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

Report Nos.: 50-327/85-39 and 50-328/85-39

Licensee: Tennessee Valley Authority
6N11 B Missionary Ridge Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-327 and 50-328 License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah 1 and 2

Inspection Conducted: November 12-15, 1985

Inspector: _____ 12/10/85
J. L. Coley Date Signed

Approved by: _____ 12/10/85
J. J. Blake, Section Chief Date Signed
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This routine, unannounced inspection involved 29 inspector-hours on site in the areas of review of inservice inspection (ISI) procedures, observation of ISI work and work activities, review and evaluation of completed ISI data, previous enforcement items and in office review of special reports.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*L. M. Nobles, Operations and Engineering Superintendent
*R. W. Olson, Modification Manager
*M. R. Harding, Engineering Group Supervisor
*G. B. Kirk, Compliance Supervisor
*D. Howard, Mechanical Branch Supervisor
*M. Gothard, Nondestructive Examination (NDE) Supervisor
*M. Bentley, NDE Engineer
*G. Minton, Inservice Inspection (ISI) Supervisor
*T. Gilbert, ISI Specialist
*J. Whitaker, ISI Specialist

Other licensee employees contacted included engineers, technicians, security force members, and office personnel.

NRC Resident Inspector

*L. J. Watson

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on November 15, 1985, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection.

3. Licensee Action on Previous Enforcement Matters

(Closed) Severity Level IV Violation 50-327/85-27-04, "Failure to Adequately Perform a Nondestructive Examination." Tennessee Valley Authority's (TVA) letter of response dated November 1, 1985, has been reviewed and determined to be acceptable by Region II. The inspector held discussions with the ISI supervisor and examined the corrective actions as stated in the letter of response. In addition to the actions taken in the letter of response, the inspector requested that sensitivity test be performed on the lot of penetrant materials involved in the NDE examination and that a sample of the examiners inspections be audited. The inspector observed the sensitivity test and the initial examiner's re-examination of weld joint Nos. SIS-7 and

SIS-34, see paragraph 6.c for further details. The inspector also cautioned the licensee that examiners should have a mirror in their possession when performing visual and surface examinations. The inspector concluded that TVA had determined the full extent of the subject noncompliance, performed the necessary survey and followup actions to correct the present conditions and developed the necessary corrective actions to preclude recurrence of similar circumstances. The corrective actions identified in the letter of response have been implemented.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Inservice Inspection - Review of Procedures (73052) Units 1 and 2

The inspector reviewed the licensee's examination procedures to determine whether these procedures pertaining to ISI are consistent with regulatory requirements and licensee commitments in the areas of approval, qualification of NDE personnel, procedural scope and technical content. The applicable code for this review is the American Society of Mechanical Engineers (ASME) Code, Sections XI and V, 1977 Edition with addenda through summer 1978.

a. Ultrasonic Examination

The inspector reviewed the following ultrasonic examination procedures to determine the scope and adequacy of the procedural technical content:

- N-UT-5, Ultrasonic Examination of Bolting Components
- N-UT-19, Ultrasonic Examination of Ferritic Butt Welds and Adjacent Base Metal in Vessels Having Wall Thicknesses Greater Than Two Inches
- N-UT-25, Ultrasonic Examination of Piping Welds for the Detection of Low-Level Cracklike Reflectors Originating at the I.D. Surface
- N-UT-26, Ultrasonic Examination for the Detection of I.D. Pitting, Erosion, and Corrosion

The above procedures were compared to ASME Code requirements in the following areas:

(1) The type of apparatus to be used including 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, electronic distance - amplitude correction and transfer mechanisms, if used, are specified and are consistent with the ASME Code.

(7) 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.

(8) Methods of demonstrating penetration are established.

(9) Level or limits for evaluation and recording of indications are specified and are in accordance with ASME Code, Section XI.

(10) Method of recording significant indications are established and the reporting requirements are in accordance with licensee requirements.

(11) Acceptance limits are specified or referenced and are in accordance with the ASME Code, Section XI.

b. Liquid Penetrant Examination

The inspector reviewed the following liquid penetrant examination procedures to determine the scope and adequacy of the procedural technical content:

- N-PT-3, Liquid Penetrant Examination Using Color-Contrast Solvent-Removable Method for Elevated Temperature Examinations.

- N-PT-4, Liquid Penetrant Examination Using the Color-Contrast Solvent-Removable Method

The above procedures were compared to the ASME code requirements in the following areas:

(1) The specified test method is consistent with ASME Code requirements.

(2) Brand names and specific types of penetrant, penetrant, remover 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 do 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 do 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. (Temperatures outside this range are permitted provided the examination procedure has been specially 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.

c. Magnetic Particle Examination

The inspector reviewed the following magnetic particle examination procedures to determine the scope and adequacy of the procedural technical content:

- N-MT-2, Magnetic Particle Examination of Nuclear Power Plant Components

- N-MT-3, Wet Fluorescent Magnetic Particle Examination of Pressure Retaining

The above procedures were compared with the ASME Code in the following areas:

(1) Examinations are done by the continuous method (current on while particles are being applied) and adequate material surface preparation are specified.

(2) When dry particles are used, the particle color provides good contrasts with background and component surface temperature is less than 600°F.

(3) When wet particles are used they are suspended in suitable liquid medium and component surface temperature is below 135°F.

(4) Viewing conditions for fluorescent particles consistent with paragraph T-725.3 of ASME Section V (Article 7).

(5) Examination is conducted with sufficient overlap to achieve 100% coverage and two separate examinations are made with field directions perpendicular to each other.

(6) When prod method is used, prod spacing does not exceed 8-in. and provisions are made to reduce arcing.

(7) Magnetizing current for the prod method urges between 100-125 amps per inch of prod spacing for section thickness more than 3/4 in. and 90-100 amps/in. for sections less than 3/4 in. thick.

(8) When coil or direction contact methods are used, current and technique are consistent with paragraphs T-732 and 733 of ASME Section V.

(9) When the yoke method is used, pole spacing is within 3-6 inches and minimum lifting power is 10 lb. for alternating current and 40 lb. for direct current.

(10) Acceptance criteria are specified or referenced and are consistent with the applicable ASME Code Section.

d. Visual Examination

The inspector reviewed the following visual examination procedure to determine the scope and adequacy of the procedural technical content:

- N-VT-1, Preservice and In-Service Visual Examination Procedure

The above procedure was compared with the ASME code in the following areas:

(1) Requirements for direct visual examinations and remote visual examinations are delineated in accordance with (IAW) the ASME Code.

(2) Examination in methods for visual examination to determine general surface, mechanical and structural condition of components and components supports (VT-1 and VT-3) and operability of mechanical supports and snubbers are described IAW the ASME Code.

(3) Lighting requirements are defined.

(4) Surface preparation or cleanliness of examination surfaces are defined.

(5) Measuring devices accuracy and calibration frequency are established.

(6) Extent of examination for each component category are defined.

(7) Measurement of clearances, tightness of bolting, physical displacement, structural adequacy, freedom of motion and verification of settings are described.

(8) Acceptance criteria are specified or referenced and are consistent with the applicable ASME Code Section.

Within the areas examined, no violation or deviation was identified.

6. Observation of Inservice Inspection Work and Work Activities (73753B) Units 1 and 2

The inspector observed work activities described below to ascertain whether the inservice inspection (ISI) of pressure retaining components, supports and closure studs are performed in accordance with regulatory requirements and licensee commitments. The applicable code for these inspections is delineated in paragraph 5.

a. Visual Examination

The inspector observed ISI visual examiners performing VT-1, VT-3 and VT-4 examinations, as applicable, on the follow supports:

| Support No. | System | Code Class | Drawing o. |
|---|---|---|---|
| 1-FDH-244 | Feedwater | C | ISO-CHM-2439 |
| 1-FDH-246 | Feedwater | C | ISO-CHM-2439 |
| 1-RCH-134 | Reactor Coolant | A | ISO-CHM-2432 |
| 1-RCH-135 | Reactor Coolant | A | ISO-CHM-2432 |
| 1-RCH-147 | Reactor Coolant | A | ISO-CHM-2432 |
| 1-RCH-186 | Reactor Coolant | A | ISO-CHM-2432 |

During the examination, the inspector verified that approved NDE procedures were available and were being followed, ISI examination personnel were knowledgeable of examination methods, surface preparations were adequate, sufficient lighting was available, mirrors and flashlights were used when component configuration or obstructions prevented direct visual examination and measurement of clearances, tightness of bolting, physical displacement, structural adequacy, freedom of motion and verification of settings were performed satisfactorily.

In addition to the above, the inspector reviewed the examiners qualification and certification records to determine if the examination personnel were certified to the proper level for the examinations observed by the inspector and if the examiner had passed a annual visual acuity and color vision examination.

b. Ultrasonic Examination

The inspector observed ultrasonic (UT) examinations for the detection of I.D. pitting, erosion and corrosion on the Unit 2 extraction steam system. These expanded UT examinations of various water and steam systems are being performed on Units 1 and 2 as a result of inspection findings of pitting, erosion, and corrosion on the essential raw cooling water system. In addition to the above examinations, the inspector requested the licensee to demonstrate their inspection techniques for performing angle beam UT examinations of the reactor closure studs. The licensee demonstrated their inspection techniques on a reactor closure stud calibration standard.

The calibration clearly demonstrated that cracks could be detected in the threaded area of the studs.

With the exception of the ultrasonic examinations performed for the detection of I.D. pitting, erosion and corrosion all ultrasonic work scheduled for the present Unit 1 outage had been completed.

c. Liquid Penetrant Examination

On July 29, 1985, Sequoyah Nuclear (SQN) Unit 2 experienced a leak in the chemical and volume control (CVC) system at a sample line connection upstream of valve 2-62-674. This event is discussed in Licensee

Event Report 50-327/85-031. Following the Unit 2 event, plant management pursued a course of action to inspect the similar connection on Unit 1. As part of the inspection, the Unit 1 CVCS sample line connection at valve 1-62-674 was examined visually and by liquid penetrant examination. There were no flaws or indications noted. However, subsequent to the visual inspection, a small leak was noted on the Unit 1 sample line on August 11, 1985. An independent analysis of the failure identified both dye penetrant and developer inside the crack which apparently indicated that the crack existed when the examination was conducted. See violation 327/85-27-04 in NRC Inspection Report Nos. 50-327/85-27 and 50-328/85-28. Following the Unit 1 leak, extensive interviews were held with the examination personnel involved who stated that the examination was performed in accordance with procedures, and they did not detect any flaws in the areas examined. The examiners were also requested to perform a mock penetrant test (PT) inspection at the actual sample line location after it was repaired. This was accomplished and witnessed by plant management and the senior resident inspector. The examiners demonstrated they knew and could adequately implement the procedure. The licensee concluded that the cause for failure to detect the crack during the examination was indeterminate. However, three explanations were given:

(1) The crack did not exist at the time of the PT examine, but initiated during the 11-day period between examination and failure.

(2) The crack existed, but was so tight that at the time of examination was not detectable.

(3) The crack existed, was detectable, and an unintentional personnel error occurred while looking for the penetrant bleedout which resulted in the crack going undetected.

The licensee inspected the remaining positions on the CVC letdown system and reviewed the maintenance history of snubbers/hangers on other selected systems for indication of vibration problems. The inspector, however, inquired as to whether other PT examinations performed by the examiner who had apparently missed the indication had been audited or if the PT materials used in the examination had been tested to see if they retained their test sensitivity. Neither of these important areas had been checked. The inspector requested a list of all welds that the examiner had inspected during this outage and found that this individual had only performed three other liquid penetrant examinations. The inspector chose two of the welds to observe the examiner reinspect. The following welds were re-examined:

| Weld Joint No. | ASME Class | System | Unit |
|---|---|---|---|
| SIS-7 | 2 | Safety Injection | 1 |
| SIS-34 | 2 | Safety Injection | 1 |

PT re-examinations of the above welds were performed in a satisfactory manner and no relevant indications were observed. The inspector also went to the TVA training center to observe the PT sensitivity test performed on the lot of penetrant materials used in the examination of the CVC sample line. Actual crack specimens and sensitivity test panels were examined at the same temperature as the initial examination. The results of these tests were also satisfactory. In addition to the above, the inspector reviewed the examiner's qualification/certification records to determine the examiner's experience level, whether the examiner fully comprehended the examination test method and if the examiner had been given a current yearly eye examination. The result of each of these actions were satisfactory.

Within the areas examined, no violation or deviation was identified.

7. Data Review and Evaluation (73755B) Unit 1

The inspector reviewed In-Service Inspection (ISI) completed records of work performed during the current outage to determine whether the ISI data files are complete, within the previously established acceptance criteria and whether the licensee's disposition of adverse findings and subsequent re-examination is consistent with regulatory requirements. The applicable code for this review is delineated in paragraph 5 above.

a. Records for the following components and supports were reviewed by the inspector:

| Report No. | Weld or Component ID | System | Method of Examination |
|---|---|---|---|
| R-2361 | 1-UHIH-60 | Upper Head Injection | VT-3 |
| R-2362 | 1-UHIH-61 | Upper Head Injection | VT-3 |
| R-2363 | 1-UHIH-62 | Upper Head Injection | VT-3 |
| R-2365 | 1-UHIH-65 | Upper Head Injection | VT-3 |
| R-2369 | 1-UHIH-69 | Upper Head Injection | VT-4 |
| R-2373 | 1-UHIH-47 | Upper Head Injection | VT-3 |
| R-2358 | MSS-9-LS-2 | Main Steam | MT |
| R-2359 | MSS-9-LS-1 | Main Steam | MT |
| R-2374 | 1-MSH-389 | Main Steam | PT |
| R-2424 | WP-1 | Pressurizer | UT-45° |
| R-2425 | WP-1 | Pressurizer | UT-60° |

The above records were reviewed to determine whether the selected records contained or provided reference to the following documents:

- Examination results and data sheets
- Examination equipment data
- Calibration data sheets

- Examination evaluation data
- Records on extent of examination
- Records on disposition of findings
- Re-examination data after repair work
- Identification of NDE material such as penetrant, penetrant cleaner and couplant.

b. The inspector reviewed UT records associated with the following pressure retraining pipe welds:

| Report No. | Weld ID | Size | System |
|---|---|---|---|
| R-2370 | RHR-5 | 18" Diameter | Residual Heat Removable |
| R-2372 | MSS-9-LS-1 | 32" Length | Main Steam |
| R-2378 | MSF-39 | 32" Diameter | Main Steam |
| R-2399 | RCS-39 | 4" Diameter | Reactor Coolant |
| R-2400 | RCS-37 | 4" Diameter | Reactor Coolant |
| R-2401 | RCS-38 | 4" Diameter | Reactor Coolant |

The records for the above welds were reviewed to determine if the following requirements were met:

- The examination unit calibration data sheets show no major deviation between initial and final calibrations.
- Collected examination data and any recordable indications are properly recorded to permit accurate evaluation and documentation.
- Evaluation of examination data was performed by a level II or level III examiner.
- Evaluation of indications comply with the criteria of the ISI examination procedure and ASME Section XI.

Within the areas examined, no violation or deviation was identified.

8. In Office Review of Special Reports (90713) Unit 2

On November 18, 1985, the inspector received and reviewed TVA's Special Report 85-08. The report provided to Region II the licensee's results of the Unit 2 steam generator tube inservice inspection completed on November 4, 1984. The inspector reviewed this report to determine whether the information reported by the licensee was technically adequate and satisfied applicable reporting requirements of Title 10, Code of Federal Regulations and the licensee's Technical Specifications.

Within the area examined, no violation or deviation was observed.