UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-338/89-29 and 50-339/89-29

Licensee: Virginia Electric and Power Company
Glen Allen, VA 23060

Docket Nos.: 50-338 and 50-339 License Nos.: NPF-4 and NPF-7

Facility Name: North Anna 1 and 2

Inspection Conducted: August 28 - September 1 1989

Inspector: _____ 10/20/89
Rich C. Knou Date Signed

Approved by: _____ 10/20/89
J. D. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine unannounced inspection was conducted in the areas of previous open items, the licensee corrective actions and analyses for fastener sampling results, and verification of Inservice Inspection (ISI) data report.

Results:

In the areas inspected, violations or deviations were not identified.

One Unresolved Item (URI), paragraph 4, was issued for pipe support calculation review because the AISC method for calculating the anchor bolt allowables was directly used in embedded anchor bolts to qualify pipe supports. The licensee was slow in response to the inspector's requests in some areas. The ISI data report is acceptable.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

J. Bischof, Lead Site Civil Engineer
G. C. Clark, Quality Supervisor
*D. C. Compton, System Engineer - NAPS (SEP)
*G. H. Flowers, Site Engineering Programs Supervisor
*B. E. Hargrave, Quality Supervisor
R. Hurd, Quality Supervisor
*G. Kane, Station Manager
*P. Kemp, Licensing Supervisor
*J. H. Lebesstien, Engineer
R. Miller, Senior Quality Control (QC) Inspector
P. J. Naughton, ISI Engineer - Site Engineering Programs
*C. E. Sorrell, Engineering Mechanics Supervisor - Civil - EM
*J. E. Wroniewicz, Design Engineering Supervisor - NAPS
*C. A. Zalesiah, Staff Engineer - Civil - EM

Other licensee employees contacted during this inspection included craftsmen, engineers, mechanics, technicians, and administrative personnel.

NRC Resident Inspectors

*J. L. Caldwell, Senior Resident Inspector
*J. Munro, Resident Inspector
L. P. King, Resident Inspector

*Attended exit interview

2. (Open) Temporary Instructions (T1) 2500/27, Inspection Requirements for NRC Bulletin 87-02

The NRC Bulletin 87-02, Fastener Testing to Determine Conformance with Applicable Material Specifications, was issued to the licensees on November 6, 1987. The Bulletins requested that licensee: 1) review their receipt inspection requirements and internal controls for fasteners, and 2) independently determine, through testing, whether fasteners in stores at their facilities meet required mechanical and chemical specification requirements. The licensee submitted the responses to the NRC in Letter Serial Nos. 87-705A. dated January 18, 1988 and 87-705B and 87-705C, dated February 29, 1989. The NRC compiled all test results from the licensees and issued TI 2500/27 for inspection of all licensees which had samples which tested significantly out of specifications. TI Section 04.01 requires the inspector to review, assure, and assess the

licensee actions on the root cause analysis, corrective action, possible locations, and the appropriate disposition of the significantly out of specification safety-related fasteners identified in Attachment 2 of TI 2500/27. Sample Nos. NPF4-AB, AE, AO, and AP were listed in Attachment 2 of the TI for North Anna.

The inspector discussed the above problems with the licensee engineers and quality supervisors and reviewed the information provided. Per the licensee's response to the NRC in Letter Serial No. 87-705C, Sample No. NPF4-AP was reclarified as acceptable based on their new review of test results against the purchase order for ASME class 2 materials. The inspector verified the purchase order 30397 which showed this material was purchased under class 2 B&M and Nonconformance Report (NCR) No. 87-104 which listed the comparison of class 2 required and as tested. Therefore, this sample was not out of specification. The Letter Serial No. 87-705C also reclarified Sample No. NPF4-AO with 100 RB hardness to be acceptable for material 3/4" and smaller in diameter when comparing with ASTM Specification A-193 Gr. B&M class 1. Therefore, Sample No. NPF4-AO was considered acceptable with elongation slightly out of specification (24 percent vs minimum of 30 percent). However, the fasteners of Sample No. NPF4-AO have been removed from shelf and used for QC training only.

Per NCR No. 87-103, the records were checked for 'usage' and it was found that this material (Sample No. NPF4-AO) was used only for 'tooling' purposes and not installed in the system. For Sample No. NPF4-AB and AE, the elongation is the only property out of specification (12 percent vs minimum of 16 percent). The licensee engineers did a study and analysis for this elongation slightly out of specification and considered it acceptable. Elongation and reduction in area are intended as measurements of ductility, which could affect performance if significantly low. Specifically, a low ductility (brittle) material could fracture under high stress without deforming. Generally, a material with 12 percent elongation is not considered a brittle material. Ductility is used to indicate to the designer the ability of the metal to flow plastically before fracture. Those samples meet the other requirements and the acceptable reduction in area. Therefore, the licensee considered Sample No. NPF4-AB and AE acceptable and dispositioned 'use-as-is'.

The cause of the problem was that the licensee did not have, at the time of receipt, an inspection program to sample the material composition of these fasteners to detect substandard material from approved vendors. The licensee has upgraded NAS-2094, Specifications For Pressure Boundary Threaded Fasteners, to specify the technical and quality assurance requirements for manufacture, materials, testing, inspection, documentation and preparation for shipment of threaded fasteners. Enhanced procurement program administrative procedures, which address all aspects of the material management process, including receipt inspection and testing of material utilizing a sampling plan is currently under development with an anticipated completion date of December 31, 1989. Pending the licensee completion of owner testing procedures for receiving materials, this TI is remains open.

3. ISI Data Report Verification (Unit 2)

The licensee submitted an Inservice Inspection Report for the North Anna Power Station Unit 2 in Serial No. 89-360 PES/ISI dated August 4, 1989 per the provisions of ASME Section XI, 1974 Edition, Summer 1975 Addenda. This report was an examination summary. A Form NIS-1, Owners Data Report for Inservice Inspection was provided as Attachment 1 in accordance with IWA-6220, Reports for Class 1 and Class 2 Components. The NIS-2 Forms, Owner's Report For Repairs and Replacement, were also provide as Attachments II in accordance with ASME XI, 1980 Edition, Winter 1981 Addenda. This ISI Report is for the refueling outage: Third Period, first interval. The inspector reviewed the report, discussed it with the licensee engineers, and randomly performed data verification.

a. Field Walkdown

To check the licensee field activities in the report, the inspector randomly selected five pipe supports for review. Only one support, Support No. CC-SH-153 for ECI-118AB, was accessible. This support was reinspected and found to be acceptable.

b. NCR and Deviation Report (DR) Disposition Review

To evaluate the adequacy of licensee documentation and disposition of the NCR and DR, the inspector reviewed the NCR's and DR's shown below. All dispositions were adequate and acceptable.

NCR or DR	Number	Description
NCR	N-88-17	Material traceability lost
NCR	N-89-20	Drawing tolerance discrepancy
DR	89-447	Gouges on pin and steam generator ring
DR	89-448	Same as above
DR	89-449	Sway strut pin to pin adjustment
DR	89-450	Clevis had a small damage
DR	89-451	Gouges on steam generator retaining ring

c. QC Inspection Record Review

The following support numbers were randomly selected from the list of components and component support indications in the report. The purpose of this record review was to verify QC inspection findings, engineering evaluations and dispositions, and the QC inspection of the corrective actions. All three QC inspections records are acceptable.

Support No	Descriptions
CC-SH-153	Spring settings required
RC-SH-002	Spring settings required
WFPD-SH-032	Spring settings required

In conclusion, all the data or documents inspected are adequate or acceptable. The verification of this Inservice Inspection Report is considered complete.

4. Pipe Support Calculation Review

During the last inspection on Inspection Report Nos. 50-338, 339/89-04, the inspector noticed that a design method based on American Institute of Steel Construction (AISC) was used to qualify the expansion anchor bolts for Support Nos. 2-WS-A-3, 2-WS-A-12, and 2-WS-A-23. The AISC method normally is used to qualify bolts or rivets for steel to steel connections. The expansion anchor bolts are different from the AISC bolts or rivets since they involve steel and concrete. The licensee's engineers stated that the use of AISC method for North Anna was approved by NRR; but the approval letter could not be retrieved by the licensee by end of inspection. During this inspection, the licensee engineer stated that he could not find the approval letter and he was not sure there was a letter for that purpose. The calculation book No. 13075.62-NPN-8-65 was reviewed. The calculation book contained about 20 pipe support calculations. Some pipe supports have detail calculations involving Hilti Anchor Bolt Qualifications and the rest have the load comparison sheets only. The review results were listed below. The inspector identified three types of problems: 1) AISC Methods were used in three support calculations, as shown in Table 1; 2) Six pipe supports used various allowables for the same Hilti Bolt diameter and embedment depth, as shown in Table 2. The allowables used are also different from the allowables provided in Specification No. NAS-1023, "Installation of Embedment Plates Using Anchors Drilled in Concrete," dated January 14, 1981; and 3) the ratio of the unstiffened distance between the members welded to the plate and the edge of the base plate for a base plate flexibility check was greater than five times the thickness of the plate which was different from the IE Bulletin 79-02 recommendations of 2 times the thickness of the plate.

Table 1

AISC Design Method Used

Calculation No.	Pipe Support Mark
NPN-Z-65-001	2-WS-A-3
NPN-Z-65-010	2-WS-A-12
NPN-Z-65-020	2-WS-A-23

Table 2

Various Hilti Allowables Used

Calculation No.	Support No.	Checker Dated	Calc Page No.	Bolt diameter (in)	Tension(#)	Shear (#)
NPN-Z-65-002	2-WS-R-4	4-1-81	17	1	3540	2500
			19	1	3700	2500
			20	3/4	3525	1800
			25	1	5710	2500
			27	1 1/4	7730	7730
			34	1	3500	2500
NPN-Z-65-007	2-WS-R-8	4-22-81	15	3/4	2400	1800
NPN-Z-65-008	2-WS-R-9	5-2-81	13	1	5710	6780
			15	1	5710	6780
NPN-Z-65-011	2-WS-R-13	5-14-81	12	1	3500	2500
			14	1/2	2100	1000
			17	3/4	3525	1800
NPN-Z-65-017	2-WS-R-18	4-22-81	10	1	5710	2500
NPN-Z-65-019	2-WS-R-21	5-13-81	21	1	5710	6780

Table 3

Examples of Base plate Flexibility
(This table only presents a few examples) $(\frac{d}{t}>2)$

Calculations No.	Page No.	Support No.	$\frac{d}{t}$
NPN-Z-65-001	11	2-WS-A-3	5.81
NPN-Z-65-002	16	2-WS-R-4	3.88
	24	2-WS-R-4	2.63
	27	2-WS-R-4	2.75
	34	S-WS-R-4	3.25

The licensee's engineers did indicate that the AISC method was used for three supports because those supports have embedded anchor bolts instead of the regular Hilti Kwik anchor bolts (expansion anchor bolts) and Stone and Webster Engineering Corporation, did have a set of generic calculations for the minimum embedment length to be used for the embedded anchor bolts to adjust in using of AISC method. Those embedded anchor bolts also were detailed in the concrete drawings. Those documents were not available for review by end of inspection. The inspector questioned the Hilti anchor bolt allowables used in support calculation NPN-Z-65-019, for Support No. 2-WS-R-21, which were different from Specification No. NAS-1023, dated January 14, 1981. The licensee engineers, did present a

set of Hilti anchor bolt allowables from Attachment 2, Page 4 of SD-STEP 6, dated May 3, 1979. The support calculation was done May 13, 1981 which was after the issuing of Specification No. NAS-1023, dated January 14, 1981. The licensee engineers could not answer why the later and lower allowables were not used in support calculations. Pending the licensee resolution of above concerns, this item is identified as UNR 50-338, 339/89-29-01, Pipe Support Calculation Concern.

5. Previous Enforcement Actions

a. (Open) UNR 50-338,339/89-04-01, Piping System Concerns

This matter concerned the discrepancies found between the field and as-built drawings in Inspection Report Nos. 338, 339/88-29 and 89-04 Pipe Support drawing illegibility, inspectors' review on support calculations, and a submittal of the final summary report. The inspector discussed with the licensee engineers and reviewed the information provided. The redrawn and legible detail drawings for two systems were reviewed and compared to the previous drawings and considered acceptable.

The drawings included drawings No. 11715-PSSK-118P.01 to 118P.06 for the Component Cooling Water System (East Lead), in the Auxiliary Building of Unit 1, and Drawing No. 12050-PSSK-101KA.01 to 101 KA.11 for the Main Steam Line in the Reactor Containment to Turbine Room By-Pass of Unit 2. All new drawings were in Rev. 2. For inspectors review on support calculations, see paragraph 4. The licensee submitted a final summary report for Unit 1 in a Letter Serial No. 89-577, dated August 17, 1989. The final summary report for Unit 2 was submitted by the licensee in a Letter Serial No. 5521, dated June 27, 1980. The inspector reviewed the final summary reports for both units and considered them acceptable. The licensee is working on the resolution of the discrepancies found between the field and the as-built drawings during the last two inspections. This resolution is in tracking system of CTS 0289 0503 (001) and is expected to be completed by the end of year. The resolution includes the firm hardware fixes, drawing and calculation revisions if required, document retrieval, and root cause analysis. Pending the licensee resolution of the above discrepancies between the field and as-bult drawings, this item remains open.

b. (Open) UNR 50-338, 339/89-04-02, Hilti Anchor Bolt Problems

This matter concerns the Hilti anchor bolt discrepancies between the field and as-built drawings, the violations of minimum center to center distance requirements, the edge distance difference from drawings, the design allowables for IE Bulletin 79-02, and justifications to NRC Information Notice Nos. 86-94 and 88-25. The resolution of the discrepancies such as edge distances, bolt spacing etc. is in tracking system of CTS 0289 0503 (002). For Hilti anchor bolt allowables and their justifications per NRC Information Notices,

the licensee is working on them to find a solution. This item remains open.

6. Exit Interview

The inspection scope and results were summarized on September 1, 1989, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

(Open) URI 50-338, 339/89-29-01, Pipe Support Calculation Concern, paragraph 4.