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JAN 30 1987

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: Mr. B. J. Youngblood

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

DRAFT COPY OF THE NRC SAFETY EVALUATION ON WELDING FOR SEQUOYAH UNITS 1 AND 2

This letter is in response to NRC's November 14, 1986 draft safety evaluation on welding for Sequoyah units 1 and 2. Enclosed are TVA's responses to the four open issues identified in the draft safety evaluation.

To facilitate closure of the four open issues, we would be happy to meet with you at your convenience to discuss the enclosed responses. If you have questions or would like to meet with TVA, please get in touch with Ralph H. Shell at (615) 751-2474.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

R. L. Gridley, Director
Nuclear Safety and Licensing

Enclosure
cc: See page 2

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ADD: IE/DQAUT/QAB
LTR ENCL

U.S. Nuclear Regulatory Commission

JAN 30 1987

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Enclosure

Responses to NRC Draft Safety Evaluation
Report Open Issues on Welding Review at
Sequoyah Nuclear Plant

Response to Item 1

Sequoyah site engineering procedures SQEP-13, Procedure for Transitional Design Change Control and SQEP-17, Procedure for Origination and Categorization of Configuration Control Drawings (CCDs) will be revised by April 30, 1987, to incorporate requirements that will address the two remaining irregularities identified in inspection report Nos. 50-327/86-33 and 50-328/86-33. Specifically provisions will be added to SQEP-13 requiring that quality levels be specified on all new or revised drawings for HVAC supports, cable tray supports, conduit supports, instrument supports, miscellaneous steel, and pipe supports; and SQEP-17 to require that pertinent as-constructed weld parameters (weld type, size, length, and location) be incorporated in the drawing configuration control program.

Response to Item 2

Information relative to compliance with 10 CFR 50 and ANSI N45.2.5 contained in Section III.3 to the NRC Safety Evaluation Report (SER) draft indicates that additional information is necessary to fully define TVA compliance with the ANSI Standard. This response will serve to consolidate TVA's position on compliance with ANSI N45.2.5.

The provisions of the Office of Engineering Design and Construction QA Program contained in procedure No. OEDC-QAP-2.0, "Quality Assurance Program," (issued May 28, 1974), provided that the Division of Design (DED and later OE) and Division of Construction (DEC and later OC) were individually responsible for the implementation of those portions of documents such as Regulatory Guides and ANSI Standards which directly affected the activities of each division.

DED specified on drawings the following criteria: codes and standards used to facilitate the design, overall quality assurance level of the feature (feature's importance to plant safety), and applicable construction specifications to be applied during fabrication/ installation. The inspection program used to verify compliance with ANSI N45.2.5 was the responsibility of the organization controlling the work activity.

The Nuclear Quality Assurance Manual for Nuclear Operations mandated Nuclear Operations establish and document an operational QA program consistent with the schedule of activities to comply with 10CFR50, Appendix B during the operational phase and for the life of the plant.

TVA did comply with the provisions of ANSI N45.2.5 through the construction phase by use of a combination of a surveillance program for verification of in-process activities and a final visual inspection of completed structural features. This program did not provide for a 100 percent fit-up inspection of all safety-related weld joints. It did, however, mandate a 100 percent final visual inspection of completed welds on safety-related structures, and a daily surveillance of in-process welding activities including fit-up inspections.

Since initial operation began at SQN, qualified QC inspectors performed fit-up inspections of safety-related structural steel fillet welds when this inspection was required either by engineering drawings or work package instructions. However, fit-up inspections were not performed on the majority of structural modifications because they were not required on engineering drawings or instructions. In these instances, the SQN welding program did not require fit-up inspections to be performed by anyone, but relied on the skill and discretion of qualified craft personnel. To ensure that this practice did not result in fit-up gaps that affected the structural adequacy of fillet welded joints a detailed evaluation of structural modifications made since SQN became operational was performed by DNE. Elements of this evaluation included: 1) a review of structural drawings issued since SQN became operational; 2) a determination of electrode sizes used for structural welding; 3) an evaluation of structural adequacy assuming a situation of a 3/16" specified fillet weld with a craft fit-up gap of 1/8"; and 4) a field inspection of present gaps of typical structural modifications to assure that this assumption has not been exceeded in actual practice.

The result of the above drawing review and engineering evaluation yielded the following conclusions: 1) the majority of structural welds performed since SQN became operational involved designs which are easily fabricated and have relatively easy fit-up, and 2) an engineering evaluation concluded that fillet weld integrity as a result of craft workmanship policy at SQN has not been compromised.

As a result of the Sequoyah Phase I review, the following documents have been revised to address ANSI N45.2.5 issues.

- The Nuclear Quality Assurance Manual, Part I, Section 2.9 was revised September 24, 1986, to establish requirements and responsibilities for fit-up inspections of safety-related structural items during construction and operations phases. These requirements and responsibilities are as follows:

1. Fit-up inspection of safety-related structural items shall be performed by qualified QC inspectors unless the following alternative requirements are implemented:

- The certified welder and welder foreman shall perform preweld checks of all safety-related structural items and document fit-up gap separation between parts to be fillet welded. This documentation must be suitable for QC inspector use during final weld inspection to verify weld size.

- The QC inspector shall be notified of in-process fit-ups and shall selectively inspect based on a sampling plan determined by the site quality manager. These inspections shall verify suitability of certified welder and welder foreman fit-up checks.

2. Final inspection of safety-related structural welds shall be performed by qualified QC inspectors.

   - The TVA Quality Assurance Topical Report (TVA-TR75-1A) has been revised (Rev. 9) in Tables 17D-1 and 17D-2 to describe TVA's method of conforming to ANSI N45.2.5.

Response to Item 3

TVA will provide NRC, within six months after restart of any unit, a revised Sequoyah Nuclear Plant ASME Section XI In-service Inspection Program. This program will include the following features:

1. 100 percent of the ASME Class 1 and 2 piping field welds identified to be examined in the first 10-year in-service interval and which remain to be examined will be scheduled for examinatin in the next two consecutive refueling outages following the submittal of the revised plan and the restart of any unit.

2. 100 percent of the ASME Class 1 and 2 pipe support field welds identified to be examined in the first 10-year in-service interval and which remain to be examined will be scheduled for examination in the next two consecutive refueling outages following the submittal of the revised plan and the restart of any unit.

3. Major component support welds made in the field on the reactor vessel, steam generator, pressurizer, and reactor coolant pumps that have been identified to be examined in the first 10-year program and which remain to be examined will be scheduled for examination in the next two consecutive refueling outages following the submittal of the revised program and the restart of any unit.

4. Where possible, the program period examination percentages will be maintained as required by the code in the Tables IWB-2412-1 and IWC-2412-1 (Inspection Program B). Note that the required percentages may not be met on specific systems, categories, or item Nos. because certain systems contain a large number of socket welds which are field welds and the majority of pipe support welds are field welds. Where conflicts with the code exam percentage requirements and the augmented/accelerated programs are identified specific requests for relief will be added in the revised program.

Program examination credit will be taken for all exams performed and no additional class 1 and 2 field welds will have to be performed in the remaining time of the first 10-year interval with the exception of the code required additional examinations resulting from unacceptable indications in the exams and the required successive examinations. Successive examinations of following 10-year intervals will follow their original schedule resulting from the original program plan and will not be required to meet the accelerated program.

With respect to unit 2, and items 1, 2, and 3 above, the first refueling outage is scheduled to occur in approximately four to six months after restart. A revision of the program plan could be accomplished in this timeframe. However, the short duration operating period following restart may not provide the needed time for the increased planning and scheduling, manpower and craft support required to perform the increased inspections. In addition, the first outage period following restart might not be of sufficient length to complete the planned examinations. In this case, the implementation of any accelerated program would be deferred to the second and third outages following restart of unit 2.

Response to Item 4

TVA has under active consideration the additional staff recommendation to use the AWS QC1 standard for certifying AWS scope weld inspectors. Any changes that TVA decides to implement will be reflected in FSAR revisions. Training in the application of any standards adopted will be provided to appropriate personnel.

TVA is taking the following actions to carry out the intent of the commitments in the Sequoyah Nuclear Performance Plan regarding improvements in the welding program.

1. A program is underway to combine the requirements of G-29 and N73M2 into a single document. This effort is scheduled to be complete by April 1, 1987.

2. A specification improvement program has been initiated that will eventually replace General Construction Specifications with project specific specifications. The procedure defining the new specification system (NEP 5.5 Specification of Engineering Requirements) was issued on 12-31-86.

TVA is supplying the following to provide clarifying information for Sections II.3, III.4, and III.5.

The conclusion derived in Sections II.3, III.4, and III.5 of the NRC Safety Evaluation Report (SER) indicates additional information is necessary to clarify the circumstances surrounding the following issues: a) the high rejection rates for the WP SQN reinspection, and b) the SQN Construction Welding Inspection and Inspector Training/Qualification Program.

Welding Project Volume I, Section VI, Enclosure 2, Attachment 2 outlines the Reinspection Plan utilized for the WP SQN reinspection effort. This plan focused on safety portions of the plant where there have been fewer previous inspections and, therefore, fewer opportunities for weld defects to have been identified. Because Class 1 and 2 piping receive more inspections during construction, Preservice Inspection (PSI) and Inservice Inspection (ISI), these piping systems were excluded. This was a conservative approach and biases the reinspection toward items which have had only one required inspection, and, therefore, had the most likelihood of having previously unreported defects.

Results provided in the SQN Phase II Report (WP Volume III) from the WP reinspection indicated, in terms of deficient weld attributes contained per weld, a reject rate of about 4% (184 of 4662 attributes) for piping welds and for structural welds on a component basis of about 15% (211 of 1394 components).

The piping weld category revealed 60% of the rejectable attributes (108 of 184 attributes) to be related to arc strikes and weld spatter. These attributes do not represent conditions impairing the safe operation of the affected system. If the totals for these two attributes, that were not addressed by codes applicable to the fabrication and examination of this piping are eliminated, then the reject rate falls to a more tolerable level of 1.6%. This would be an acceptable rate for any major reinspection effort of this nature.

The structural weld category indicates a majority of the rejectable attributes to be weld size and weld profile. Rejectable weld sizes were reported as being undersize for 10.38% of the reinspected weld and 82.5% of these were undersized by 1/16" or less.

The level of detail used in measuring weld size has been enhanced from the time of the original inspection which was to measure points on the weld surface, to the present method of measuring the entire weld.

Considering the circumstances surrounding the reinspection (oversight by an independent consultant, NRC reinspection, and high visibility within TVA) the inspectors were extremely conservative in measuring, rounding off, and reporting weld size. A similar rationale can be applied to weld profile.

These rejectable conditions were identified in the reinspection effort by the visual inspection process and lead to questions centering around the SQN welding inspector visual training program in effect during the original construction.

Welding Project Generic Employee Concern Evaluation Report Number WP-06-SQN, RO, states the evolution of the training program within TVA as follows.

"The base requirement for visual inspection is mandated through both AWS and ASME B&PV Code rules but the training, qualification, and certification requirements have not been developed, consolidated, nor agreed upon by members of the utility industry." This remains true today. The American Society for Nondestructive Testing (ASNT) presently has a committee which is actively working toward the formulation of a recommended practice for visual weld inspection in the nuclear industry.

TVA has committed to ANSI N45.2.6 with certain exceptions. These exceptions are minimal and simply substitute training and qualification elements which are generally accepted in the nuclear industry. These exceptions include levels of certification and alternate training and qualification requirements where industry codes and standards do not mandate such requirements. This is true of the Visual Weld Inspection Training, Qualification, and Certification program. TVA's commitment is described in the Topical Report (TVA-TR75-1A).

From the beginning of construction in 1970 through the end of construction in 1981, the Office of Construction (OC) complied with the requirements of ANSI N45.2.6 regarding program development and documentation requirements. This program is outlined in SQN Construction Procedure No. P-33, "Certification of Inspectors."

ANSI N45.2.6 allows the use of SNT-TC-1A for certifying nondestructive testing personnel.

In the absence of clear source document requirements regarding visual inspection, TVA interpreted ANSI N45.2.6 to apply to visual inspection personnel and modeled the details of the program such as worktime experience on SNT-TC-1A recommendations for Liquid Penetrant and Magnetic Particle Testing. Certification in these disciplines required three months of worktime experience prior to certification. Certification in these disciplines was a prerequisite for certification in the visual inspection method. The initial classroom training, testing, and certification was done at the unit-level by a certified Level III instructor. This practice continued through the construction era at SQN. The aforementioned system was used to train and certify welding inspectors assigned to the Welding Inspection Unit at SQN. These welding inspectors performed inspections of pressure boundary and main structural welds at SQN.

In 1978 a decision was made to utilize discipline inspectors from the Hanger inspection, electrical inspection, and instrumentation inspection units to perform visual inspections on hanger features at SQN. These inspectors performed visual inspections only. Their training for visual inspection did not contain the prerequisite Liquid Penetrant and Magnetic Particle Testing.

These personnel were trained in final visual inspection principles only. This training program required a period of on the job training (accompanying a certified inspector on actual inspections), classroom training, evaluation by supervisory and training personnel, and testing and certification similarly to what was done in the Welding Discipline Visual Inspection Program. The principal difference was the lack of the prerequisite PT and MT training and certification for these personnel.

It is important to note that these inspectors performed final visual inspections on hanger features only. Additionally, the construction effort at this time was principally one of working on hangers, supports, and small diameter piping. All the pressure piping and main structural welding was essentially complete and had been inspected by welding inspectors attached to the Welding Inspection Unit; whose sole responsibility was the performance of nondestructive testing and visual welding inspections.

In summary, the Welding Project feels that the following factors should be considered in the results reported from the WP SQN reinspection effort:

A. The reinspection plan was biased toward features which have been subjected to only one required inspection performed at initial installation.

B. The metallurgical significance of the types of rejectable attributes reported.

C. All rejectable attributes reported were acceptable based on evaluation of additional NDE and no repairs were necessary.

D. The methods of performing visual inspection have evolved from measuring points on the weld surface to measuring the entire profile.

E. The reinspection was more meticulous than the original inspection because of the special circumstances surrounding the reinspection effort.

F. The evolution of methods used to comply with standards throughout the industry.

The conclusion derived in Sections III.4 of the NRC Safety Evaluation Report (SER) indicates additional information is necessary to clarify the circumstances surrounding the issue of welder certification/continuity at Sequoyah Nuclear Plant (SQN).

The issue of welder certification has been addressed in Section III of the Welding Project (WP) Generic Employee Concern Report WP-03-SQN, Revision 0, dated June 27, 1986, subsequent revisions (latest is Revision 3 dated September 15, 1986), and in the Welding Project Sequoyah Phase (Volume II) and Phase II (Volume III) Reports. This narrative is being written to consolidate those reports by defining historical data addressing this issue. Attachment A is a time line depicting these documented events. More detailed information is given in the following paragraphs.

On August 25, 1985, during a routine survey (5A-85-A-006) of special welding processes by the site Office of Quality Assurance (OQA) at SQN, Modification Branch Welder Certification Records were reviewed and it was revealed continuity had not been properly documented for a modifications electrician welder. At that time a special survey was scheduled to investigate this finding and to examine other welder certifications to determine if a generic condition existed.

A subsequent specific survey (5A-85-A-007) of the Modifications Branch Welder Certification Records began on August 26, 1985, and ended September 5, 1985. An executive summary with this report dated October 3, 1985, states, "As a result of this survey and Watts Bar's continuity problems, all Sequoyah Nuclear Plant welders who maintained continuity at Watts Bar or were identified as having welder qualification/continuity deficiencies had their qualification files pulled. These welders will not be allowed to weld on any CSSC work until it has been determined that they have successfully completed the welders qualifications renewal test."

Sequoyah Nuclear Plant Corrective Action Report SQ-CAR-85-09-014 was initiated by site QA against the SQN Modifications Branch on September 12, 1985, and resulted in the following corrective actions: (1) a complete review of all active welders' files was performed by the site QA surveillance personnel and weld-test representatives. Of the twenty-eight (28) questionable welder certifications, twenty (20) were determined to be clerical errors and eight (8) were required to be retested in accordance with ASME Section IX. All eight successfully passed the retest; therefore, no reinspection of their previous work was performed. It is important to note that any corrections made to the welder records at SQN because of clerical errors were not made to the OC welder records. The OC welder records were maintained and retrievable from 1974 through the construction phase and they were not altered after construction was complete. (2) SQN site procedure Modification and Addition Instruction-5 (M&AI-5) "Welding Material Control and Welder Certification Procedure" was revised to define welder qualification record processing and maintenance.

The Nuclear Safety Review Staff (NSRS) conducted an investigation (-85-135-SQN) on November 26, 1985 thru December 12, 1985. The purpose of this investigation was to resolve two (2) employee concerns specific to Sequoyah. The information taken from the Quality Technology Company (QTC)/Employee Response Team (ERT) K-form is as follows:

XX-85-049-001	Sequoyah: Welder certifications have been updated for welders who did not meet update requirements or backdated to give appearance of requirements compliance.
XX-85-049-X03	Sequoyah: Welder certification card falsified.

In this specific timeframe, NSRS reviewed approximately twenty-five (25) welder certification and continuity records randomly chosen. It is not specified in their report (I-85-135-SQN) which welder records were reviewed or if it was welders with previously identified documentation problems. NSRS reported that there was evidence of clerical errors, omissions in data entry, and that welder continuity requirements were not being met. Although some clerical errors had been corrected through supportive documentation, NSRS concluded that no evidence of backdating or falsification of records was found. Corrective actions were underway due to the recent QA audit finding and the subsequent CAR. From the data reviewed in the NSRS Investigation Report, it is logical to conclude that their references are only to the Modifications Branch welder certification records.

During the weeks of January 13, 20, and 27, 1986, the Bechtel Power Company performed an independent quality audit of the SQN Welding Program. This audit was requested by the Welding Project and included both the Office of Construction (OC) and Nuclear Operations (NO). Section 3.0 of the WP Sequoyah Phase II Report (Volume III) contains the Bechtel Audit Report.

In addition to other areas of the TVA Welding Program at Sequoyah, the audit consisted of a random sampling of welder qualification records. This consisted of thirty-seven (37) welders which involved one hundred twenty-four (124) qualification records for OC and twenty-five (25) welders involving one hundred seven (107) for NO. It is important to note that the Office of Construction welder certifications were viewed by Bechtel in the condition they were generated in during construction. Since the construction phase was basically completed in 1980, and the construction records were inactive; any corrections made had to be made to the active files (i.e. the MODS welders) because there was no basis on which to correct any identifed deficiencies in the construction program.

The previously identified corrective actions for SQ-CAR-85-09-014 were completed on January 22, 1986. Verification of the results and closure of the CAR was performed by site QA on February 18, 1986.

On April 8, 1986, the Welding Project Generic Employee Concern Evaluation Report WP-03-SQN, Revision 0, (latest is Revision 3 dated September 15, 1986) "Welder Performance Qualification Continuity" was written. This report identifies and evaluates WBN employee concerns with possible generic applicability to SQN. After a review of the available information, the WP concluded that all of the lapses of continuity identified on SQN active welder qualification records had been properly corrected by NO.

The following points should be considered during the summary of this historical "chain of events:"

A. The sequence of events was not planned, but occurred as a result of unrelated actions by a number of different organizational entities.

B. The QA survey was on NO welders only and did not include welders from OC.

C. SQ-CAR-85-09-014 covered NO welders only and did not include welders from OC.

D. The Bechtel Audit included OC and NO but any referenced "fix" of welder qualification records was limited to NO because the preceding chain of events began in August 1985.

E. The Bechtel Audit viewed OC welder certifications in the condition generated during the construction era.

8/22/85	8/26/85 thru 9/22/85	9/12/85 (OPENED)	11/26/85 thru 12/12/85	1/31/86	2/18/86 (CLOSED)	4/8/86 (REV. 0)
OQA SURVEY	OQA SURVEY	SQN-CAR	NSRS REPORT	BECHTEL AUDIT	SQN-CAR	WP-03-SQN
Office of Quality Assurance Survey 5a-85-A-006. Routine Survey on Welding Program.	Office Of Quality Assurance Survey 5a-85-A-007. Dates of Investigation 8/25/85 thru 9/22/85. Specific Survey on welder certifications.	Sequoyah Nuclear Plant Corrective Action Report SQ-CAR-85-09-014. Written to document corrective actions to be taken based on discrepencies idenfified in specific survey.	Nuclear Safety Review Staff Report I-85-135-SQN. Dates of investigation 11/26/85 thru 12/12/85. Investigation performed to resolve EC #XX-85-049-001 & XX-85-049-X03.	Bechtel Power Corporation Quality Audit of Sequoyah Nuclear Plant. Dates of investigation during the weeks of 1/13, 1/20, & 1/27 1986. Independent audit of SQN welding program requested by the Welding Project. One key element included on the audit checklist being records of welder certification for both DNC & NO along with site implementing procedures.	Sequoyah Nuclear Plant Corrective Action Report SQ-CAR-85-09-014. Corrective Action of reviewing all active welders' files and revision to plant procedure M&AI-5, "Welding Material Control and Welder Certification Procedure" was completed on 1/22/86. Verification by site QA and closure was 2/18/86.	Welding Project Generic Employee Concern Evaluation Report. Rev. 1, dated 6/27/86 included additional employee concerns. Rev. 2, dated 8/26/86 incorporated comments made by the Senior Review Panel at WBN. Rev. 3, dated 9/15/86 added results of Nuclear Operations of welder certification and continuity records.