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SUBJECT: Forwards Rev 1 to Civil Engineering Branch Instructions CEB-CI 21.97, "Operability Criteria for Pipe..." & program for resolving small bore piping issue, per 880318 meeting w/ NRC to resolve IE Bulletins 79-02 & 79-14.

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U.S. Nuclear Regulatory Commission
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Gentlemen:

In the Matter of) Docket Nos. 50-260
Tennessee Valley Authority)

BROWNS FERRY NUCLEAR PLANT (BFN) - SEISMIC QUALIFICATION OF SMALL BORE PIPING, CONTROL ROD DRIVE INSERT AND WITHDRAWAL PIPING, AND IE BULLETINS 79-02 AND 79-14 - (NRC TAC NOS. 00305, 00020 AND 00016)

This letter describes the BFN program for the seismic qualification of small bore piping and pipe supports. This material was requested by R. J. Clark's letter dated July, 1986 to S. A. White. This letter supplements the information provided by R. Gridley's letters dated April 8, 1987 and March 10, 1988 and section III.3.7 of revision 1 to the BFN Performance Plan that was transmitted by S. A. White's letter dated July 1, 1987. This letter incorporates resolution of the NRC staff's concerns as discussed in our meeting, dated March 18, 1988.

Enclosure 1 to this letter describes the BFN program for resolving the small bore piping issue. Enclosure 2 provides the BFN interim operability criteria for pipe and pipe supports on TVA Class I seismic piping, revision 1. These criteria are also being utilized on the program to seismically qualify control rod insert and withdrawal piping and in the program to resolve IE Bulletins 79-02 and 79-14. TVA requests your review of this program and the issuance of a written statement documenting the program's acceptability.

Please refer any questions regarding this submittal to M. J. May, Manager, BFN Site Licensing, (205) 729-3570.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. Gridley, Director
Nuclear Licensing and
Regulatory Affairs

Enclosures
cc: See page 2

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U.S. Nuclear Regulatory Commission

APR 29 1988

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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT
UNIT 2
SMALL BORE PIPING AND SUPPORTS
MARCH 1988

This report provides TVA's plan for specific action to qualify seismic Class I field run small bore piping.

Issue

Significant condition reports have questioned the adequacy of base plates, concrete anchors, weld details, and structural integrity of supports for safety-related small bore piping. These questions revolve around the criteria used to design and install those supports.

Background

The majority of the Class I small bore (one-half to two-inch diameter) piping at Browns Ferry Nuclear Plant (BFN) was field routed and field supported. Installation was in accordance with American National Standards Institute standards. Two criteria were issued for BFN small bore piping design. The first design criteria was "Design Criteria for Supporting Process Instrument Piping and Instrument Air Lines," dated May 3, 1971. The other was "Criteria for Seismically Qualifying Field Run Piping - Sizes 1/2 through 2 in.," which was issued on November 29, 1972. Both criteria were reissued as controlled document BFN-50-712 in 1972.

In 1984, a nonconformance report (NCR BFNMEB 8406) was written on the application of BFN 50-712 to the installation of schedule 160 pipe since the schedule 160 pipe was not addressed in this design criteria. While revising BFN 50-712 to address schedule 160 pipe, it was determined that the qualification of some base plates in the typical support details of the criteria could not be verified and that no weld details had been specified. It was also determined that some support members for field-routed schedule 160 piping could be underdesigned since their selection was based on the tables in the design criteria for schedule 40 and 80 piping. A significant condition report (SCR BFNCEB 8520) was written addressing those conditions and BFN 50-712 was revised to place the support details on hold pending the resolution of the SCR.

Resolution

The scope of this activity for unit 2 and the required common small bore piping is estimated to be 16,000 ft. of pipe with 750 supporting structures. The following types of piping are excluded from this evaluation:

a) Piping reviewed under the long-term torus integrity program
b) Piping reviewed under 79-14 program
c) Control Rod Drive piping

In order to address the concerns regarding the seismic qualification of Class I small bore piping, representative piping problems (approximately 10 percent of the total scope) were selected for evaluation. The following attributes were considered:

- High temperature/high pressure systems
- Large concentrated weights (i.e., valves)
- Large differential movements (i.e., source pipe connections)
- Seismic - non-seismic overlap
- Schedule 160 piping
- Plant location
- Different pipe sizes

This evaluation will consist of walkdowns of the selected piping, evaluation of this data to design criteria requirements and review to the operability criteria to determine required modifications. Those piping and supports which do not meet the design criteria, but are within the interim operability criteria, will be modified to the design criteria after restart. Those which do not meet the interim operability criteria will be modified to the design criteria unless specifically requested and approved by NRC on a case-by-case basis prior to restart. A comparison of design and operability criteria is summarized in table 1.

Attributes will be identified for those supports which require modifications to meet the operability criteria. These attributes will then be reviewed for generic implications to the entire small bore scope. The representative scope will be increased as determined necessary by an extensive root cause analysis and evaluation of the extent-of-condition. This review will address the interdependency of discrepancies and the impact due to the general accumulation of discrepancies.

The design criteria for small bore piping and supports satisfy the FSAR. Specific requirements for piping and supports are provided in Appendix C of the FSAR.

Licensing Issues

Issue:

This program involves the use of interim operability criteria for piping and supports.

Justification:

These criteria, as documented in CEB-CI 21.97, assure structural integrity of the piping and supports and are used for the 79-14 program. The criteria are similar to those approved on Sequoyah Nuclear Plant for large bore supports. Approval of the Sequoyah operability criteria is documented in NUREG 1232. For a comparison between Sequoyah's and Browns Ferry's operability criteria, refer to table 2.

The small bore qualification program is comprehensive and provides assurance that piping and supports will remain functional. Modifications required to meet design criteria will be implemented prior to start-up after the next refueling outage.

ENCLOSURE 1

TABLE 1

BROWNS FERRY UNIT 2
SMALL BORE PIPING
CRITERIA COMPARISON CHART

COMPONENT	DESIGN CRITERIA	OPERABILITY CRITERIA
PIPING		
PRIMARY	$1.8S_H$	$2S_Y$
SECONDARY	S_A	ASME EQ 10
PRIMARY & SECONDARY	$S_A + S_H$	ASME EQ 11 OR AUGMENTED FATIGUE EVALUATION
CONCRETE EXPANSION ANCHORS FACTOR OF SAFETY WEDGE AND SHELL	WEDGE TYPE 4 SHELL TYPE 5 FOR TENSION 4 FOR SHEAR	ALL TYPES 2
PIPE SUPPORT TENSILE AND FLEXURAL STRESS	1.5 X AISC MAXIMUM LIMIT $0.9S_Y$	LESSER OF $0.7S_U$ OR $1.2S_Y$
COMPRESSIVE STRESS	1.5X AISC MAXIMUM LIMIT $0.9S_Y$	MAXIMUM LIMIT $0.9P_{CR}$
ALLOWABLE SHEAR STRESS	MAXIMUM LIMIT $0.52S_Y$	LESSER OF $0.42S_U$ OR $0.72S_Y$
STRESS BOLT	$0.56S_U$	S_Y (MIN) (WHEN NOT AVAILABLE $.7S_U$)

ENCLOSURE 1

TABLE 2

BROWNS FERRY UNIT 2
SMALL BORE PIPING
COMPARISON OF OPERABILITY CRITERIA
TECHNICAL ATTRIBUTES

COMPONENT	SEQUOYAH CEB-CI-12-89	BROWNS FERRY CEB-CI-21-97
Piping		
PRIMARY	$2S_Y$	$2S_Y$
SECONDARY	ASME EQ 10	ASME EQ 10
PRIMARY & SECONDARY	ASME EQ 11 OR AUGMENTED FATIGUE EVALUATION	ASME EQ 11 OR AUGMENTED FATIGUE EVALUATION
STRAINS	CODE CASE N-47 APPEND T LIMITS	WILL NOT USE
CONCRETE EXPANSION ANCHORS FACTOR OF SAFETY	ALL TYPES 2	ALL TYPES 2
PIPE SUPPORT TENSILE AND FLEXURAL STRESS	LESSER OF $1.2S_Y$ & $.7S_U$	LESSER OF $1.2S_Y$ & $.7S_U$
COMPRESSIVE STRESS	MAXIMUM LIMIT OF $.9P_{CR}$	MAXIMUM LIMIT OF $.9P_{CR}$
SHEAR STRESS	LESSER OF $.42S_U$ & $.72S_Y$	LESSER OF $0.42S_U$ & $.72S_Y$
STRESS BOLT	S_Y	S_Y OR $.7S_U$ WHEN $S_{Y\ (MIN)}$ IS NOT SPECIFIED
LOAD SHARING BY ADJACENT SUPPORTS	USE ON CASE BY CASE BASIS	USE ON CASE BY CASE BASIS
THERMAL MONITORING	USE AS METHOD OF DEFERRING MODIFICATION	USE AS METHOD OF DEFERRING MODIFICATION