



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

NRC WELDING CATEGORY - MISCELLANEOUS/ONE OF A KIND

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

1.0 SUBJECT

NRC Welding Category: "Miscellaneous/One of a Kind"  
TVA Category: WELDING  
TVA Subcategories: CO10300, WE50908, QA80415, WE50710, WE50813, OP30803,  
WE50825, WE50119, WE50103, WE50919, WE50911, WE50319,  
WE50719,

The employee concerns were evaluated by TVA as potentially safety-related and applicable to the Sequoyah site or as potentially applicable to the Sequoyah site on a generic basis. TVA established the Welding Project to formulate a program for each nuclear plant site to address the employee concerns related to TVA's welding program. Many of the concerns which originated at the Watts Bar Nuclear Plant were determined by TVA as possibly being generic, and therefore applicable to all of the TVA nuclear plant sites.

For the Sequoyah site, the TVA Welding Project is divided into two phases. Phase 1 is a review of the records to determine if there are any problem indicators. Most of the final element reports which are TVA's evaluation of employee concerns with a common issue(s) were written on the basis of the Phase 1 efforts. Phase 2 involved a review of ISI and LER records, an audit by Bechtel of the welding program records, and a physical reinspection of specific weldment populations whose samples were selected on an engineering and logic basis.

The NRC staff formed a Welding Task Group with representatives from the Offices of Nuclear Reactor Regulation (NRR), Inspection and Enforcement (I&E), and Region II. The Task Group established an Expert Welding Team through an NRR Technical Assistance contract with Brookhaven National Laboratory (BNL). BNL provided a Technical Evaluation Report (TER) which summarized the opinions of the Expert Welding Team concerning the various welding issues and the actions taken by TVA as addressed in TVA's Element Report drafts of mid-1986. The NRC Welding Task Group also performed independent visual, surface and volumetric reinspections of weldments at the Sequoyah site with help of Region I personnel operating out of the NDE van. The TER and the Inspection Reports were incorporated in the initial Welding SER issued to TVA on November 11, 1986. This SER is being provided to address in more detail the individual employee concerns and the changes made of the individual employee concerns declared generic to the Sequoyah facility since the initial staff Welding SER.

The staff believes that there are five essential elements which must be functioning for a welding program to be viable. The staff placed each of the individual employee concerns into one of these essential element categories. A miscellaneous category was established to cover those aspects which are not directly related to the TVA welding program, or applicable to the Sequoyah site. These program essential element categories are as follows:

Welding Procedures  
Welder Qualification/Training  
Welding Inspection  
Weld Design and Configuration  
Filler Material Control  
Miscellaneous/One of a Kind

The staff's approach has been to group similar employee concerns within an essential element to establish an "issue" or "issues." The staff reasons that the particular issue(s), if valid, and significant, would generate an adverse condition in the hardware. As part of the overall program for reassessing the TVA welding program implemented during plant construction and operations, TVA and the NRC staff conducted reinspections at the Sequoyah site to determine (1) that the licensee's corrective actions for resolving the issues raised by the employee concerns were being satisfactorily implemented, and (2) that the hardware was suitable for service. NRC staff inspections and evaluations were performed on TVA's record audits program, personnel performing TVA's audits and reinspections, and TVA's records.

The employee concerns considered in NRC Essential Element "Miscellaneous/One of a Kind" are as follows:

<u>EMPLOYEE CONCERN NO.</u>	<u>TVA FINAL ELEMENT REPORT RESPONDING TO CONCERN</u>	<u>BRIEF DESCRIPTION OF CONCERN</u>
EX-85-059-001	WP-08-SQN	WELDS ARE NOT PAINTED AFTER THEY ARE FINALIZED, RESULTS IN RUST
IN-85-192-002	WP-08-SQN	NUMEROUS UNPAINTED WELDS ON CONDUIT AND PIPING SUPPORTS THROUGHOUT PLANT ARE RUSTED
IN-85-273-001	WP-08-SQN	UNPAINTED WELDS ON PIPE SUPPORTS
IN-85-451-001	WP-08-SQN	PAINTERS WERE INSTRUCTED NOT TO PAINT ANYTHING ABOVE 6 FEET
WI-85-030-010	WP-10-SQN	WELDING AND NDE QA PROGRAM NOT IMPLEMENTED
IN-85-247-002	WP-13-SQN	SETTING OF 50 & 100 AMPS WITH 3/32" RODS IS AN UNSUITABLE WELDING MACHINE.

IN-85-303-001	WP-13-SQN	ALL WELDING MACHINES SHOULD HAVE REMOTE SWITCHES SO TUNGSTEN TIP DOES NOT HAVE TO TOUCH BASE METAL TO START WELD. MAY CAUSE TUNGSTEN TO BE LEFT IN WELD WHEN
IN-85-127-001	WP-17-SQN	BERGEN-PATTERSON HANGER WELDS OF POOR QUALITY ARE ACCEPTED WHILE TVA WELDS OF BETTER QUALITY ARE REJECTED
IN-85-007-003	WP-17-SQN	VENDOR WELDS ARE OF POORER QUALITY AND WOULD NOT PASS THE SAME ACCEPTANCE STANDARDS AS TVA FIELD WELDS
IN-85-657-001	WP-17-SQN	" " " " " " " " EXAMPLE - YUBA HEAT TRANSFER CO.
IN-85-021-003	WP-19-SQN	STEAMFITTER'S WELDER CERTIFICATION CARDS HAVE BEEN BACKDATED 1 OR 2 WEEKS TO COVER WELDER'S WHOSE CERTIFICATION CARDS WERE NOT RE-STAMPED AFTER 90 DAY
IN-85-540-001	WP-19-SQN	INADEQUATE WELDER CERTIFICATION UPDATE, WELDERS ARE KEPT UPDATE EVEN THOUGH THEY DON'T WELD FOR YEARS
IN-85-543-002	WP-19-SQN	WELDER CERTIFICATION UPDATE PROCEDURE IS INADEQUATE
IN-85-612-006	WP-19-SQN	WELDER CERTIFICATION UPDATE IS INADEQUATE
IN-85-965-001	WP-19-SQN	WELDER CERTIFICATION CARDS ARE BEING BACKDATED
IN-86-143-002	WP-19-SQN	WELDER'S CERTIFICATION CARD WERE BACKDATED ABOUT 30 DAYS. THIS WAS DONE BECAUSE THE WELDER FAILED TO HAVE HIS CARD UPDATED
IN-86-167-005	WP-19-SQN	WELDER REQUALIFICATIONS HAVE BEEN BACKDATED
IN-85-503-001	WP-19-SQN	INDIVIDUAL DISCIPLINED FOR NOT HAVING CERTIFICATION UPDATED
IN-85-021-X05	WP-19-SQN	WELDER CERTIFICATION CARDS FALSIFIED
IN-85-424-X13	WP-19-SQN	FALSIFIED WELDER CERTIFICATION CARD
IN-85-770-X07	WP-19-SQN	FALSIFIED CERTIFICATION CARDS
IN-85-778-X07	WP-19-SQN	FALSIFIED CERTIFICATION CARDS
IN-86-167-X06	WP-19-SQN	WELDER CERTIFICATION CARDS HAVE BEEN FALSIFIED

WI-85-003-001	WP-19-SQN	FALSIFICATION OF WELDER CERTIFICATION CARD BY CMA. CONCERN IDENTIFIED BY WELDING UPDATING OFFICE. WELDER WORKED IN UNIT 2 TURBINE BUILDING MAY 27
WI-85-003-X02	WP-19-SQN	WELDER CERT CARD FALSIFIED
IN-85-770-003	WP-19-SQN	INDIVIDUALS POSSESSING INVALID WELDER CERTIFICATION
IN-85-612-X07	WP-19-SQN	WELDER CERTIFICATION CARD FALSIFIED
IN-85-299-003	WP-19-SQN	EXCESS METAL REMOVED AT BUTT WELDS, EXCESSIVE SHRINKAGE
IN-85-532-006	WP-19-SQN	OVERSIZE HANGER FILLET WELDS
IN-85-335-002	WP-19-SQN	WELDERS ON RESTRICTIONS (NOT ALLOWED TO WELD) ARE TOLD TO KEEP CERTIFICATIONS UPDATED WITHOUT USING THE PROCESS
IN-85-501-001	WP-19-SQN	UNUSED BUNDLES OF WELD ROD FREQUENTLY FOUND IN TRASH CANS IN TURBINE BUILDING OF UNIT 2
WI-85-084-001	WP-19-SQN	A WELDER WHOSE CERTIFICATION HAD EXPIRED WAS ALLOWED TO CHECK OUT WELD ROD FROM THE ROD SHACK
IN-85-725-X14	WP-19-SQN	WELDER RECERTIFICATION PROGRAM HAD INADEQUATE SUPERVISORY OVERSIGHT. GOOD WELDERS COULD HAVE MADE OR FINISHED TEST PLATES FOR ANOTHER WELDER
IN-85-725-X15	WP-19-SQN	CONTROL OF WELDER RECERTIFICATION TEST PLATES WAS INADEQUATE: TEST PLATES BEGUN BY ONE WELDER COULD HAVE BEEN COMPLETED BY ANOTHER WELDER
WI-85-055-001	WP-19-SQN	THE WELDER RECERTIFICATION PROGRAM BEING ADMINISTERED TO WELDERS AT WATTS BAR IS NOT IN ACCORDANCE WITH ASME CODE REQUIREMENTS
WI-85-056-001	WP-19-SQN	WELDER, ARE BEING TESTED ON FLAT PLATE, IN FLAT POSITION FOR WELDING PIPE USING THE T.J.G. AND S.M.A.W. PROCESSES. THIS DOES NOT CONFORM TO ASME CODE
WI-85-030-008	WP-19-SQN	THERE MAY HAVE BEEN THOUSANDS OF WELDS THROUGH CARBO-ZINC PRIMER. HOWEVER, TVA REPORTS INDICATE THAT ONLY 100-150 WELDS WERE INSPECTED IN THIS MANNER

## 2.0 SUMMARY OF ISSUES

The issue involved with the four employee concerns addressed in WP-08-SQN is summarized as follows:

- The welds of various steel structures are not being painted. The possibility of weakening of welds due to corrosion, or that sandblasting in preparation for painting may cause unacceptable metal loss with attendant loss of strength.

The issue involved with the employee concern addressed in WP-10-SQN is summarized as follows:

- The corrective actions specified in TVA Report Number QAE-80-2, "Review and Evaluation of the OEDC Welding and Construction - Watts Bar and Later Plants" may not have been implemented (at Sequoyah).

The issue involved with the two employee concerns addressed in WP-13-SQN is summarized as follows:

- The welding machines do not have adequate adjustments or special features which would allow for production of more consistent, good quality welds by avoiding the generation of rejectable defects.

The issues involved with the three employee concerns addressed in WP-17-SQN are summarized as follows:

- Vendor welds are not of the same quality as TVA field welds.
- Vendor welds are not inspected in the field.

The 27 employee concerns covered by WP-19-SQN were originally assigned a generic classification by the TVA Employee Concern Task Group. These concerns had been investigated by the ERT or NSRS as a specific Watts Bar issue, and some of the concerns referenced Watts Bar or specific features of Watts Bar and were obviously not directly relevant to Sequoyah. On these bases, the TVA Welding Project took issue with TVA's Employee Concern Program's original generic classification for these 27 concerns. The final element report resolved the issues between the groups and TVA determined that the employee concerns in this element report did not have generic applicability but were Watts Bar specific issues.

## 3.0 EVALUATION

The four concerns addressed in WP-08-SQN relate to paint not being applied to various carbon steel weldments, their subsequent rusting and probable loss of strength, and that sand blasting to remove the rust also removes metal

(imitating this could also cause some loss of strength). All of the carbon steel weldments which TVA and NRC reinspected were painted, and the weldments reinspected included many examples more than six foot above the floor. There are probably isolated, individual instances of carbon steel weldments not having been painted. TVA, as a corrective action to deficiencies found in CAR No. SQ-CAR-86-00-001, "Protective Coating Program," has initiated a comprehensive reinspection program of protective coatings. Included in this program is a 100 percent baseline coating inspection of the Level 1 and Level 2 coating areas at SQN.

The one concern of WP-10-SQN was about TVA not having applied the results of TVA's Quality Assurance Evaluation Report 2 (QAE-2) to other plants, specifically, the Sequoyah site. The report is specifically noted on the front page "Applies to: Watts Bar and later nuclear plants". The report is dated September 4, 1980, which is after almost all construction had been completed at the Sequoyah site. Sequoyah is an earlier plant than Watts Bar, and accordingly, this report is not applicable to Sequoyah.

The two concerns addressed in WP-13-SQN are about welding machines lacking additional control features and that these missing features could cause weld defects. The TVA and NRC reinspections did not find the type defects which would have been caused by the conditions stated in the concerns. Regardless of the shortcomings of the machines, welders with proper training and skill can make code acceptable welds with the machines without the additional control features discussed in the concerns. The additional control features may allow a particular weld to be made easier, however, this is not a code requirement. There is no basis for further action.

The three concerns addressed in WP-17-SQN are about vendor welds being of a lower quality than TVA field welds, and that the vendor welds are not inspected in the field. Concern IN-85-127-001 relates to Bergen-Patterson hanger welds. There are no Bergen-Patterson hangers at Sequoyah, and accordingly, this concern is not applicable to Sequoyah. Concern IN-85-657-001 relates to Yuba Heat Engineering Company's welds not meeting TVA weld standards. Yuba has not supplied any equipment to Sequoyah, and accordingly is not applicable to Sequoyah. Concern IN-85-007-003 specifically mentions Watts Bar in its text, and accordingly, it also is not applicable to Sequoyah. None of the employee concerns relating to vendor welds appear to be applicable to Sequoyah. These concerns will be addressed at the Watts Bar site.

The 27 employee concerns listed in WP-19-SQN were deemed originally generic by the TVA Employee Concern Task Group. The items were subsequently reviewed by the TVA Welding Project and were determined by the TVA Welding Project not to be applicable to Sequoyah. The basis for their action was that either the concerns in their text mention Watts Bar or some particular feature at Watts Bar, or that NSRS or ERT investigative reports addressed these concerns as occurring at Watts Bar. The majority of these concerns (19) are about the dating of welder certification cards or falsification of these cards. In addition, four of the concerns are about administrative control of the renewal of certification testing for welders, or that this testing was not in accordance with the code.

The staff does not necessarily agree with TVA's determination of the generic nonapplicability of these concerns to Sequoyah. However, the issues involved with these concerns are identical to those addressed in our Welder Qualification/Training SER. The NRC staff believes that the reinspections performed at Sequoyah demonstrated that the welders made welds acceptable to the code, and accordingly, were qualified. The types of defects found showed that the acceptance inspections were remiss in accepting undersize welds, under-length welds, arc strikes and weld spatter (cleanup). These defects reflect that the original acceptance standards emphasized welder skills, and that the welds be present, and in their proper locations. Only four defects attributable to poor welder skill were found. These characteristics indicate to the staff that the original acceptance inspections were only of the surveillance type and physical measurements of weld size and length were not performed. The engineering analyses performed proved that these defects were insignificant and no weld repairs were necessary. Accordingly, the staff finds that the welders were qualified because they produced acceptable welds.

The staff does not necessarily agree with TVA's determination of the generic nonapplicability of these concerns to Sequoyah. The staff evaluation for the remaining four employee concerns are summarized as follows:

Employee concern IN-85-299-003 is about stainless steel butt joints (probably piping) having excess metal removed and excessive shrinkage. A characteristic of stainless steel is that because of its higher coefficient of expansion compared to carbon steels, it naturally exhibits more shrinkage at its weldments. The "excess" metal being removed at butt joints is normal surface preparation for ultrasonic examination. This concern does not raise any technical issues of significance.

Employee concern IN-85-501-001 relates to filler material control as unused bundles of weld rod and are frequently found in trash cans. For the Sequoyah site, filler material control was more rigorous in that rod heaters were required for moisture control. The large number of welds reinspected by NRC and TVA with no cracks and the five year operating history of the site without weld cracking incidents demonstrate that filler material control for welding during instruction and operations was adequate. Similar issues related to this concern are discussed further in the "Filler Material Control" SER.

Employee concern IN-85-532-006 is about a conflict between a weld visual inspection acceptance criteria and a hanger drawing note on the amount fillet weld can be oversize. The hangers involved are not subject to fatigue loadings where excessive weld size could be a detriment. Local distortion due to excessive weld size is not a factor when design dimensions are met. The engineering importance of excessive weld size in this case is moot.

Employee concern WI-85-030-008 relates to original weld acceptance inspections being performed with the welds painted (coated). The text of the concern asserts that 100-150 welds at Watts Bar were inspected through paint. Several other concerns on this issue of weld inspections conducted through paint were addressed in our SER for the Welding Category "WELDING INSPECTION" dated

August 20, 1987. The staff believes that this issue has been satisfactorily addressed for Sequoyah for the reasons stated in the "Welding Inspection SER."

#### 4.0 CONCLUSIONS

The staff conclusion stated in the Welding SER dated October 30, 1986 was that the performance of inspections was the area of most concern, and that augmented and accelerated in-service inspections (ISI) were required to provide added assurance. None of the employee concerns categorized in the miscellaneous/one of a kind category have changed this position. The concerns about carbon steel welds not being painted (WP-08-SQN) were addressed by a large painting reinspection program at Sequoyah. The applicability of the conclusions of QAE-2 to Sequoyah (WP-10-SQN) was not appropriate because the construction phase of Sequoyah was almost complete when the report was issued. There are no requirements that welding machines have additional settings or other features to make the welders job easier; a qualified welder should be able to make acceptable welds with such equipment (WP-13-SQN). The employee concerns relating to vendor welds were demonstrated as not being applicable to the Sequoyah site (WP-17-SQN). The concerns addressed in Element Report WP-17-SQN were originally determined to be generically applicable to Sequoyah, and subsequently determined by TVA not to be applicable to Sequoyah. Although nonapplicability was not specifically demonstrated by TVA for all of the concerns in this element report, the staff believes that the issues raised by these concerns were satisfactorily addressed elsewhere or were of no significance.