

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-334/89-24

Docket No. 50-334

License No. DPR-66

Licensee: Duquesne Light Company
Post Office Box 4
Shippingport, Pennsylvania 15077

Facility Name: Beaver Valley Unit 1

Inspection At: Shippingport, PA

Inspection Conducted: November 13-16, 1989

Inspectors: J. Strosnider 1/12/90
for H. W. Kerch, Senior Reactor Engineer,
Materials and Processes Section, EB, DRS date

J. Carrasco 1/12/90
J. E. Carrasco, Reactor Engineer,
Materials and Processes Section, EB, DRS date

for J. Strosnider 1/12/90
M. A. Oliveri, NDE Technician, Materials
and Processes Section, EB, DRS date

Approved by: Jack Strosnider 1/12/90
J. R. Strosnider, Chief, Materials
and Processes Section, EB, DRS, Region I date

Inspection Summary: On November 13, 1989, an announced NRC inspection was conducted at Beaver Valley Unit 1. The inspection focused on activities related to damage identified on the "A" and "C" main feedwater piping lines and an ultrasonic indication in the "A" feedwater line steam generator nozzle to elbow weld. The performance and documentation of the preservice inspection (PSI) on the main feedwater lines that had been replaced at the time of this inspection was very good. One violation was identified during this inspection. The violation involved the replaced elbow on the "A" main feedwater line. Specifically, the engineering specification regarding the geometry of the feedwater elbow counter bore was not strictly adhered to. Also, the system for tracking replacement welds was considered weak in that quality records for each generation of weld were not easily retrievable without prior knowledge of how many times the weld had been replaced and when the replacements occurred.

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DETAILS

1.0 Persons Contacted (30703) Duquesne Light Company (DLC)

F. J. Lipchick, Sr. Licensing Supervisor
R. J. Freund, Sr. Health Physics Specialist
W. H. Sikorsici, Director, ISI
C. E. Kirsohner, QA Supervisor
B. Sepelace, Licensing Engineer
R. J. Snowden, Quality Control
N. R. Tonet, Nuclear Engineering Manager
*R. Perry, Supervisor ISI
R. Hansen, Engineering
B. Zini, Engineering
F. G. Curl, Construction
*W. S. Lacey, General Manager
*K. Grada, Nuclear Safety Manager
*R. E. Martin, Nuclear Engineering Manager
*M. A. Pergar, QA Director

U.S. Nuclear Regulatory Commission

P. Wilson, Resident Inspector, RI

*Denotes persons attending exit meeting.

2.0 Scope of Inspection

During the period of October 13-16, 1989, an inspection was conducted at the Beaver Valley Unit 1 facility by the NRC. Beaver Valley Unit No. 1 identified an ultrasonic indication in the first elbow upstream from the "A" steam generator feedwater nozzle during the current refueling outage. The elbow was replaced and inspections were conducted on the upstream piping. The inspections disclosed that one snubber was damaged and the piping for both the "A" and "C" lines were contacting the adjacent pipe whip restraint. The licensee had replaced the elbow on the "A" steam generator nozzle on two previous occasions because of cracking.

The objectives of this inspection were to assess the adequacy of the licensee's main feedwater system piping repairs and engineering support activities. The inspectors reperformed independent nondestructive examinations required of the licensee by regulations and codes. Also, engineering designs and analyses were reviewed.

3.0 Nondestructive Examination (NDE)

Ultrasonic Examination (57080)

Two safety related pipe weldments, FW10 on drawing 8700-ISI-62-1, were ultrasonically examined by the NRC inspectors on steam generators A and C. A USL-48 ultrasonic flaw detector was used per NRC procedure NDE-1, Rev. 0, in conjunction with the licensee's procedure UT-308, Rev. 8 to examine the welds. The examination referenced the associated isometric drawings and ultrasonic test data reports. The ultrasonic instrument calibration (linear verification) was performed per NRC procedure NDE-2, Rev. 0. A distance amplitude correction curve (DAC) was constructed using the licensee's calibration standard BV1-60. A weld profile was re-constructed on steam generator "A", FW10, at the 9 o'clock position using a $\frac{1}{4}$ " 5 MHz transducer with a 12.97° half angle beam spread. This was done to verify the profile constructed by the licensee.

Results:

During the data review of weld FW10 on the "A" steam generator feedwater line, a weld profile performed by the utility revealed a counter bore transition angle that exceeded that specified by engineering sketch PIPS MO6.1 Rev. 0. The licensee's ultrasonic thickness profile for weld FW10 was verified to be accurate by the NRC inspector's independent examination (see section 4.0 for disposition).

Magnetic Particle Examination (57070)

Two safety related pipe weldments and adjacent base material ($\frac{1}{2}$ inch on either side of the weld) were examined using the direct contact, magnetic particle method (yoke) with dry powder as the inspection medium. These welds were ASME Class 2 pipe weldments from steam generator "A" (FW10 and FW 891). The examinations were performed in accordance with NRC procedure NDE-6, Rev. 0.

Results: No deficiencies or violations were identified.

Visual Inspection (57050)

During this inspection, several safety related pipe hanger/supports were visually inspected per NRC procedure NDE-10, Rev. 0, Appendices A and B. Included in this inspection were the "A" and "C" feedwater system piping. The accessible surface of welds and the adjacent base metal, for a distance of one-half inch on either side, were examined. Specific attributes looked for were installation; configuration or modification of supports; evidence of mechanical or structural damage; and corroded, bent, missing or broken members. Also inspected was the pre-welding pipe fit up and alignment for the "A" and "C" feedwater system piping repairs.

Results:

The licensee was doing an outstanding job of realigning the steam generator "A" and "C" loops before welding.

4.0 Review of Pre-service and Inservice Inspection (ISI)

During this inspection, a review of the pre-service inspection (PSI) data for the main feedwater piping repairs was accomplished. The ISI program for Beaver Valley Unit 1 incorporates the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition with addenda through Summer 1983. The nondestructive data reports were documented in a professional manner for the pre-service examinations performed. As described in Section 3.0, the NRC re-performed visual, magnetic particle and ultrasonic examinations of a selected sample of welds that were required by regulations and codes to be examined by the licensee. The purpose of this re-examination was to assess the adequacy of the licensee's pre-service inspection of repairs, that is a part of the inservice inspection program.

Results:

As discussed in Section 3.0, review of the ultrasonic thickness profile data disclosed that field weld 10, on drawing 8700-ISI-62-1, did not meet the engineering requirements nor was the nonconforming condition documented. PIPS MO6 (DET "C") required that the counterbore transition angle be 18° maximum. Ultrasonic thickness profiles performed by the licensee and independently verified by the NRC inspector indicated that approximately 30% of the counterbore exceeded the 18° requirement. The ultrasonic profiles of the counterbore displayed areas with greater than a 40° transition angle. This geometry will act as a stress riser and also will make ultrasonic examinations more difficult to perform. Failure to adhere to engineering specifications is a violation of Technical Specification 6.8.1 (50-334/89-24-01).

Control of Weld Identification of Replaced Weldments

Beaver Valley Unit 1 has a weak method for identification of weldments that have been replaced. For example, on main feedwater piping Loop "A", drawing number 8700-ISI-62-1, FW 10, the elbow to nozzle weldment has been cutout and replaced three times. The original construction weld identifier, FW10, is still being used for this weld with no modifier. The present system of retrieving weld examination records and welding historical data requires prior knowledge of the welding history of the system, in order to retrieve the proper weld historical data. The drawing user may not have the necessary prior knowledge of the system weld history to retrieve the desired weld data. Although this does not appear to violate any specific regulatory requirement, it does make it more difficult to audit and trend the information.

5.0 Review of Engineering Activities

In October 1989, ultrasonic indications were identified in the 16" diameter feedwater elbow to nozzle weld on the "A" steam generator. After an engineering review of the situation, the licensee decided to replace the subject elbow. During installation of the new elbow to the steam generator

nozzle, the licensee noticed the feedwater piping was contacting the first pipe whip restraint upstream of the nozzle, outside the crane wall on the 'A' feedwater line. Lines 'B' and 'C' also were inspected to determine their condition. No anomalies were identified in line 'B'; however, line 'C' displayed similar problems to those found on line 'A'. In order to restore lines 'A' and 'C', the licensee cut each line in three places to realign and reinstalled the piping.

During the inspection, the piping was being prepared for welding at the cut locations. However, cold readings on the spring cans, gaps on whip restraints, and actual realignment dimensions had not been established. This was to be done at a later date with fluid in the pipe lines.

Analysis and design review.

The inspector reviewed the following aspects of the licensee's latest stress analysis of the feedwater system piping which incorporated pump trip and valve closing time history forces.

1. Assumptions were reviewed to ensure that the analyses accurately represent the case in consideration.
2. Methodology was reviewed to ensure that the analysis was performed in accordance with the ASME Boiler and Pressure Vessel Code, Section III.
3. System loads and forcing functions utilized in the analysis were reviewed to assure that appropriate loading conditions for all modes of operation were considered.
4. The model used in the analysis was reviewed to verify that the geometric configuration reflected the piping, and location and orientations of pipe supports.
5. Maximum stress levels at critical model points along the pipe run were compared to the specified stress allowables.
6. Pertinent drawings also were reviewed to determine their adequacy.

The documents reviewed are listed below.

1. Stone and Webster Pipe stress calculation for steam generator feedwater piping inside containment (RC-E-aA) No. X783 Revision 1 add. No. A1 dated 11-15-89.
2. Duquesne Light Co. Drawing No. 8700-RC-16R Interior conc. details SH-8 and 9 Reactor Containment.
3. Duquesne Light Co. Drawing No. 8700-RC-16AC main steam pipe and feedwater pipe anchor plate details Sh-1 R.C.
4. Southwest Fabricating & Welding Co. Isometric 62 Street 1 and 2.

5. Duquesne Light Co. Steam Generator Feedwater R.C. 8700-1SI-0662A, B and C.
6. Duquesne Light Co. Drawing Nos. 8700-RV-78A-4, 8700-RV-78B, 78L and 8700-RC-16AC.

During this audit, the inspector found an error on page 38 of Stone & Webster calculation No. X783 Rev. 1. The drawing of the finite element model on that page shows that nodal point 65 is restrained by 2 snubbers, H-202 and H-201. These snubbers were erroneously labeled in that the identifications were transposed between the two snubbers. However, the loads for the support and piping stress analyses were correctly entered in the analysis. Therefore, the mislabelling did not result in an error in analysis. The licensee took the proper corrective action in a timely manner via an addendum to the calculation. The licensee also promptly corrected the pertinent drawings to correct this error.

Based on the analysis review, the inspector determined that, for the portions reviewed, the analysis was adequate and the maximum stresses were within code allowables. The inspector reviewed the calculation for support H-201 which was performed to relocate the snubber to a stiffer plate which is embedded in structural concrete on the crane wall. This design calculation was acceptable.

Review of root cause

The licensee is conducting a study to determine the cause of the abnormal displacement of the feed water lines 'A' and 'C'. The licensee is evaluating performance of the air actuated, feedwater flow-control valve. It is currently postulated that a small valve position movement may cause a change in flow resulting in a hydraulic wave along the pipe. The licensee is analyzing the hydrodynamic characteristics of the system. In addition, the licensee is putting in place instrumentation to provide operational transient data to assist in identifying the root cause. This instrumentation consist of thermocouples, strain gages, lanyards and accelerometers. The strain gages and thermocouples will be located at the nozzle to elbow junction. This instrumentation will be used in the elaboration of a detailed finite element model which in turn will be used to assess localized stresses. In addition, the lanyards and acclerometers will be installed to pick up and record any abnormal vibration of the feedwater piping and steam generator in terms of displacement and acceleration as functions of time. The inspector found the licensee's corrective and actions are adequate.

The licensee also was having a metallurgical evaluation performed on the elbow from the "A" feedwater line which had the ultrasonic indications. This evaluation was not complete at the time of the inspection.

6.0 Management Meetings (30703)

Licensee management was informed of the scope and purpose of the inspection at the entrance interview on October 13-16, 1989. The findings of the inspection were discussed with licensee representatives during the course of the inspection and presented to licensee management at the exit interview (see paragraph 1.0 for attendees). At no time during the inspection was written material provided to the licensee by the inspector. The licensee did not indicate that proprietary information was involved within the scope of this inspection.