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

Report Nos.: 50-390/86-02 and 50-391/86-02

Licensee: Tennessee Valley Authority
6N11 B Missionary Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-390 and 50-391 License Nos.: CPPR-91 and CPPR-92

Facility Name: Watts Bar 1 and 2

Inspection Conducted: January 21, to February 21, 1986

Inspectors: RL Carroll Jr for 3/18/86
M. B. Shymlock Date Signed

RL Carroll Jr for 3/18/86
W. E. Holland Date Signed

RL Carroll Jr for 3/18/86
C. W. Caldwell Date Signed

Approved by: SP Weise 3/18/86
S. P. Weise, Section Chief Date Signed
Division of Reactor Projects

SUMMARY

Scope: This routine inspection entailed 410 resident inspector-hours onsite and at the Office of Engineering (OE) in Knoxville in the areas of licensee action on previous enforcement items, fire prevention and fire protection, preoperational test program implementation verification, testing of pipe support and restraint systems, and QA program - design changes and modifications.

Results: Two violations were identified in this inspection report.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

W. R. Brown, OEDC Project Manager for Watts Bar
W. T. Cottle, Site Director
*E. R. Ennis, Plant Manager
R. H. Ector, Assistant Site Director
G. Wadewitz, Construction Project Manager
*B. S. Willis, Operations and Engineering Superintendent
H. B. Bounds, Maintenance Superintendent
D. W. Wilson, Design Services Manager
J. E. Gibbs, Site Services Manager
R. Norman Jr., Operations Supervisor
T. L. Howard, Quality Engineering Supervisor
*R. C. Miles, Modifications Manager
R. D. Greer, Electrical Maintenance Supervisor
C. D. Nelson, Special Projects Manager
M. K. Jones, Engineering Group Supervisor
R. A. Beck, Health Physics Supervisor
*R. T. McCollom, Acting Instrument Maintenance Supervisor
*J. A. McDonald, Plant Compliance Supervisor
R. R. Garu, Preoperational Test Supervisor
*R. D. Tolley, Project Manager, Design Services
T. W. Hayes, Nuclear Licensing Unit Supervisor
L. C. Miller, Head, Plant Quality Engineering and Control Group
A. J. Everitt, Welding Engineer, OC
*L. E. Ottinger, Plant Compliance Staff, Nuclear Engineer
C. A. Borelli, Plant Compliance Staff, Nuclear Engineer
*R. E. Yarbrough Jr., Assistant Operations Supervisor
R. E. Bradley, Assistant Operations Supervisor
M. J. Burzynski, Regulatory Engineering Supervisor
J. E. Lee, Assistant Supervisor, Instrument Maintenance
*G. R. Owens, Nuclear Engineer, Nuclear Licensing Section
T. R. Brown, Asst. Construction Engineer - Construction
*J. S. Williams, Mechanical Engineer, OE-CEB
*J. K. Hannifin, Mechanical Project Engineer, OE-MEB
*M. E. Reeves, Project Engineer, PMO-WBN
*D. F. Bailey, Supervisor, Support Services
*R. L. Heatherly, Drawing Unit Supervisor, Support Services
*L. E. Wallace, QA Engineer, WBN PQA
*G. W. Curtis, Project Engineer, WBN-PMO
*W. C. Ludwig, Nuclear Engineer, NLB
*P. J. Wilson, Nuclear Licensing Unit, OC
*W. S. Delk, Acting Supervisor, WBN Engineering
*W. E. Trout, QA Engineer, QMS

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

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on February 28, 1986, with those persons indicated by an asterisk in paragraph one above. Additional discussions were held with OE management during telephone conversations held on March 5, 1986. Two violations were identified during this inspection period. One violation was identified with two examples of failure to follow procedure during performance of work by construction personnel (paragraph 3) and modifications personnel (paragraph 3); and two examples of inadequate procedure were identified with regards to preparation of a work plan by modifications personnel (paragraph 3) and engineering review of vendor supplied seismic documentation (paragraph 7). One violation was identified with regards to design control of classification of the safety-related portion of the control air system (paragraph 7). Three unresolved items were identified during this inspection period. One unresolved item concerns inspector review of licensee evaluation of a vendor seismic qualification test plan (paragraph 7), one unresolved item concerns Quality Management Staff (QMS) timely review of a condition adverse to quality (paragraph 7), and one unresolved item concerns review of documentation relating to a stop work order of generic engineering change notices (paragraph 7). In addition, three inspector followup items were identified. One followup item was identified in reference to inspector reviews of personnel training in reconfiguration of equipment and denoting of special precautions when preparing work plans (paragraph 3). One followup item was identified with regards to inspector reviews of the Civil Engineering Branch (CEB) program for handling of documentation and audit capabilities of Nuclear Steam Supply System (NSSS) equipment (paragraph 7). One inspector followup item was identified with regards to followup of concerns identified during an inspection of QMS audit reports (paragraph 7).

The licensee acknowledged the inspection findings with no dissenting comments. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection. At no time during the inspection period did the inspectors provide written material to the licensee.

3. Licensee Action on Previous Enforcement Matters (92702)

(Closed) URI (390/85-53-02; 391/85-43-02), Apparent ASCO Solenoid Mounting Problems. The subject item was identified in inspection report 390/85-53; 391/85-43. The mounting problems were identified on a tour when the inspector noted that three ASCO solenoid valves for the Safety Injection System near the Boron Injection Tank were not mounted flush with their hangers which could potentially jeopardize their seismic qualification. In addition, several of the valves had loose and/or missing nuts on the mounting screws.

Since the original identification of these deficiencies, the inspector has continued with a review of applicable engineering change notices (ECN), Work Plans (WP), and other associated documentation. In addition, the inspector has held discussions with the licensee to determine the details of the ASCO solenoid mounting problem. The results of these efforts are detailed in the following paragraphs. These solenoids are environmentally qualified equipment per NUREG 0588 (10CFR 50.49) requirements. The licensee identified that the environmental qualification of the subject valves was violated during a 1984 changeout.

The inspector determined that the original valves were installed between 1980 and 1981, and were supported per the 47A051, "Mechanical Category 1 Support Instrument Sensing Lines," series typical mounting drawings. Additional notes for these solenoids and other instrumentation are included on drawing 47W600-0-4, "Electrical Instruments and Controls." During installation, there was some modification of the valves required to mount the solenoid to the support. The craft personnel removed the solenoid valves' bonnet screws on one end and replaced the bonnet screws with all thread rods. The all thread rod was in turn used to mount the solenoid to the support. However, since reconfiguration of the valve was necessary, craft personnel should have identified this to the cognizant engineer and a variance or a field change request (FCR) should have been issued to identify this discrepancy to the Office of Engineering (OE) in accordance with Quality Control Instruction (QCI)-1.28, Rev. 0, "Preparation and Documentation of Seismic Support Variance" or QCI-1.13, Rev. 2, "Preparation and Documentation of Field Change Requests." Failure to follow procedures by construction personnel is a violation (390; 391/86-02-01).

The solenoids were reconfigured from their original design in order to mount them to the support. Due to a lack of mounting details, craft personnel devised a method for installation using the all thread rod. Since this configuration change was not handled in accordance with procedure, Office of Engineering personnel were not notified of changes made and a seismic analysis of this mounting method was never performed by the Civil Engineering Branch (CEB) as required by Engineering Procedure (EP)-3.02, Rev. 2, "Seismic Design, Review and Control." Thus, the seismic qualification of these valves was degraded during the original installation.

In August, 1984, nonconforming condition (NCR) NEB8128 was issued to identify that these ASCO solenoids lacked adequate documentation to prove that the valves met NUREG 0588 requirements. Since the documentation available did not satisfy the applicable requirements, the licensee issued NCR MEB8115 in September, 1984, to identify valves that needed to be replaced with qualified equipment. In October, 1984, ECN 5122 was issued for Unit 1 (ECN 5123 for Unit 2) by the Office of Engineering to change out the existing series 8316-54 solenoids and replace them with qualified equipment. This ECN package contained an ECN data sheet prepared by the OE Electrical section personnel. An ECN data sheet gives a list of drawings that require revision due to the scope of the work outlined in the ECN. The

ECN and the ECN data sheet which contained selected 47B601, "Electrical Instrument Tabs," series drawings were then sent to the site and work plan (WP) 4890 was prepared to give detailed instructions of the work required by the ECN. Both the ECN and the WP specified that their purpose was to replace existing solenoids with environmentally qualified equipment.

WP 4890 was prepared and reviewed in November, 1984, by nuclear power modifications personnel. This WP included the ECN and the ECN data sheet. In addition, the WP preparer included additional drawings to aid craft personnel marked "for information only." These drawings included selected electrical instrumentation and controls and mechanical layout drawings. Neither the ECN nor the WP included any mounting drawings (including vendor drawings) for these solenoids since it was assumed, by the preparers, that their replacement was a one-for-one changeout and no reconfiguration would be required. Due to the nature of the ECN and WP programs, the burden of responsibility is placed on the site cognizant engineer to gather all necessary information required for craft personnel to adequately perform work and include this information in the WP. Examples of this information includes vendor drawings and vendor manuals. The cognizant engineer can obtain the vendor manuals by cross reference with the contract number which is available on various drawings. These manuals are generally available on-site. In this case, the cognizant engineer did not obtain the vendor manuals or drawings. However, the vendor drawings were required since they provided details of the solenoid valve configuration (including mounting brackets) to ensure that the environmental qualification is maintained. The method by which the vendor mounted the solenoid was also the method used during performance of the seismic qualification test.

During performance of the work, craft personnel reconfigured the valves by removing the brackets and the bonnet screws. The screws were then replaced with all thread rod. The valves were reinstalled using the all thread rod, as in the original installation, since the craft believed that this was the approved mounting method. However, the WP had no instructions for disassembly and reassembly of the solenoids. The vendor documents include specific disassembly and assemby details including torque specifications and tightening patterns for the bonnet bolts. These details are to assure that the environmental qualification of the valve is maintained. The WP was inadequate in that it did not include all required information for proper installation of the 8316-54 series solenoids. In addition, the WP did not contain any precautions against disassembly or reconfiguration of these valves as required per Administrative Instruction (AI) 8.5, Rev. 12, "Control of Modification Work on Transferred Systems Before Unit Licensing." Failure to establish an adequate procedure (WP-4890) is a further example of violation 390, 391/86-02-01.

Review of the WP indicated that the cognizant engineer attempted to maintain control over component reconfiguration since the WP did have some specific requirements with regards to the mounting methods. Step 4 in the WP states: "the mounting brackets shall be modified as needed to insure proper installation of the valves per direction of the cognizant engineer. Cognizant Engineer shall obtain FCRs (field change requests) as needed for

mounting bracket changes." Step 6 stated "Cognizant engineer shall verify that each solenoid valve is installed correctly and sign below." Although the WP specifically identified that the craft personnel should notify the cognizant engineer of any modifications to the valve mounting brackets, the modifications personnel failed to follow the instructions by not notifying the cognizant engineer of the valve reconfigurations that were made. This failure to follow procedure is a further example of violation 390, 391/86-02-01.

The cognizant engineer's review of installation included a satisfactory completion of the functional test, a wiring check, and an installation check which were completed by WP 4891. However, without vendor documentation on these valves, the cognizant engineer verified that they were installed to the original "all thread" mounting configuration that in fact, was incorrect. Thus the new valves were installed with their seismic qualification in question. During discussions on this matter, the inspector noted that the craft personnel are trained not to reconfigure equipment. However, in this case, the craft personnel did reconfigure the NUREG 0588 solenoids since they assumed that the original mounting configuration was proper and that these valves could be changed as necessary to meet that original configuration. The inspector considers that the training program needs additional review with regards to interpretation of reconfiguration of vendor supplied equipment. This is necessary, since equipment that is qualified as a unit (e.g. with mounting brackets) cannot be changed without proper approval or the qualifications will be voided. In addition, the procedural requirements for denoting of precautions will be further reviewed to ensure that the cognizant engineers and reviewers are aware of the significance of denoting precautions in the WP when dealing with qualified equipment. Review of personnel training in reconfiguration and special requirements is identified as inspector followup item (390, 391/86-02-02).

The inspectors identified the apparent mounting deficiencies of the ASCO solenoids to the licensee, and they issued NCR 6298, Rev. 0, in September, 1985, to initiate an investigation of this mounting method. NCR 6566 was later issued to initiate a review of these mounting deficiencies for Unit 2. In addition, these NCRs were evaluated for reportability in accordance with 10CFR 50.55(e) and construction deficiency reports (CDRs) 390/85-52; 391/86-14, "Improperly Installed Solenoid Valves" were issued. Since initial identification of this problem, the licensee has found a total of 8 of these improperly mounted solenoids in Unit 1 and 32 in Unit 2. Shortly after this NCR was generated, a first revision was issued to identify that the solenoids were partially disassembled in order to install them. In addition, a second revision to this NCR was issued to indicate that a generic evaluation was performed with regards to instrumentation mounting methods and it was determined that there are no mounting details for some locally mounted instruments. The licensee is in the process of sketching the mountings of these instruments for OE to evaluate and approve. The inspectors acknowledged the licensee's generic review of instrumentation

mounting methods but noted that a generic review of all equipment may be necessary. The inspectors spent several days at OE in Knoxville reviewing the licensee's program for handling seismically qualified equipment. This inspection effort is detailed in paragraph 7.

Within the areas inspected, one violation was identified.

4. Fire Prevention and Fire Protection - Unit 2 (42051)

During plant tours, the inspectors conducted observations of fire prevention and protection activities in areas containing combustible materials where ignition of these materials could damage safety-related structures, systems or components. The observations included verification that applicable requirements of Administrative Instruction (AI) 9.9 (Torch Cutting, Welding, and Open Flame Work Permit), Standard Practice WB 12.6 (Fire Brigade Instructor's Guide and Fire Brigade Handbook), AI 1.8 (Plant Housekeeping) and WBNP Quality Control Instruction (QCI) 1.36 (Storage and Housekeeping) were being implemented with regards to fire prevention and protection.

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

5. Preoperational Test Program Implementation Verification - Unit 1 (71302)

The inspectors conducted routine tours of the facility to make an independent assessment of equipment conditions, plant conditions, security, and adherence to regulatory requirements. The tours included a general observation of plant areas to determine if fire hazards existed, observation of other activities in progress (e.g., maintenance, preoperational testing, etc.) to determine if they were being conducted in accordance with approved procedures. Also, observation of other activities which could damage installed equipment or instrumentation. The tours also included evaluation of system cleanliness controls and a review of logs maintained by test groups to identify problems that may be appropriate for additional followup.

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

6. Testing of Pipe Support and Restraint Systems - Unit 1 (70370C)

The inspector toured areas of the Unit 1 auxiliary building and reactor building. Numerous snubbers and restraints were observed. Visual examinations were conducted to check for deterioration and physical damage of mechanical snubbers. Visual examinations were also conducted to check for proper installation of base support plates, fasteners, locknuts, brackets, and clamps of fixed pipe supports.

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

7. QA Program - Design Changes and Modifications (35744)

a. During this inspection period, the inspectors conducted a review of the Office of Engineering (OE) design control process with regards to seismic qualification of safety-related structures, systems and components. This review focused on current programmatic controls as well as past practices and control. OE revised all procedures governing performance of their work and issued a new procedures manual containing Office of Engineering Procedures (OEPs) effective June 28, 1985. The main function of the OEPs is to control the quality of OE drawings, specifications, and reports. The inspectors reviewed the appliciable OEPs and also reviewed the procedures that were used prior to issuance of the OEPs. Some of the OEPs reviewed were:

- OEP-06, Design Input
- OEP-07, Calculations
- OEP-08, Design Output
- OEP-10, Review
- OEP-11, Change Control
- OEP-17, Corrective Action

Other procedures reviewed that were in use prior to issuance of the OEPs were:

- EN DES-EP 3.01; Design Criteria Documents - Preparation, Review, and Approval
- EN DES-EP 3.02; Seismic Design, Review, and Control
- EN DES-EP 4.02; Engineering Change Notices (ECNs) Before Licensing - Handling
- EN DES-EP 4.04; Squadcheck Process
- SWP-EP 43.05; Engineering Change Notice Procedure

After the inspectors reviewed the procedures and completed general discussions with OE management, the inspection was continued in the specific branches of OE.

Mechanical Engineering Branch (MEB) Inspection - The inspectors conducted a review of the MEB program which was used to assure that seismic qualification of structures, systems, and components was being maintained during the timeframe from issuance of the construction permit for Watts Bar to the present. A general discussion was held with the supervision of the Watts Bar design project MEB staff. Based

on the discussions, the inspector determined that the seismic qualification of safety-related systems was the responsibility of the Civil Engineering Branch (CEB) from the fall of 1973 to the present. The inspector concluded that MEB and CEB have had a close working relationship which has minimized the possibility for omission of the proper seismic reviews of engineering changes to safety-related structures or components under MEB control.

The inspector then identified ten systems for review to MEB supervision. The systems reviewed were system 1, main steam (MS); system 3, auxiliary feedwater (AFW); system 30, auxiliary building gas treatment (ABGTS); system 65, emergency gas treatment (EGTS); system 67, essential raw cooling water (ERCW); system 70, component cooling water (CCW); system 72, containment spray (CS); system 74, residual heat removal (RHR); system 78, spent fuel pit cooling and cleaning (SFPCC); and system 82, diesel generator (DG). The inspector then reviewed selected revisions on the mechanical piping drawings for the systems identified above as follows:

- 47W400-1, "MECHANICAL MAIN STEAM PIPING"
  Revisions 2, 3, 4, 5, and 6

  - Revision 2 was accomplished by Engineering Change Notice (ECN) 1125.
  - Revision 3 was accomplished by ECN S1.
  - Revision 4 was accomplished by ECN 1267.
  - Revision 5 was accomplished by ECN S1.
  - Revision 6 was accomplished by ECN S1.

- 47W427-2, "MECHANICAL AUXILIARY FEEDWATER PIPING"
  Revisions 5, 6, 7, 8, and 9

  - Revision 5 was accomplished by ECN S1.
  - Revision 6 was accomplished by ECNs 2955 and 3195.
  - Revision 7 was accomplished by ECN 3212.
  - Revision 8 was accomplished by ECNs 3198 and S1 (Field Change Requests (FCRs) M-6891 and M-6923).
  - Revision 9 was accomplished by ECNs 3100 and 3721.

- 47W920-23, "MECHANICAL HEATING, VENTILATING AND AIR CONDITIONING"
  Revisions 20, 21, and 22

  - Revision 20 was accomplished by ECN S1 (FCR M-5889).
  - Revision 21 was accomplished by ECNs 2860 and S1 (FCRs M-6158, M-6154, M-6153, and M6176).
  - Revision 22 was accomplished by ECN S1 (FCRs M-6249, M-6199, and M-6279).

- 47W920-24, "MECHANICAL HEATING, VENTILATING AND AIR CONDITIONING" Revision 36

  - Revision 36 was accomplished by ECN S1 (FCR MH-2906).

- 47W450-1, "MECHANICAL ESSENTIAL RAW COOLING WATER" Revisions 13, 14, and 15

  - Revision 13 was accomplished by ECNs 2756 and S1 (FCR M-6240).
  - Revision 14 was accomplished by ECN 2756.
  - Revision 15 was accomplished by ECN S1 (FCR M-6765).

- 47W464-1, "MECHANICAL COMPONENT COOLING SYSTEM" Revisions 5, 6, and 7

  - Revision 5 was accomplished by ECN S1 (FCR M-2871).
  - Revision 6 was accomplished by ECN 1765.
  - Revision 7 was accomplished by ECNs 1799 and S1 (FCRs M-3139 and M-3119).

- 47W432-1, "MECHANICAL CONTAINMENT SPRAY SYSTEM PIPING" Revision 11

  - Revision 11 was accomplished by ECN 2096.

- 47W432-1, "MECHANICAL RESIDUAL HEAT REMOVAL SYSTEM PIPING" Revisions 6, 7, 8, and 9

  - Revision 6 was accomplished by ECN S1.
  - Revision 7 was accomplished by ECN S1.
  - Revision 8 was accomplished by ECN 1361.
  - Revision 9 was accomplished by ECN S1.

- 47W454-3, "MECHANICAL FUEL POOL COOLING AND CLEANING SYSTEM" Revision 18

  - Revision 18 was accomplished by ECNs 3317 and S1 (FCRs H-6055, A195 and A195 Rev. 1).

- 17W586-2, "MECHANICAL EXPOSED OIL, AIR, WATER, AND MISC. PIPING" Revision 11

  - Revision 11 was accomplished by ECNs 2259 and S1 (FCR M-3759).

Each of the preceding revisions were issued to implement a change. The inspectors reviewed the associated documentation with the cognizant OE system engineer or section chief to determine if appropriate consideration was given to seismic analysis for each change. During the review, the inspectors found that many changes were made to drawings using an

ECN S1. This type of change was included in procedure EP-4.02 to allow for drawing revisions without the need for preparing and processing an ECN. However, this process of drawing changes did not provide for documentation of the review process as is available when a formal ECN is processed. This concern is addressed later in this report.

In order to further verify that seismic analysis was being conducted when required, the inspectors selected five additional system configurations and identified these "as constructed" configurations to the licensee. The configurations identified from the 47W800 series as-constructed flow diagrams were as follows:

- 47W803-1, "FLOW DIAGRAM - FEEDWATER"
  Revision 34

  - 16" main feedwater (MF) piping from steam generator #2 nozzle to the north valve room wall where the class "B" boundary ends.

- 47W803-2, "FLOW DIAGRAM - AUXILIARY FEEDWATER"
  Revision 26

  - Auxiliary feedwater (AFW) mini-flow recirculation piping from the breakdown orifice at each pump (1A-A, 1B-B, 1AS) to the control/auxiliary building wall.

- 47W809-1, "FLOW DIAGRAM - CHEMICAL AND VOLUME CONTROL SYSTEM"
  Revision 26

  - Chemical and volume control (CVCS) piping from the volume control tank discharge connection to centrifugal charging pumps 1A-A and 1B-B suction connection.

- 47W810-1, "FLOW DIAGRAM - RESIDUAL HEAT REMOVAL SYSTEM"
  Revision 22.

  - Piping from FCV 74-21 through residual heat removal (RHR) pump B and RHR heat exchanger B to FCV 74-28.

- 47W848-1, "CONTROL AIR SYSTEM FLOW DIAGRAM"
  Revision 13

- 47W848-10, "ELECTRICAL FLOW DIAGRAM - CONTROL AIR"
  Revision 22

  - Piping from air receiver A-A to system 3 and system 65 flow control valves.

The licensee furnished the inspectors copies of the isometric drawings which were used in the performance of the static, thermal, and seismic analyses of these sections of the MF, CVCS, and RHR systems. The inspectors reviewed these drawings and concluded that seismic analysis was being incorporated to asssure that these "as constructed" plant systems were seismically qualified. The inspectors also reviewed the isometric drawings and alternate analysis calculation packages for the selected section of the AFW system and no discrepancies were identified.

The inspectors were informed that the selected portion of the control air system was installed using the 47A054 typical drawings and that no analysis package was required for this installation. During the review of control air system flow diagram, 47W848-1, the inspector observed that the portion of the system upstream of the A-A air receiver is identified as TVA class "G". Final safety analysis report (FSAR), section 3.2.2.6, states that "components that are used in Seismic Category I structures ... not required to function during an accident ... have been assigned TVA classification G or K." The inspector determined that TVA class "G" is designed to Seismic Category I(L) which only requires the components to retain limited structural integrity. The inspector questioned this classification based on the statement in FSAR section 9.3.2, which identifies the following: "The auxiliary control air system is located entirely within Category I structures and is designed to Category I seismic requirements." The inspector then determined that the portion of the control air system in question was reclassified from TVA class "C" (safety-related) to TVA class "G" (not safety-related) by ECN 3189 dated November 23, 1981. The FSAR section 3.2.2 states that fluid system components for the Watts Bar Plant that perform a safety-related function are identified by TVA Classes A, B, C, or D. These piping classes are assigned to fluid systems based on the ANS Safety Classes 1, 2a, 2b, and 3, respectively. The TVA Classes A, B, C, and D are controlled by the requirements of the ASME Code Section III unless noted otherwise. Due to the inspector's concerns, the licensee provided additional documentation on the control air system.

The licensee furnished the inspectors with documentation to demonstrate that the equipment was qualified to perform its safety-related function. The inspector reviewed this information and determined that the air compressors and the air receiver tanks did receive an engineering evaluation to qualify the components seismically. However, the documentation provided included Attachment C to WBNP quality control instruction (QCI)-1.08, "Request to Invalidate, Supplement, or Delete QA Records." This attachment deleted the process control operation sheets from QA records for the portion of the system in question. Based on additional discussions with the licensee, inspectors concluded that downgrading of that portion of the control

air system from TVA class "C" to TVA class "G" removed any requirements for maintaining QA control of that portion with the exception of supports. The inspectors discussed this conclusion with the licensee and was provided a copy of Watts Bar OE design criteria procedure (WB-DC-40-36), "Classification of Piping, Pumps, Valves, and Vessels," which was used to provide guidance to the designers and engineers when ECN 3189 was prepared and issued. The inspector reviewed the procedure and determined that the TVA classification system did not provide for those systems or components which were safety-related and did not meet the requirements of ASME Section III. The inspectors discussed this issue with the licensee's project engineering management during a telephone conversation on March 5, 1986. The results of this discussion was that a design control problem has existed with regards to classification of safety-related systems or components which do not fall under the requirements of ASME Section III. Failure to establish measures to assure that applicable regulatory requirements and design bases, as specified in the licensing application, for safety-related systems and components are correctly translated into drawings, procedures, and instructions is a violation (390; 391/86-02-03).

Electrical Engineering Branch (EEB) Inspection - The inspectors conducted a review of the EEB program which was used to assure that seismic qualification of structures, systems, and components was being maintained during the time frame from issuance of the construction permit for Watts Bar to the present. Discussions were held with appropriate EEB supervision and specific topics of discussion were identified. The inspectors specifically requested the applicable documentation necessary to prove that the appropriate seismic considerations and analyses were given for equipment upon changeout by ECN, FCR, etc., and that the appropriate CEB reviews of vendor seismic qualification documentation was performed.

The inspectors selected random revisions to control diagrams for review to determine if the proper seismic considerations were given when drawing updates were performed. The diagram revisions selected were:

- 47W610-3-3, "Electrical Control Diagram Auxiliary Feedwater System" Revisions 1,2, and 3.
    - Revision 1 was accomplished by ECN S1
    - Revision 2 was accomplished by ECNs 1438 and 1504
    - Revision 3 was accomplished by ECN 1572
- 47W610-30-2, "Electrical Control Diagram Containment Ventilation System" Revisions 1,2,3,4, and 7.
    - Revision 1 was accomplished by ECN S1
    - Revision 2 was accomplished by ECN S1
    - Revision 3 was accomplished by ECN S1 and ECN 1331
    - Revision 4 was accomplished by ECN S1 and ECN 1429
    - Revision 7 was accomplished by ECN S1

- 47W610-32-1, "Electrical Control Diagram Control Air System" Revisions 1, and 2.

  - Revision 1 was accomplished by ECN S1
  - Revision 2 was accomplished by ECN S1 and ECN 1284

- 47W610-54-1, "Electrical Control Diagram Injection Water System" Revisions 1, and 5.

  - Revision 1 was accomplished by ECN S1
  - Revision 5 was accomplished by ECN S1 (FCR FS 228 Rev. 3)

- 47W610-62-1, "Electrical Control Diagram Chemical and Volume Control System" Revisions 1 and 2.

  - Revision 1 was accomplished by ECN 1679
  - Revision 2 was accomplished by ECN S1 (FCRs I-434 and I-450)

- 47W610-63-1, "Electrical Control Diagram Safety Injection System" Revisions 1, and 2.

  - Revision 1 was accomplished by ECN S1
  - Revision 2 was accomplished by ECN S1

- 47W610-63-2, "Electrical Control Diagram Safety Injection System" Revisions 1 and 4.

  - Revision 1 was accomplished by ECN S1.
  - Revision 4 was accomplished by ECN 1411.

- 47W610-68-1, "Electrical Control Diagram Reactor Coolant System" Revision 1.

  - Revision 1 was accomplished by ECN S1.

- 47W610-68-3, "Electrical Control Diagram Reactor Coolant System" Revisions 1, 3, and 5.

  - Revision 1 was accomplished by ECN S1.
  - Revision 3 was accomplished by ECN 1301.
  - Revision 5 was accomplished by ECN S1 (FCR I-185).

- 47W610-72-1, "Electrical Control Diagram Containment Spray System" Revisions 1, 2, 3, and 4.

  - Revision 1 was accomplished by ECN S1 (FCR M-202).
  - Revision 2 was accomplished by ECN S1.
  - Revision 3 was accomplished by ECN S1.
  - Revision 4 was accomplished by ECNs 1259, 1326, and S1.

- 47W610-74-1, "Electrical Control Diagram RHR System" Revisions 1, 2, and 3.

  - Revision 1 was accomplished by ECNs S1, 1011 and 1012.
  - Revision 2 was accomplished by ECNs S1, 1195 and 1105.
  - Revision 3 was accomplished by ECN S1.

Each of the preceding revisions, including associated documentation, was reviewed by the inspectors to determine if appropriate consideration was given to seismic analysis for each change. During the review the inspectors noted that many changes were being made to drawings using an ECN S1 as described previously. This type of change does not provide for documentation of the review process as is available when a formal ECN is processed. This concern is further addressed later in this report.

The inspectors also selected several components from various systems to determine if seismic qualifications were performed by the vendor or the licensee and if the Civil Engineering Branch (CEB) has performed the proper reviews of seismic qualification information supplied by the vendor. CEB review of this information, to assure technical adequacy, was required in the past by procedure EP 3.02 and currently by CEB Discipline Interface Instruction (DI)-121.03. The components selected were as follows:

- Target Rock reactor vessel head vent valves
- Tobar Reactor Coolant System wide range pressure transmitters
- ITT Barton Main Steam System pressure transmitters
- Hydrogen igniters in the Permanent Hydrogen Mitigation System
- 480-Volt Delta 208/120-Volt WYE Regulating Transformers in the onsite distribution system
- York Electro Panel CRT Consoles for control room operations
- ASCO Solenoids in various plant systems
- 480-Volt Shutdown Switchgear
- General Electric 6900-Volt Switchgear in the Additional Diesel Generator Building
- Brown Boveri 6900-Volt Air Interrupter Switchboards in the Diesel Generator Building
- Reactor Vessel Level System Instrumentation
- Nutherm International Inc. Diesel Generator Relay Boards

- 480-Volt Diesel Auxiliary Boards

The inspectors reviewed the information supplied by the licensee and found that the seismic qualification test reports were available for all of the equipment. CEB did review this vendor supplied documentation except for the following equipment:

- The Target Rock reactor vessel head vent valves,
- Tobar Reactor Coolant System wide range pressure transmitters,
- ITT Barton Main Steam System pressure transmitters
- Reactor Vessel Level System Instrumentation
- 480-Volt Shutdown Switchgear

As a result of these documentation reviews, the inspectors had several concerns with regards to licensee interface reviews of seismic qualification test reports and handling of NSSS supplied equipment.

b. During this inspection the following areas of concern were identified by the inspectors:

- Interface Control - As noted in previous paragraphs, there was some inconsistency with regards to reviews by the CEB. CEB is ultimately responsible for reviews of vendor documentation as required by procedure EP-3.02. Since issuance of the OEPs in July 1985, CEB-DI 121.03, which replaced EP-3.02, gave ultimate responsibility for these reviews to CEB. Both of these procedures state that after the contract is awarded, the requisitioning branch determines which seismic qualification procedures and test/analysis reports received from the vendor are reviewed by CEB. These reports are then submitted to CEB. However, a note in the procedure states that when less than the complete set of documentation is submitted to CEB for review, the requisitioning branch writes the guidelines for allocating review responsibility to CEB, the requisitioning branch, and others. Thus, these procedures allowed for other branches to perform followup reviews of vendor documentation. This policy was also allowed by a September 5, 1974 letter from F. W. Chandler, Chief, EEB to R. G. Domer, Chief, CEB, which stated the following: "(EEB) has the responsibility for approving or disapproving all its vendor test reports, including seismic."

  In the case of the 480 volt switchgear, CEB review of vendor seismic qualification documentation was not performed. The 480-Volt Shutdown Switchgear was not reviewed by CEB but, was instead reviewed by EEB. Due to the established policy, CEB also did not review the seismic documentation for the additional

480-Volt switchgear (panels 11 and 12) that were added in 1983. Discussions with various EEB section personnel revealed that some were not aware of the September 5, 1974 policy letter and that they have routinely submitted documentation for CEB review in accordancee with the requirements of procedure EP-3.02. This was evidenced by the fact that seismic documentation for other switchgear such as the General Electric 6900-Volt Switchgear in the Additional Diesel Generator Building and the Brown Boveri 6900-Volt Air Interrupter Switchboards in the Diesel Generator Building had been reviewed by CEB.

The inspectors reviewed procedures EP-3.02 and CEB-DI 121.03 to determine what requirements had been established for review and approval of this vendor supplied seismic qualification documentation. During this review, the inspectors found that there are no guidelines established for the requisitioning branch to determine how to allocate review responsibility and that the only procedural requirements given on how to perform vendor documentation reviews were those associated with CEB. No procedural requirements or guidelines were established for EEB. CEB documents, in accordance with OE QA Standards, the results of its review of all specifications and test reports used to qualify the seismic Category I and I(L) systems and equipment. Since there were no procedural requirements delineated for EEB, there is no documentation available to demonstrate that the vendor seismic qualification documentation for the 480-Volt shutdown switchgear was reviewed and found acceptable. This failure to establish guidelines for allocating review responsibilities and assigning requirements for EEB when performing reviews of vendor seismic qualification documentation is identified as a further example of violation 390; 391/86-02-01.

In addition to the deficiency noted with regards to EEB review of vendor supplied seismic documentation, the inspectors found that no documentation existed to prove that the Westinghouse seismic qualification test plan for the additional 480-Volt switchgear panels was approved in the procurement phase for this equipment. The inspector will hold further discussions with the licensee to determine if the test plan was reviewed by CEB. This item is identified as unresolved item (390; 391/86-02-04).

In the case of the Target Rock reactor vessel head vent valves, Tobar Reactor Coolant System wide range pressure transmitters, ITT Barton Main Steam System pressure transmitters, and the Reactor Vessel Level System Instrumentation, the inspectors found that this equipment is all Westinghouse Nuclear Steam Supply System (NSSS) supplied. Although the seismic qualification documentation was provided to OE, it was not reviewed by CEB. The licensee responded to the lack of CEB review by stating that the NSSS

contract does not require CEB review of Westinghouse's seismic reports or calculations. However, CEB has the right to audit or request a review of Westinghouse's calculations. The inspector held discussions with the licensee to evaluate the controls for review of NSSS seismic documentation and the process for auditing of the NSSS seismic qualification program. The results of these discussions are detailed below.

- Review and Audits of NSSS seismic documentation. The inspectors found that CEB does not review seismic qualification of NSSS supplied equipment as mentioned in the preceeding paragraph. The inspectors found that neither EP-3.02 nor CEB-DI-121.03 provide any guidance with regards to handling of NSSS documentation. No provisions exist for acceptance of seismic documentation without CEB review nor any mention of the auditing ability of CEB. In addition, the inspectors asked if the documentation for this equipment has ever been audited. The licensee stated that there have been audits of NSSS documentation in the past, but that there is no formalized program for audits and thus no documentation of auditing of this equipment. The inspector will further review the handling of NSSS documentation and associated audits. This review is identified as inspector followup item (390; 391/86-02-05).

- Engineering Drawing Changes Made By ECN S1. During the engineering branch reviews, the inspectors found that many changes were being made to drawings without documentation (i.e., S1 changes were being made to drawings without preparing and processing an ECN). The licensee explained that this process was used for those changes specifically allowed by EN DES-EP 4.02, paragraph 4.6.2; however, they also stated that ECN S1 changes may have been misused. Licensee supervision in both the MEB and EEB groups stated that this concern had been identified by the Office of Quality Assurance (OQA) in 1982. OQA began a study of the ECN S1 issue in December, 1982 and completed the study in May, 1983. During that study, an OQA audit identified a deficiency which cited the Watts Bar Design Project Electrical Group for misuse of ECN S1. This deficiency was evaluated by the OE Nuclear Engineering Branch (NEB) for reportability and determined to be not reportable. After completion of the OQA study in May, 1983, discussions were held between OQA and OE management. As a result, OQA issued a stop work order for all plants on the use of ECN S1s to accomplish drawing changes. While the stop work was in effect, OE took specific corrective actions at both the division and project levels to rectify the situation. Based on the accomplishment of corrective actions associated with each plant, OQA lifted the stop work for Watts Bar on July 12, 1983. The inspectors contacted the OE quality management staff (QMS) and obtained a listing of documents relating to issuance of the stop work order, corrective actions taken during the stop work, and lifting of the stop work order for Watts Bar. This concern will remain

unresolved pending further review of these documents by the inspector (390; 391/86-02-06).

- During this evaluation of design changes and modifications, a review was performed of audits conducted by the Office of Engineering Quality Management Staff (QMS). This effort entailed a cursory review of materials included in several QMS audits. The audit reports reviewed were the following:

  - Audit 85-03, Civil Engineering Branch Engineering and Design Activities, conducted November 15 - 28, 1984

  - Audit 85-04, Watts Bar Engineering Project Design Activities, conducted December 10 - 18, 1984

    Audit 85-05, Electrical Engineering Branch, conducted January 14 - February 7, 1985

    Audit 85-07, Civil Engineering Branch Pipe Analysis and Pipe Support Design Activities, conducted February 20 - March 1, 1985

    Audit 85-09, Mechanical Engineering Branch Facilities Support and Services Group, conducted April 3 - 4, 1985

    Audit 85-13, Watts Bar Engineering Project Mechanical Design Project, conducted July 1 - 3, 1985

    Audit 85-26, Watts Bar Engineering Project Electrical Design Project, conducted July 22 - 24, 1985

    Audit 86-06, Electical Engineering Branch Staff, conducted November 12 - 18, 1985

    Audit 86-10, 86-11, Watts Bar Engineering Project Analysis, Support, and Civil Design Project, conducted December 9 - 13, 1985.

  As a result of the review performed on these audits, several concerns were noted as follows:

  (a) The audit plan listed the 10 CFR 50 Appendix B criteria to be audited in each audit; however, the audit checklist that was prepared as a guideline for performance of each audit and the final audit report could not be correlated to the actual 10 CFR 50, Appendix B criteria. (Example: Each audit plan for the audits reviewed by the inspectors stated that criterion III was being audited; however, the audit packages inspected did not provide information to conclude that criterion III was in fact reviewed.)

(b) Specific activies and/or areas audited cannot be determined from the completed audit checklist questions (Example: Do new holders of Design Criteria Manual have current Design Criteria documents?). One cannot determine how many control documents there were nor how many were actually reviewed during this audit effort to determine the adequacy of the document control program.

(c) Discussion with QMS management and staff indicated that Condition Adverse to Quality reports and/or trending data that may relate to upcoming audits are not reviewed and used as input to these audit plans.

The inspector considers that further review of how QMS actually monitors, or performs these activities is necessary to resolve these concerns. This item is identified as inspector followup item (390; 391/86-02-07).

The inspector reviewed QMS's program for handling deficiencies identified during audits. Per procedure QMS-T-65.04 the Audit Team Leader is required, during the exit meeting, to present deficiency evaluations. He also advises the audited organization that deficiencies are to be evaluated in accordance with OEP-17. It may take greater than 30 days for the audit report to be transmitted to the audited organization. Then they have 30 days to review the deficiency and determine proper corrective action.

During review of some corrective actions, the inspectors found that the problems identified in current 10 CFR 50.55(e) construction deficiency reports, (50-390/86-17; 50-391/86-13), had been noted earlier. The current reports identified a lack of adequate calculations to document electrical systems designs bases. This problem was first identified in OQA Audit Report D51-A-84-0006, dated August 1, 1984. The inspector will review additional documentation provided by the licensee with regards to how QMS evaluated this deficiency. Followup of this issue is identified as an unresolved item (390; 391/86-02-08).

In the areas inspected, one violation was identified. In addition, a further example of the violation in paragraph 3 was identified.