TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

NSRS INVESTIGATION REPORT NO. I-85-861-SQN

EMPLOYEE CONCERN: XX-85-090-002

INTERIM REPORT

SUBJECT: GENERIC IMPLICATIONS OF WATTS BAR KEROTEST VALVE PROBLEMS ON SEQUOYAH

DATES OF INVESTIGATION: DECEMBER 5, 1985 - MARCH 6, 1986

INVESTIGATOR: Charles L Breeding
C. L. BREEDING — DATE 3/14/86

INVESTIGATOR: John C Catlin Sr
J. C. CATLIN — DATE 3/17/86

REVIEWED BY: L. E. Brock
L. E. BROCK — DATE 3/17/86

APPROVED BY: W D Stevens
W. D. STEVENS — DATE 3/17/86

I. BACKGROUND

A Nuclear Safety Review Staff (NSRS) investigation was conducted to determine the validity of an expressed employee concern received by Quality Technology Company (QTC)/Employee Response Team (ERT). The concern of record, as summarized on the Employee Concern Assignment Request Form from QTC and identified as XX-85-090-002, stated:

> Sequoyah: Unit 1 & 2. Per CI TVA used globe valves - (Kerotest) extensively in both plants, Watts Bar and Bellefonte and had leakage & corrosion problems. CI questions the usage of these valves at Sequoyah - the sister plant - for leakage & corrosion problems. The systems to be checked as examples are CVCS, safety injection, RHR & reactor coolant, etc. CI has no further information. NUC POWER concern.

A similar concern has been raised for Kerotest valves installed at Bellefonte Nuclear Plant (BLN). This concern will be addressed by the investigation of concern XX-85-090-001.

II. SCOPE

A. The scope of this investigation was determined from the stated concern of record to be that of two specific issues requiring investigation:

1. Verification of whether Watts Bar Nuclear Plant (WBN) has experienced extensive leakage and corrosion problems with Kerotest globe valves.

2. Determination of any safety implications for Sequoyah Nuclear Plant (SQN).

B. The failure of these valves at WBN was investigated through document reviews and personnel interviews. The specific use of Kerotest valves at SQN was investigated. The generic implications of valve failures at WBN upon the safe operation of SQN were also investigated, and industry experience with these valves was reviewed through the Nuclear Plant Reliability Data System (NPRDS).

C. This report will be issued as an interim report. Revision 1 will be issued when the results of further investigation of supporting documentation become available. Missing documentation includes Westinghouse specification G-678824 Rev. 7 and TVA specifications applicable to WBN purchases.

III. SUMMARY OF FINDINGS

A. Requirements and Commitments

1. 10 CFR 50.55(e) of the Title 10 Code of Federal Regulations (January 1, 1985 Edition) (Ref. 1) requires that the holder of a construction permit for a nuclear plant notify the NRC of each deficiency found in design and construction which, were it to have remained uncorrected, could have affected adversely the safety of operations of the nuclear power plant at any time throughout the expected lifetime of the plant.

2. 10 CFR 21, "Reporting of Defects and Noncompliance," of the Title 10 Code of Federal Regulations (January 1, 1985 Edition) (Ref. 2) requires reporting to the NRC of substantial safety hazards or that components supplied to a nuclear plant contain defects which could create a substantial safety hazard.

3. TVA Specification 9923 (no date - no revision number), "Principal Piping Systems and Appurtenances - Sequoyah Nuclear Plant Units 1 and 2," was attached to contract 71C37-92615. This contract was to NAVCO for piping and valves for SQN.

B. Findings

1. A problem with Kerotest valves at WBN was identified and documented in a Division of Construction Nonconformance Report (NCR) 2501R dated October 20, 1980 (Ref. 4). The final report on this problem was transmitted from John A. Raulston to L. M. Mills on April 27, 1981 (Ref. 3). In that report the "Description of the Deficiency" identified several hundred 3/4-, 1-, and 2-inch valves with leakage and corrosion problems. The "Safety Implications" section of the report states:

> While some of the subject Kerotest valves are installed in essential safety-related systems: CVCS, SIS, RHR, UHI, RCS, and CSS, operation of the valves is not required for the safe shut-down of the plant during a loss of coolant accident. As a result, TVA could identify no valves that perform a safety function. However, to document this, a failure effect analysis was performed. The analysis identified no detrimental effect on plant safety as a result of the failure of any of these valves.

The report also stated in the "Corrective Action" section:

> TVA does not consider the valves to perform a safety function; however we do believe that the corrosion identified with the valves could result in a maintenance problem during the life of the plant. Therefore, TVA has instituted a maintenance program to dismantle, inspect, and replace parts as required for those valves installed at WBN.

In addition, the report noted the "generic applicability of the corrosion problem" and stated:

> Verbal discussions with personnel at SQN indicated that during normal disassembly for maintenance, they have identified no Kerotest valves with what they consider excessive corrosion.

A letter from L. M. Mills to James P. O'Reilly dated April 24, 1981 (Ref. 11) transmitted this report to NRC in accordance with the requirements of 10 CFR 50.55(e) and 10 CFR 21. However, no mention was made that the WBN procurement specification was deficient by not requiring valve packing removal and bonnet drying after hydrostatic testing.

2. The response to NCR 2501R does not address the safety consideration of a 1-percent fuel failure as stated in the safety analysis. If their stems leaked, are these valves in areas where they might impair personnel entry which in turn might be required to maintain other safety functions?

3. On September 10, 1981, R. W. Cantrell wrote a memo to J. A. Raulston on the subject of "Sequoyah Nuclear Plant Units 1 and 2 - Deficient Kerotest Y-Type Globe Valves - Report No. 4 (Final)" (Ref. 8). This memo was in response to the commitment made in NCR 2501 to follow up on generic implications of the Kerotest valve failures. This memo stated:

   > We have reviewed the Kerotest valve installations at Sequoyah Nuclear Plant and find that these valves' safety function would not be compromised by problems developing from a water saturated stem packing. Westinghouse provided the majority of the valves installed in safety systems of SQN. Westinghouse specified packing replacement after hydrostatic testing on their procurements.

4. The Westinghouse specification applicable to these valves is G-678824, Rev. 7. NSRS has been unable to obtain a copy to verify the quoted statement above as of the date of this report.

The Westinghouse-procured valves were dedicated to the Nuclear Steam Supply System (NSSS). Most of them were designed with a unique valve body length.

5. The remainder of the small valves for SQN were procured either by NAVCO as part of the principal piping contract (71C37-92615) or directly by TVA on contract 824147. TVA specification 9923 (no revision number, no date) was used in these purchases. This specification did not require that valve bonnets be dried out or packing removed after hydrostatic tests.

6. The response following review of SQN Kerotest valves (Ref. 8) stated that most of the valves at SQN were procured by Westinghouse and implied that there was no problem at SQN.

7. Most of the Kerotest valves used at WBN were also procured through the Westinghouse NSSS contract. The remainder were procured directly by TVA. Applicable specifications and requirements for WBN remain to be investigated.

8. A search was made of Maintenance Requests (MRs) filed at SQN since the plant went into operation. The object was to find valves that had failed or needed repair due to leakage or corrosion; 128 failures were found in the files. None of these failures were Kerotest Y-type globe valves.

9. A search of the NPRDS (a nationwide data base for operating nuclear plants) revealed operating data on over 1600 Kerotest globe valves in their data base. Of these valves, 60 failure reports have been filed with the system over the past ten years. Of those 60 failures, only four were caused by corrosion. These failures were reported from non-TVA nuclear plants. SQN participates in the NPRDS; WBN (since it does not have an operating license) does not. None of the Kerotest valves included in the system for SQN have failures reported.

10. Maintenance personnel at SQN were interviewed to obtain information on Kerotest valve maintenance. They were aware of the WBN problems, but they could recall only two problems with Kerotest valves. These problems were the results of improper installation of the yoke of the valves and not related to the corrosion and leakage problem.

11. A search of TVA's Equipment Identification System (a computerized data base containing data on plant equipment) for Kerotest valves installed at SQN was made; 1,528 Kerotest globe valves are listed as installed at SQN. The size of all of these valves is two inches or less. A second search for non-Westinghouse valves found over 500 Kerotest globe valves installed in SQN CSSC systems that were not provided by Westinghouse. These valves are used extensively in the ERCW system and as instrument isolation valves, root valves, sample connections, vent valves, and drain valves for other systems.

12. Spare Kerotest Y-type globe valves were found in the ECN warehouse at SQN. A one-inch Kerotest valve was located in the ECN warehouse, and a workplan was written to disassemble the valve. The manufacturer's identification contained the following information: serial number, SY4-1; class, 2; year built, 1975; size, 1"; TVA-D-9916; 39875-5198. A second tag attached to the valve had two numbers on it which read: P. O. 39875-5198 and 47W495-303. The valve was disassembled by SQN mechanical maintenance at the request of NSRS. A clear liquid that looked like water was in the bonnet area. The bearing on the stem was corroded. Rust was visible on parts inside the bonnet. The bearing would rotate, but it was not smooth. Photographs were taken of the valve parts and will be retained in the NSRS files.

13. Three former TVA field inspectors were interviewed. The consensus was that packings were generally removed at the various suppliers because it was good practice and not because it was stated in the specifications. The asbestos/graphite packing generally used during the time period when these valves were shipped would retain water; and, hence, could cause corrosion and/or seizure of the valve stem. Source inspection of smaller valves was sometimes waived making their condition uncertain.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

1. WBN has experienced leakage and corrosion problems with Kerotest valves, and the resolution of this problem is documented in NCR 2501.

2. Over 500 Kerotest globe valves purchased on non-Westinghouse contracts are installed in CSSC systems at SQN. These valves appear to have been subjected to the same type of factory hydrostatic test as the WBN valves.

3. Inspection of a one-inch Kerotest valve by this investigation revealed corrosion on the valve bonnet internals. This investigation could find no documentation that indicated that the Westinghouse hydrostatic testing procedure was better than that in the TVA specification. Thus, there could be concern about the ability of the approximately 1,000 Kerotest valves procured by Westinghouse being able to function for their expected 40-year life.

4. The Kerotest valves at SQN have been in service for many years and have no history of problems. Also, tests at the Kerotest factory (Ref. 10) have shown that these valves can operate even though corrosion is present in the stem area. In addition, safety evaluations have been performed that indicate even if the SQN Kerotest valves were subject to extensive corrosion and leakage, their safety function would not be impaired.

5. The safety issue of the secondary effect of stem leakage during a 1-percent fuel failure accident was not addressed.

6. Although there may be no compromise of the "safety function" of the Kerotest Y-type globe valves themselves at SQN by their failure, corrosion in the stem area would result in maintenance problems during the remaining life of the plant. Leaking valves could result in plant inaccessibility, inoperability, and excessive personnel radiation exposure.

7. The employee concern is substantiated because there has been no objective attempt to evaluate this generic concern about the Kerotest valves at SQN.

B. Recommendations

1. I-85-861-SQN-01, Kerotest Valve Inspection

   Although there may be no compromise of the "safety function" of the Kerotest Y-type globe valves at SQN by their failure, corrosion in the stem area would result in maintenance problems during the remaining life of the plant and leaking valves could result in plant accessibility, operability, and excessive personnel radiation exposure.

   Therefore, an inspection should be made of representative Kerotest valves at SQN. If corrosion is found in the stem area, or stem leakage is found, an engineering evaluation should be performed to determine the reportability and proper resolution of this problem. If corrosion and leakage are not found, an evaluation should be performed to determine why the difference exists between WBN and SQN valves.

   OE should evaluate the methods used to determine generic applicability and not rely solely on verbal information such as that received from SQN. [P1].

2. I-85-861-SQN-02, NRC Reportability

   WBN should provide objective evidence that the statements regarding the Westinghouse testing procedure contained requirements for drying out bonnets and/or replacement of bonnet packing after hydrotesting were actually in the applicable Westinghouse specification. Facts to the contrary should be reported to the NRC.

WBN should notify the NRC in accordance with 10 CFR 50 Part 21 of the root cause of the WBN valve failures. This is presumed by the NSRS to be lack of proper precautions taken after hydrostatic testing. [P2]

3. I-85-861-SQN-03, Analyze 1-Percent Fuel Failure Accident

The impact of Kerotest valve stem leakage coupled with the 1-percent fuel failure accident stated in the safety analysis should be investigated. [P1]

DOCUMENTS REVIEWED IN INVESTIGATION I-85-861-SQN
AND REFERENCES

1. 10 CFR 50.55(e)

2. 10 CFR 21, "Reporting of Defects and Noncompliance," dated January 1, 1985

3. Memorandum from John A. Raulston, Chief Nuclear Engineer, to L. M. Mills, Manager, Nuclear Regulation and Safety, "Watts Bar Nuclear Plant Units 1 and 2 - Deficient Kerotest Y-Type Globe Valves - Report No. 4 (Final) - NCR 2501R," dated April 27, 1981 (810430C0153)

4. NCR 2510R R1 dated October 22, 1980 (801027B0425)

5. NCR 2510R dated August 4, 1980 (8008270D0133)

6. NCR 2272R dated April 18, 1980 (WBN 8004256003)

7. Memorandum from R. M. Pierce, Sequoyah and Watts Bar Design Projects Manager, to J. E. Wilkins, Project Manager, Watts Bar Nuclear Plant, "Watts Bar Nuclear Plant - Nonconformance Report No. 21272R," dated May 12, 1980 (SWP 800513 009)

8. Memorandum from R. W. Cantrell, Sequoyah and Watts Bar Design Projects Manager, to J. A. Raulston, Chief Nuclear Engineer, "Sequoyah Nuclear Plant Units 1 and 2 - Deficient Kerotest Y-Type Globe Valves - Report No. 4 (Final)," dated September 10, 1981 (810916F0144)

9. Letter from C. J. Transue, National Sales Manager, Kerotest Manufacturing Corporation, to Larry Tummel, TVA, dated May 29, 1980

10. Letter from C. J. Transue, National Sales Manager, Kerotest Manufacturing Corporation, to Larry Tummel, TVA, dated August 11, 1980

11. Letter from L. M. Mills, Manager Nuclear Regulation and Safety, to James P. O'Reilly, Director, Office of Inspection and Enforcement, NRC, "Watts Bar Nuclear Plant Units 1 and 2 - Deficient Kerotest Y-Type Globe Valves - NCR 2501R - Final Report," dated April 24, 1981 (A27 810424 014)

12. TVA Design Specification, WBN-DS-1935-1521-CK, R2, dated August 20, 1976, "Motor-Operated and Manual Valves"

13. TVA Division of Engineering Design, WB-DC-40-31.2, Watts Bar Nuclear Plant, Design Criteria for Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment, R1 dated October 25, 1974

DOCUMENTS REVIEWED IN INVESTIGATION I-85-861-SQN
AND REFERENCES (Continued)

14. Contract 71C 37-92615 between TVA and National Valve & Mfg. Co. (NAVCO) dated August 26, 1970

15. TVA Specification 9923 for Principle Piping Systems and Appurtenances Sequoyah Nuclear Plant Units 1 and 2 (attached to contract 71C 37-92615) no date, no revision number

16. Westinghouse Equipment Specification G-678824, "2 Inch and Below Manual Valves (Class 1, 2, and 3 of ASME Boiler and Pressure Vessel Code, Section III)," Rev. 1, dated December 9, 1975

17. Westinghouse Purchase Orders 106765, 146831, 178250, 178257, and 178258 under TVA contract 68C60-91934

18. TVA Specification MEB-SS-10.19, Rev. 0, dated November 17, 1977, "Technical Specification for ASME Code Valves, 2 Inches and Smaller"

TVA 84 (08-9-85)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

TO : H. L. Abercrombie, Site Director, Sequoyah Nuclear Plant

FROM : K. W. Whitt, Director of Nuclear Safety Review Staff, E3A8 C-K

DATE : March 17, 1986

SUBJECT: NUCLEAR SAFETY REVIEW STAFF INVESTIGATION REPORT TRANSMITTAL

Transmitted herein is NSRS Report No. SQN-85-001-02

Subject: FIBERGLASS INSULATION INSIDE CONTAINMENT

Concern No.: SQN-85-001-02

No response or corrective action is required for this report. It is being transmitted to you for information purposes only. Should you have any questions, please contact W. D. Stevens at extension 6231-K.

Recommend Reportability Determination: Yes ___ No X

Director, NSRS/Designee

WDS:BRP
Attachment
cc (Attachment):
W. C. Bibb, BFN
W. T. Cottle, WBN
J. P. Darling, BLN
R. P. Denise, LP6N40A-C
G. B. Kirk, SQN
M. L. Martin, WBN
D. R. Nichols, E10A14 C-K
QTC/ERT, WBN
E. K. Sliger, LP6N48A-C
J. H. Sullivan, SQN (2)

WATTS BAR NUCLEAR PLANT SITE DIRECTOR'S OFFICE
MAR 19 '86

	Note	Action	Reply
Mgr			
Mgr			
Mgr			
Mgr			
QA			
Personnel			
Manager			
Compliance			
Officer			
ACTION ITEMS			

RPD —