

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

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October 24, 1984

U.S. Nuclear Regulatory Commission  
Region II  
Attn: Mr. James P. O'Reilly, Regional Administrator  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

Dear Mr. O'Reilly:

WATTS BAR NUCLEAR PLANT UNIT 1 - OFFICE OF INSPECTION AND ENFORCEMENT -  
BULLETIN 79-02 - PIPE SUPPORT BASE PLATE DESIGNS USING CONCRETE EXPANSION ANCHOR  
BOLTS - SUPPLEMENTAL INFORMATION

NRC-OIE Bulletin 79-02 and Revision 1 to Bulletin 79-02 were transmitted to TVA by letters dated March 8 and June 21, 1979, respectively. We submitted our response to these letters for TVA's nuclear facilities on July 5, 1979. In response to your November 8, 1979 letter, which transmitted IE Bulletin 79-02 Revision 2, we submitted the results of our investigations for TVA's nuclear facilities on December 6, 1979. Our final report and a revised response to the subject Bulletin and Revision 1 of the Bulletin for Watts Bar Nuclear Plant Unit 1 were submitted on August 26, 1983 and June 20, 1984, respectively.

This letter supersedes our previous supplemental information letter dated August 24, 1984. Enclosures 1 and 2 are information pertinent to the subject Bulletin which was requested by NRC Region II representatives on July 13 and September 13, 1984 respectively. Enclosure 1 provides additional details of the sampling program undertaken to respond to the expansion shell anchor factor of safety concern and the documentation of in-process testing of expansion anchors. Enclosure 2 provides information on the population of expansion anchored supports in all Category I piping systems at Watts Bar.

During an NRC inspection of TVA's Office of Engineering (OE) activities the week of October 1, 1984, the NRC-OIE representatives expressed concern over the fact that the random sample of the total pipe support population did not provide better coverage of the pipe supports on a system-wide basis. Enclosure 3 to this report provides information on the additional sampling TVA is performing to address the above concern of the NRC-OIE representatives. The expanded program is presently underway. We expect to submit a revision to our previous final response on or about January 11, 1985.

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U.S. Nuclear Regulatory Commission

October 24, 1984

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

*DS Kammer*

*for* L. M. Mills, Manager  
Nuclear Licensing

Enclosures

cc (Enclosures):

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

Records Center  
Institute of Nuclear Power Operations  
1100 Circle 75 Parkway, Suite 1500  
Atlanta, Georgia 30339

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT UNIT 1  
NRC-OIE BULLETIN 79-02  
SUPPLEMENTAL INFORMATION

Baseplate Sample

Section 4.0 of the revised response discusses the use of a sample for the evaluation of baseplate flexibility and expansion anchor factor of safety. The sample consisted of 300 engineered pipe supports from unit 1.

The total population of supports for unit 1 and common areas which are covered by the quality assurance program is 38,591. Of these, 22,964 are expansion anchored. Expansion anchored pipe supports consist of unique engineered supports and typical supports. Of the 22,964 expansion anchored supports, 5,757 are unique engineered supports, and 17,207 are typical supports.

The sample was randomly selected from the drawing files for unique engineered supports for all primary systems and some secondary systems. However, the sample is representative of all primary and secondary system supports because the same basic design methods were used. Typical supports were not included because in-place typical supports are rarely loaded with the maximum number and size of pipes on which the design was based and the designs used the worst-case response spectra for any Watts Bar Nuclear Plant (WBN) location regardless of the location of the support.

We believe that the sample size of 300 is adequate for the population of expansion anchored supports. The minimum sample size for determining the attributes of a population depends on the acceptance criteria and the level of confidence to be applied to the determination. A sample size of 60 with 0 defects provides 95-percent confidence level that less than 5 percent of an infinite population was defective. A sample size of 60 is therefore the minimum necessary to show compliance with the acceptance criteria for expansion anchor factor of safety. For the 79-02 baseplate design sample, the sample size was increased to 300. This sample size can provide a higher level of confidence that the acceptance criteria is met or allows calculation of defect rates less than 5 percent with the same level of confidence. The results of the sample are discussed in section 4.0 of the revised response.

The allowable expansion anchor loads in the TVA anchorage design standard were revised in 1981 to comply with 79-02. However, the revised loads were not fully implemented, and a nonconformance was written in 1984. The sampling of 300 supports was therefore used for both evaluation of Bulletin 79-02 and the NCR. The sampling was performed in early 1984.

Since the sampling was performed several years after the 79-02 allowables were invoked, the sample of 300 contains some supports which were designed using the 79-02 allowables. A review was performed to determine the percentage of the original designs for the supports in the 300 sample that used the pre-79-02 allowables. The review showed that approximately 70 percent of these supports were designed using the pre-79-02 allowable loads. This percentage is representative of the entire population of engineered pipe supports. Therefore,

the sample of 300 is not biased toward supports using the allowables which conform to 79-02. Two of the four anchors found to have a factor of safety less than five were designed using the pre-79-02 allowables. One support in the sample of 300 was found to have a design error which resulted in a significantly reduced factor of safety. The support has been redesigned and a generic evaluation performed. The support calculations performed by the same designer and checker were reviewed and none were found to contain the same design error. No additional unit 1 supports were found to contain the same design error.

#### In-Process Inspection and Testing

Documentation is available for all pipe supports which verifies that the anchors have been inspected in accordance with TVA General Construction Specification G-32. A computerized hanger tracking program is in place which assures that all required inspections have been performed and that the documentation has been received by the records storage unit.

Since 1981, the inspection and tests in G-32 have complied with the bulletin requirements. Before 1981, G-32 required proof loading of representative anchors in each lot. However, it did not require inspection of thread engagement, recess, or cone expander depth. Therefore, a special inspection was performed to evaluate compliance with 79-02. This inspection is discussed in section 6.0 of the revised response.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNIT 1  
NRC-OIE BULLETIN 79-02  
SUPPLEMENTAL INFORMATION

DISCUSSION

Table 1 provides a listing of all Category I piping systems at WBN which use concrete expansion anchors. The table lists the total number of unique engineered supports in each system. These numbers were obtained from the computerized hanger tracking program used by WBN construction for hangers covered by the QA program. Some systems used only typical supports. Typical supports were not included in the sampling program for reasons given in Enclosure 1.

The table also shows the distribution of supports which were included in the sample of 300 pipe support designs. As would be expected for a random sample, supports from some systems were not included in the sample. This does not affect the conclusions from the sample because the design methods for concrete expansion anchors were the same for all pipe supports regardless of the piping system.

TABLE 1

SYSTEM NO.	SYSTEM NAME	SAFETY FUNCTION #	ENGINEERED SUPPORTS	SAMPLED SUPPORTS
1	Blowdown Mainsteam	P	159	1
3	Aux. Main Feedwater	P	350	5
12	Aux. Boiler	S	76	
18	Fuel oil	P	*	
24	Raw Cooling Water	S	46	6
25	Raw Service Water	S	*	
26	High Pressure Fire Protection	P	578	12
29	Potable Water Distribution	S	13	
30	Ventilation	P	18	
31	Air Condition	P	227	
32	Control Air	P	*	
33	Service Air	S	*	
36	FW Secondary Treatment	S	*	
39	CO2 Storage, F.P., Purging	S	46	
40	Station Drainage	S	90	

# P - Primary S = Secondary

\*All supports in system are typical.

TABLE 1

SYSTEM NO.	SYSTEM NAME	SAFETY FUNCTION #	ENGINEERED SUPPORTS	SAMPLED SUPPORTS
41	Layup Water Treatment	S	44	
43	Sampling & Water Quality	S	*	
44	Bldg. Heating	S	*	
49	Breathing Air	S	*	
51	Raw Wtr. Chlorination	P	*	
59	Demineralized H2O	S	18	1
61	Ice Condenser	P	53	5
62	Chem & Vol Control	P	823	68
63	Safety Injection	P	529	36
65	Emer. Gas Treatment	P	*	
67	Essential Raw Cooling Water	P	952	103
68	Reactor Coolant	P	151	3
70	Component Cooling	P	1,011	38
72	Containment Sprav	P	93	
74	Residual Heat Removal	P	151	
77	Waste Disposal	S	84	

# P - Primary S = Secondary

\*All supports in system are typical.

TABLE 1

SYSTEM NO.	SYSTEM NAME	SAFETY FUNCTION #	ENGINEERED SUPPORTS	SAMPLED SUPPORTS
78	Spent Fuel Pit Cooling System	P	135	15
81	Primary Water Makeup	S	9	
82	Standby Diesel Generator	P	32	
84	Flood Mode Boration Makeup	P	*	
87	Upper Head Injection	P	56	7
90	Radiation Monitor	P	13	
Totals	---	---	5, 757	300

# P - Primary S = Secondary

\*All supports in system are typical.

ENCLOSURE 3

WATTS BAR NUCLEAR PLANT UNIT 1  
NRC-OIE BULLETIN 79-02  
SUPPLEMENTAL INFORMATION

Discussion

While we believe that the basis for the original sample of 300 supports continues to be valid because their design was independent of system type implications, we will expand the original sample to provide better distribution on a system-wide basis.

We have initiated an extension of the sampling program of all unit 1 piping systems at WBN which use concrete expansion anchors and serve a primary safety function. The expanded program will provide approximately ten percent coverage of all engineered supports in each piping system performing a primary safety function. The expanded program will increase the sample size from 300 supports to approximately 500 supports.