U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No.: 50-331/92004(DRS)

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

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

Facility Name: Duane Arnold Energy Center

Inspection At: Palo, IA 52324

Inspection Conducted: February 2-4, March 3-5, 9-10, 30-31, April 1, May 13-14, and 20, 1992

Inspector: _____ 6-5-92
J. F. Schapker Date

Approved By: _____ 6-5-92
J. M. Jacobson, Chief Date
Materials and Processes Section

Inspection Summary
Inspection on February 2 thru May 20, 1992 (Report No. 50-331/92004(DRS)).
Areas Inspected: Routine, announced safety inspection of the implementation of inservice inspection (ISI) activities including review of program (73051), procedures (73052), observation of work activities (73753), and data review and evaluation (73755); review of concerns related to improper ISI practices (73052), an onsite review of a Licensee Event Report (LER) regarding control rod drive insert/withdraw line leakage (92700), and a review of licensee action on previous inspection findings (92701).
Results: Of the areas inspected, no violations or deviations were identified. During the course of the inspection, the following were noted:

- Based on the areas reviewed, the licensee appears to have an effective ISI program. The licensee contracts for some ISI services and performs ISI activities to ASME Section XI requirements, utilizing state of the art ISI equipment and procedures.

- The licensee's program addressing intergranular stress corrosion cracking (IGSCC) in stainless steel piping (Generic Letter (GL) 88-01) has been successful in arresting crack growth in the recirculation and related system piping.

- The licensee's action taken to resolve the NRC inspector's finding concerning adequate ultrasonic (UT) inspection of overlayed piping with irregular surface conditions was innovative and conservative.

DETAILS

1. Persons Contacted

Iowa Electric Light and Power Company (IELP)

M. Huting, Quality Control Supervisor
*F. Dohlman, Corporate NDE Level III
K. Medulin, ASME Administrator
*S. Shangari, Corporate Welding Engineer
*C. Rushworth, Licensing
G. Park, ASME Specialist, Codes and Materials
*T. Sims, Licensing Specialist, Regulatory Communications
*M. Smith, Quality Control Engineer
J. Probst, Technical Support Engineer
K. Putman, Technical Support Supervisor
J. Thorsteinson, Assistant Plant Superintendent, Operations Support
G. VanMiddlesworth, Assistant Plant Superintendent, Operations and Maintenance

Lambert, McGill and Thomas, Inc. (LMT)

K. Lavette, NDE Inspector, Level III, UT
D. Richey, NDE Inspector

U. S. Nuclear Regulatory Commission (NRC)

M. Parker, Senior Resident Inspector
C. Miller, Resident Inspector

*Denotes those participating in the teleconference exit interview on May 20, 1992.

Other plant technical personnel were contacted during the course of this inspection.

2. Onsite Followup of Nonroutine Events (92700)

(Closed) LER 90-010-01 (331/90010-LL): Control Rod Drive Insert/Withdraw Line Leakage and Indications at One Bundle Due to High Cycle Fatigue.

a. Background

On May 19, 1990, the licensee identified pin hole leaks on a control rod drive (CRD) withdraw line (WL) inside the annulus (air gap) area between the steel drywell shell and the concrete containment wall. An unidentified leak of approximately one gallon per hour was collected from a torus downcomer drain.

The leak was identified by using an articulating video inspection probe inserted into the sleeve piping surrounding the CRD lines through the concrete shell. The leak was observed as small streams (2 - 7) from CRD pipe 30-07WL. The leaking CRD 30-07WL is located in the southwest bundle which contains 50 of the 189 withdraw and insert CRD lines. The three other bundles identified as northwest, northeast, and southeast did not show evidence of leakage. Further visual examination of the southwest bundle identified a circumferential crack of approximately 200 degrees. Weeping leakage was observed within the area of the crack. The area surrounding the leakage displayed corrosion and scaling, indicating the leak had probably existed over a long period of time. This was evident due to the relative clean appearance of the other CRD bundles and the dry section of the CRD southwest bundle.

The licensee contacted the NRC per 10 CFR 50.72 requirements and provided justification for continued operation with degraded CRD insert and withdraw lines.

b. Licensee Action

Details of the licensee's corrective action to repair the leaking CRD line is documented in NRC Inspection Report No. 50-331/90013(DRS), Paragraph 2. Subsequent to the repairs, the licensee installed accelerometers, strain gauges, and temperature monitoring devices in an attempt to ascertain the root cause of the CRD cracking. Acoustic emission for detection of leakage or cracking was also installed on all four CRD bundles.

Data gathering from the monitoring equipment continued throughout 1991 and into early 1992, during which a number of plant scrams and other controlled shutdowns occurred. There was no evidence of pipe degradation over this period. No abnormal transients or trends were detected which would have been indicative of a driving force sufficient to have caused the piping failure. Visual inspection of the air gap region at the southwest bundle in April 1992, found no evidence of further problems.

As previously reported, a high cycle forcing function was considered the chief cause of the piping failure detected in 1990. Given the extensive monitoring that has been completed and the lack of indication of the forcing function at any CRD bundle, it appears unlikely that this phenomena is still in existence or will be detected by further monitoring. Therefore, the

monitoring instrumentation is being removed. The torus downcomer areas will continue to be inspected for moisture periodically during each cycle as part of routine surveillance activities. No further action appears necessary at this time to ensure continued CRD piping operability.

c. NRC Review

The NRC inspector observed the CRD monitoring system installation and reviewed the data recorded by the monitoring system. No apparent driving force was detected over the extensive period of time that the data was in operation. Therefore, it is apparent that the driving force for the CRD cracking no longer exists or was induced during fabrication, shipping or installation.

3. (Closed) Unresolved Item 331/90013-01: Inadequate surface condition of weld overlays for ultrasonic (UT) examination.

a. Background

NRC Inspection Report No. 50-331/90013 included an unresolved item regarding the surface conditions of weld overlays in recirculation piping. Some of the weld overlays have surface conditions which are not conducive to achieving adequate UT inspection coverage.

Past practice in achieving the required surface condition was to grind and flap the weld to smooth the weld ripples. This method is not always desirable due to minimum thickness requirements of the overlay which may require additional weld overlay to be applied if that minimum thickness is removed during surface improvement methods.

b. Licensee Action

As an alternative to mechanically improving the surface of the overlays, the licensee contracted for the services of a nondestructive examination (NDE) laboratory to develop a UT inspection technique which can effectively detect and size flaws in overlays with surface conditions as those found at DAEC. This inspection system was developed and recently tested on the EPRI overlay test blocks (qualification of UT system and two inspectors).

The licensee also purchased a specimen which represents the worst-case overlay (surface condition). The specimen (10-inch stainless steel pipe) was fabricated

by Independent Qualification Corporation, with in-planted thermal fatigue cracks of various sizes and through-wall depths.

c. Inspection

At the request of the licensee, the NRC inspectors went to the EPRI NDE Center located in Charlotte, North Carolina, on January 28, 1992, to observe the demonstration of the LMT/IELP UT system operation on the nonstandard overlay. The NRC inspectors reviewed the weld overlay specimen documentation, with emphasis on crack size and location. Visual inspection of the specimen confirmed surface roughness in excess of those referenced in NRC Inspection Report No. 50-331/90013.

The UT demonstration commenced with the referenced specimen as the inspection focus. The UT system was specifically designed to traverse the rough surface and maintain the correct angle of incidence while maintaining acoustic coupling with the surface.

The UT system performed this task by use of a special designed UT transducer attached to an automatic scanner with special designed manipulators and profilometry instrumentation. Control of the automatic scanner is with special computer program software designed/created by LMT. The signal digitization and recording is the same basic system used by LMT for standard overlay inspection.

Observation of the demonstration UT satisfied the NRC inspectors in that the UT system was able to detect and size the embedded cracks in the "worst-case" overlay specimen.

Further observations of the automated UT system during this inspection confirmed the adequacy of the techniques to perform the inspection as required by GL 88-01. The NRC inspector observed the data acquisition and analysis for the worst case overlay (at DAEC) and found it acceptable.

4. (Closed) AMS No. RIII-92-A-006 - Concerns of Improper Inservice Inspection Practices

a. Concern No. 1

During the Summer 1990 outage, contractor NDE technicians were responsible for removing their own magnetic particle (MT) indications by filing or whatever means deemed necessary. This may have been

done to avoid the Code required inspection expansion when flaws are discovered.

(1) NRC Review

The NRC inspector reviewed the licensee's MT procedure used during the time period in question.

IELP Procedure No. 1111.8, Revision 5, titled "Nondestructive Examination Procedure Magnetic Particle (Dry or Wet Visible) MT-1," dated June 8, 1990, was reviewed. Paragraph 6.7, "Interpretation of Results," Subparagraph 6.7.1.4 states: "Any indication in excess of Paragraph 6.10, Standards of Acceptance, which are believed to be a false indication shall be regarded as a defect and shall be re-examined to verify whether or not actual defects are present. Surface conditioning may preclude the examination."

The word preclude was an error in the procedure which could have influenced an inspector to interpret that there would be no need for an additional MT examination, after removal of nonrelevant indications. The NRC inspector could not determine through record review, if this was the interpretation of the MT inspectors, as evidence of this interpretation may not have been documented.

A review of the records was made to determine the identity of the MT inspectors. The NRC inspector contacted the MT inspectors and interviewed them to determine what action they had taken in response to the procedure wording. Each MT inspector who worked to this procedure stated that after any surface conditioning by either themselves or the craft workers, the MT was performed to assure relevant indications were not present.

The NRC inspector also reviewed the MT inspectors/ examiners qualifications and certifications. As part of their training, every certified MT inspector is required to know the ASME Code method and rules of MT examinations. One of the basic rules of MT is that any time a surface is filed, sanded, brushed, ground, etc., to remove suspect nonrelevant indications, the MT examination must be repeated to assure all indications have been removed or documented as defects.

It is not required by the Code to expand the sample size if the MT indication is not a defect (i.e., crack, slag, porosity in excess of Code requirements). Surface imperfections from inadequate preparation of the examination surface (i.e., scratches, dings, laps, etc.) are not considered relevant and therefore, are not documented as defects. It is common practice to allow the removal of such nonrelevant indications without documenting this activity.

(2) Conclusion

From the review of MT documentation and interviews with the MT inspectors, the NRC inspector concluded that no Code or regulatory requirements were violated. The error of wording in IELP Procedure No. 1111.8, Revision 5, Paragraph 6.7.1.4, has been revised to read "Surface conditioning may precede the re-examination." This change was made at the last revision of the procedure dated October 18, 1991. Review of documented MT Report No. MSE-CF9 for this outage disclosed that the procedure and Code requirements referenced above were adhered to. This concern could not be substantiated.

b. Concern No. 2

The licensee NDE contractor may have performed a technically inappropriate UT examination of the installed reactor vessel closure head studs. The calibration standard was not a full length standard and therefore, may not have been appropriate for UT unless the studs were removed from the vessel to permit UT from both ends of the stud.

(1) NRC Review

The NRC inspector reviewed UT procedures, Code requirements, and documentation of the examinations performed during the referenced outage of the reactor vessel (RV) closure head studs. The UT procedure used to examine the RV studs was GE-UT-108, Revision 0, dated June 14, 1990, titled "Procedure for Manual Ultrasonic Examination of Bolting Greater Than 2" Diameter." Review of this procedure and Section V, Paragraph T-536, "Inservice Examination of Bolts and Studs," of the ASME Code, confirmed that calibration on a

one-half length standard was an acceptable alternate to a full length standard. The required flat bottomed hole of the half length standard is scanned from both ends. Scanning from the end containing the flat bottomed hole essentially provides a sound path length equivalent to a full length standard.

Furthermore, the Authorized Nuclear Inservice Inspector (ANII) had reviewed the procedure and clarified the wording of GE-UT-108, Revision 0, Paragraph 5.3.2.4(b) with the following comments: "Calibration for Zone 2 is actually done by shooting at the 3/8" diameter flat bottom hole from the far side and shooting at the same hole from the opposite side." This comment acknowledges the ANII's understanding and concurrence for the use of the half length calibration standard (Zone 2 is the half of the stud furthest from the end from which the examination is performed).

(2) Conclusion

The NRC inspector's review of UT examinations of the RV closure head studs concluded that the licensee performed the examinations in accordance with the Code and regulatory requirements. This concern could not be substantiated.

No violations or deviations were identified.

5. Inservice Inspection (ISI) (73051)

a. Background

The NRC inspector reviewed the licensee's inspection plan for the current refueling outage. The ISI plan conforms to the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section XI, 1980 Edition through the Winter 1981 Addenda. The services of an Authorized Nuclear Inservice Inspector (ANII) were procured and the ISI procedures and personnel certifications were reviewed by the ANII. The licensee contracted Lambert, McGill and Thomas, Inc. (LMT), to perform selected nondestructive examinations.

b. ISI Documentation Review (73052, 73755)

The NRC inspector reviewed documents relating to the following:

- Ultrasonic instruments, calibration blocks, transducers and UT couplant certifications.

- Liquid penetrant material certifications.

- NDE personnel certifications in accordance with SNT-TC-1A and GL 88-01 requirements (where required).

- NDE procedures utilized for ISI.

- NDE calibration and examination data reports.

The documentation reviewed complied with the applicable Code and regulatory requirements.

c. Observation of Work Activities

The NRC inspector observed the following ISI work activities in progress:

- Visual examination of the reactor vessel internals with remote television. This examination identified feedwater sparger T-box cracks at four locations (45°, 135°. 270°, and 315°), and jet pump (JP) restrainer set screws tack weld cracks at three locations. JP 1, 3, and 11 had cracks on one of two welds which seize the set screws. The NRC inspector reviewed the licensee's nonconformance reports 92-032, 92-033, and 92-017. General Electric engineering analysis for these indications determined that the flaws were not safety significant but should be inspected to assure no further degradation occurs. VT is to be performed during refueling outages to monitor the defects to assure no safety significant flaw growth is apparent.

- UT of recirculation and residual heat removal overlayed piping using automatic UT scanning and digital recording (weld overlays RRD-J007-OVL and RHB-J001-OVL).[1]

- Manual UT of recirculation piping and reactor water cleanup welds in accordance with GL 88-01 requirements (IGSCC examination).

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[1] The automated UT of weld overlays is described in Paragraph 3 of this report.

- Liquid penetrant (PT) examination of recirculation pump suction weld joint.

The licensee's work activities observed were in compliance with the ASME Section XI, Section V, and applicable NDE procedure requirements.

The licensee's ISI program appears to be adequate to meet the requirements of ASME Section XI and regulatory requirements.

No violations or deviations were identified.

6. Erosion/Corrosion Program (73051, 73052, 73753)

The licensee's erosion/corrosion program (E/C) was developed and initiated by the licensee's engineering staff in response to industry and safety concerns. The licensee's program is based on state-of-the-art Chec, Checmate and Chec-T computer analysis programs developed by EPRI. NDE procedures used for data collection were developed by the corporate NDE Level III. Data collection is performed by NDE Level II inspectors certified to SNT-TC-1A requirements.

The NRC inspector observed data collection using the ultrasonic thickness measuring equipment with appropriate thickness wedges and calibration standards. Each component examined was marked with a specified grid pattern (2") starting at a reference point for repeatability.

The licensee's E/C program appears to be conservatively administered and uses state-of-the-art technology to identify and inspect the most susceptible locations of E/C.

7. Exit Meeting

The inspector conducted a teleconference exit with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on May 20, 1992. The inspector summarized the scope and findings of the inspection activities. The licensee acknowledged the inspection findings. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any such documents/processes as proprietary.