

**TENNESSEE VALLEY AUTHORITY**

CHATTANOOGA, TENNESSEE 37401

5N 157B Lookout Place

January 31, 1986 29

WBRD-50-390/85-43

WBRD-50-391/85-42

U.S. Nuclear Regulatory Commission  
Region II

Attention: Dr. J. Nelson Grace, Regional Administrator  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

Dear Dr. Grace:

**WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - QUESTIONABLE COMPRESSION FITTINGS ON  
INSTRUMENTATION TUBING - WBRD-50-390/85-43, WBRD-50-391/85-42 - SECOND INTERIM  
REPORT**

The subject deficiency was initially reported to NRC-OIE Inspector  
Al Ignatonis on September 24, 1985 in accordance with 10 CFR 50.55(e) as NCR  
WBN 6278. Our first interim report was submitted on October 24, 1985.  
Enclosed is our second interim report. We expect to submit our next report on  
or about March 31, 1986.

If there are any questions, please get in touch with R. H. Shell at  
PTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

*R. L. Gridley*

R. L. Gridley  
Manager of Licensing

**Enclosure**

cc: Mr. James Taylor, Director (Enclosure)  
Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Records Center (Enclosure)  
Institute of Nuclear Power Operations  
1100 Circle 75 Parkway, Suite 1500  
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## ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2  
QUESTIONABLE COMPRESSION FITTINGS ON INSTRUMENTATION TUBING  
WBRD-50-390/85-43, WBRD-50-391/85-42  
NCR WBN 6278  
10 CFR 50.55(e)  
SECOND INTERIM REPORT

### Description of Deficiency

TVA has identified through its employee concern program (employee concerns IN-85-795-001 and 002) that various compression fitting installations were not in accordance with fitting manufacturers' installation recommendations. These compression fittings are used for instrument-related ASME Section III tubing connections on various systems throughout the plant. ASME Section III requirements for use of compression fitting joints include installation in accordance with manufacturers' recommendations. The types involved are Parker Hannifin "CPI" fittings as well as Imperial Eastman "Hi-Seal" fittings.

As a result of these employee concerns, a sample inspection of 107 compression fittings used in instrument or sampling lines was performed and 60 discrepancies identified which fall in the following general categories: tubing cuts were not deburred; tubes were not bottomed out inside the fittings; nuts were not properly tightened; and ferrules were either unidentifiable, missing, or reversed.

These installation problems resulted from inadequate or nonexistent site procedures and inadequately trained construction craftsmen. This resulted from inadequate specification of requirements.

### Safety Implications

In general, without adherence to manufacturers' recommendations during installation, compression fittings may not totally seal which would result in leaking connections. All "close-ended", safety-related instrumentation tubing receive hydrostatic or pneumatic pressure testing. This testing eliminates any concern with the adequacy of the initial seal of the compression fittings. However, potential long-term concerns existed with the adequacy of the seal due to vibration induced during normal plant operation or during a seismic event as either of these situations had the potential for allowing the vibrations to loosen the fittings and develop a leak. Also, burrs in instrumentation tubing would not be detected during pressure testing and could lead to an accumulation of "crud" and an eventual flow restriction. Tube leakage or flow restriction could cause errors in instrument readings of varying degrees depending on the instrument in question and the type of problem. Such instrumentation errors could adversely affect plant safety.

In the case of open-ended instrument tubing, drains, and vent lines, the lines are not pressure tested and any leakage due to inadequate fittings would be minimal as such leakage would not have significant pressure behind it.

### Corrective Action

A compression fitting testing program was performed at TVA's Singleton Material Laboratory. This program included testing of the effect on flow rate due to the presence of tubing burrs, testing of the integrity of fittings with various installation deficiencies including tensile pullout vibration fatigue tests and seismic event tests. The results of these tests showed that for the instances where fittings where tube ends were not deburred, tubes were not bottomed out or nuts were not properly tightened, fitting performance would still be satisfactory even though there would be some reduction in fitting integrity. Also, normal operation fatigue testing exhibited no leaks in any of the samples tested (including Imperial Eastman Fastener "Hi-Seal" ferrules installed backwards), and seismic event testing only produced very slight leakage (undetectable on the pressure gauges) in 2 of 47 samples. The seismic tests are conservative and are a severe test of fitting integrity.

For fittings with missing, reversed, or unidentified ferrules, it was determined that a missing ferrule would cause a definite leak during hydrostatic testing; a reversed ferrule would leak if it was a "CPI" fitting, but would not leak if it was a reversed "Hi-Seal" ferrule; and that the unidentified ferrule noted on the nonconformance report was probably a reversed ferrule which had been distorted by subsequent nut tightening. This specific case was a "CPI" fitting, and this condition has been found to leak during pressure testing. Because of this, TVA has determined that for these three particular types of questionable ferrule installations, unacceptable installations would be detected during hydrostatic testing due to leakage or if the fittings were used in lines that are not hydrotested there would be no driving force to create any significant leakage.

Overall TVA has determined that it is acceptable to use these type fittings "as-is" with the exception of fittings on lines which are not subject to pressure tests but could see radioactive service and some local instrument panels which may not have been hydrostatically tested. On lines that are subject to pressure testing, those that have already been pressure tested are acceptable as their lack of leakage is sufficient assurance that they will provide satisfactory service and those fittings installed on unit 2 lines which have not yet been tested will be replaced at the time of normal hydrostatic testing if they leak.

For those fittings seeing radioactive service in lines not pressure tested (e.g. drains) TVA plans to have the connections reinspected and any discrepancies found during this reinspection are to be replaced. For the local panels mentioned above, TVA plans to inspect all the panels for safety-related instrumentation for leaking compression fittings.

To prevent recurrence of this type problem, TVA has revised Construction Specification C-29, "Process Specification for Welding, Heat Treatment, Nondestructive Examination, and Allied Field Fabrication Operations," to detail the requirements for installation, remake, and inspection of compression fittings. These requirements are being incorporated into both construction and operation implementing procedures. In addition, a craft training and certification program is being established to ensure that only trained craftsmen install and maintain compression fittings.

TVA has determined that there is a problem on drawing series 47W500 and 47BM 600 which allow the use of one brand of compression fitting (tube end reduced) with another brand nut and ferrule which are compatible. TVA is still investigating this problem and will provide a final report on this matter by March 31, 1986.