

TENNESSEE VALLEY AUTHORITY

SN 157B Lookout Place

March 31, 1986

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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:

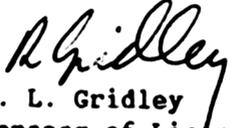
WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - QUESTIONABLE COMPRESSION FITTINGS ON
INSTRUMENTATION TUBING - WBRD-50-390/85-43, WBRD-50-391/85-42 - THIRD INTERIM
REPORT

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. Previous interim reports were submitted on October 24 and
January 31, 1986. Enclosed is our third interim report. We expect to submit
our next report on or about July 18, 1986.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY


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 6278 R1
10 CFR 50.55(e)
THIRD INTERIM REPORT

Description of Deficiency

TVA has identified through its employee concern program (employee concerns IN-85-795-001 and 002) and subsequently, through NCR 6278 R0 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 are attributed to inadequate or nonexistent site procedures and inadequately trained construction craftsmen. This resulted from inadequate specification of requirements.

After this sample inspection was completed, WBN maintenance personnel identified an additional category which was then included in revision 1 to NCR 6278. This category involves the use of Parker-CPI tube end reducers with Imperial-Eastman "Hi-Seal" nuts and ferrules as a means to connect tubing to instrument panel isolation valves. These installations are not in compliance with manufacturer's recommendations. (It should be noted that these type installations are not in the ASME code boundary.) The cause of this particular condition was determined to be an error in TVA drawings which allowed the use of either Parker or Imperial-Eastman tube end reducers.

Safety Implications

In general, without adherence to manufacturers' recommendations during installation, compression fittings may not totally seal which would result in leaking connections. All "closed-ended", safety-related instrumentation tubing receives 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.

Interim Progress

A compression fitting testing program for those items identified in Revision 0 of NCR 6278 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 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.