U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 50-331/78-22

Docket No. 50-331 License No. DPR-49

Licensee: Iowa Electric Light and Power Company
IE Towers
Post Office Box 351
Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Inspection At: Duane Arnold Site, Palo, IA

Inspection Conducted: August 3, 4, and 18-23, 1978

Inspector: W. J. Key 10/12/78

Approved By: D. H. Danielson, Chief 10/12/78
Engineering Support Section 2

Inspection Summary

Inspection on August 3, 4, and 18-23, 1978 (Report No. 50-331/78-22)
Areas Inspected: Inspection on August 3 and 4, 1978; review procedures developed for cutting and removal of feedwater recirculation nozzles. Inspection on August 18-23, 1978; observe the cutting of nozzles N2E, N2C, and N2A, and the preparation of nozzle N2E for shipment to Battelle laboratories. The inspection involved 54 inspector-hours onsite by one NRC inspector.
Results: No items of noncompliance or deviations were identified.

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DETAILS

Persons Contacted

Licensee Employees

K. Harrington, Technical/Advisor
D. Wilson, Assistant Project Coordinator
R. Rinderman, Quality Supervisor
J. Kiuhn, Assistant Radiation Protection Engineer

Contract Personnel

R. Jenson, Project Supervisor
T. Anderson, Welding Qualification Supervisor
J. Duncan, Welding Qualification Supervisor
J. Marden, Quality Supervisor
P. Owens, Engineer
J. McCann, Cutting Supervisor

Functional or Program Areas Examined

1. Safe End Repair Procedure Review

The inspector reviewed the following safe end repair procedures and determined that adequate precautions were being taken, and that the procedures were adequate for the work to be performed.

a. No. RP64/ie-5, Revision 1, dated August 8, 1978
Titled: Installation of Recirculation Riser and Temporary Supports

b. No. RP64/ie-6, Revision 0, dated July 26, 1978
Titled: Shield Support/Shield Wall Installation at the Drywell Recirculation Inlet Penetration

c. No. RP64/ie-7, Revision 0, dated July 28, 1978
Titled: Installation of Recirculation Riser Temporary Piping Supports (In Place Monitoring Equipment Installation)

d. No. RP64/ie-8, Revision 0, dated July 31, 1978
Titled: Installation of Recirculation Riser Temporary Pipe Supports (Strain Gage Installation on Recirculation Inlet Nozzles)

e. No. RP64/ie-9, Revision 0, dated August 13, 1978
Titled: Recirculation Riser Safe End Removal

f. No. RP64/ie-10, Revision 0, dated August 4, 1978
Titled: Installation of Recirculation Temporary Pipe Supports (Strain Gage Monitoring Equipment Calibration)

g. No. RP64/ie-11, Revision 1, dated August 5, 1978
Titled: Etching Procedure

h. No. RP64/ie-13, Revision 0, dated August 3, 1978
Titled: Installation of Recirculation Temporary Pipe Supports (In Place Monitoring)

i. No. RP64/ie-14, Revision 0, dated August 3, 1978
Titled: Installation of Recirculation Temporary Pipe Supports (LVDT Installation on Recirculation Inlet Riser Piping)

j. No. RP64/ie-15, Revision 0, dated August 5, 1978
Titled: Safe End and Riser Witness Mark and Cut Location Instruction

k. No. RP64/ie-16, Revision 0, dated August 10, 1978
Titled: Installation of Recirculation Riser Temporary Pipe Supports (LVDT Monitoring Equipment Calibration)

No items of noncompliance or deviations were identified.

2. Safe End Cutting and Removal

To reduce personnel radiation exposure lead bricks were installed around each recirculation nozzle to form a shield wall in accordance with Procedure No. RP64/ie-6. Visual inspections and radiological surveys were conducted during and after installation to insure adequate shielding of personnel.

Following the shield wall installation, pipe supports and monitoring equipment were installed and the safe ends were etched and marked in accordance with approved procedures.

After all safe ends were marked, the portable cutting machine was set up and positioned in accordance with procedure No. RP64/ie-9 to make cut No. 1 on safe end nozzle N2E. Pipe jacks were positioned under the 10" stainless steel recirculation line to support the pipe and minimize movement during cutting. Lead blankets were also installed on the recirculation and riser piping to reduce personnel exposure.

Cut No. 1 on nozzle N2E was made on the stainless steel pipe near the elbow. After completion of the cut the machine was removed, the spool and elbow were realigned with pipe jacks and tack welded to maintain rigidity.

The cutting machine was then positioned on the stainless steel spool to make cut No. 2 through the safe end nozzle and thermal sleeve.

In order to prevent chemical contamination of the section of the safe end nozzle to be metallurgically examined, only demineralized water was used as a coolant during the cutting operation.

After completion of cut No. 2 the machine was removed, tack welds on cut No. 1 were ground and a lead plug installed in the nozzle portion of the thermal sleeve to reduce the radiation level to personnel working in the area.

Safe end N2E was then lowered to the drywell floor, packaged and moved to the CRD room where cut No. 3 would be performed.

Prior to making cut No. 3, radiographic inspection of the nozzle was performed. The RIII inspector reviewed this radiograph which showed slag and porosity in the vicinity of the nozzle repair weld and crack like indications in the thermal sleeve to nozzle weld.

Safe end N2E was positioned and secured on a bench in the CRD room and a portable power saw was used to make cut No. 3 which removed a 4.5" section of the nozzle including the field weld of the thermal sleeve to nozzle and the nozzle repair weld made during manufacture.

The 4.5" section of the nozzle was again radiographed with the source more ideally positioned. These radiographs showed that there was extensive cracking in this nozzle. The cracking that was revealed in these radiographs, substantiated the ultrasonic examination indications observed prior to removal of the safe end.

While work was being performed on nozzle N2E nozzles N2C and N2A were cut, packaged and moved to the CRD room.

Radiographic inspection of these two nozzles was performed and reviewed. Like nozzle N2E these radiographs revealed crack like indications. The radiographs also reveal slag and porosity in the vicinity of the repair weld.

The 4.5" section of nozzle N2E was packaged by the licensee and shipped to Battelle laboratories where NRC's independent metallurgical analysis will be performed in an effort to establish the cause and extent of nozzle cracking.

No items of noncompliance or deviations were identified.

3. Welder Qualifications

DAEC welding procedures P8-AT-AG and P43-AT-AG are being used to qualify welders. Procedure P8-AT-AG is used to weld stainless steel to carbon steel, and procedure P43-AT-AG is used to weld Inconel 600. Mock-ups of each nozzle have been set up in the weld shop. These mock-ups are designed with the same clearance as will be encountered during nozzle welding.

Welders qualifying on the mock-ups are required to wear all protective clothing, including mask that will be worn during nozzle replacement welding.

Two forgings, that had been rejected by G.E., were forwarded to the site to be used on the mock-ups. These forgings were identified as DKK-6 and DKK-11.

No items of noncompliance or deviations were identified.

4. Nondestructive Examination

Radiographic examination of welder qualification welds and production welds is being performed by Peabody Magniflux under material license No. 12-99622-07. A review of personnel qualifications by the RIII representative indicated that the requirements of SNT-TC-1A were being met.

No items of noncompliance or deviations were identified.

Exit Interview

An informal exit interview was held with Mr. D. Wilson on August 23, 1978. The inspector stated that there were no items of noncompliance or deviations noted during his inspection of repair activities.