



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

Report No.: 50-413/84-105

Licensee: Duke Power Company  
 422 South Church Street  
 Charlotte, NC 28242

Docket No.: 50-413

License No.: NPF-31

Facility Name: Catawba 1

Inspection Conducted: December 10-13, 1984

Inspector:	<u>Frank Jape</u>	<u>1/7/85</u>
	J. J. Lenahan	Date Signed
Approved by:	<u>Frank Jape</u>	<u>1/7/85</u>
	F. Jape, Section Chief	Date Signed
	Engineering Branch	
	Division of Reactor Safety	

SUMMARY

Scope: This routine, unannounced inspection entailed 29 inspector-hours on site in the areas of thermal expansion and vibration testing, licensee action on previous inspection findings, and follow-up on IE Bulletin 80-11.

Results: No violations or deviations were identified.

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## REPORT DETAILS

### 1. Licensee Employees Contacted

- \*W. L. Anfin, Mechanical Maintenance Support Engineer
- \*W. H. Bradley, QA Operation Supervisor
- \*J. P. Fraedrich, Junior Engineer, Mechanical Maintenance
- \*G. Smith, Superintendent of Maintenance
- S. Starcher, Civil-Structural Engineer
- J. B. Swords, Civil-Structural Engineer
- H. Taylor, Structural Engineer

Other licensee employees contacted included three technicians.

NRC Resident Inspectors

- \*P. A. Skinner
- \*P. K. VanDoorn

\*Attended exit interview

### 2. Exit Interview

The inspection scope and findings were summarized on December 13, 1984, with those persons indicated in paragraph 1 above. The licensee was informed of the inspection findings listed below. The licensee acknowledged the inspection findings without significant comment.

Unresolved Item 413/84-105-01, Failure of Hanger Number 1-R-SV-1620 on Main Steam Vent to Atmosphere Line - Paragraph 5.

Inspector Followup Item 413/84-105-02, Modifications to Cross-over Leg Whip Restraint Shims - paragraph 6.

### 3. Licensee Action on Previous Enforcement Matters

a. (Closed) Deviation 413/83-45-01, Failure to Comply with FSAR Commitments for Conducting the Thermal Expansion Test.

The licensee's corrective actions to resolve this deviation are stated in the licensee's January 20, 1984, response to NRC Region II for Inspection Report 50-413/83-45. In order to correct this problem, the licensee performed a complete retest of the ASME Code piping thermal expansion test during pre-critical heatup. The inspector reviewed the licensee's thermal expansion test procedure and reviewed the results of the completed thermal expansion test. The details of this inspection effort are discussed in paragraph 6 below. The licensee's corrective actions to resolve this problem were also previously reviewed during

RII inspections conducted on September 18-21, 1984, (Report Number 50-413/84-92) and on October 23-26, 1984, (Report Number 50-413/84-99). The licensee's corrective actions to resolve this problem have been completed. Deviation 413/83-45-01 is closed.

- b. (Closed) Violation Item 413/84-92-01, Failure to Perform Piping Vibration Testing in Accordance with Test Procedures. The licensee's actions to correct this violation are stated in the licensee's November 7, 1984 response to NRC Region II for Inspection Report 50-413/84-92. In order to correct this problem, the licensee committed to perform a complete retest of all piping systems prior to criticality with the exception of systems which were originally scheduled (per the FSAR and the test procedure) to be tested during power escalation and the spent fuel pool cooling and cleanup system. The fuel pool system will be tested after it is operable and prior to storage of any spent fuel in the fuel pool. The inspector reviewed the results of the completed steady-state piping system operation vibration measurements, and reviewed the results of the completed post transient piping surveys. Additional details of this inspection effort are discussed in paragraph 7, below. Violation Item 413/84-92-01 is closed.

#### 4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. New unresolved items identified during this inspection are discussed in paragraph 5.

#### 5. Independent Inspection Effort

- a. The inspector walked down the auxiliary building and made a cursory examination of hangers supporting portions of various safety-related piping systems. During examination of supports in the interior main steam doghouse, the inspector noted that the four concrete expansion anchors supporting hanger number 1-R-SV-1620 had failed and pulled out of the concrete. This hanger was mounted from the ceiling (roof) of the doghouse structure and had supported a six-inch diameter main steam vent to atmosphere line. The failure was most likely the result of water hammer which occurred during operation of the vent line. The licensee had not identified this problem prior to the inspection. Pending further investigation of the support failure by the licensee to determine its cause and corrective action, and further review by NRC to determine if the licensee's program should have identified the failed support prior to start up of the plant, this problem was identified to the licensee as Unresolved Item 413/84-105-01, Failure of Hanger Number 1-R-SV-1620 on Main Steam Vent to Atmosphere Line.
- b. The inspector reviewed Westinghouse procedure "Control Rod Drive Mechanism Heavy Drive Rod Assembly Breech Guide Screw Torque Test".

Within the areas inspected, no violations or deviations were identified.

## 6. Thermal Expansion Test (70370)

The inspector examined the thermal expansion test procedures and reviewed the completed thermal expansion test data. Acceptance criteria utilized by the inspector appear in FSAR Section 3.9.2.1.2 and FSAR Table 14.2.12.1.

### a. Review of Thermal Expansion Test Procedures

The inspector examined test procedure number TP/1/A/1150/08A, Thermal Expansion Testing of ASME Code Piping (Retest). This procedure covered testing of Duke Classes A, B, and C piping (ASME Classes 1, 2, and 3 piping, respectively) with the exception of the primary loop NSSS piping. The inspector verified test prerequisites were specified, test instructions and objectives were clearly stated, and acceptance criteria were specified. The test acceptance criteria required that snubbers not be within  $\frac{1}{2}$ -inch of either piston stop during the test, that spring load settings be within plus or minus ten percent of the values given on the as-built drawings, and that piping and components not contact any interferences which may restrict piping expansion.

The inspector also examined procedures which control thermal expansion testing of the primary loop piping. These procedures were as follows:

- (1) Specification Number CNS-1144.05-00-0016, Specification for Shimming of Major NSSS Equipment Supports and Reactor Coolant System - Thermal Exposure Monitoring.
- (2) Construction Procedure Number CP-813, NSSS Thermal Monitoring - Unit 1

### b. Review of Thermal Expansion Test Data

The inspector reviewed data documenting the results of thermal expansion testing conducted in accordance with procedure number TP/1/A/1150/03A. Test data reviewed were as follows:

- (1) Procedure Enclosure 13.1 (data sheets) which documents cold load setting of spring cans and snubbers of ambient temperature and hot load setting of spring cans and snubbers when reactor coolant system temperature was 557°F for systems NC (reactor coolant), NI (safety injection), CA (auxiliary feedwater), SA (main stream to auxiliary equipment), SM (main steam) and portions of system BB (steam generator blowdown).
- (2) Procedure Enclosure 13.1 (data sheets) which documents cold load setting of spring cans/snubbers at ambient temperature and hot load setting of spring cans/snubbers when reactor coolant system was 350°F for the ND (residual heat removal) system.

- (3) Procedure Enclosure 13.3 (data sheets) which documents snubbers and spring cans that had cold load setting (at ambient temperature) not meeting acceptance criteria and corrective action taken to resolve the problems.
- (4) Procedure Enclosure 13.3 (data sheets) which documents snubbers and spring cans that had hot load settings (when NC temperature was 557°F) not meeting acceptance criteria and corrective action taken to resolve the problem.
- (5) Work requests listed in the Table below. These work requests document corrective action taken to adjust various spring cans and snubbers which had settings that did not comply with the test acceptance criteria.

TABLE

<u>Work Request Number</u>	<u>NC System Temperature</u>	<u>Hanger Number</u>	<u>Support Type*</u>
WR 1121 MNT	Ambient	1-R-BB-1412	SC
WR 1122 MNT	Ambient	1-R-NI-2265	SC
WR 1126 MNT	Ambient	1-R-SM-1538	SC
		1-R-SM-1036	SC
WR 1430 MNT	557°F	1-R-NC-1003	SC
		1-R-NC-1535	SC
WR 1422 MNT	557°F	1-R-BB-1355	M
WR 1431 MNT	557°F	1-R-SM-1007	SC
WR 1432 MNT	557°F	1-R-SM-1616	SC
		1-R-SM-1554	SC
		1-R-SM-1036	SC
WR 1439 MNT	557°F	1-R-NC-1634	Constant

\*Support types      M - mechanical snubber and SC - spring can

c. Review of Primary Loop Thermal Expansion Data

Prior to this inspection, the resident inspector notified Region II that the primary loop piping had come in contact with the cross-over leg pipe whip restraints on Loops B and D during pre-critical heatup. Based on data obtained by the licensee during pre-critical heatup, the licensee estimated that the piping came in contact with the restraint when the temperature of the reactor coolant system reached approximately 465°F. The temperature of the reactor coolant system reaches 618°F at 100 percent power. The gap between the whip restraints and the piping is specified to be 0.13 inches at 618°F.

During the hot functional test which was performed in fall of 1983, the licensee monitored the thermal expansion of the reactor coolant system to determine the actual movement of the piping in order to demonstrate

that the actual thermal expansion values were approximately equal to the predicted analytical design movements within the system. Based on the data obtained during this test, the licensee's design engineers computed the cold gaps required between various restraints/supports and the primary loop piping and equipment to comply with original design requirements. The licensee's construction department calculated the thickness and size of the shims that needed to be added to various supports/restraints to obtain the specified cold gaps. The shims were fabricated and installed prior to pre-critical heat up.

During review of the original hot functional test data, the licensee noted discrepancies in actual versus predicted movements at the cross-over leg whip restraints for B and D loops. These movements were 0.15 inches less than predicted for B loop and 0.22 inches less than predicted for D loop. This resulted in smaller cold gaps being specified for these loops, and thus fabrication of thicker shims for these locations. After evaluation of the problem, the licensee has determined that its cause was probably due to small errors in measurements which were made during the 1983 hot functional tests. The inspector reviewed the licensee's evaluation and concurs with their conclusions. The inspector reviewed the test data collected during the 1983 hot functional test. These data are documented on data sheets (forms) attached to completed Construction Procedure CP 813. These data sheets included Form 813A, Thermal Monitoring Activity Log; Form 813 B, Temperature Measurements; Form 813 C, Gap Movement Data; and Form 813 D, Equipment Calibration Data.

In order to resolve the problem, licensee design engineers prepared a Nuclear Station Modification (NSM) package (number NSM 10501) which modifies the specified cold leg gap at the cross-over whip restraints. These revised gaps were based on measurements taken during cool down of the system. The inspector reviewed NSM 10501. The inspector will make a detailed review of the implementation of this modification, including the program to re-monitor thermal expansion of the NSSS primary loop piping and verify that implementation of the NSM has corrected the problem in a future inspection. This was identified to the licensee as Inspector Followup Item 413/84-105-02, Modifications to Cross-Over Leg Whip Restraint Shims.

Within the area inspected, no deviations or violations were identified.

#### 7. Piping Vibrations (Module 70370)

The inspector reviewed test procedures numbers TP/1/A/1200/21, Steady State Piping System Operation Vibration Measurement, and TP/1/A/1200/26, Post Transient Piping Survey. These procedures provide preoperational retest instructions for measuring piping vibrations during steady state and transient conditions. Acceptance criteria utilized by the inspector appear in FSAR Section 3.9.2.1.1 and FSAR Table 14.2.12-1. The inspector verified that test prerequisites and acceptance criteria were specified, and that test instructions and objectives were clearly stated.

The inspector reviewed the data sheets documenting steady state vibration retesting performed on the reactor coolant, safety injection, residual heat removal, containment spray, chemical and volume control, nuclear service water, main steam, auxiliary feedwater, and steam generator blowdown systems. The inspector also reviewed the data sheets documenting the results of post-transient piping survey conducted for re-performance of the transient piping vibration tests for the safety injection, residual heat removal, containment spray, nuclear service water, main steam, steam generator blowdown, auxiliary cooling and reactor coolant systems.

Review of the steady state data sheets disclosed that, when excessive vibration was identified, (i.e., when test acceptance criteria were not met) the data were submitted to design engineering for evaluation. Review of the post-transient survey data sheets that none of the piping or supports were damaged during transient testing.

Within the areas inspected, no deviations or violations were identified.

8. (Closed) IE Bulletin 80-11 - Masonry Wall Design

IE Bulletin (IEB) 80-11 was issued to Catawba and other construction sites for information only. This Bulletin was received and evaluated by the licensee in order to respond to an NRC Office of Nuclear Reactor Regulation information request which was transmitted to all licensees with plants under construction in a letter dated April 21, 1980. This information request asked for data on the design and construction of Category I masonry walls in plants under construction. NRR documented review of the licensee's response to this information request in paragraph 3.8.3 of the Safety Evaluation Report.

In order to preclude problems of the type addressed by IEB 80-11, the licensee designed all walls in the proximity of safety-related equipment to meet seismic design criteria. The walls were inspected by QA/QC inspectors to verify that they were constructed in accordance with details shown on the construction drawings. In addition, attachment of equipment to the masonry block wall was not permitted, except in a few cases where the loads were very light. These attachments were approved on a case-by-case basis.

The inspector reviewed drawing numbers CN 1201-4 and CN 1201-4.4, Concrete Block Wall Details, and procedure number M-11, Inspection of Concrete Masonry Wall Erection. The inspector walked down portions of the auxiliary building on elevations 537, 543, 554, 560, 574 and 594 and examined the masonry walls. The inspector verified that there were no attachments to the masonry walls, except for a few cases where small cabinets, 1-inch diameter electrical conduit, or lighting fixtures had been attached. IE Bulletin 80-11 is closed.

Within the areas inspected, no deviations or violations were identified.