U.S. NUCLEAR REGULATORY COMMISSION
REGION I

DOCKET/REPORT NOS.	50-295/93-401 50-304/93-401
LICENSE NOS.	DPR-39 DPR-48
LICENSEE:	Commonwealth Edison P.O.Box 767 Chicago, IL 60690
FACILITY NAME:	Zion Nuclear Power Station, Units 1 and 2
INSPECTION AT:	Zion, Illinois
INSPECTION DATES:	November 29 - December 10, 1993
CONTRACTORS:	William Mingus, TET,Inc., Mobile, AL David Payne Jr., TET, Inc., Mobile AL

INSPECTORS: For RHH 12/21/93
Richard H. Harris, NDE Technician — Date
Mobile NDE Laboratory, EB, DRS

12/21/93
Patrick M. Peterson, NDE Technician — Date
Mobile NDE Laboratory, EB, DRS

APPROVED BY: E H Gray 12/22/93
E. Harold Gray, Chief — Date
Mobile NDE Laboratory, EB, DRS

Inspection Summary: An announced inspection was conducted at Zion Nuclear Power Station during the period November 29, through December 10, 1993, using the Nuclear Regulatory Commission (NRC) Mobile Nondestructive Examination (NDE) Laboratory, (Report Nos. 50-295/93-401 and 50-304/93-401). The purpose of the NDE Mobile Laboratory is to perform independent nondestructive examinations, evaluations of components, systems and weldments to assure that examinations performed are in compliance with codes, standards and regulatory requirements.

Areas Inspected: Areas examined during this inspection included a review of the licensee's inservice inspection (ISI) program and nondestructive examinations of safety-related weldments, hanger and supports selected from the safety injection (SI), residual heat removal (RHR), service water (SW), and feedwater (FW) systems. Also included in this inspection, was a review of the erosion/corrosion (E/C) program. Independent ultrasonic thickness measurements were made and compared to the licensee's data.

Results: Within the expected normal variations in examination techniques, the results of the NDE evaluations performed by the NRC essentially agreed with the results obtained by the licensee.

Two items were found to be in conflict with the American Society of Mechanical Engineers (ASME) Code in the area of ultrasonic testing (UT). These are not doing weld centerline marking and not recording geometric reflectors that are over 50% of the distance-amplitude correction (DAC) curve. For the geometric reflector issue, Procedure ISI-206, Rev. 1, does not require the recording of geometric reflectors; however, Procedure OPS-NSD-101, Rev. 5, does. The NRC inspectors identified two feedwater welds where geometric reflectors in excess of 50% of the DAC curve were present but were not recorded on the UT documentation.

Weaknesses in the inservice inspection program were also noted. These include licensee technical review of UT data sheets being limited to those with rejectable indications, lack of routine involvement of the licensee NDE Level III individual in ISI outage activity especially manual UT, and not conducting periodic review and updating of NDE procedures.

The licensee submitted ten position papers on their interpretations of the Code. The licensee stated that since no comments were made either accepting nor rejecting the position papers in the ISI program review process, they consider that work performed as discussed in the position papers meets the regulations on the granting of relief requests. The NRC inspection team concluded that activities performed per the position papers, in some cases, may result in the licensee being outside the ASME requirements without having obtained proper relief from the ASME Code by the NRC.

DETAILS

1.0 INDEPENDENT MEASUREMENTS - NRC NONDESTRUCTIVE EXAMINATION AND QUALITY RECORDS REVIEW OF SAFETY-RELATED SYSTEMS (73753)

During the period of November 29 through December 10, 1993, an onsite independent inspection was conducted at Zion Nuclear Power Station. The inspection was conducted by NRC inspectors and contractors. The objectives of this inspection were to assess the adequacy of the licensee's inservice inspection (ISI) program, the licensee's actions regarding the as-built configuration of pipe hanger/supports, and implementation of the erosion/corrosion (E/C) program. This was accomplished by duplicating those examinations performed by the licensee required by regulations and codes, evaluating the results, and performing a detailed review of the ISI program, E/C program and NDE procedures used to implement these programs. Section 4.0 of this report contains a listing of the specific welds, hangers and supports inspected.

The Code of Federal Regulations (CFR), Title 10, Part 50.55a (10 CFR 50.55a), requires ISI of safety-related equipment to identify system degradation. Before the licensee generated program of inspection is applied to the equipment, it must be submitted for review and approval by the Nuclear Regulatory Commission (NRC) under the authority embodied in 10 CFR 50.55a (g)(4)(iv). The required inspections are detailed in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, for Inservice Inspection as embraced in 10 CFR 50.55a(b). The NRC inspection described in this report was made using the Mobile Nondestructive Examination (NDE) Laboratory. The Mobile NDE Laboratory is capable of independently performing the examinations required of the licensee. This capability provides the NRC with unique insights into the licensee's inservice inspection program and, on a sampling basis, the adequacy and accuracy of the licensee's specific NDE inspections.

The scope of this inspection was to review the administrative portions of the program and to perform NDE of the systems that were available.

Results: During the inspection, several weaknesses, were noted. A weakness is a condition that without attention could develop into a safety problem or regulatory issue. Weaknesses are identified for licensee review and corrective action as appropriate. Two weaknesses are noted below.

Technical oversight of in-progress NDE by a licensee NDE Level III individual is minimal. Ultrasonic data sheets are not normally reviewed by either a contractor or licensee UT qualified Level III reviewer. The licensee NDE Level III individual usually reviews ultrasonic (UT) data sheets only when an indication is recorded by the contracted NDE technician. The NDE contractor provides the final technical acceptance of those UT data sheets without recorded indications.

Technical verification, i.e., performance demonstration, of the NDE subcontractors is not performed by the licensee. The signatures by the licensee and Authorized Nuclear Inservice Inspector (ANII) on the data sheets verify the examination is completed, but not that a technical review was performed.

The second weakness is the infrequent review of NDE procedures. Procedure OPS-NSD-101 has not been reviewed and updated since 4/8/75. Other ISI NDE procedures in use during this outage have not been updated since 1984. Changes in ASME Code requirements and NDE techniques have occurred since 1984. To assure the NDE techniques employed are current, NDE procedures should be periodically reviewed and updated.

1.1 Nondestructive Examination (NDE)

Inspection of Hanger/Supports (57050)

Seventeen (17) safety-related hanger/supports were visually inspected per NRC Procedure NDE-10, Rev. 0, Appendix A and B, in conjunction with Zion Site Procedure ISI-8, Revision 9, quality control documents and associated isometric/drawings. Included in this inspection were hanger/supports selected from the service water (SW) system. The accessible surface area and adjacent base metal for a distance of one-half inch on either side of the weld was examined. Component integrity was also examined, including proper installation, configuration or modification of supports, evidence of mechanical or structural damage, corrosion, bent, missing or broken members.

Results: The inspections by the NRC closely matched those of the licensee. Two supports rejected by the NRC were also rejected by the licensee. No deviations were identified.

Visual Examination (57050)

Thirty two (32) safety-related pipe weldments and adjacent base material (1/2 inch on either side of the weld) were visually examined in accordance with NRC Procedure NDE-10, Rev. 0, Appendix A, Zion Site Procedure ISI-8, Revision 9, quality control documents, isometrics and as-built drawings. Examined during this inspection were ASME Class 1, 2, and 3 pipe weldments selected from the safety injection (SI), service water (SW), Residual heat removal (RHR), and feedwater (FW) systems. Inspections were performed specifically to identify any cracks or linear indications, gouges, leakage, arc strikes with craters, or corrosion, which may infringe upon the minimum pipe wall thickness and modifications to piping or components. Mirrors, flash lights and weld gauges were used to aid in the inspection and evaluation.

Results: The welds examined were ground for inservice inspection prior to surface and volumetric examinations. The welding and overall workmanship inspected was acceptable. The inspection reports of the licensee reflected the as-found conditions. No deviations were identified.

Liquid Penetrant Examination (57060)

Eleven (11) safety-related pipe weldments and adjacent base material (1/2 inch on either side of the weld) were examined using the visible dye, solvent removable method per NRC Procedure NDE-9, Rev. 1, in conjunction with Zion Site Procedure ISI-11, Revision 10. Included in this inspection were ASME Class 1 and 2 stainless and carbon steel pipe weldments selected from the SI, and RHR systems.

Results: The surface areas examined were adequately prepared for the examination. The licensee recorded the same relevant indications noted by the NRC. No rejectable indications were identified, and no deviations noted.

Magnetic Particle Examination (57070)

Ten (10) safety related pipe weldments were examined with the magnetic particle method using NRC Procedure NDE-6, Rev. 1, Zion Site Procedures ISI-70, Revision 2, NDT-B, Revision 17 and associated isometric drawings. Included in this examination were ASME Class 1 and 3 pipe weldments form the FW and SW systems.

Results: The surface areas examined were adequately prepared for the examinations. There were no recordable indications found by the NRC. Eight of the weldments were part of the recent SW modification work. These examinations are not part of the ISI program. The acceptance standards for these examinations are the original construction code, ANSI B31.1 and ASME Section III.

Ultrasonic Examination (57080)

Sixteen (16) safety-related pipe weldments were ultrasonically examined using NRC Procedure NDE-1, Rev. 1, in conjunction with Zion Site Procedure ISI-206, Revision 1, and associated isometric drawings and ultrasonic inspection reports. Included in this examination were ASME Class 1 and 2 pipe weldments selected from the RHR, SI, and FW systems. To obtain the greatest possible repeatability in performing the NRC independent evaluations, the examinations were performed using ultrasonic units, transducers and cables that matched, as closely as possible, those used by the licensee. A distance-amplitude correction (DAC) curve was established utilizing Zion calibration standards CWE-10, CWE-36 and CWE-3.

Results: The ultrasonic examinations performed by the NRC closely matched within expected variations for this method, those of the licensees. However, geometric indications on FW welds 15-CWE-2-2201 and 16-CWE-2-2201 were not recorded by the licensee. UT procedure ISI-206, Revision 1, is in conflict with the ASME Code in that Procedure ISI-206 defines a geometric indication as a non-valid indication that is exempt from recording on the UT data sheet. The ASME Code Section XI, IWB 3514.5, requires geometric reflectors greater than 50% of the distance-amplitude correction (DAC) curve to be recorded.

The inspectors noted a potential weld volume coverage problem with UT examinations performed using calibration block CWE-10. These may not be in full compliance with the ASME Code for examination coverage, depending on the joint configuration and restrictions. A nominal 45° shear wave, 2.25 MHz, produces an actual 26° shear wave in the calibration block. This is an example of where technical involvement and review by the licensee's NDE Level III reviewer of in-progress NDE may be important and in this case would establish the need for change in technique to provide the proper extent of UT examination coverage.

The licensee Position Paper #4, submitted as part of the second interval ISI Program, provides that the station continue using a procedurally based weld identification system that would give subsequent relocation with an accuracy of 0.5 inches. This procedure, OPS-NSD-101, Revision 5, does not include a requirement for weld centerline marking and requires datum points be established only when recordable indications are to be reported. The ASME Code, 80W81, requires a method for weld centerline marking. The only time the licensee marks the centerline of the weld is when there is a recordable indication, as required by Procedure OPS-NSD-101, Revision 5. The use of centerline marking is not only to accurately locate indications, but to verify reflectors are geometric in nature. The practice of not marking the centerline of the weld is in conflict with the ASME Code, Section XI, Article III, 4330. This was a previous unresolved item (50-304/90-12-01) that remains open. The licensee currently considers the approval of the ISI program to include approval of the #4 Position Paper, but this is in conflict with 10 CFR 50.55a (g)(5)(iii) in that it has the effect of obtaining Code relief without submitting a Code relief request.

Erosion/Corrosion (49001)

Concerns regarding erosion/corrosion (E/C) in balance of plant piping systems has heightened as a result of the December 9, 1986, feedwater piping line rupture which occurred at the Surry Plant. This event was the subject of NRC Information Notice 86-106, issued December 16, 1986, and its supplement issued on February 13, 1987.

The actions by the Zion plant staff with regard to the detection of erosion/corrosion in plant components were reviewed with respect to NUREG-1344, "Erosion/Corrosion Induced Pipe Wall Thinning in U. S. Nuclear Power Plants," dated April 1989, Generic Letter 89-08 issued May 2, 1989, and NUMARC Technical Subcommittee Working Group on Piping and Erosion/Corrosion Summary Report, dated June 11, 1987.

The administration of the Zion E/C Examination Program is described in Procedure ZAP 510-10 and includes definition of E/C terms, responsibilities of Station personnel, component selection, component naming scheme, NDE certification and reporting of results. This procedure identifies the basis for not including certain systems in the E/C program and

lists the 16 systems (or subsystems) that are included in the long term E/C program. These 16 systems were computer modeled using the seven Keller equation factors to establish the E/C susceptibility ranking of the components in each system. The components selected for examination during an outage include those based on susceptibility from the model from each of the sixteen systems, plant experience and industry experience.

The procedure for selecting, examining and evaluating components susceptible to E/C at Zion Station is TSGP-138. Components with areas less than the required thickness are identified for analysis on a problem identification form (PIF). Procedures 510-10 and TSGP-138 were reviewed and the operation of the E/C program was discussed with the past and current responsible engineers. The computer based data recording and records management system were observed and sampled. The inspector found the E/C program to be within industry and NRC guidelines in that it has appropriate procedures, corporate technical oversight, continuity of site engineering support, designated engineering responsibilities and adequate documentation including both computer based and hard copy records. The sample of E/C measurements taken by the NRC technicians in 10 areas compared closely with the measurements made by the E/C program of the licensee.

The licensee's ultrasonic data is taken by a certified Level II UT technician and the recorded data is evaluated by the responsible engineer for accuracy and wall thickness. All data which is below the allowable wall thickness, as determined by the engineer, is evaluated and dispositioned prior to plant restart.

Results: Zion Nuclear Power Station has an E/C program that includes application of NRC and EPRI guidance and industry experiences. The methods used by Zion personnel to select and evaluate components are conclusive. The component inspections performed by the NRC closely matched those of the licensee.

2.0 REVIEW OF SITE NDE PROCEDURES AND MANUALS (73052)

Before a license's program of inspection is used, it must be submitted for review and approval by the Nuclear Regulatory Commission under the authority embodied in 10 CFR 50.55a (g)(4)(iv). The required inspections are detailed in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, for Inservice Inspection as embraced in 10 CFR 50.55a (b). For any inspection program, the Code edition and addenda used is determined in accordance with the requirements of 10 CFR 50.55a (g).

Zion Nuclear Power Plant, Units 1 and 2 submitted their second (ten year) interval inservice, inspection programs to the NRC on June 27, 1983, and August 14, 1984, respectively. The items and areas planned to be examined in these programs, are in accordance with the Plant Technical Specifications Section 4.0.5. The 1980 Edition of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code up to and including Winter, 1981 Addenda (80W81) is the applicable Code edition.

The following licensee procedures were reviewed for compliance to the applicable codes, standards and specifications.

Procedure Title	Number/Revision	Date
Manual Ultrasonic Examination of Vessel Welds	ISI-47 Revision 4	10/19/84
Manual Ultrasonic Examination of Welds	ISI-206 Revision 1	10/19/84
Visual Examination	ISI-8 Revision 9	10/12/84
Liquid Penetrant Examination	ISI-11 Revision 10	6/21/82
Magnetic Particle Examination	ISI-70 Revision 2	6/21/82
Magnetic Particle Examination ASME Section III	NDT-B Revision 17	4/30/93
Magnetic Particle Examination Acceptance	NDT-B1 Revision 9	4/30/93
Preservice and Inservice Examination Documentation	OPS-NSD-101 Revision 5	4/8/75
Ultrasonic Equipment Qualification	NSD-ISI-10 Revision 6	11/1/83

Results: The manual UT Procedure ISI-206, Revision 1, is in conflict with the 1980 edition, winter '81 addenda (80W81) of the ASME Code. The code requires all indications in excess of 50% DAC to be recorded. UT Procedure ISI-206 does not require non-valid (geometric) indications to be recorded or noted. The above NDE procedures, except for NDT-B and NDT-B-1 have not been reviewed and updated by the licensees NDE Level III since 1984 or earlier.

3.0 MANAGEMENT MEETINGS

Licensee management was informed of the scope and purpose of the inspection at the entrance meeting on November 29, 1993. The findings of the inspection were discussed with the licensee representatives during the course of the inspection and presented to licensee management at the exit meeting December 10, 1993. The licensee did not indicate that proprietary information was involved within the scope of this inspection, nor did the licensee object to any of the findings of the inspection. The following individuals were contacted:

Commonwealth Edison (CECo)

* R. Tolentino	ISI Coordinator
* M. Rauckhorst	Station Support
M. Pigon	Station Support
K. Dickerson	Regulatory Assurance
* S. Kaplan	Regulatory Assurance
* W. Stone	Performance Improvement Director
* M. Madigan	Site Quality Verification
K. Hansing	Site Quality Verification

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J. Schapker	RIII, DRS Inspector
* M. Miller	RIII, Zion Resident Inspector

* Denotes those attending entrance and exit meeting.

The inspectors also contacted other administrative and technical personnel during the inspection.

4.0 COMPONENTS INSPECTED

Following is a list of the components inspected by the NRC NDE Mobile Laboratory at the Zion Nuclear Power Station:

NRC NDE MOBILE LABORATORY
TABLE No. 1

WELD ID. No. OR ISO/DRAWING	SYS OR LIN	NONDESTRUCTIVE TEST						SHT.# 1	
		CL	RT	UT	PT	MT	VT	ACC	REJ
10-COM-1-4403	SI	1		X			X	X	
11-COM-1-4403	SI	1		X			X	X	
12-COM-1-4403	SI	1		X			X	X	
13-COM-1-4403	SI	1		X			X	X	
14-COM-1-4403	SI	1		X			X	X	
15-COM-1-4403	SI	1		X			X	X	
16-COM-1-4403	SI	1		X			X	X	
17-COM-1-4403	SI	1		X			X	X	
34-COM-1-4403	RHR	1		X			X	X	
35-COM-1-4403	RHR	1		X			X	X	
36-COM-1-4403	RHR	1		X			X	X	
15-CWE-2-2201	FW	2		X		X	X	X *	
16-CWE-2-2201	FW	2		X		X	X	X *	
8-CWE-1-4309	SI	1			X		X	X	
9-CWE-1-4309	SI	1			X		X	X	
10-CWE-1-4309	SI	1			X		X	X	
11-CWE-1-4309	SI	1			X		X	X	
12-CWE-1-4309	SI	1			X		X	X	
13-CWE-1-4309	SI	1			X		X	X	
14-CWE-1-4309	SI	1			X		X	X	
15-CWE-1-4309	SI	1			X		X	X	
1-ISW-103-8	SW	3				X	X	X	
2-ISW-103-8	SW	3				X	X	X	
3-ISW-103-8	SW	3				X	X	X	
4-ISW-103-8	SW	3				X	X	X	
15-ISW-70-8	SW	3				X	X	X	

* geometric reflectors greater than 50% DAC

NRC NDE MOBILE LABORATORY
TABLE No. 1

WELD ID. No. OR ISO/DRAWING	SYS OR LIN	NONDESTRUCTIVE TEST						SHT.# 2	
		CL	RT	UT	PT	MT	VT	ACC	REJ
16-ISW-7O-8	SW	3				X	X	X	
6-OSW-093-6	SW	3				X	X	X	
9-OSW-088-6	SW	3				X	X	X	
14-CWE-1-4403	RHR	1		X	X		X	X	
15-CWE-1-4403	RHR	1		X	X		X	X	
22-CWE-1-4403	RHR	1		X	X		X	X	

NRC MOBILE NDE LABORATORY
HANGER/SUPPORTS
TABLE 2

IDENTIFICATION	SYS	CL	ACC	REJ	COMMENTS
H1/3-3131	SW	3	X		NRI
H2/3-3131	SW	3	X		RUST
H3/3-3131	SW	3	X		RUST
H4/3-3131	SW	3	X		RUST
H5/3-3131	SW	3	X		RUST
H6/3-3131	SW	3	X		RUST
H7/3-3131	SW	3	X		RUST
H8/3-3131	SW	3		X	HEAVY RUST
H9/3-3131	SW	3		X	HEAVY RUST
H10/3-3131	SW	3	X		RUST
H11/3-3131	SW	3	X		RUST
H12/3-3131	SW	3	X		RUST
H13/3-3131	SW	3	X		HEAVY RUST
H14/3-3131	SW	3	X		HEAVY RUST
H15/3-3131	SW	3	X		HEAVY RUST
H16/3-3131	SW	3	X		HEAVY RUST
H17/3-3131	SW	3	X		RUST