



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

Report Nos.: 50-327/84-26 and 50-328/84-26

Licensee: Tennessee Valley Authority
500A Chestnut Street
Chattanooga, TN 37401

Docket Nos.: 50-327 and 50-328

License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah 1 and 2

Inspection Conducted: October 9-12, 1984

Inspector: J. V. Coley 10/30/84
Date Signed

Approved by: Jerome J. Blake 10/30/84
Date Signed
Jerome J. Blake, Section Chief
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This routine, unannounced inspection involved 35 inspector-hours on site in the areas of inservice inspection (ISI) - review of program, ISI - review of procedures, ISI - observation of work and work activities, IE Bulletin followup, followup on inspector identified item and unresolved item, and independent inspection effort.

Results: Of the six areas inspected, no violations or deviations were identified.

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REPORT DETAILS

1. Licensee Employees Contacted

- *P. R. Wallace, Plant Manager
- *J. B. Knell, Plant Superintendent, Maintenance
- *D. F. Goetcheus, Site Services
- *L. M. Nobles, Plant Superintendent, Operations and Engineering
- L. D. Alexander, Field Services Modification Group
- *R. Bentley, Power Plant Maintenance Specialist
- *F. C. Leonard, NDE Supervisor
- *C. R. White, Operational QA
- *H. R. Rogers, Compliance Engineer

Other licensee employees contacted included construction craftsmen, technicians, operators, mechanics, security force members, and office personnel.

NRC Resident Inspector

E. Ford, Senior Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on October 12, 1984, with those persons indicated in paragraph 1 above. The inspector described the areas inspected, and discussed in detail, the inspection findings listed below. No dissenting comments were received from the licensee.

(Open) Unresolved Item, 50-328/84-26-01, No program credit will be given for examination of Weld RC-180-17 due to attenuation losses not considered during the examination of this weld, paragraph 6b.

(Open) Unresolved Item, 50-327/84-26-01, Missing radiographs for Unit 1 Main Steam Containment Penetration Weld 1-12B, 2, 4, 5, and 6, paragraph 7.

3. Licensee Action on Previous Enforcement Matters

(Closed) Unresolved Item 327, 328/83-20-01: Incorporation of code case N-335 or its equivalent for inspection of similar or dissimilar piping welds. Code case N-335 was approved by the ASME B&PV Council on April 2, 1982. It represents the Committee's position on how similar (austenitic stainless steel) and dissimilar metal piping welds should be examined since the ASME Code has failed to address this issue adequately in the past. TVA has replaced procedure SQ-UT-27, which did not cover the requirements of code case N-335, with procedure N-UT-25, Revision 4, which meets or exceeds code case N-335.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. New unresolved items identified during this inspection are discussed in paragraphs 6.b and 7.

5. Independent Inspection Effort - Unit 1 and 2 (92706B)

The inspector reviewed work activities involved with three Sequoyah relief requests. During this inspection, the inspector examined in detail work packages for QC holdpoints and technical content, drawings, procedures, personnel qualification, equipment calibration and welding procedure qualification records, and observed in-process work to determine if work activities performed in these specific areas were in accordance with regulatory requirements and licensee commitments. The following areas were examined:

- a. Licensee request dated September 13, 1984, for approval to use ASME Code Case N-401, "Eddy Current Examination - Recording Data." The inspector reviewed Combustion Engineering Procedure No. 00000-ISI-077, which included changed No. 84-1388 for the setup and operation of the Zetec MIZ-18 multi-frequency eddy current tester system. In addition, work activities consisting of calibration of the tests, examination of steam generator tubes, and review of the examiner's evaluation of the test results were observed.
- b. Licensee request dated September 18, 1984, for relief of the hydrostatic test requirements specified in the 1977; Summer 1978 Addenda of Section XI of the ASME Code. This relief was applicable to the installation of the 2-inch bypass lines around 16-inch feedwater check valves 3-508, 3-509, 3-510, 3-511, and the deletion of 1½-inch feedwater drain valves 3-512, 3-513, 3-516, 3-517, 3-520, 3-521, 3-524, and 3-525.

The inspector reviewed the work package for the installation of the 2-inch bypass line, observed and verified weld-o-let fit-up, verified welding parameters, certification of welder, qualification of welding procedure, and calibration of test equipment.

- c. Licensee request dated September 21, 1984, for relief from ASME Code, Section XI, hydrostatic test requirements following the replacement of portions of the carbon steel piping in the ERCW system. This relief request was the result of TVA adding a new fifth diesel generator and modification to the ERCW piping to accommodate the addition.

This inspector reviewed the work package for the discharge ERCW piping from the diesel to the concrete reservoir for Technical Content and proper QC sign-offs. Installation of the new diesel was observed and a review of drawings relating to its installation was performed.

Within the areas examined, no violations or deviations were observed.

6. Inservice Inspection - Unit 2

The inspector reviewed the licensee's program, procedures, and observed work activities for the inservice inspection (ISI) of Unit 2 to ascertain whether these activities were in accordance with regulatory requirements and licensee commitments.

In accordance with 10 CFR Part 50.55a(g)(4)(iv), Sequoyah's ISI program for Unit 2 was prepared to meet the requirements of the 1977 Edition, Summer 1978 Addenda, of Section XI of the ASME Boiler and Pressure Vessel Code. Steam Generator Tubing Examination requirements are in accordance with Regulatory Guide 1.83, Rev. 1, and Technical Specification 4.4.5.3. In accordance with 10 CFR Part 50.55a(b)(2), the extent of examination for piping welds Examination Categories B-J and C-F is in accordance with the 1974 Edition, Summer 1975 Addenda of ASME, Section XI (Examination Categories B-J, C-F, and C-G). Extent of examination is defined as criteria for the selection of Class A and Class B components for examination and as criteria for determining which Class B components may be exempt from examination. The extent of examination also specifies the location on the components to be examined (i.e., length of weld).

a. Review of TVA and Southwest Research Institute Inservice Inspection Program (73051B)

The inspector reviewed TVA Surveillance Instruction SI-114.2, Revision 5 to ascertain whether the licensee's ten year program included the following:

- Description of areas to be examined in accordance with the ASME B&PV Code, Section XI, Articles IWB-2000 and IWC-2000
- Examination category for each area
- Method of inspection for each area
- Extent of examination for each area
- Justification for exceptions to codes and standards

In addition to the above, the inspector reviewed Southwest Research Institute's QA program for performing ISI examinations of the reactor vessel nozzles on Unit 2. The following program areas were reviewed to ascertain whether adequate QA plans and procedures had been established (written, reviewed, approved, and issued) to assure that the activities listed below are controlled and accomplished:

- Organizational structure and QA personnel
- Audits

- General QA requirements
- Work and quality inspection procedures
- Control of processes
- Corrective action
- Document control
- Examination control and control of examination equipment
- Quality records

The following Southwest Research Institute (SwRI) procedures were also reviewed:

<u>Procedure No.</u>	<u>Title</u>
IX-FE-101-2 Change 1	Deviations to Nuclear Projects Operating Procedures
IX-FE-103-2	Weld Joint Identification Marking on Nuclear Piping
IX-FE-104-2	Measuring and Recording Search Unit Location and Maximum Signal Amplitude Data During Ultrasonic Weld Examinations
IX-FE-101-2	Onsite NDE Records Control
XIII-AG-101-2	Control of Nuclear Inspection Equipment and Materials
SwRI-NDT-800-17/26	Special Procedure for Manual Ultrasonic Examination of Austenitic Components with High Acoustic Attenuation Properties
SwRI-NDT-200-1/55	Liquid Penetrant Examination, Color Contrast Method
SwRI-NDT-300-2/36	Fluorescent Magnetic Particle Examination
SwRI-NDT-600-5/36	Manual Ultrasonic Examination of Nuclear Reactor Pressure Vessel Flange Ligaments
SwRI-NDT-600-15/55	Manual Ultrasonic Examination of Pressure Vessel Welds

SwRI-NDT-600-18/34	Manual Ultrasonic Examination of Pressure-Retaining Studs and Bolts 2 Inches or Greater in Diameter Containing Access Holes
SwRI-NDT-600-31/11	Manual Ultrasonic Examination of Austenitic Pressure Piping Welds
SwRI-NDT-700-5/9	Mechanized Ultrasonic Examination of Vessel Components, Vessel Welds, and Piping Welds
SwRI-NDT-6/15	Mechanized Ultrasonic Examination of Ferritic Vessels Greater than 2.0 Inches in Thickness

In addition to the above, personnel qualifications, equipment certifications, and calibration records were reviewed.

b. Review of ISI Procedures (73052B)

The inspector reviewed the procedures listed below to determine whether their technical content met code and regulatory requirements:

<u>Procedure No.</u>	<u>Title</u>
SwRI-NDT-200-1, Rev. 55	Liquid Penetrant Examination, Color Contrast Method
SwRI-NDT-800-17, Rev. 26	Special Procedure for Manual Ultrasonic Examination of Austenitic Components with High Acoustic Attenuation Properties
TVA-N-VT-1, Rev. 6	Preservice and Inservice Visual Examination Procedure
TVA-N-UT-25, Rev. 4	Ultrasonic Examination of Piping Welds for the Detection of Low-Level Crack-like Reflectors Originating at the I.D. Surface
CE-00000-ISI-077, Rev. 1	Procedure for Multifrequency Eddy Current Examination of Nonferromagnetic Steam Generator Tubing in Accordance with USNRC Regulatory Guide 1.83

Procedure Nos. SwRI-NDT-800-17, Rev. 26 and TVA-N-UT-25, Rev. 4 were reviewed to verify that the following requirements were met:

- (1) The type of apparatus to be used included frequency range as well as linearity and signal attenuation accuracy requirements is specified.
- (2) The extent of coverage (beam angles, scanning surface, scanning rate, and directions) as well as the scanning techniques are specified and are consistent with the ASME Code.
- (3) Calibration requirements, methods and frequency including type, size, geometry and material of calibration blocks as well as location and size of calibration reflectors within the block are clearly specified and consistent with the applicable ASME Code.
- (4) The sizes and frequencies of search units are specified and are consistent with the ASME Code.
- (5) Beam angle or angles are specified and are consistent with the ASME Code.
- (6) Methods of compensation for the distance traversed by the ultrasonic beam as it passes through the material including distance - amplitude correction curves, and transfer mechanisms, if used, are specified and are consistent with the ASME Code.
- (7) Reference reflectors for accomplishing transfer and the frequency of use of transfer mechanisms, if applicable, are specified and in accordance with ASME Code.
- (8) The reference level for monitoring discontinuities is defined and the scanning gain setting specified and that these values are in accordance with the ASME Code.
- (9) Methods of demonstrating penetration are established.
- (10) Levels or limits for evaluation and recording of indications are specified and are in accordance with ASME Code, Section XI.
- (11) Method of recording significant indications is established and the reporting requirements are in accordance with licensee requirements.
- (12) Acceptance limits are specified or referenced and are in accordance with the ASME Code, Section XI.

During the inspector's review of SwRI-NDT-800-17, Rev. 26, it was noted that the SwRI procedure deviated from subparagraph T-535.1 of Article 5, Section V, which states that transfer be accomplish between the production material and the basic calibration block and correction made for the difference. Paragraph 75 of SwRI-NDT-800-17 requires attenuation measurements be recorded and considered during analysis. It also specifies that no attempt shall be made by the examiner to compensate for the observed difference. The problem with this deviation is that

the procedure recording criterion requires ultrasonic reflectors producing a response of 50% of the reference level to be recorded. When significant attenuation is experienced during examination of a weld and the examiner does not compensate for the observed difference, the reflectors may not reach the level to be recorded or evaluated strictly because of the attenuation factor and not because of the defect size. A review of the attenuation measurements taken for the reactor vessel nozzles examined by SwRI revealed that on weld No. 29-RC-180-17, the average attenuation difference between the calibration block and the weld joint was five decibels with readings in two of the four areas as high as seven and eight decibels. This exceeds the scanning sensitivity, indications observed at the calibration reference level in these areas may not be recorded when they should be evaluated for acceptance. Later editions of the ASME Code (80 & 83) have deleted the requirement to establish attenuation measurements. The wisdom of the decision will not be discussed in this report. The fact remains that attenuation measurements were taken and an attenuation problem was noted that possibility nullifies the results of the examinations. Therefore, until the examination of the weld compensates for the recorded attenuation difference, NRC will not give credit for this examination. This item was reported as Unresolved Item 50-328/84-26-01, No program credit will be given for examination of weld RC-180-17 due to attenuation losses not considered during the examination of this weld.

Procedure No. TVA-N-VT-1, Rev. 6, was reviewed to determine if the following requirements were met:

- (1) Method - direct visual, remote visual, or translucent visual
- (2) Application - hydrostatic testing, fabrication procedure, visual examination of welds, leak testing, etc.
- (3) How visual examination is to be performed
- (4) Type of surface condition available
- (5) Method or tool for surface preparation
- (6) Whether direct or remote viewing is used
- (7) Special illumination, instruments, or equipment to be used
- (8) Sequence of performing examination, when applicable
- (9) Data to be tabulated
- (10) Acceptance criteria are specified consistent with the applicable Code section and specific contract requirements.

Procedure No. SwRI-NDT-200-1, Rev. 55, was reviewed to determine if the following requirements were met:

- (1) The specified test method is consistent with ASME Code requirements.
- (2) Brand names and specific types (number of letter designation if available) of penetrant, penetrant remover, emulsifier, and developer are specified.
- (3) Penetrant materials used for nickel base alloys are required to be analyzed for sulfur using method prescribed in the ASME Code and allowed residual total sulfur does not exceed the established limits.
- (4) Penetrant materials used for the examinations of austenitic stainless steel are required to be analyzed for total halogens using method prescribed in the ASME Code and the total residual halogen content does not exceed the specified limits.
- (5) Methods for acceptable preexamination surface preparation are specified and that these methods are consistent with the applicable ASME Code.
- (6) The procedure establishes a minimum drying time following surface cleaning.
- (7) The method of penetrant application and the penetration time are specified and the penetration time is consistent with the penetrant manufacturer's recommendation.
- (8) The examination surface temperature is specified and the specified range is between 60 and 125°F. (If temperatures outside this range are permitted, examination procedure has been specifically qualified.)
- (9) Methods for removal of solvent removal penetrant are specified and that these methods do not permit flushing the examination surface with solvent.
- (10) Method of surface drying prior to developing is specified.
- (11) The type of developer to be used, method of developer application and the time interval between penetrant removal and developer application are specified.
- (12) Examination technique is specified and the permitted time interval during which the "final interpretation" is made falls within 7-30 min. after developer application.

- (13) Technique for evaluation of indications is specified, acceptance standards are referenced, and are consistent with applicable ASME Code.
- (14) Requirements exist for procedure requalification when changes are encountered in any of the following parameters:
 - Surface treatments which may alter the condition of surface openings (blast cleaning, acid etching).
 - Change in precleaning materials or methods.
 - Changes in the type of penetrant materials (including developer, etc.) or in processing techniques.

Procedure No. CE-00000-ISI-077, Rev. 1, was reviewed to determine if the following criteria was met:

- (1) A criteria has been established for maximum sensitivity.
- (2) A criteria has been established for determining material permeability.
- (3) The method of examination is described. (Impedance, Phase Analysis, Modulation Analysis.)
- (4) Methods of calibration and calibration sequence is described.
- (5) Acceptance criteria are specified and correspond with ASME Code.

Within the areas examined, no violations or deviations were identified.

c. Observation of ISI Work and Work Activities (73753B)

The inspector reviewed the licensee's inservice inspection (ISI) plans and schedules for the current inspection period of the inspection interval, reviewed the qualifications and certifications of examiners, and observed work activities for the ultrasonic, liquid penetrant, and eddy current methods of examination of components to ascertain whether the following requirements were being met:

- (1) Approved NDE procedures are available, are being followed and specified NDE equipment is being used.
- (2) Examination personnel are knowledgeable of examination method and operation of NDE equipment.
- (3) Examination personnel with proper level of qualification and certification are performing the various examination activities including designation of NDE method/technique to be used, equip-

ment calibration, examination, and interpretation/evaluation/acceptance of test results.

- (4) Examination results, evaluation of results, and any corrective actions/repairs/replacements are being recorded as specified in the ISI program and NDE procedures.

The following methods of examination and the components involved in their use are described below:

(1) Ultrasonic Examination

The inspector observed SwRI's calibration for the straight-beam examination and angle-beam examination of loop 2, hot leg nozzle N-15, weld RC-9SE. The inspector did not, however, observe the examination of this weld because insulators were removing lagging in the area and air respirators became necessary. The following examination parameters were verified during calibration:

- The type of apparatus used, including frequency range as well as linearity and signal attenuation accuracy.
- Calibration, methods and frequency including the type, size, geometry and material of identified calibration blocks as well as location and size of calibration reflectors within the block are clearly determined and recorded.
- The sizes and frequencies of search units.
- Beam angle or angles.
- Methods of compensation for the distance traversed by the ultrasonic beam as it passes through the material including distance - amplitude correction curves.
- Reference reflectors for accomplishing transfer and the frequency of use of transfer mechanisms.
- The reference level for monitoring discontinuities is as defined and the scanning gain setting is as specified.
- Methods of demonstrating penetration.
- Levels or limits for evaluation and recording of indications.
- Method of recording significant indications.
- Acceptance limits are determined.

Within the areas examined, no violations or deviations were identified.

(2) Liquid Penetrant Examination

The inspector observed the penetrant materials equipment and examiners that were to perform the penetrant examination on weld RC-9SE. However, the inspector was not able to monitor the examination because of reasons mentioned in (1) above. The following test parameters were observed.

The penetrant, penetrant remover, and developer are identified and consistent with ASME Code, Section V.

Penetrant materials used for nickel base alloys were analyzed for sulfur content. Residual total sulfur does not exceed the established limits.

Penetrant materials used for the examinations of austenitic stainless steel were analyzed for total halogens. The total residual halogen content does not exceed the established limits.

The examination surface temperature ranges between 60° and 125°F. If the temperature is outside this range, it must be specially qualified in the procedure.

Within the area examined, no violations or deviations were identified.

(3) Eddy Current Examination

The inspector observed eddy current examinations performed by Combustion Engineering on Steam Generator No. 1 using both the Zetec MIZ-12 and the MIZ-18 Multi-frequency testing systems. Four phase examinations in both the absolute and differential calibration modes were verified. In addition, evaluations for the following AVB tubes (tubes that pass through the anti-vibration bars which have higher probability of failure based on other Westinghouse steam generators) were observed by the inspector:

<u>Row Number</u>	<u>Column Number</u>
26	50
26	48
26	46
26	45
26	43
26	41
26	37
26	33
26	31
27	30
27	28

<u>Row Number</u> (continued)	<u>Column Number</u>
27	32
27	34
27	36

Within the areas examined, no violations or deviations were identified.

7. IE Bulletin 80-08, Examination of Containment Liner Penetration Welds - Unit 1 and 2 (92703B)

TVA's letter of response dated July 8, 1980, to the above bulletin has been received by Region II. The licensee stated in this letter that nondestructive methods of examination other than ultrasonics was used for examination of these penetration welds specifically radiography. The licensee also stated that backing bar type weld joints were not used. During this inspection, the inspector reviewed a random sample of penetrations to insure that radiographs were available and that no backing bar discontinuities existed. The following sample was selected for Unit 1:

<u>Penetration No.</u>	<u>System</u>
Penx-1-13A	Feedwater
Penx-1-12B	Main Steam
Penx-1-20A	Safety Injection
Penx-1-40B	Auxiliary Feedwater
Penx-1-107-2	Residual Heat Removal

During this inspector review of radiographs for penetration No. Penx-1-12B-2, 4, 5, and 6, the inspector noted and concurred with the examiner's rejection of five film segments. However, the final acceptance radiographs of these five film segments were not in the film package. The inspector did not have time to wait for a search to be performed in the vault for the missing film, therefore, Unresolved Item 327/84-26-01 (Missing Radiographs for Unit 1 Main Steam Containment Penetration Weld 1-12B-2, 4, 5, and 6) was reported to licensee for licensee action.

Within the area examined, no violations or deviations were identified.

8. Inspector Followup Items - Unit 2 (92701B)

(Closed) IFI 50-328/83-20-02, Welding Specification for Repairs of Condensate Storage Tank "B".

On September 27, 1983, an inspector examined the repairs made by Chicago Bridge and Iron Works to the CST. The repairs consisted of replacing the bottom two feet of tank side wall for 360° of the tank circumference. In addition, a 360° four foot donut section of the bottom plate extending from the corner weld inward had to be replaced. The external weld surface appeared adequate and several locations were apparent where plug welds had been removed for metallurgical tests. The licensee stated that these metallurgical tests were used in lieu of radiography in accordance with the

American Water Works Association (AWWA) specification, which was used for this repair. However, the licensee did not have a copy of this specification at the site. The licensee was requested to obtain a copy of the AWWA specification for the inspector's review on a subsequent inspection. During this inspection, the inspector was given a copy of AWWA D100-73, "Welded Steel Elevated Tanks, Stand Pipes, and Reservoirs for Water Storage." Section 11.5 of this specification concurred with the method for inspection and sample size taken. This item is considered closed.

Within the areas examined, no violations or deviations were identified.