TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

January 27, 1983

WBRD-50-390/81-82
WBRD-50-391/81-76

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U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - DESIGN OF AXIAL SUPPORTS FOR PIPING USING LUGS WELDED TO THE PIPE - WBRD-50-390/81-82, WBRD-50-391/81-76 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector R. V. Crlenjak on September 22, 1981 in accordance with 10 CFR 50.55(e) as NCR WBN SWP 8155. Interim reports were submitted on October 22, 1981 and March 16, and August 31, 1982. Enclosed is our final report.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Licensing

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

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
DESIGN OF AXIAL SUPPORTS FOR PIPING USING LUGS WELDED TO THE PIPE
NCR WBN SWP 8155
WBRD-50-390/81-82, WBRD-50-391/81-76
10 CFR 50.55(e)
FINAL REPORT

Description of Deficiency

The two deficiencies identified by this NCR are:

1. Lugs, designed to keep piping from moving axially, butt up against the rounded corner of square tubing on pipe supports allowing greater movement than designed for. This results in a longer moment arm, thus creating a bending moment on the pipe wall that could result in overstressing of the piping.

2. The criteria for determining the moment arm to the centroid of the bearing area was misinterpreted. This resulted in smaller moment arms, producing nonconservative pipe stresses induced by the lug.

This deficiency occurred because the criteria for determining the moment arm to the centroid of the bearing area was misinterpreted by the designers. In addition, some designers overlooked and failed to take into consideration the curved portion of the square tubing which allowed greater pipe axial movement than the analysis allowed. At the time of this occurrence, no pipe support design manual was available to control this activity.

Safety Implications

If the subject condition had remained uncorrected, safety-related piping could be overstressed due to the bending moment imposed by lugs attached to the piping which bear on the axial pipe supports. In addition, greater than designed for axial movement of the piping could cause overstressing of the pipe wall. This could adversely affect the safety of operations of the plant.

Corrective Action

TVA designers have reviewed all typicals and engineered supports for Watts Bar against reevaluated criteria (which removed some of the conservatism). The lug criteria still meets code requirements of ASME section 3, division 1, subsection NC, NC-3652. All the typical supports have been found to be adequate. Some engineered supports with lugs causing an overstressed condition have been redesigned. The remaining supports with lugs causing an overstress of the pipe walls were modified using a shimming process. This process eliminates the effects of condition No. 1 (see Description of Deficiency).

Since the discovery of these nonconforming conditions, a pipe support design manual (a controlled document) has been issued (May 18, 1982) which will prevent recurrence of this condition. The Pipe Support Design Manual (PSDM) Volume 3, Sections 7.4 and 8.1 - "Integral Pipe Attachments" and "Lug Stress Calculation" outline the correct procedure to follow in designing lugs to avoid the above condition.

Also, a Design Input Memorandum on the piping support Design Criteria, WB-DC-40-31.9, was issued (December 28, 1982) to reflect the requirements of the new lug-induced pipe stress allowables.