TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: CO17304-SQN

REPORT TYPE: Sequoyah Nuclear Plant Element
(Final Report)

REVISION NUMBER: 3

TITLE: Compression Fittings

REASON FOR REVISION:

Incorporate TAS and SRP comments. — Revision 1

Changed III. H and IV. H. 3.
Added date of evaluation to I. — Revision 2

Incorporate Line Management response, incorporate NRC comments and finalize report. — Revision 3

PREPARATION

PREPARED BY:

William M Stone — SIGNATURE — 12/9/86 — DATE

REVIEWS

PEER:

Charles A Manning — SIGNATURE — 12-9-86 — DATE

TAS:

REM 12/18/86

D W Stewart — SIGNATURE — 12/23/86 — DATE

CONCURRENCES

		CEG-H: Jack F. Howard	12-09-86
		SRP: James R. Russell	12-23-86
SIGNATURE	DATE	SIGNATURE*	DATE

APPROVED BY:

M J Martin — EGCSP MANAGER — 12/31/86 — DATE

N/A — MANAGER OF NUCLEAR POWER CONCURRENCE (FINAL REPORT ONLY) — DATE

*SRP Secretary's signature denotes SRP concurrences are in files.

1440T

I. INTRODUCTION

Nine concerns involving the installation of compression fittings in instrument and drain lines were evaluated at Sequoyah Nuclear Plant (SQN) from July 7, 1986 to July 10, 1986.

A. XX-85-050-001
B. HDE-85-001
C. JAM-85-001
D. IN-85-514-001
E. IN-85-795-001
F. IN-85-795-N04
G. PH-85-002-027
H. XX-85-050-002
I. XX-85-050-003

II. SUMMARY OF PERCEIVED PROBLEMS

A. Compression fittings were not installed in accordance with the manufacturers' recommendations. Craft personnel were not trained in how to install compression fittings.

B. The installation of compression fittings was not adequately addressed by the Quality Assurance (QA) program.

III. EVALUATION METHODOLOGY

A. Interviewed plant personnel in the Instrument Maintenance (IM) Section, Mechanical Maintenance (MM) Section, and the Modifications Section at SQN to determine what problems had been experienced with compression fittings and if these problems had been corrected.

B. Reviewed letter from Olson, Modifications Manager, SQN, to Abercrombie, Site Director, SQN, dated January 13, 1986, titled, "Compression Fitting Evaluation Report," and interviewed modifications personnel involved in survey.

C. Interviewed training personnel at SQN to determine what training for the installation of compression fittings was available. Interviewed IM, MM, Modifications and QA Section Supervisors to determine what training on compression fittings was required.

D. Walked down approximately 50 percent of the instrument panels on elevations 669 and 690 of the Auxiliary Building, and visually examined panels for obvious problems, leaking fittings on instrument and drain lines, and mismatch of fittings.

E. Examined storage of compression fittings at SQN Power Stores.

F. Reviewed SQN Construction Procedures Index dated November 13, 1985, and SQN Inspection Instructions Index dated */24/86, to determine which procedures might contain installation and inspection requirements. Reviewed procedures on instruments, instrument lines, and piping to determine if any installation and inspection requirements applied to compression fittings.

Interviewed former Construction Instrument Engineer to determine if any procedures specified installation or inspection requirements for compression fittings during construction. Asked MM, IM, and Modifications personnel if any plant procedures now specify installation and inspection requirements.

*Month was unavailable because hole was punched through.

G. Interviewed QA personnel at SQN to determine what the inspection requirements were for the installation of compression fittings.

H. Reviewed Quality Technology Company (QTC) expurgated files on the concerns addressed by this evaluation for additional information and reviewed Nuclear Safety Review Staff (NSRS) reports I-85-329-SQN, IN-85-514-001 and Q-85-795-001-02 and SQN Generic Concerns Task Force (GCTF) Report on concerns XX-85-050-003 and PH-85-002-027 to determine if this evaluation agreed with the conclusions and recommendations of these previous reports. | R3

I. Reviewed WBN Instrument Project (IP) Activity 1240 Evaluation Report and file to determine if incorrect installations were acceptable.

IV. SUMMARY OF FINDINGS

A. Cognizant IM personnel stated that problems had been found with the installation of compression fittings early in the plant life. These problems had been discovered and repaired during normal maintenance

IV. SUMMARY OF FINDINGS (continued)

They also stated that they don't have many leaking or bad fittings now. Some incorrect installations have been found on new installations by modifications. MM or Modifications personnel did not report any problems.

B. The "Compression Fitting Evaluation Report," (Olson to Abercrombie), stated that 306 fittings were inspected and only 5 defects were found. Personnel involved in the survey stated that all the fittings surveyed had been installed by Modifications. The survey was performed in late 1984, during the unit 2 cycle 2 outage.

C. IM training instructor stated that he had written a training class on compression fittings in late 1984. This class became Power Operations Training Center class MMT-28 in August of 1985. The course has been taught to most personnel involved with the use of compression fittings. IM Supervisor stated that all Instrument Mechanics are required to have the training. MM Supervisor required all annual fitters to have the training, but not hourly employees. Modifications stated that most fitters had attended the training, but it was hard to be sure because of changing personnel.

D. A personal visual examination of instrument panels on elevations 669 and 690 of the Auxiliary Building was performed and no problems were observed. No signs of leaking fittings on instrument or drain lines were found.

E. Three drawers of compression fittings were examined at Power Stores and fittings were not mixed with different sizes, brands, or materials in the same bins.

F. The Construction Procedures Index and the Inspection Instructions Index were reviewed and no procedures were found which addressed the installation of compression fittings. The procedures for instruments, instrument lines, and piping were reviewed and no requirements were found for the installation or inspection of compression fittings. The lack of procedures during construction was confirmed during a telephone interview with a former Construction Instrument Engineer. Personnel of IM, MM, and MOD stated that they had no procedures for the installation or inspection of compression fittings.

G. QA personnel stated that they now require inspection on all new installations in the reactor coolant system; however, this requirement is not contained in any plant procedures. QA inspections are not required on any other installations or on remakes of already installed fittings.

IV. SUMMARY OF FINDINGS (continued)

H. No additional information was found in the QTC files for the concerns. The findings of the NSRS and GCTF reports are consistent with the results of this evaluation.

1. This evaluation concurs with the recommendation of the GCTF report and with NSRS recommendations I-85-329-SQN-02, I-85-329-SQN-03, Q-85-514-001-02, Q-85-795-001-02, and I-85-329-SQN-04, that a formal training program for craft and inspection personnel involved in the installation and maintenance of compression fittings be implemented. The program should ensure and document that only personnel satisfactorily trained should perform compression fitting work. NSRS also recommended that plant procedures include the installation instructions and inspection requirements for compression fitting work.

2. NSRS recommendations I-85-329-SQN-01 and Q-85-795-001-01, stated that NCR-6278 be reviewed for generic applicability. NCR 6278 Revision 1, was transmitted to the other plants by DNE in Memorandum from J. A. Raulston dated February 25, 1986 (RIMS B45 860225 259). At the time of this evaluation , SQN had not performed the generic condition evaluation of NCR-6278 (Revision 1) as requested by the DNE memorandum.

3. NSRS recommendation Q-85-514-001-01 addresses WBN site-specific observations concerning two specific tubes and does not pertain to other plants.

I. The IP Activity 1240 was assigned responsibility for investigating and resolving all the problems associated with the use of compression fittings. To determine if the incorrect installations identified at WBN on NCR 6278, revision 0 and 1 were acceptable for use as installed, DNE established a testing program at TVA's Singleton Materials Laboratory (SME) beginning September 11, 1985. |R3

Testing of compression fittings assembled both correctly and with the problems identified in NCR 6278, revision 0, and NCR 6278, revision 1 was performed at SME. The fittings were subjected to axial tension test (pullout test), low-amplitude vibration test simulating extended plant operation, and high-amplitude cyclic test simulating a seismic event. The results of test for correctly and incorrectly assembled fittings were compared, and although some |R3

decrease in strength was noted, the incorrect assemblies were leaktight. Flow tests were also performed on tubing that was not deburred, and results were found to be acceptable. |R3

IP reviewed the test results from SME and agreed that the incorrectly installed compression fittings were acceptable, if proven not to leak by pressure testing or plant operation. |R3

Conclusion

A. Compression fittings may not be installed in accordance with the manufacturers' recommendations; however, these installations are acceptable if the joints do not leak. This evaluation and past operating history at SQN showed that the fittings were not leaking, and therefore acceptable. This concern was not conclusively factual.

No formal training program on compression fittings existed during construction, therefore, this concern was factual. A training class on compression fittings has been taught since January, 1985. However, a formal program with personnel training requirements has not been established.

B. SQN has never had any procedures documenting the QA requirements for the installation of compression fittings, therefore, this concern was factual. No procedures have been written to implement recently issued requirements in General Construction Specification G-29, Part 3.M.13.1, for the installation and inspection of compression fittings. (Note: WBN has committed to have instructions controlling compression fitting work.)

V. ROOT CAUSE

TVA did not recognize the need for ensuring that compression fittings were correctly installed. No TVA documents outlined the requirements for installation and inspection, and no site quality control program existed. Craftsmen, foremen, engineers, or inspectors were not trained to correctly install compression fittings in accordance with vendors' recommendations.

VI. CORRECTIVE ACTION

The following is the Line Management's response to corrective actions. These corrective actions are not restart items. |R3

CATD 17304-SQN-01 |R3

A procedure will be written defining requirements for installation of tube fittings at SQN. |R3

Retraining requirements will be established on a frequency of one year for Modifications personnel and two years for Maintenance personnel. |R3

CATD 17304-SQN-02 |R3

A memorandum (SO2 861202 827) was transmitted to DNE requesting their evaluation of NCR/SCR 6278 for generic applicability to SQN. |R3

VII. GENERIC APPLICABILITY

These concerns are potentially generic to TVA's other nuclear plants as determined by WBN Element Report CO17?04 (Revision 1).

VIII. ATTACHMENTS

Attachment A - Listing of concerns indicating safety relationship and generic applicability. |R3

ATTACHMENT A

REFERENCE - ECPS120J-ECPS121C
FREQUENCY - REQUEST
ONP - ISSS - RWM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
LIST OF EMPLOYEE CONCERN INFORMATION

CATEGORY: CO CONSTRUCTION-PROCESS SUBCATEGORY: 17300 INSTRUMENT LINE INSTALLATION

CONCERN NUMBER	CAT	SUB CAT	SHR D	PLT LOC	GENERIC APPL B F	B L	S Q	W B	QTC/NSRS INVESTIGATION REPORT	PSR	CONCERN DESCRIPTION	KEYWORD A KEYWORD B KEYWORD C KEYWORD D
XX -85-050-001 T50096	CO QA	17300 80202	S	SQN	Y K-FORM	Y	Y	Y	I-85-329-SQN	SS	INADEQUATE QUALITY ASSURANCE CONTROLS WERE APPLIED TO THE INSTALLATION OF INSTRUMENT TUBING COMPRESSION FITTINGS AT SEQUOYAH. NO FURTHER INFORMATION AVAILABLE. NO FOLLOW UP REQUIRED.	INSPECTION INSTALLATION INSTRUMENTATION FITTINGS
XX -85-050-002 T50096	CO	17300	N	BFN	Y REPORT	Y	Y	Y	I-85-330-BFN	SR	INADEQUATE QUALITY ASSURANCE CONTROLS WERE APPLIED TO THE INSTALLATION OF INSTRUMENT TUBING COMPRESSION FITTINGS AT BROWNS FERRY. NO FURTHER DETAILS AVAILABLE. NO FOLLOW UP REQUIRED.	INSPECTION INSTALLATION INSTRUMENTATION FITTINGS
XX -85-050-003 T50096	CO QA	17300 80202	S	BLN	Y REPORT	Y	Y	Y	I-85-331-BLN	SR	INADEQUATE QUALITY ASSURANCE CONTROLS ARE APPLIED TO THE INSTALLATION OF INSTRUMENT TUBING COMPRESSION FITTINGS AT BELLAFONTE. NO FURTHER DETAILS AVAILABLE. NO FOLLOW UP REQUIRED	INSPECTION INSTALLATION INSTRUMENTATION FITTINGS
PH -85-002-027 T50164	CO	17300	N	WBN	Y REPORT	Y	Y	Y		SR	INSTRUMENTATION TUBING WHICH AHD BEEN CUT SHORT WAS NOT RECUT, BUT WAS IMPROPERLY INSTALLED IN THE FERRULE CONNECTION TO COMPENSATE FOR THE IMPROPER LENGTH. DETAILS KNOWN TO QTC, WITHELD DUE TO CONFIDENTIALITY. CONSTRUCTION DEPT CONCERN. CI HAS NO FURTHER INFORMATION. NO FOLLOWUP REQUIRED.	INSPECTION INSTALLATION INSTRUMENTATION FITTINGS
JAM-85-001	CO	17300	N	SQN	Y K-FORM	Y	Y	Y		SS	COMPRESSION FITTINGS - EMPLOYEE FOUND 2 OUT OF 4 IMPERIAL EASTMAN FITTINGS INSTALLED IMPROPERLY (FERRULE INSTALLED BACKWARDS). WILL THIS AFFECT BOTH NUCLEAR AND/OR PERSONNEL SAFETY.	
IN -85-795-N04	CO	17300	N	WBN	Y REPORT	Y	Y	Y		SR	NRC IDENTIFIED THE FOLLOWING CONCERN FOR REVIEW OF QTC FILE. "NO FORMAL TRAINING GIVEN TO CRAFT ON COMPRESSION FITTINGS INSTALLATION." REVIEW OF FILE INDICATES THAT THIS CONCERN APPLIES PRIOR TO UNIT 2.	
IN -85-795-001 T50078	CO	17300	N	WBN	Y REPORT	Y	Y	Y	IN-85-795-001	SS	COMPRESSION FITTINGS ON INSTRUMENT TUBING ARE NOT INSTALLED PER VENDOR INSTRUCTIONS.	NONCONFORMANCE INSTALLATION INSTRUMENTATION FITTINGS
IN -85-514-001 T50043	CO	17300	N	WBN	Y REPORT	Y	Y	Y	IN-85-514-001	SR	1/4" O TUBING FROM DRN 150 VLV TO DRN HDR ON SYSTEM 276 CLOSED DRAIN SYS REQUIRES REAMING WHEN CUT WITH A TUBE CUTTER. THIS IS NOT ALWAYS DONE, NOR IS THERE AN INSPECTION HOLD POINT. IT IS POSSIBLE, BECAUSE OF TUBING DEFORMATION DURING CUTTING PROCESS, THAT DRAIN SYS WILL NOT FUNCTION AS DESIGNED AND AN INDIVIDUAL CUTTING INTO A SYSTEM COULD BECOME CONTAMINATED. BOTH UNITS #1&2.	INSPECTION INSTALLATION INSTRUMENTATION FITTINGS
HDE-85-001	CO	17300	N	SQN	Y REPORT	Y	Y	Y		SR	2-FSV-43-319 HAS PARKER TUBING REDUCERS WITH IMPERIAL EASTMAN NUTS. THIS IS AN AIR SAMPLE LINE.	