



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

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS
ELEMENT REPORT CO 19201-SQN, "CONDUIT INSTALLATION"

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

1.0 SUBJECT

Category: Construction (10000)
Subcategory: Installation (19200)
Element: Conduit as Related to Construction (19201)
Employee Concern: The following conduit installation concerns are identified as follows.

Quality of Conduit Materials

IN-85-512-002 IN-85-512-003

Conduit Installation Deficiencies

IN-85-341-001 OW-85-007-008

Control of Dirt and Debris into Conduits

IN-85-148-001

Conduit Design Deficiencies

IN-85-201-003 IN-85-856-004 EX-85-066-002

The basis for Element Report Co 19201, Revision 8, dated May 1, 1987, was the generic applicability determination resulting from Watts Bar Nuclear Plant (WBN) Employee Concern Task Group (ECTG) Element Report conduit, CO 19201, within the construction Category. Also considered, were flexible conduit installation deficiencies resulting from the generic implication identified for Browns Ferry Nuclear Plant (BFN). No SQN related site specific concerns were identified.

2.0 SUMMARY OF ISSUE

- ° The quality of conduit material may not be assured at the time of receipt and maintained during storage.

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- ° Site procedure and training may be inadequate concerning tightening of flexible conduit couplings. Also, correct length to assure seismic/thermal movement and minimum bend radius.
- ° Site procedure and training may be inadequate to preclude dirt and debris from entering conduit bodies while conduit and pull box covers are not in place.
- ° Site procedure and training may be inadequate in the installation of the conduit system concerning excessive bends between pull points. This condition may cause the cable manufacturer's maximum sidewall pressure recommendation to be exceeded.

3.0 EVALUATION

The licensee's evaluators reviewed the Quality Technology Company (QTC) expurgated files, to determine if information was available to assist the evaluation, also to determine whether or not other investigations had been performed on the above issues. Procedures and nonconformance reports were reviewed and discussions were held with cognizant personnel involved in the engineering or installation of the conduit system. The specific evaluation concerning the Employee concerns are as follows:

- ° The Administrative Instruction AI-11, Revision 37, did not provide guidance concerning the acceptability of conduit and fitting material. The acceptance of non safety-related items, which are used as a raceway for Class 1E cables, without guidelines concerning burrs, sharp edges, flattened threads or other irregularities may cause cable damage. No specific quality problems with conduits and conduit fitting were documented for SQN. The SQN Project Engineer in a memorandum to the Manager Site Service requested that Administrative Instruction AI-11 be revised to include specific guidelines for receipt inspection on nonsafety-related item, which may interface with safety-related systems, with emphasis placed on the quality of conduit material and accessories. The conduit installation procedure M&AI-6, Revision 6, is inadequate by not containing instruction to the craft to prevent the installation of damaged or defective conduit components.

The staff agrees that the procedures, AI-11 & M&AI-6, should be revised, for the reasons stated above. This revised procedure would be available to provide guidance for the receipt of conduit and fittings used in future modifications. Training should also be provided to the personnel receiving the conduit and conduit fittings. The staff has verified that the licensee has committed to revise procedures AI-11 and M&AI-6 and training to provide guidance to the craft to prevent the installation of damaged or defective conduit components.

- ° During an NRC safety inspection, several flexible conduit connections were determined to be loose or improperly installed as documented in Inspection Report 50-327, 328/86-68. The controlling procedure for conduit system installation, M&AI-6, requires that the conduit couplings be tightened in

accordance with the manufacture's torque requirements and verification by QA/QC personnel. The licensee has not determined if the above loose flexible conduit connection was a random case. There was a field walkdown of flexible conduit installation for other problems. However, the concern of loose flexible conduit couplings was not verified during this walkdown.

The appropriate engineering requirement specification will be revised to add a table of maximum and minimum torque values for each flexible conduit fitting in each size used by TVA. DNE will establish values for future installation requirements and backfit as required. An SCR was written to assure that proper corrective action is taken. The evaluators concluded that no further corrective action was required based upon the plants maintenance history.

- ° Procedures did not specify the minimum length of flexible conduit to accommodate thermal and seismic movement between the rigid conduit system and the equipment. The procedure also did not provide guidance for the minimum bend radius recommended by the flexible conduit manufacture and/or cable manufacturer. These concerns have been identified in significant Condition Report (SCR) BFNEEB8632 with the generic implication for SQN. Calculations, "Seismic/Thermal Movements - Class 1E Electrical conduit for all plants," was made. The results of these calculations were used to revise procedure, SRN-G-40-11, for the above deficiencies. A field walkdown of flexible conduit installation was made, using the guidance from the revised procedures. Work requests would be written to correct any identified deficiencies.
- ° The conduit installation procedure M&AI-6, Revision 6 does not include provisions to cover all openings in the conduit runs, by either permanent or temporary means, to prevent dirt and debris from entering the conduit body and is considered inadequate in this area. A memorandum for Project Engineer to Modification Manager requested that the procedure M&AI-6 be revised to provide instruction to cover all openings in conduit runs to preclude dust, dirt, and debris from entering the conduit system during installation activities.
- ° The licensee evaluators concluded that conduit runs containing more than 360 degree of accumulated bends between pull points were installed at SQN. The concern is that the cable manufactures recommendation for maximum cable pull tension, maximum cable side wall pressure, and minimum bend radius may have been exceeded. Exceeding these recommendations may have caused cable damage. This concern along with other cable installation problems has been addressed by the licensee in Employee concern, Element Report CO 10900-SQN. The staff has evaluated this concern in the Safety Evaluation Report for Employee Concern, Element Report CO 10900-SQN "Cable Installation." The staff finds the acceptability of the installed Class 1E cable systems in conduit dependent upon the outcome of a special

test program. This test is designed to demonstrate, by performance of the dc high voltage tests, the integrity of selected representative Class 1E cables installed in conduits is acceptable. This is discussed in employee concern Element Report CO 10900.

The staff reviewed the General Construction Specification, G-40, "Installing Electrical Conduit System and Conduit Boxes" Revision 9, dated January 15, 1986 Modification and Addition Instructions, SQN-M&AI-6, Installation of Conduit and Junction Boxes, Revision 8, dated May 22, 1987, and Administrative Instruction AI-11, Receipt Inspection, Nonconforming Items, QA Level/Description Changes and Substitutions, Revision 44, dated October 27, 1987. The staff concludes from the review of the above procedures that sufficient guidance is provided to assure the proper installation of conduit raceway systems. TVA's corrective action CATD 19201-NPS-02 to revise G-40 and SQN-M&AI-6 to add a table of maximum and minimum torque values for each flexible conduit fitting in each size used by TVA has not been completed. This is not a restart item. The staff did not identify any improper conduit installation during a walkdown, of portions, of Sequoyah Unit 2.

4.0 CONCLUSION

The NRC staff concludes that the licensee's investigation of the concerns were adequate and their resolution of the concerns described in Element Report CO 19201-SQN, Revision 8, were acceptable.

SEQUOYAH NUCLEAR POWER PLANT, UNITS 1 & 2
SAFETY EVALUATION REPORT FOR EMPLOYEE CONCERN ELEMENT REPORT
CO 19203-SQN "CONDUIT FITTINGS"

I. Subject:

Category: Construction (10000)

Subcategory: Conduit and Tray (19200)

Element: Conduit Fittings (19203)

Employee Concern: IN-85-374-002

The basis for Element Report CO 19203-SQN, Rev. 2 dated January 9, 1987 is Watts Bar Employee Concern IN-85-374-002 which states:

"Approx. 500 Erickson connectors/fittings for conduit had been installed and discovered to be aluminum and not magnetic. These are in the process of being removed. Since Erickson connectors are not requisitioned out to the craft, how can they be identified and removed with confidence that all have been replaced? WBNP #2."

This concern was evaluated by TVA as potentially nuclear safety-related and potentially applicable to Sequoyah (generic).

II. Summary of Issue

The problem as defined by TVA is that conduit fittings composed of metal which could react with borated water to form hydrogen may have been procured and installed inside containment without being included in the appropriate calculation package for the percent hydrogen build-up inside containment following a Loss of Coolant Accident (LOCA) or a Design Basis Event.

III. Evaluation

The TVA Employee Concern Task Group (ECTG) evaluators reviewed applicable documents and interviewed cognizant Sequoyah engineering personnel to determine the procurement requirements for electrical conduit and accessories and to determine how light metal inventories inside containment were developed and updated. It was determined that the conduit fittings installed were die cast zinc and not aluminum. Since die cast zinc can react with borated water to form hydrogen, design basis calculations for hydrogen build-up should include this material in the inventory of hydrogen sources.

The ECTG evaluators established that the construction specification applicable to Sequoyah did not control the installation of zinc materials within containment, and the procurement specification did not preclude procurement of zinc coated or die cast zinc conduit fittings. Thus the

potential exists for reactive metals to have been procured and installed in containment without having been included in the inventory of hydrogen sources.

The corrective actions proposed by TVA will preclude the future use of zinc conduit fittings in containment, and ensure that an accurate update of reactive metal inventory is prepared and hydrogen generation calculations revised to determine whether a hydrogen buildup problem exists at Sequoyah.

IV. Conclusion

The NRC inspectors reviewed Element Report CO 19203-SQN, Rev. 2 and the related ECTG file, and discussed the report with the ECTG evaluator.

The NRC staff concludes that the TVA's investigation and evaluation of the concern described in Element Report CO 19203-SQN, Rev. 2, is adequate and the corrective actions to be taken are adequate. Implementation of the corrective actions should be verified by NRC inspectors in a future inspection.