



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

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

EMPLOYEE CONCERN ELEMENT REPORT 223.1(B)

"INSTRUMENT LINE SUPPORT CONNECTIONS"

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR POWER PLANT UNITS 1 AND 2

I. SUBJECT

Category: Engineering (20000)
Subcategory: Instrument Support Design (22300)
Element: Instrument Line Support Connections (22301)

The basis for Element Report 223.1(B) Revision 1, dated January 14, 1987 is employee concerns PH-85-054-001, IN-85-398-002 and IN-85-398-003 which state:

PH-85-054-001:

"The notes on the 47A050 series drawings were really confusing to the Quality Control inspection personnel. Much confusion existed between the size, number and type of instrumentation support clamps which were acceptable by the 050 series note and what type clamp was called for on the typical support drawing ..."

IN-85-398-002:

"Inconsistent hanger torquing: until June 1, 1985 no instrumentation hanger bolts were torqued. From that date, bolts were required to be torqued to 6 ft-lb. This amount of torque flattens half moon clamps and damages clamp noses. Three to four months ago, hanger inspectors randomly inspected an unknown [number] of bolts and 40% failed (possibly 80 tested.) Concerned individual (CI) questions corrective action for the 10-20 thousand not tested. New 050 notes (early July 1985) permit hand tightening and then turning 1/2 turn with wrench, but this can leave the tubing loose. (Both units) ..."

IN-85-398-003:

"Bolts for clamps manufactured by Unistrut were not required to be torqued prior to June 1, 1985 for Unit 1. Unit 2 bolts have an option to be torqued to 6 ft-lbs. Half moon clamps flatten during a 6 ft-lb torque. If torquing is an option on unit 2, why wasn't it an option on unit 1, and when should the option be applied? CI knows that this was not a procedural requirement on units ..."

These concerns were evaluated by the licensee as potentially nuclear safety-related and potentially applicable to Sequoyah (generic).

II. SUMMARY OF ISSUES

Six issues were defined by the licensee as applicable to this evaluation:

1. The notes on the 47A050 series drawings for typical supports describing sizes, numbers, and types of instrument line support connections were confusing to Quality Control inspection personnel.
2. Bolts for instrument line clamps were not torqued before June 1, 1985.
3. The bolts were over-torqued to 6 ft-lb after June 1, 1985 causing damage to the clamps.
4. Forty percent of the clamps failed random inspection (possibly 80 visually examined.)
5. The new requirement is for bolts to be hand-tightened followed by a half-turn with a wrench. This may be inadequate.
6. The torque requirements for Unit 1 are different from those for Unit 2.

III. EVALUATION

TVA Employee Concerns Special Program Report No. CO17303-SQN, Revision 3 dated January 28, 1987, "Instrument Line Clamps" covers similar issues and was used in the evaluation.

DRAWING NOTES

The licensee's evaluation team restated this issue to mean that confusing information in the 47A050 series drawings caused construction to use unqualified clamps to support Category I and I(L) instrument lines. The licensee admitted that clamps were used to support the instrument lines at Watts Bar Nuclear Plant without authorization from the engineering department and 17 types of unauthorized clamps were found in their warehouse. The Sequoyah drawings did not specify the types found at Watts Bar, but two types of unauthorized clamps were found in the Sequoyah warehouse.

These instrument connections were sampled in April 1986 in response to a civil engineering branch significant condition report no. SCR SQN CEB 8612, "Specific Bolt Tightening Instructions" to determine the torque on installed bolts. A total of 302 mechanical piping, electrical conduit and instrument tubing clamps were examined. All of the 120 instrument line clamps examined were authorized connections. Although the 47A050 drawings at Sequoyah were generally confusing, the licensee's inspectors told the licensee's evaluation team that drawing interpretation problems relating to instrument line clamps were resolved satisfactorily. This concern was not substantiated.

BOLTS NOT TORQUED

Sequoyah construction procedures SNP Inspection Instruction No. 1 dated August 8, 1973, "Inspection of Bolted Connections" and SNP Inspection Instruction No. 66 dated January 7, 1977, "Inspection of Supports", gave bolt tightening instructions for hangers, supports and miscellaneous steel that were undefined, i.e., "show no slack and hand tight." The sampling program identified above showed that about one-half of the 302 clamps examined were loose and the employee concern is substantiated. Special Maintenance Instruction SMI-0-317-25 was initiated on March 27, 1986 to walk-down instrument lines and tighten items found to be loose. This instruction was first applied to lines outside of containment. The licensee has committed to tightening bolts for instrument line clamps under the program described in engineering change notices 6690 and 6791. Since then, the Sequoyah Plant Manager has directed that all instrument line clamps be tightened.

BOLTS OVER-TORQUED

An inspection at Watts Bar Unit 1 showed instrument lines and supports damaged because of high torque. Sequoyah drawings 47A050-17 Revision 0, dated May 19, 1986, specifies 5-7 ft-lbs torque for some 1/4 in. diameter bolts, one-half turn past hand tight for other 1/4 in. bolts and 17-19 ft-lbs for the 3/8 in. bolts. These numerical values are in accordance with the manufacturer's recommendations, i.e., Unistrut Corporation General Engineering Catalog No. 10R, page 35. The 302 clamps examined in the Sequoyah sampling program were not damaged by over-torquing. This concern is substantiated for Watts Bar, but not for Sequoyah.

CLAMPS FAILED INSPECTION

About one-half of the 302 clamps examined in the sampling inspection were loose and the concern is substantiated. The corrective actions are found in the special maintenance instruction and plant manager's directions mentioned above.

HAND TIGHTEN AND HALF TURN INADEQUATE

Sequoyah drawing 47A050-17 Revision 0 dated May 19, 1986 specifies one-half turn past hand tight for the Unistrut single-hole clamps that are used to attach 1/4 in. through 1 in. diameter tubing to panel supports. The manufacturer's literature shows that round head screwdriver slot screws should be used. The licensee reported in memo no. B46-860612-001, "SQN Unistrut One- and Two-piece Tubing Clamps with Stainless Steel Tubing," that it took about 35 lbs to pull the tubes out of the clamps, regardless of diameter and the torque on the clamps could be as little as 1.2 ft-lbs. The licensee felt that this amount of tightening met the design requirements.

The NRC staff did not accept this conclusion because of the low values for the large tubing sizes and the lack of confidence in achieving proper tightening with a screw driver. The staff and the licensee performed additional tests at Sequoyah on 1/4 in. tubing with screwdriver-tightened screws. It took little

effort to rotate the tube within the clamp and moderate manual effort was required to pull the tube out of the clamp. However, the staff found that the large size clamps for the 3/4 in. and 1 in. tubing are not in stock at Sequoyah and the smaller clamps are used with hex head bolts, which are wrench-tightened. The staff performed a walk-down in the Power Block and the 1/4 in. clamps observed were tight and hex head bolts were used. Since only 1/4, 3/8 and 1/2 in. clamps are involved and bolts are used, the tightening is sufficient and this employee concern is not substantiated for Sequoyah.

UNIT 1 AND UNIT 2 REQUIREMENTS

Units 1 and 2 of Watts Bar had different bolt torquing requirements, while both Sequoyah units always had the same requirements. This concern is substantiated for Watts Bar, but not for Sequoyah.

IV. CONCLUSION

The NRC staff believes that the licensee's investigation and resolution of the issues in TVA Employee Concerns Special Program no. 223.1(B) Revision 1, dated January 14, 1987, "Instrument Line Support Connections" was adequate. For Sequoyah, two issues concerning loose instrument line clamps were substantiated and corrective actions are almost complete and four issues were not substantiated.