



UNITED STATES  
 NUCLEAR REGULATORY COMMISSION  
 REGION II  
 101 MARIETTA STREET, N.W.  
 ATLANTA, GEORGIA 30303

Report Nos.: 50-390/83-48 and 50-391/83-37

Licensee: Tennessee Valley Authority  
 500A Chestnut Street  
 Chattanooga, TN 37401

Docket Nos.: 50-390 and 50-391

License Nos.: CrPR-91 and CPPR-92

Facility Name: Watts Bar 1 and 2

Inspection at Watts Bar site near Spring City, Tennessee

Inspectors:	<u>P. F. Anderson</u>	<u>12/15/83</u>
Jr	W. B. Swan, Senior Resident Inspector-Construction	Date Signed
	<u>P. F. Anderson</u>	<u>12/15/83</u>
Jr	W. E. Holland, Resident Inspector-Operations	Date Signed
Approved by:	<u>P. F. Anderson</u>	<u>12/15/83</u>
Jr	C. A. Julian, Section Chief	Date Signed
	Division of Project and Resident Programs	

SUMMARY

Inspection on October 24 - November 26, 1983

Areas Inspected

This routine, announced inspection involved 172 inspector-hours on site in the areas of Inspector Open Items; Independent Inspection Effort; Review of Licensee Identified Items; Soil Liquefaction Barrier Installation; Licensee Action on Previous Enforcement Items.

Results

Of the five areas inspected, no violations or deviations were identified.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*R. M. Pierce, OEDC Project Manager for Watts Bar
- \*G. Wadewitz, Construction Project Manager
- \*S. Johnson, Construction Quality Manager
- \*C. O. Christopher, Assistant Quality Manager-Construction
- \*H. J. Fischer, Construction Engineer
- \*T. Hayes, Nuclear Licensing Unit Supervisor
- \*R. T. McCollom, Instrument Engineer, Nuclear Power Compliance
- \*J. W. Coan, OEDC WB Project Engineer
- \*R. C. Miles, OEDC, Project Manager, Office for WB
- A. W. Rogers, OQA, Unit Supervisor

Other licensee employees contacted included 18 engineers, technicians, nuclear power supervisors and construction supervisors.

\*Attended exit interview

### 2. Exit Interview

The inspection scope and findings were summarized on November 23, 1983, with those persons indicated in paragraph 1 above.

### 3. Licensee Action on Previous Enforcement Matters

Not Inspected.

### 4. Unresolved Items

Unresolved items were not identified during this inspection.

### 5. Dams (Soil Liquefaction Barriers) Observation of Work (Procedure 45063B)

Two inspection tours were made by the senior resident inspector-construction of compaction of backfill clay, west and northwesterly of the intake pumping station (IPS). Backfilling and compaction is being supported by well points and sump pumps diverting ground water and storm water into the intake canal. The licensee stated at an exit meeting on November 23, 1983, that a decision on repairing or replacing the exposed 36" cased outflow line (which will be embedded in upper backfill) has not been reached. Backfill will soon reach the lower level of this piping.

No violations or deviations were identified in the soil compaction work.

6. Independent Inspection Effort (Module 92706)

- a. The resident inspectors made periodic routine surveillance tours of the power blocks of Units 1 and 2. The resident inspector (operations) followed pre-operational testing in Unit 1. No violations, deviations or unresolved items were identified during these surveillance inspections.
- b. The resident inspector (operations) reviewed corrective actions taken to the essential raw cooling water system with regards to replacing carbon steel piping in the system due to excessive corrosion. The review included verifying piping replacement with stainless steel piping and witnessing a hydro of one of the larger sections of the system. Within the area inspected, no violations or deviations were identified.

7. Preoperational Test Program Implementation (Module 71302)

The resident inspector conducted plant tours of Unit 1 and associated areas shared by both units. The inspections concentrated on fire hazards, pre-op activities in progress, equipment/instrumentation condition and cleanliness control. Within the areas inspected, no violations or deviations were identified.

8. Comparison of As-Built Plant to FSAR Description (Module 37301)

The inspector obtained as-constructed drawings of the following systems: chemical and volume control system, containment spray system, residual heat removal system, safety injection system and the upper head injection system. A walk-down of each system listed above is being conducted (only safety portion of chemical and volume control system) after confirming that the as-constructed drawings conform to FSAR commitments. Within the areas inspected at this time, no violations or deviations have been identified.

9. Followup on Licensee Identified Items (LII) (92700)

- a. (Closed) LII (CDR 390/81-10; CDR 391/81-09) Corrosion of Carbon Steel Piping in the Essential Raw Cooling Water System - WBRD-50-390/81-10; 391/81-09. NCRs WBN NEB 8017; 2849R; 3269R. On December 30, 1980, the licensee reported a quality problem in that the original criteria for the use of carbon steel piping in raw water systems at TVA nuclear plants may not be adequate. Corrosion has been found to cause greater than predicted pressure drops when pipes are sized according to standard industry practice. In addition, the corrosion can cause a thinning of the pipe wall which may not have been accounted for in the design of the systems.

The corrosion of carbon steel piping in the ERCW system could affect the capability to remove the specific heat load required of the system under the worst condition of two-unit operation. Failure to remove sufficient heat from the components served by the ERCW could result in

loss of equipment necessary for a safe shutdown and therefore could adversely affect safety of operations of the plant.

TVA has completed the reevaluation of the Watts Bar ERCW system in accordance with criteria stated in TVA's Division of Engineering Design (EN DES) Design Guide No. DG-M 3.5.1, "Pressure Drop Calculations for Raw Water Piping and Fittings," and found that changes must be made to ensure operability of the system over the plant life. These changes involve applying a cement mortar lining to the existing carbon steel yard piping, changing selected pipe segments within the buildings to stainless steel, and requalifying certain components for lower flows.

The licensee's corrective actions included issuing ECN 2756 which implemented a changeout of specified pipe segments in the system to stainless steel and provided a cement lining to other existing sections of carbon steel yard piping. The inspector reviewed the corrective actions implemented by ECN 2756 by: 1) Reviewing a random sampling of the affected drawings to ensure changes had been made, 2) Inspecting portions of the ERCW system, and 3) Witnessing hydrostatic testing of sections of the ERCW system that was modified (Test #1-067-47W845-2-2-01). The inspector also reviewed properational test results to insure that testing of the system from an operational point of view was conducted after the system was modified. All areas inspected appeared to provide adequate results.

These items are closed.

- b. (Closed) LII (CDR 390/81-17; CDR 391/81-16) Inadequate QA Requirement for HVAC Systems - WBRD-50-390/81-17; WBRD-50-391/81-16 Audit Deficiency WB-G-80-02; Audit Deficiency WB-M-81-03; NCR 2929R, NCR 2938R. Inadequacies in the quality assurance program and implementation in heating, ventilation and air conditioning systems (HVAC) were reported under 10 CFR 50.55(e) to NRC on January 24, 1980. WBNP Construction began a comprehensive review of the CONST QA program early in 1980, which identified the lack of adequate controls and acceptance criteria concerning activities related to HVAC systems. Site audit, WB-G-80-02, conducted from January 14 through February 1, 1980, formally identified this problem in deficiency No. 1 and recommended corrective action to initiate a quality control procedure to verify and document the fabrication of those duct systems under the quality assurance program.

CONST QAB Audit WB-M-81-03 was conducted by TVA from January 5 through 23, 1981. The scope of the audit included fabrication and installation of duct supports, procurement of HVAC components, HVAC piping classification, and HVAC duct classification. The audit identified several entire specialized HVAC systems and portions of other HVAC systems designated by design criteria WBN-DC-40.36.1, revision 0, as ANS safety Class 2b that did not specify adequate quality assurance requirements for ductwork, components, and piping.

NCR's 2929R and 2938R also identified conditions that did not meet the requirements for documentation and QA controls on HVAC systems. NCR No. 2929R identified the lack of a QA program to all HVAC ductwork installed prior to August 1, 1980. Ductwork requiring a Certificate of Compliance or Certified Material Test Report had been fabricated without proper QA controls. Safety-related HVAC Systems without proper QA controls included HVAC Chilled Water System 31, Electrical Board Room System, Main Control Room System, and Shutdown Board Room System.

During the follow-on work, the licensee identified related problems and gave additional 50.55(e) notices; so, starting in May 1981, initial reports have had the following heading:

WBRD-50-390/81-17  
 WBRD-50-391/81-16  
 WBRD-50-390/81-32  
 WBRD-50-391/81-31  
 WBRD-50-390/81-35  
 WBRD-50-391/81-34  
 WBRD-50-390/81-46  
 WBRD-50-391/81-45

More reportable items have been found by TVA and deficiencies have been identified during NRC inspections: A tabulation on March 10, 1983, resulted in the following listing:

	<u>UNIT 1</u> <u>50-390</u>	<u>UNIT 2</u> <u>50-391</u>	
CDR	81-17	81-16	
	81-24	81-23	Closed in report 82-32
	81-32	81-31	Closed in report 83-39
	81-35	81-34	
	81-46	81-45	
	81-61	81-57	Closed in report 83-05
	81-73	81-69	Closed in report 83-27
	82-11	82-11	Closed in report 83-42
	82-18	82-17	Closed in report 83-05
	82-45	82-42	
	82-108	82-102	Closed in report 83-15
LII	81-17-06	81-17-06	
VIOLATION	81-05-02	--	Closed in report 83-36
	81-26-04	81-24-03	Closed in report 83-39
UNRESOLVED	81-31-06	--	Closed in report 83-46
OPEN	82-39-01	82-36-01	

DEVIATION	82-20-01	--	Closed in report 83-44
	82-20-02	--	
IFI	82-20-03	82-20-03	
	82-39-03	--	

The licensee's responses and corrective actions have included additional audits; clearing deficiencies on prior audits; revision of quality control instructions (QCIs), QC procedures (QCPs), QC tests (QCTs); construction specification N3G-881; and production of an additional construction specification: N3M-914, Quality Assurance Requirements for Construction, Construction Testing, and Inspection of Safety-Related HVAC Systems.

On February 10, 1981, a NRC regional Confirmation of Action Letter (COA) was mailed to the licensee requiring information and action on the Watts Bar quality assurance program for HVAC Systems. This letter discussed TVA reports and frequently expressed concerns by the NRC resident inspectors and regional supervision. For closure, see reports 50-390/82-39 and 50-390/83-36. Violation 50-390, 391/81-05-02, Failure to Establish a HVAC Quality Assurance Program, closed in report 50-390/83-36, covered the same general area but on the basis of timeliness for establishment of a satisfactory program. The licensee's responses to this and other NRC-TVA discussions have involved to a degree all of the 50.55(e) notifications and other findings listed above.

The discussion below is confined to the impact on the specific subject CDR 50-390/81-17; CDR 50-391/81-16. Corrective actions taken:

Deficiency No. 1 of Audit WB-G-80-02 was closed 07/31/80.  
 Deficiency No. 5 of Audit WB-M-81-03 was closed 02/17/83.  
 Deficiency No. 6 of Audit WB-M-81-03 was closed 02/17/83.  
 NCR 2929 R3 was closed 03/15/83 with Deficiency No. 10 of  
 Audit WB-G-81-06.  
 NCR 2929 R1, R2, R3 was closed 10/06/82.

Quality Control Instruction WBNP-QCI-1.22, Transfer of Permanent Features to the Division of Nuclear Power, was revised 04/24/81; 04/12/82; 09/09/82; and 09/02/83. It superseded QCP-1.22, R7.

WBNP-QCI 1.40, Inspection and Test Documentation Accountability, was revised 02/22/82; 06/02/82; 10/05/82; 02/24/83; and 06/22/83.

WBNP-QCI 1.56, Work Packages, was revised 10/27/82, 02/23/83, and 04/07/83.

WBNP-QCI 4.34, Preparation of Segment and Test Boundary Maps, was revised 01/07/83 and 02/25/83.

Quality Control Test Procedure WBNP-QCT 4.35, Duct Cleaning, was issued 12/08/82; Addendum No. 1 was issued 01/31/83 and Addendum No. 2 on 02/09/83.

WBNP-QCT 4.39, Testing of HVAC Systems, was revised 08/05/82 and 01/13/83; Addenda 1 and 2 were issued 01/31/83 and Addendum No. 3 was issued 08/04/83.

WBNP-QCT 4.40, Balancing of HVAC Systems, was revised 07/30/83; Addendum No. 1 is dated 01/31/83.

Quality Control Procedure WBNP-QCP 4.10-21, Welding and Brazing Inspection Verification, was revised 07/10/82 and 05/26/83.

WBNP-QCP 4.24, Inspection of Non-ASME Code QA Piping, was cancelled and superseded by QCP 1.42-1, revised 12/22/81, 07/14/82, 10/01/82, 11/02/82, and 02/08/83; and QCP 4.10-2, revised 09/02/81 and 09/22/83.

WBNP-QCP 4.27, Inspection and Documentation of Ductwork, was revised 06/23/82; 01/10/83, 04/04/83 and 11/04/83.

WBNP-QCP 4.28, Piping Location Verification, was cancelled 04/09/82 and superseded by QCP-4.10-2, R4 03/04/83 and R5 09/22/83 which also superseded portions of QCP-4.24 and QCP-4.50 pertaining to pipe location verification.

WBNP-QCP 4.50, Location Verification of Category I(L) Piping, was revised 04/09/82.

Clearance of audit deficiencies, NCR's, and updating revision of procedures demonstrates a sustained effort to improve the quality assurance program for HVAC systems. Further improvements have been and will be pursued through other 50.55(e) CDR's and NRC initiated items.

This item is closed.

- c. (Closed) LII (CDR 390/81-14; CDR 391/81-13) Improperly Installed Support Anchors - WBRD-50-390/81-14; WBRD-50-391/81-13. The subject deficiency was reported to NRC on June 8, 1981, under NCR 3311R and covered improperly installed support anchors for Watts Bar Unit 2 reactor building. NCR 2789R had been written in January 1981, involving similar deficiencies on both Units 1 and 2. In Final Report dated March 14, 1983, TVA stated they had expanded the scope of concern to any support installation that used surface mounted plates and self-drilling expansion shell anchors (SSD); and that, after completing inspection and evaluation of approximately 2000 anchors, the licensee concluded that the extent of the problem was defined and that common installation deficiencies included:

- (1) Anchors that have been cut short. (NCR's 3311R, 2901R, 2789R).

- (2) Cut off bolts or improper length bolts which may result in insufficient thread engagement. (NCR's 3624R, 3311R, 2789R).
- (3) Anchors not set to the proper depth (a common but nonsignificant problem).
- (4) Oversized base plate holes (NCR's 3311R, 2789R).
- (5) Removal and relocation of conduit supports without Electrical Engineering Unit's (EEU's) approval (NCR 3311R, Unit 2 reactor building, conduit supports in annulus area only).
- (6) Anchors installed without proper pull test documentation (NCR 3409R).

Note - The listed NCRs have been completed and their closure verified by the senior resident inspector.

An inspection program was initiated in response to IE Bulletin 79-02 for testing anchors on safety-related pipe supports, but this program did not address other support installations that use surface-mounted plates and SSDs such as supports for cable trays, conduit, and HVAC ducting.

TVA's final report on IE Bulletin 79-02, Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts, for Unit 1 was issued August 26, 1983, and awaits review and evaluation by RII specialists.

IE Bulletin 79-14 required seismic analyses for as-built safety-related piping systems. A Final Report for Unit 1 on this bulletin was issued October 19, 1983. TVA also transmitted completed Special Engineering Procedure EN DES SEP 82-25 on November 2, 1983, for Unit 1.

The final report on the subject CDR's (390/81-14 and 391/81-13) detailed extensive corrective actions, procedural and craft. Final inspection and repair of cable tray supports was authorized by work package E 293A02, under which inspection and craft work were completed 4/28/83. The 100 percent reinspection for Unit 2 conduit supports inside the annulus area, and verification that actual support location agrees with the drawings, were covered by work package F 293A01, under which reinspection was completed 4/28/83 and craft work was completed 8/04/83.

Repeated sampling inspections of support anchors have been made since 1981, by RII specialists and resident inspectors. The senior resident inspector concluded a review of the licensee's reports and substantiating documents. The corrective actions and documentation were found to be adequate.

This item is closed.

- d. (Closed) LII (CDR 390/81-35; CDR 391/81-34) HVAC Noncompliances WBRD-50-390/81-35; WBRD-50-391/81-34; Audit WB-G-81-06, Deficiencies 2, 3, 6, 9 and 10; NCR's WBN NEB 8107 R1; WBN SWP 8120 and WBN SWP 8121.

The audit and NCR's identified these problems: TVA's classification for piping, ductwork and components could not be determined on numerous HVAC flow diagrams; inadequate QA criteria requirements on several HVAC systems, ANSI safety class 2b (this condition was also reported as Deficiency No. 1 on Audit WBN-M-81-03); lack of traceability for carbon steel piping in chilled water system; incomplete weekly welding surveillance check list for chilled water piping; uncontrolled documentation of test data for high velocity ducts; conflicting sections in Specification N3G-881 on QA classifications of HVAC components and systems; issuance of unchecked drawings or drawings for which design calculations had not been published; and conflict on safety-related classification of main steam valve room exhaust fan system.

Conditions reported under Audit WB-G-81-06 were corrected and closed as follows: deficiency 2 on 1/28/82; deficiency 3 on 12/18/81; deficiency 6 on 6/22/82; deficiency 9 on 6/22/82; and deficiency 10 on 5/6/81.

Deficiency No. 1 of Audit WBN-M-81-03 was corrected and closed on 12/31/81.

The subject NCR deficiencies were corrected and closed out as follows:

WBN NEB 8107 closed 2/17/83 and effectively closed by revision of N3G-881 on 12/29/82.

WBN SWP 8120 closed 9/9/81

WBN SWP 8121 not reportable, not adverse to quality per letter 4/27/81.

Design Input Memorandum (DIM) WB-DC-40.36.1 was issued to revise WB-DC-40.36.1 to include QA requirements for each component in each safety-related HVAC system, including QA requirements for purchasing grilles, terminals and balancing dampers and construction QA requirements for Seismic Category 1 and I(L) HVAC chilled water piping and ductwork.

Construction Specification N3M-914 R1 "Quality Assurance Requirements for Construction, Construction Testing, and Inspection of Safety-Related HVAC Systems" was issued on 2/28/83, to consolidate all HVAC construction QA requirements in one document. Revision 2, initiated by approved FCR M 7372 imposes requirements for cleaning, flushing and testing refrigerant systems.

The deficiencies cited in the cleaning documents have been reviewed by the senior resident inspector-construction. Construction Deficiencies have been corrected. The inspector concluded that adequate documents have been issued to obviate similar deficiencies at Watts Bar. The licensee's QA program for HVAC was approved by closure of Violation 50-390/81-05-02 and Violation 50-391/81-05-02, Failure to Establish a HVAC Quality Assurance Program, in Report 50-390/83-36.

This item is closed.

- e. (Closed) LII (CDR 390/81-45; CDR 391/81-44) Revisions to the Program Requirements Manual - WBRD-50-390/81-45; WBRD-50-391/81-04. On April 29, 1981, the licensee gave notice of a Program Requirements Manual deficiency under Audit Deficiency M 81-3. A Final Report dated May 29, 1981, stated that incorrect application of codes or standards could have led to inadequate quality. A review of the controlling documents revealed no case where this had happened. A complete review of the PRM manual was performed. NCR WBN QAB 8202 was used to investigate the potential deficiency, of which Block 18 required revision of the OEDC Program Requirements Manual and implementing engineering procedures to require OEDC to identify and document the generic implications of significant conditions adverse to quality.

TVA internal memorandum 830926451 dated September 26, 1983, reported that: "15QAI-1, paragraph 5.F.3.b, currently requires the responsible organization to: 'determine and document the root cause and generic implications of the (significant) CAQ.'

16QPR-1 further requires both EN DES and CONST to: 'refer NCRs to another organization if corrective action by them is required.'

It appears that the PRM adequately addresses the concern raised by the subject NCR and that no revision is required."

This item is closed.

- f. (Closed) LII (CDR 390/81-46; CDR 391/81-45) Inadequate QA Requirements for HVAC Systems - WBRD-50-390/81-46, WBRD-50-391/81-45; NCR 2938R3; NCR 3181R1

On April 29, 1981, the licensee gave notice of HVAC materials documentation deficiencies. This CDR constituted additional examples of HVAC quality assurance program deficiencies. It involved unidentifiable materials, fittings, components and piping. Because it was only a part of the HVAC QA program problem, the licensee's written reports of July 23, 1981 and October 29, 1981, were a combined response on Watts Bar Nuclear Plant Units 1 and 2 - HVAC Concerns - WBRD-50-390/81-17, WBRD-50-391/81-16, WBRD-50-391/81-16, WBRD-50-390/81-32, WBRD-50-391/81-31, WBRD-50-390/81-35, WBRD-50-391/81-34,

WBRD-50-390/81-46, and WBRD-50-391/81-45. This response detailed TVA's survey of warehouse records including an inventory of storeroom requisitions (TVA form 575) which led to TVA's determination that the materials used were carbon steel of correct sizes, schedule and acceptable quality. NCR 2938 R3 was closed on 10/6/82, on the engineering notation to "use as is".

NCR 3181 R1 was replaced by NCR 3181 R2 which was closed on 8/24/81 on the basis that only acceptable grades A106 and A53 had been issued. The inspector has reviewed the pertinent documentation and found it acceptable.

This item is closed.

- g. (Closed) LII (CDR 390/82-16; CDR 391/82-15) Resolution of Unanticipated Vibratory Loading Concerns; WBRD-50-390/82-16; WBRD-50-391/82-15. The concerns were reported to NRC on January 20, 1982, stemming from NCR W-30-P and NCR GEN CEB 8201 in that allowance had not been made in system design for continuous or extended periods of vibration, possibly leading to degradation and eventual failure of anchorages. A memo from Stanifer to Cottle dated May 3, 1982, stated that the condition described in NCR W-30-P is not a nonconforming condition. A generic concern was extended to all TVA plants under NCR GEN CEB 8201.

By Revised Final Report dated October 19, 1983, the licensee stated that, for Watts Bar:

"New requirements for assessing significance of piping vibration problems during preoperational testing were issued by a design input memorandum (DIM) DIM-WB-DC-40-31.16-1. This DIM provides conditions which identify line segments with potential long-term vibration problems as they relate to pipe supports, anchors, branch lines, and rotating equipment. These new requirements have been incorporated into test procedures/instructions.

The requirements include provisions for reporting, evaluating, taking corrective action, and long-term tracking. This action will prevent recurrence of this concern in the future."

The senior resident inspector concurred in this long term resolution because from extensive experience he has learned that system and component response to vibration varies and is unpredictable under changing magnitudes, amplitudes and pitches of vibrations.

This item is closed.

- h. (Closed) LII (CDR 390/82-44) Use of Incorrect Response Spectra in Gilbert/Commonwealth Piping Analysis - NCR WBN CEB 8207 - WBRD-50-390/82-44, WBRD-50-391/82-41. The subject deficiency was reported to NRC on April 26, 1982. The discrepancy was discovered during an analysis review. There was a possibility that safety-related piping and/or supports could have been stressed beyond design limits

and might have resulted in failure, creating a condition adverse to safe operation of the plant.

Corrective Action for Unit 1 (from licensee's report dated August 31, 1983) Piping analysis 0600200-09-05 was reanalyzed using the correct response spectra and anchor movements. All TVA Civil Engineering Support Branch (CEB) drawings associated with this discrepancy have been issued for Unit 1. Watts Bar Design Project (WBP) has completed all Unit 1 support drawing modifications, and it has been determined that no field hardware changes are required for Unit 1. To prevent recurrence, a section of the WBN rigorous analysis handbook which delineates the proper procedures for choosing the applicable response spectra and dynamic movement data has been issued to TVA designers.

The senior resident inspector - construction has reviewed documentation on this matter and found the licensee's response and corrective actions to be proper and adequate.

This item is closed for Unit 1.

- i. (Closed) LII (CDR 390/82-45; CDR 391/82-42) Incomplete Documentation of HVAC System Requirements - WBRD-50-390/82-45; WBRD-50-391/82-42; NCR WBNP SWP 8217

The licensee reported on April 27, 1982, that HVAC hardware for safety-related systems had been purchased without seismic requirements and with limited quality assurance requirements as allowed by Watts Bar Design Criteria WB-DC-40.36.1 under design input memorandum (DIM) WB-DC-40.36.1 dated February 4, 1981; however, the FSAR and Construction Specification N3G-881 were not revised to note the exceptions taken for seismic and QA requirements for the components. Also, TVA lacked the documentation to assure that seismic analysis of the components as required by DIM WB-DC-36.1-1 had been accomplished.

Corrective actions taken by the licensee have included:

- (1) Seismic analysis of the subject components resulting in determination that all are qualified to seismic Category 1 and, therefore, to Category I(L).
- (2) Determination that attachments of components to ductwork or other structures are structurally adequate.
- (3) Damper designs altered to assure that balancing damper blades will remain in set position.
- (4) By SRN-N3G-881, 1 through 5, Construction Specification N3G-881 has been revised. The latest revision (5) included issuance on 12/29/82, of a set of a six volume Quality Assurance List in which criteria for HVAC systems 30 and 31 are listed.

- (5) Design criteria, WB-DC-40-36.1 has been revised to include the limited seismic and QA requirements for these components.
- (6) EN DES procedures for verification of design and design performance and training of review personnel are in effect.
- (7) Construction specification N3M-914 R1 was issued 02/28/83 to add section 3.5 to provide instructions on QA requirements for construction, construction testing and inspection of primary safety function refrigerant piping.

NCR WBNP SWP 8217 was generated to initiate corrective actions. It was closed 12/16/82.

Pertinent revisions of the construction specifications were reviewed by the inspector. The NCR was reviewed and its closure verified.

This item is closed.

- j. (Closed) LII (CDR 390/82-83; CDR 391/82-79) Failure to Inspect Stud Welds On Flush-Mounted Embedded Plates - WBRD-50-390/82-83; WBRD-50-391/82-79. On August 12, 1982, the licensee gave notices that NCR WB-M-82-06 Deficiency 4 had identified a weld inspection failure in that, since the implementation of QCP 4.47 RO Equipment Installation on April 3, 1981, which superseded QCP 4.7, TVA had no program to ensure that equipment anchor bolts welded to embedment plates had been inspected. WBNP QCP 4.07-1 was revised to include inspection of welded equipment stud anchors during initial equipment setting and specify weld inspection hold points. NCR 4329R was initiated to determine the scope of the problem and determine the root cause. In most cases, equipment was already installed and connected to systems. Disposition under this NCR was to accept welded anchor studs based on a successful torque test. NCR 4329R was closed July 17, 1983. Torque testing of each accessible stud was performed under NCR 4491R per General Construction Specification G-53 to verify acceptability. The Construction Project Manager certified on July 20, 1983, that all construction activities for closure were completed. The senior resident inspector - construction obtained and reviewed the documentation on corrective actions under the NCRs and found the actions and documentation adequate to demonstrate clearance of the deficiency by the licensee.

This item is closed.

- k. (Closed) LII (CDR 390/83-11; CDR 391/83-10) Fillet Welds Replacing Concrete Anchors on Pipe Supports - WBRD-50-390/83-11, WBRD-50-391/83-10. On March 2, 1983, the licensee reported a design deficiency as NCR WBN SWP 8273. During an independent review of the auxiliary feedwater system performed by Black and Veatch and subsequent investigation by TVA's Division of Engineering Design (EN DES), it was discovered that on several pipe supports, the use of fillet welds to

replace concrete anchors was permitted per General Note 3 on TVA drawing 47A050-1T. In accordance with General Note 3, TVA's Division of Construction (CONST) could substitute a 2-inch long, 5/16-inch fillet weld for each concrete anchor where supports attach to existing embedded plates. After investigation, it was discovered that the service load capacity of 1-1/4-inch diameter wedge bolts and anchors with equal or greater capacity exceeds the capacity of a 2-inch long, 5/16-inch fillet weld allowed by General Note 3.

The licensee's Final Report dated September 6, 1983, stated that in response to the Black and Veatch finding TVA identified 10 systems in which there were 22 supports for Unit 1 and nine supports for Unit 2 designed with 1-1/4-inch and larger diameter wedge bolts or 1-inch and larger diameter grouted anchors. An inspection of all identified supports was conducted, and it was found that of the 22 supports for Unit 1, the substitution of welds for anchor bolts was made on five supports. A review of the detailed calculations for these supports determined that the installation of all five supports is adequate. None of the nine identified Unit 2 supports were installed. TVA has completed an evaluation of all typical supports and general notes and has found no similar deviations of this type. There is no other note of this type in the typical drawing series.

To alleviate this condition and prevent recurrence, TVA has stopped the use of the note for bolts 1-inch and larger in diameter, and has revised drawing 47A050-1T. The revised drawing has been issued under engineering change notice (ENC) 3988. Also, TVA Construction Specification N3C-928 was issued on February 10, 1983. This specification provides requirements for locating attachments on embedded plates and will require a detailed review of connections of this nature.

Corrected documents were issued. No physical change was required. This item is closed.

1. (Closed) LII (CDR 390/83-44; CDR 391/83-44) Cable Bend Radius Deficiencies Due to Non-Standard Fittings - WBRD-50-390/83-44; WBRD-50-391/83-44. This deficiency was reported to NRC on July 20, 1983. It was initiated by NCR WBN 4933. During inspection of cables in Level V cable tray systems, TVA found violations of specified minimum bend radius at intersections of cable trays with non-standard fittings, at intersections of cable trays using hinge-type joints, and at points of conduit terminations at cable trays. Twenty-five violations were listed in the NCR. TVA informed the cable manufacturers of the facts and sought evaluations. The manufacturers responded with relaxed minimum bend radii specifications. Disposition of the NCR was to rework cables to achieve the relaxed bend radii.

The rework required no revision to EN DES drawings. Field rework involved clipping cable ties in cable trays and repositioning conduits at cable trays to provide the cable slack necessary to meet the minimum

cable bend radius. Rework was completed and NCR 4933 was closed September 30, 1983.

To prevent recurrence of violation of bend radius specifications, the craft were instructed to comply with requirements of General Construction Specification G-38 or receive specific relaxation values from EN DES prior to cable installation.

The senior resident inspector has reviewed the documentation and received concurrence from RII electrical engineers on acceptance of the licensee's corrective actions.

This item is closed.

- m. (Closed) LII (CDR 390/83-57; CDR 391/83-53) Support for Test Lines by Alternate Analysis - WBRD-50-390/83-57 and WBRD-50-391/83-53. The licensee on September 19, 1983, gave notice under NCR WBN WBP-8324 of a potential quality assurance deficiency in that:

"The test lines for each of the 10 containment purge air penetrations were supported from the steel containment vessels using TVA 47A051 series typical hanger drawings which qualify the tubing in accordance with the SBN alternate analysis criteria CEB 75-9 for seismic loading. This criteria, however, does not account for loadings created by a design basis accident (DBA)."

In Final Report dated November 17, 1983, TVA stated:

"After reviewing the flow diagram for this system (47W866-1), we have determined that a nonconforming condition does not exist. The root valves (which isolate the process piping from the test piping) on the test lines, where the test lines are connected to the penetrations, are clearly shown closed. Also, the class change occurs at the root valve; therefore, the test lines do not require pressure boundary integrity and the supports for the test lines need not be qualified for a DBA. The present support scheme ensures position retention and meets all requirements for TVA class G piping. Since the present support scheme meets all requirements, there are no conditions adverse to safety, and we no longer consider 10 CFR 50.55(e) applicable."

The resident inspector concurs in this resolution. This item is closed.

- n. (Closed) LII (Open Item 390/81-17-06; and 50-391/81-17-06) HVAC-QC Audit WB-G-81-06, Deficiency 10 - NCR 3181 R1, R2; NCR 2929 R1, R2

On March 27, 1981, the licensee notified Region II of a 10 CFR 50.55(e) item concerning deficiency 10 of QA audit WB-G-81-06 in the area of HVAC. Deficiency 10 involved the failure to have a proper QA program in place for testing of safety related HVAC systems.

"In a review of test results documented on operation sheets and test data sheets for 'SMACNA High Velocity Duct' it was discovered that the operation sheets and data sheets used to document the test were not considered QA documents and were not controlled. Also, test instruments were not calibrated, the table referenced in G-37, page 4, for Pressure Tap Locating, and the formula for calculating air flow does not agree with "ASHRAE" handbook for HVAC systems."

For corrective actions, the licensee:

- (1) Revised Construction Specification G-37 (SRN-G-37-1) to include testing per ANSI N-509 and ANSI N-410 and incorporated it in testing procedure WBNP-QCT-4.39 Testing of HVAC Systems.
- (2) WBNP-QCT-4.39, R1 was issued 8/5/82 and R2 was issued 1/13/83. Addendum 3 was added 08/04/83. A typical work package for a segment test has been reviewed by the NRC inspector.
- (3) NCR 2929R, R1 and R2 was generated to cover previous duct tests/checks. It was closed 3/15/83.
- (4) NCR 3181, R2 was closed 8/24/81.
- (5) Design Input Memorandum (DIM) WB-DC-40-36.1 was issued to revise WB-DC-40.36.1 to include QA requirements for each component in each safety related HVAC system, including QA requirements for purchasing grilles, terminals and balancing dampers and construction QA requirements for Seismic Category 1 and I(L) HVAC chilled water piping and ducting.

From review of documents and observation of a test and test documentation preparation, the inspector has concluded that the cited deficiencies have been corrected.

This item is closed.

#### 10. Licensee Action on Previous Inspection Findings

- a. (Open) IFI (390/83-18-10) Main System Followup on Monitor Physical Deficiencies and Questionable Areas. This item remains open. The number was used by error in Report 50-390/83-46, paragraph 3.a which should have shown: (Open) IFI 390/83-18-01.
- b. (Closed) Open Item (390/82-39-01; 391/82-36-01) Alternate Acceptance Criteria Used for Inspection and Testing of Previously Installed HVAC Systems. At the time this item was initiated approximately 95 percent of safety-related ductwork had been installed and many of the HVAC systems had been fabricated and installed in Unit 1. Many quality achieving functions and QC checks that should have been specified for the fabrication and installation process were not completed or were partially completed without formal documentation. This open item

provided for NRC review for adequacy of alternate acceptance criteria to be developed by TVA to verify the adequacy of the previously installed systems and components.

In response to Confirmation of Action Letter (COA) dated February 10, 1981; to Violations 390/81-05-02, 391/81-05-02; and 390/81-26-04, 391/81-24-03; to 50.55(e) reports by the licensee; and other items opened by NRC inspectors, the licensee improved the HVAC quality assurance program by generation of new procedures, revision of other procedures, and five revisions to construction specification N3C-881 including the publication of a six volume Quality Assurance List in which requirements for HVAC systems 30 and 31 are detailed.

Construction specification N3M-914 R1 summarizes construction quality assurance requirements for HVAC systems. Revision 2, initiated by approved FCR M 7372, imposes cleaning, flushing and testing of refrigerant systems.

Quality Control Procedure QCP-4.27, Inspection and Documentation of Ductwork, was revised five times up to November 4, 1983, and Quality Control Test Procedure QCT 4.39, Testing of HVAC Systems was revised August 5, 1982, and again on January 13, 1983, as part of the corrective action.

In addition to revision of controlling documents, the licensee performed extensive inspection and testing of the previously installed HVAC hardware. These qualifying actions are detailed in TVA memorandum WBP '83 1006 111, Standifer to Wadewitz, dated October 6, 1983, and titled WBNP - Alternate Acceptance Criteria for HVAC Ductwork - NCR 2929R - NRC Item 390/82-39-01 and 391/82-36-01. (NCR 2929 R2 was closed March 15, 1983). The actions and results detailed in the memo appear to the senior resident inspector to have been effective and adequate. The inspector has concluded that alternate criteria and procedures developed and the inspection and testing actions taken by the licensee have provided for adequate inspection and certification of HVAC system facilities installed prior to COA on February 10, 1981 and subsequently.

This item is closed.