermal sleeve and the safe-end. The inside surface of the safe-end in this area appeared to be eroded and worn. The upstream end of the thermal sleeve was no longer square, but rounded. The above conditions indicated that the thermal sleeve had broken loose some time ago and that both axial and radial movement had occurred.

Nozzle "B"

A sharp straight line was noted in the area where the thermal sleeve was rolled into the safe-end. The line extended for half of the 3-inch area of rolling. This indicates that the rolling, a two-step operation, was only half completed when the thermal sleeve was originally installed in the nozzle. The four retaining lugs appeared to be intact, and there were no signs of movement of the thermal sleeve.

Nozzle "C"

No unusual conditions were noted in the nozzle, safe-end, or thermal sleeve.

Nozzle "D"

The retaining lugs and thermal sleeve appeared to be in their proper positions. A dark line was noted on the radiographs in the approximate center of the rolled area of the thermal sleeve. The dark line was observed to extend 360° on the inside diameter of the sleeve and was originally thought to be a machining mark on the surface. A closer examination of the radiographs revealed that the dark line was not absolutely straight as it first appeared to be, and that it also exhibited an indication extending an undetermined depth into the wall of the sleeve. Because of the depth and the lack of line straightness, this indication is now considered to be a circumferential crack in the thermal sleeve.

An ultrasonic inspection was performed on each of the four nozzles and safe-ends. No reportable indications were noted during the ultrasonic examination. The subsequent liquid penetrant inspection of Nozzles "A" and "B" revealed no reportable indications. Liquid penetrant inspection of Nozzle "C", however, disclosed a 2-inch linear indication at the edge of the safe-end to nozzle weld and two transverse linear indications in the weld. The indications did not exhibit the sharp dark "bleed-out" indicative of a defect of significant depth. A decision was made to judiciously attempt to remove these indications or prove them irrelevant. Following a minor metal removal operation, the indications did not reappear and are no longer considered to be anomalies. Two rounded indications were found during the liquid penetrant inspection of Nozzle "D". These were both less than 1/16-inch in diameter and are not considered detrimental.

The NRC inspector witnessed the ultrasonic inspection of Nozzle "A" and the liquid penetrant inspection of Nozzles "C" and "D" and verified that the indications were as noted.

Repairs to be performed on the HPI nozzles will be monitored by the NRC during future inspections to assure compliance with the requirements of the ASME Boiler and Pressure Vessel Code.

3. Exit Interview

No exit interview was held at the end of this inspection. Several status update meetings were attended by the NRC inspector and the necessary exchanges of information were accomplished at these times.