UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-390/95-15 and 50-391/95-15

Applicant: Tennessee Valley Authority
6N 38A Lookout 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 Nuclear Plant Units 1 and 2

Inspection Conducted: February 27 through March 10, 1995

Inspector: N. Merriweather 4/4/95
N. Merriweather, Reactor Inspector (Lead) Date Signed

Other Inspectors: A. Dummer, Reactor Systems Engineer, NRR
C. Gratton, Reactor Systems Engineer, NRR
C. Smith, Reactor Inspector, RII
M. Thomas, Reactor Inspector, RII
H. Walker, Senior Reactor System Engineer, NRR

Consultants: H. Oak, Nuclear Safety Engineer, INEL
A. Udy, Engineering Specialist, INEL

Accompanying Personnel: G. Hubbard, Chief
Balance of Plant Section, NRR

Approved by: for P. E. Fredrickson, Chief 4/5/95
TVA Construction Branch Date Signed
Division of Reactor Projects

SUMMARY

Scope:

This special, announced inspection was conducted to review and assess the applicant's implementation of the electrical and mechanical environmental qualification (EQ) special programs at Watts Bar Nuclear Plant. The auditable scope was primarily limited to those systems that had been identified by the applicant as being qualification status complete. The scope of this inspection included evaluating the applicant's EQ Program documentation (e.g., EQ/MEQ binders, environmental drawings, EQ Master Lists, and etc.), EQ design change control activities, EQ procurement activities, EQ maintenance activities, EQ training, QA/EQ interfaces, and the insitu configuration of EQ components installed in the plant.

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Results:

The team concluded that both the electrical and mechanical EQ programs were being implemented in accordance with program controls and procedures, that completed EQ documentation files were adequate, that QA Assessments had been effective in identifying problems with the EQ Program implementation, and that those identified EQ problems were being adequately addressed by the applicant's corrective action programs. However, the scope of the audit was limited by the number of EQ systems that had been completed. Further inspection will be required to determine if the EQ Program is satisfactorily completed at Watts Bar.

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

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# REPORT DETAILS

## 1.0 PERSONS CONTACTED

Applicant Employees

*R. Baron, Acting Nuclear Assurance and Licensing Manager
*R. Brown, Licensing Engineer
*W. Clothier, Nuclear Materials Manager
*J. Childers, Instrumentation and Controls Senior Engineer
*W. Elliot, Engineering Manager
*H. Ferguson, Principal Engineer
*D. Goforth, EQ Engineer
*M. Lalor, EQ Project Manager
*D. Kehoe, Site Quality Manager
*D. Malone, Quality Engineering Manager
*P. Metcalf, EQ Section Supervisor
*P. Pace, Compliance Licensing Manager
*J. Norris, QA CAP/SP Manager
*L. Robinson, QA Specialist
*J. Rubert, Acting Engineering and Materials Manager
*J. Scalice, Vice President Site Operations
*B. Schofield, Site Licensing Manager
*J. Symonds, Construction Completion Manager
*W. Thompson, Training Manager
*O. Zeringue, Senior Vice President Nuclear Operations

Other TVA - Watts Bar employees contacted during this inspection included engineers, craftsmen, and administrative personnel.

Applicant Contractors

*P. Dibenedetto, EQ Consultant, Dibenedetto Associates, Incorporated

NRC Personnel

*P. Fredrickson, Chief, TVA Construction Branch
*F. Hebdon, Director, Project Directorate II-4, NRR
*J. Jaudon, Deputy Director, TVA Construction
J. Lara, Resident Inspector, Construction
*M. Peranich, Senior Project Manager
*G. Walton, Senior Resident Inspector, Construction

*Attended exit interview on March 10, 1995

Acronyms and initialisms used throughout this report are listed in the last paragraph.

## 2.0 INTRODUCTION

The mechanical and electrical equipment used to perform a necessary safety function must be demonstrated capable of maintaining functional operability under all service conditions postulated to occur during its installed life and for the time it is required to operate in response to any postulated accident conditions. This requirement, embodied in General Design Criteria (GDC) 1, 2, 4, and 23 of Appendix A and Sections III and XI of Appendix B to 10 CFR 50, applies to equipment located inside and outside containment. More detailed requirements and guidance relating to the methods and procedures for demonstrating this capability are included in 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important-to-Safety for Nuclear Power Plants," and NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment." Regulatory Guide 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," and NUREG-0588 endorse IEEE Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," providing supplemental information pertinent to the qualification of electrical equipment. IEEE Standard 383-1974, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations," is a daughter standard of IEEE Standard 323-1974. Regulatory Guide 1.131, "Qualification Tests of Electric Cables, Field Splices, and Connections for Light-Water-Cooled Nuclear Power Plants," endorses the use of IEEE Standard 383-1974 for the qualification of cables.

Although there are no detailed requirements for mechanical equipment, GDC 1, "Quality Standards and Records," and 4, "Environmental and Dynamic Effects Design Bases," and Appendix B to 10 CFR 50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," Sections III, "Design Control," and XVII, "Quality Assurance Records," contain the following requirements related to equipment qualification:

- Components shall be designed to be compatible with the postulated environmental conditions, including those associated with LOCAs.
- Measures shall be established for the selection and review for suitability of application of materials, parts and equipment that are essential to safety-related functions.
- Design control measures shall be established for verifying the adequacy of design.
- Equipment qualification records shall be maintained and shall include the results of tests and material analyses.

This special, announced inspection was conducted to review and assess the applicant's implementation of the electrical and mechanical environmental qualification (EQ) special programs at Watts Bar Nuclear (WBN) Plant Unit 1. The inspection team included NRC staff and

contractors from the Idaho National Engineering Laboratory (INEL). This inspection primarily focused on those five EQ systems listed in Table 1. Based on the applicant's EQ Progress Report dated January 27, 1995, these systems were scheduled to have the system pre-operability checklist (SPOC) completed prior to the inspection. At that time, the 50.49 Lists, EQ baseline activities, and qualification maintenance instruction (QMI) activities were expected to be completed and up to date, or any exceptions would be punchlisted. However, at the time of the inspection only those 4 systems designated by an asterisk (*) had actually undergone SPOC review.

TABLE 1

| SYSTEM | DESCRIPTION |
|---|---|
| *83 | Hydrogen Recombiner |
| *72 | Containment Spray |
| *81 | Primary Water Makeup |
| 63 | Safety Injection |
| *74 | Residual Heat Removal |

The inspection included reviews of 28 binders of equipment qualification documentation (17 electrical equipment and 11 cables). It also included physical walkdowns of 32 devices and 24 associated cables. The components inspected consisted of two level transmitters, two temperature elements, one hand switch, two solenoid valves, three position switches, two conduit seals assemblies, two junction boxes, one terminal block, one containment penetration, one hydrogen recombiner, four ventilation system drive motors, three pump motors, four motor-operated valve motors, and four temperature switches. The results of these inspections are discussed in the paragraphs below.

## 3.0 ELECTRICAL EQ PROGRAM (2512/036)

The EQ Program was evaluated in several functional areas to determine the status of the environmental qualification of safety-related electrical equipment. The scope of the inspection included evaluating the applicant's EQ Master Lists, EQ binders, EQ design change control activities, EQ procurement activities, EQ maintenance activities, EQ training, QA/EQ interfaces, and the insitu configuration of EQ components installed in various areas of WBN Unit 1. The results of these reviews are as follows.

### 3.1 Equipment Qualification Master List (Equipment and Cable)

The Code of Federal Regulation (10 CFR 50.49) requires that a list be prepared for electric equipment important to safety located in harsh environments and that qualification files (i.e., Environmental Qualification Binders at Watts Bar) be established. The list and the

qualification files are to be auditable, kept current and retained for the entire period for which the covered item is installed in the nuclear power plant or is stored for future use. This requirement is to ensure that each item of electric equipment important to safety meets the requirements specified in 10 CFR 50.49.

WBN maintains two lists of qualified equipment, one for electrical components, the other for cables. The lists, "1E Electrical Equipment Requiring Environmental Qualification Under 10 CFR 50.49," Volumes 1-3, are controlled documents with Revision 5, dated December 22, 1994, being the most recent revision available for this inspection. Volume 1 contains electrical equipment important to safety, Volumes 2 and 3 contain the associated cables for these systems. Components and cables contained in these volumes are categorized by system. Qualification information about electrical splices for all systems are contained in a generic section (System 510) in Volume 1. At the time of the inspection, 16 systems in the component qualification list and 29 systems in the cable qualification list were complete and available for review.

In a previous inspection conducted December 12-16, 1994, the NRC performed a programmatic review of Watts Bar procedures. During this review, Watts Bar procedures providing the format and content requirements for the EQ lists were examined to verify program acceptability, adequate program auditability, controls, and maintenance for the environmental qualification of equipment in accordance with 10 CFR 50.49 and GDC 4 of Appendix A. The EQ lists were not reviewed for their completeness or technical accuracy during that inspection.

To determine whether the lists were complete and accurate, 75 safety-related components located in harsh environments were selected from three Emergency Operating Instructions (EOIs) (See Table 2), system flow diagrams (See Table 3), and environmental drawings. The components were compared with the Watts Bar EQ list to verify its completeness and accuracy. No discrepancies were found.

Table 2

| Procedure No. | Name | Effective Date |
|---|---|---|
| EOI-E-0, 0.1 | Reactor Trip or Safety Injection | 2/17/95 |
| EOI-E-1 | Loss of Reactor or Secondary Coolant | 2/17/95 |
| EOI-E-3 | S/G Tube Rupture | 2/17/95 |

Table 3

| Drawing No. | Name | Effective Date |
|---|---|---|
| 1-47W810-1 R13 | Residual Heat Removal | 2/6/95 |
| 1-47W812-1 R12 | Containment Spray | 2/8/95 |
| 1-47W811-1 R19 | Safety Injection System | 2/14/95 |

Various components required by Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants To Assess Plant and Environs Conditions During and Following an Accident," were also selected from Watts Bar Procedure WB-DC-30-7, "Post Accident Monitoring Instrumentation," and Calculation No. WBPEVAR8809048, "PAM Instrumentation Evaluation and Verification Methodology, Standards and Guidelines," and verified to be on the EQ list. No discrepancies were found during this review.

Walkdowns were conducted of two safety-related systems (Residual Heat Removal and Containment Spray) and Steam Generator Room #2. The purposes of the walkdowns were to verify that the EQ list matched the installed configuration of the components in these systems and spaces, and to obtain cable and conduit numbers of EQ components for verification of the EQ cable list. Cables identified during the walkthrough were verified to be on the EQ cable list. No discrepancies were identified.

Based on the NRC inspection team's review, the Watts Bar component and cable EQ lists are acceptable.

3.2 EQ Documentation files (Binders)

10 CFR 50.49(j) requires that a record be maintained that documents each item is qualified and meets its specified performance requirements when subjected to the conditions predicted to be present when it must perform its safety function up to the end of its qualified life. In accordance with the requirements of 10 CFR 50.49(k), the electrical equipment in WBN Unit 1 may be qualified in accordance with the acceptance criteria delineated in NUREG-0588, Category II. NUREG-0588 provides detailed guidance on (a) how to establish environmental service conditions, (b) how to select methods considered appropriate for qualifying safety-related electrical equipment in a harsh environment, and (c) other specific topics such as margin, aging, and documentation.

The scope of this audit included evaluating the qualification criteria that the equipment must meet and the environments in which the equipment must function, assessing the qualification documentation for the equipment in addressing the qualification criteria and environments, and assessing the physical installation of the equipment. The principal area of review was the qualification of safety-related electrical

equipment that must function to prevent or mitigate the consequences of a loss-of-coolant accident (LOCA) or a high energy line break (HELB) inside or outside of containment, while subjected to the harsh environments associated with these accidents. The inspectors reviewed 32 equipment items and 24 associated cables to determine that the test data and analyses in the files supported the qualification status determined by the applicant. Walkdowns inspections were conducted to verify that the equipment was installed in accordance with the tested configuration or that the deviations had been evaluated by the applicant in the documentation.

The inspectors reviewed a total of 28 EQ binders of equipment qualification documentation (17 electrical equipment and 11 cables). These binders and the equipment examined are listed in Table 4. The EQ binders were reviewed to determine if qualification had been demonstrated based on the documents contained in the files. The specific qualification attributes examined for each binder and the conclusions reached are as follows.

3.2.1 Temperature, Pressure, and Humidity Conditions

Watts Bar Nuclear Plant's electric equipment important to safety, as defined in 10 CFR 50.49, that is required to be environmentally qualified are identified by plant areas. These areas, by room number and elevation, are on Watts Bar series drawings 47E235, Nuclear Plants Units 1 and 2, Environmental Data Drawings. These drawings identify both mild and harsh environments in the plant, and the environmental parameters are given in tabular form for each area. These tables include temperature, pressure, relative humidity, radiation, chemical effects (containment spray) and submergence (flooding inside and outside containment) information for the areas. The calculation and records that are used to support these environmental parameters on the drawings were not reviewed during this inspection. However, for all equipment items examined, the inspectors found the documented testing conditions included the postulated environments and additional margins. This satisfied this step for establishing the environmental qualification of the equipment.

3.2.2 Submergence

The examined equipment was located above the calculated flood levels at the component location. None of the inspected equipment or cables are subject to submergence following a postulated event.

3.2.3 Chemical Spray

For the equipment items examined that could be exposed to chemical spray, the inspectors found that the documented testing included the simulation of the chemical spray with a solution that encompassed the pH and buffering of the chemical spray solution. This satisfied this step in establishing the environmental qualification of the equipment.

3.2.4 Aging

The applicant used the Arrhenius equation in establishing the simulated age of the component tested. This methodology establishes the life of equipment qualification prior to a LOCA/HELB harsh environment. This approach to simulated aging was acceptable.

3.2.5 Radiation (Inside and Outside Containment)

The maximum total radiation dose specified by the applicant, included in the 47E235- series of drawings for both inside primary containment and outside primary containment in areas exposed to recirculating fluid lines, and additional margins were enveloped by the total integrated dose provided in the radiation testing. Thus, the radiation testing provided was acceptable in establishing the environmental qualification of the equipment.

3.2.6 Conclusion

The inspectors determined that there was adequate documentation in the binders to establish qualification of the inspected equipment to the requirements of 10 CFR 50.49 or NUREG-0588.

3.3 Field Inspection of EQ Equipment

As part of the audit, the installed equipment was inspected during plant walkdowns. The purpose of the walkdowns was to verify manufacturer, model number, serial number, location, and proper installation consistent with the qualification documents, and that no damage to the equipment was evident. The equipment examined is shown in Table 4. No installation deficiencies were identified by the inspectors that would invalidate the EQ status of the device.

3.3.1 EQ Degradation Inspection Program

The inspectors noted that the opening of any Class 1E component requires a degradation inspection when opening and before closing the component. This is consistent with the applicant's EQ Program procedure requirements. The degradation inspection includes steps to monitor and correct the following:

- Cleanliness, freedom from debris, trash, foreign materials, dirt, dust, and shavings.
- Assessment or replacement of gaskets.
- Terminal blocks - verification of manufacturer and type, proper mounting, and coating of the terminations with Dow-Corning RTV-3140 in containment and high moisture areas is complete.

- Junction boxes - Verification of two open 1/4-inch weep holes in the bottom of the box and qualified wire is used (Rockbestos Firewall SIS).

The inspection includes observations for rust, corrosion, moisture, excessive dust or dirt, pliability, brittleness, cracks, or deformation; damaged, broken, loose, missing, or improperly installed parts; evidence of arcing or overheating; damage to cable jackets, insulation, conductors, shielding, or splices; and leakage or seepage of lubricants.

A degradation inspection report noted the Dow Corning RTV-3140 coating of Terminal Block 1-TB-293-3201-B was not uniform nor applied to coat all terminations. The applicant issued a work order to correct the condition. Flakes of paint in the bottom of Junction Box 1-JB-293-4360-E were cleaned out before the box was secured. Another degradation inspection noticed a spare wire with a Raychem end cap that was not appropriate for the application in Limitorque valve motor operator 1-MVOP-063-0172-B. A work request was issued to change the end cap from one for rubber wire insulation to one for plastic wire insulation at that location and to inspect for and correct similar conditions in other Limitorque operators. From these observations, it is apparent that the program for degradation inspection is an acceptable compliment to the environmental qualification program.

The equipment items selected for audit were as shown in Table 4 below.

TABLE 4

| Plant ID Number & Use | Equipment | EQ Binder |
|---|---|---|
| 1-LT-063-0181-E, Containment Sump Level | Barton dP Transmitter 764 with 351 Remote Sensor | WBNEQ-XMTR-001 |
| 1-LT-063-0182-F, Containment Sump Level | Barton dP Transmitter 764 with 351 Remote Sensor | WBNEQ-XMTR-001 |
| 1-TE-072-0006, CS Heat Exchanger B Outlet Temperature | Weed Instruments Model 612-1B-A-4C-13.25-0-0 Resistance Temperature Detector | WBNEQ-ITE-006 |
| 1-HS-074-0003B-A, Hand Switch, RHR Pump 1A-A Inlet Flow Control Valve | Cutler Hammer 10250T Hand Switch | WBNEQ-HS-002 |
| 1-TE-074-0039, RHR Heat Exchanger B Outlet Temperature | Weed Instruments Model 612-1B-A-4C-13.25-0-0 Resistance Temperature Detector | WBNEQ-ITE-006 |
| 1-FSV-081-0012-A, PW RCS Pressurizer Relief Tank | ASCO Solenoid Valve NP831654E | WBNEQ-SOL-006 |
| 1-ZS-081-0012A-A, Valve Position Switch | NAMCO Controls EA-180-14302 | WBNEQ-IZS-005 |

| Plant ID Number & Use | Equipment | EQ Binder |
|---|---|---|
| 1-ZS-081-0012B-A, Valve Position Switch | NAMCO Controls EA-180-15302 | WBNEQ-IZS-005 |
| 1-CSC-072-0006, Conduit Seal for 1-TE-72-6 | NAMCO Controls Quick Disconnect Conduit Seal, Series EC210-34000 | WBNEQ-CSC-002 |
| 1-CSC-081-0012-A, Conduit Seal for 1-FSV-81-12-A | NAMCO Controls Quick Disconnect Conduit Seal, Series EC210-34000 | WBNEQ-CSC-002 |
| 1-FSV-030-146A-A, Aux. Bldg. Gas Treatment Sys. (ABGTS) Fan A-A Exhaust Damper | ASCO Solenoid Valve 206-380-2RVU | WBNEQ-SOL-005 |
| 1-ZS-030-0146A-B, ABGTS Fan A-A Exhaust Damper Position Switch | NAMCO EA740-20100 Limit Switch | WBNEQ-IZS-003 |
| 1-JB-293-4340-G, Junction Box (two cable splices) | Raychem Corporation WCSF-N, NPKC, NPKS, NPK, NPKV, NMCK, NCBK, NESK, and NEIS cable splices (JBox is not required to be qualified) | WBNEQ-SPLC-001 |
| 1-JB-293-3201-B, Junction Box | JVB (10"x10"x6", NEMA 4) | WBNEQ-JBOX-001 |
| 1-TBLK-293-3201-B, Terminal Block | General Electric CR151B | WBNEQ-JBOX-001 |
| 1-PENT-293-27A, Primary Containment Electrical Penetration | Conax 7429-10002-05 | WBNEQ-PENT-002 |
| 2-3PL-30-3753A, connected to 1-FSV-30-146A-A | American Insulated Wire Corporation PXMJ Cable, EPDM | WBNEQ-CABL-002 |
| 1V-9245-A, connected to 1-FSV-81-12-A | American Insulated Wire Corporation PXMJ Cable, FR-XLPE | WBNEQ-CABL-003 |
| 1V-9246-A, connected to 1-ZS-81-12B-A | American Insulated Wire Corporation PXMJ Cable, FR-XLPE | WBNEQ-CABL-003 |
| 1PM1930, connected to 1-TE-72-06 | Rockbestos FR-XLPE, Type MS, Firewall III, KXL-760-D insulation | WBNEQ-CABL-037 |
| 1V-6211A, connected to 1-PENT-293-27A | Okonite Power and Control Cable, PXMJ, FR-CSPE | WBNEQ-CABL-051 |
| 1-3V-043-9963B, connected to 1-TBLK-293-3201-B | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |

| Plant ID Number & Use | Equipment | EQ Binder |
|---|---|---|
| 1-3V-043-9973B, connected to 1-TBLK-293-3201-B | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |
| 1-3A-30-6206, connected to 1-ZS-030-0146AB | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |
| 1V-4919A, connected to 1-PENT-293-27A | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |
| 1V-8768A, connected to 1-PENT-293-27A | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |
| 1-2PM-68-0822G, connected to 1-TE-68-79A-G | Rockbestos YPS thermocouple extension lead wire cable, FR-XLPE, KXL-760G insulation | WBNEQ-CABL-055 |
| 1-2PM-68-0832G, connected to 1-TE-68-79B-G | Rockbestos YPS thermocouple extension lead wire cable, FR-XLPE, KXL-760G insulation | WBNEQ-CABL-055 |
| 1-HTR-083-0001-A, Containment Hydrogen Recombiner A | Westinghouse Hydrogen Recombiner, Serial 61 | WBNEQ-HTR-001 |
| 1-MTR-030-0146-A, ABGTS Exhaust Fan 1A Motor | Reliance Wound Motors - Outside Containment, Serial 1YF882365A1-YC | WBNEQ-MOT-003 |
| 1-MTR-030-0175-A, RHR Pump 1A-A Room Cooler Motor | Reliance Wound Motors - Outside Containment, Serial 1YF883397A4-VK | WBNEQ-MOT-003 |
| 1-MTR-030-0177-A, CS Pump 1A-A Room Cooler Motor | Reliance Wound Motors - Outside Containment, Serial 2YF883397A1-VK | WBNEQ-MOT-003 |
| 1-MTR-030-0180-A, SI Pump 1A-A Room Cooler Motor | Reliance Wound Motors - Outside Containment, Serial 1YF883397A1-VK | WBNEQ-MOT-003 |
| 1-MTR-063-0010-A, SI Pump 1A-A Motor | Westinghouse Motors on SIS, CS, and RHR, HSDP, Serial 1S-76 | WBNEQ-MOT-001 |
| 1-MTR-072-0010-B, CS Pump 1B-B Motor | Westinghouse Motors on SIS, CS, and RHR, HSW2, Serial 1S-77 | WBNEQ-MOT-001 |
| 1-MTR-074-0010-A, RHR Pump 1A-A Motor | Westinghouse Motors on SIS, CS, and RHR, VSW1, Serial 1S-75 | WBNEQ-MOT-001 |

| Plant ID Number & Use | Equipment | EQ Binder |
|---|---|---|
| 1-MVOP-063-0172-B, RHR to RCS Hot Leg 1 & 3 Flow Isolation Valve Operator | Limitorque Motorized Valve Operator with Type RH Insulation, SB-2, Serial 192138 | WBNEQ-MOV-001 |
| 1-MVOP-074-0003-A, RHR Pump 1A-A Suction Shutoff Valve Operator | Limitorque Motorized Valve Operator with Type RH Insulation, SB-2, Serial 197000 | WBNEQ-MOV-001 |
| 1-MVOP-074-0008-A, RHR System Isolation Bypass Valve Operator | Limitorque Motorized Valve Operator with Type RH Insulation, SB-1, Serial 241211 | WBNEQ-MOV-001 |
| 1-MVOP-074-0012-A, RHR Pump 1A-A Minimum Flow Valve Operator | Limitorque Motorized Valve Operator, SMB-000, Serial 358806 | WBNEQ-MOV-003 |
| 1-TS-030-5236A-A, RHR Pump 1A-A Room Ambient Air Temperature Switch A | Static-O-Ring Incorporated Temperature Switch (Vented), 201TA-BB125-JJTTX6, Serial 93-11-7022 | WBNEQ-ITS-002 |
| 1-TS-030-5236B-B, RHR Pump 1A-A Room Ambient Air Temperature Switch B | Static-O-Ring Incorporated Temperature Switch (Vented), 201TA-BB125-JJTTX6, Serial 93-11-7018 | WBNEQ-ITS-002 |
| 2-TS-030-0200A, EGTS 2A-A Room Ambient Air Temperature Switch A | Static-O-Ring Incorporated Temperature Switch (Unvented), 201TA-BB125-JJTTX6, Serial 85-3-3451 | WBNEQ-ITS-002 |
| 2-TS-030-0207B, EGTS 2A-A Room Ambient Air Temperature Switch B | Static-O-Ring Incorporated Temperature Switch (Unvented), 201TA-BB125-JJTTX6, Serial 85-3-3458 | WBNEQ-ITS-002 |
| 1PL 1062A, Power Cable for 1-HTR-083-0001-A | Brand-Rex Co., PXJ, PXMJ | WBNEQ-CABL-050 |
| 1PL 2981A, Power Cable for 1-MTR-030-0180-A | Triangle-Plastic Wire and Cable (PWC), CPJ, CPJJ | WBNEQ-CABL-032* |
| 1PP 575A, Power Cable for 1-MTR-074-0010-A | Anaconda Wire and Cable Co., EPSJ | WBNEQ-CABL-005 |
| 1V 2346B,# Control Cable for 1-MVOP-063-0172-B | Cyprus Wire and Cable Co., PJJ (1) | WBNEQ-CABL-015 |
| 1V 2343B,# Power Cable for 1-MVOP-063-0172-B | Rockbestos Co., PXJ, PXMJ | WBNEQ-CABL-053 |
| 1-V-1922A,# Control Cable for 1-MVOP-074-0003-A | Cyprus Wire and Cable Co., PJJ (1) | WBNEQ-CABL-015 |

| Plant ID Number & Use | Equipment | EQ Binder |
|---|---|---|
| 1-V-1920A,# Power Cable for 1-MVOP-074-0003-A | Rockbestos Co., PXJ, PXMJ | WBNEQ-CABL-053 |
| 1-3V-074-1218A,# Control Cable: 1-MVOP-074-0008-A | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |
| 1V-2144A,# Power Cable for 1-MVOP-074-0008-A | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |
| 1-3V-74-1937A,# Control Cable: 1-MVOP-074-0012-A | Triangle-Plastic Wire and Cable (PWC), CPJ, CPJJ | WBNEQ-CABL-032* |
| 1V 1935A,# Power Cable for 1-MVOP-074-0012-A | Okonite Power and Control Cable, PXMJ, FR-CSPE | WBNEQ-CABL-051 |
| 2PL 3778A, Signal Cable for 2-TS-030-0200A | Rockbestos Cable, PXMJ, XLPE (irradiation), KXL-760G insulation | WBNEQ-CABL-052 |

* Revision 6, dated 1/26/95, to EQ Binder WBNEQ-CABL-032 put a limited qualified life of 24.14 yr after initial criticality on the PWC cables, but failed to present a replacement maintenance requirement in the Qualification Maintenance Data Sheet (QMDS) in Tab G. Revision 7, issued during the inspection, corrected this.

\# The inspection verified the environmental qualification of only the power and control cables of each inspected Limitorque motor operator.

3.4 EQ Modifications

The inspector reviewed the applicant's implementation of the design control program to ensure that equipment located in harsh environments was environmentally qualified in accordance with the requirements of 10 CFR 50.49. Reviews of selected EQ modification packages were performed to verify the following design engineering activities had been adequately performed:

(1) Equipment/components specified in DCN Packages which require installation in harsh environmental areas have been accurately incorporated in the EQ Binders and the 50.49 List.

(2) Installation instructions specified in DCN Packages have been appropriately implemented and field configuration of installed equipment is consistent with the as tested configuration.

(3) EQ Binders and the 50.49 List have been revised to reflect as-constructed plant configuration.

(4) Equipment Management System (EMS) computer data base have been updated to reflect all design changes.

The design engineering activities were evaluated for compliance with the requirements of 10 CFR 50, Appendix B, Criterion 3, Design Control; TVA Topical Report TVA-NQA-PLN89-A, Nuclear Quality Assurance Plan, Revision 4; ANSI N45.2-1974, Quality Assurance Requirements for the Design of Nuclear Power Plants; and selected site level quality implementing procedures identified in NRC Report No. 50-390,391/94-74, Section 2.2.1, Design Control.

The following DCN Packages, affected EQ Binders, and specified equipment were reviewed to verify compliance with the above program documents.

| DCN NO | EQ Binder NO | Equipment ID |
|---|---|---|
| M-07380A | MOV-002 | 1-FCV-3-33A, 47B<br>1-FCV-3-87A, 100B |
| M-15529B | MOV-002 | 1-FCV-1-17A<br>1-FCV-1-18B |
| DCA-M15092<br>Sheets 5, 6, 7 | HTR-001 | Cable numbers (System78)<br>1PL4540A, 1PL4895B, 1PL1061A,<br>1PL1081B, 1PL1062A, 1PL6380B,<br>1PL6385A, 2PL4859A |
| | HTR-001 | Cable numbers(System 83)<br>1PL1062A, 1PL1061A, 1PL1081B,<br>1PL1082B |
| M-08066A | 1PT-001 | 1-FT-3-163A-A, 1-FT-3-163B-B |
| M-16180 | 1TS-002 | 1-TS-30-201A-A, 1TS-30-201A-B |
| W-08625A | XMTR-007 | 0-LT-77-134A, 0-LT-77-135B |
| M-16271A | 1TS-002 | 1-TS-030-5235A\B,<br>1-TS-030-5236A\B,<br>1-TS-030-5237A\B<br>1TS-030-5238A\B<br>1-TS-030-5239A\B |
| M15935A | SOL-009 | 1-FSV-68-394, 1-FSV-68-395,<br>1-PCV-68-334, 1-PCV-68-340A |

Based on the above reviews, the inspectors determined that the design control requirement for preparing and reviewing Environmental Qualification Change Supplements, (EQCS), had been performed. The EQCS is the method used to revise or prepare new EQ documentation because of plant modifications. The approved and issued EQCS's are intended to

support the qualification to 10 CFR 50.49 for devices installed in the plant and made operational without additional qualification efforts.

The inspector independently verified that the equipment/components specified in the plant modifications were suitable for their end use applications. Procurement information contained in the DCN Packages were reviewed to determine the material controls that were applicable for identifying and controlling the equipment/component required for implementing the plant modifications. This information was verified to be identical to that contained in Tab E, Miscellaneous Documents, of the applicable EQ Binder. Identification of the qualification report was subsequently performed by reviewing the Certificate of Conformance provided by the vendor.

The inspector reviewed the following sections of the EQ Binders to determine if they contained adequate documentation of the equipment; and a positive statement that the documentation had been reviewed and approved, and the equipment determined to be qualified for it's application.

Tab B, EQ Checklist for Evaluation of Environmental Qualification Including Summary and Conclusion
Tab C, Analyses and Justification
Tab D, Qualification Documents

Based on the above reviews the inspector concluded that a clear and auditable path from the DCN Packages to the EQ Binders existed for demonstrating qualification of specified equipment/components to the requirements of 10 CFR 50.49. The design engineering controls were also determined to have been adequately implemented and no deficiencies were identified during these reviews.

The inspector performed additional reviews of the EQ Binders and the 10 CFR 50.49 Lists in order to verify that the EQ Binders had been revised to reflect as-constructed plant configuration. Tab A of the EQ Binders was also reviewed to assure that the EMS computer data base had been updated to identify the equipment within the scope of the design changes. Tab F, Field Verification Data, referenced EQIR numbers which provide as-installed information from the field for incorporation in the EQ Binders. The inspector reviewed Tab F to ascertain if the binder had been revised to reflect as-constructed plant configuration. Based on these reviews, the inspector determined that most of the EQ Binders impacted by the plant modifications had not been revised to incorporate information from Tab F. Additionally, there were instances of discrepancies between the 10 CFR 50.49 List and Tab A of some binders caused by the 10 CFR 50.49 List not having been revised.

Discussions with the applicant's engineering personnel concerning this issue revealed that the inspector's random selection of DCN Packages to be inspected fell outside the auditable scope of the inspection. The DCN Packages were randomly selected, from the population of EQ Binders that TVA Management had previously identified on January 27, 1995, as

being available for the pending NRC inspection. These design changes impacted a larger number of systems other than those defined by TVA as the auditable scope (i. e., systems 63, 72, 74, 81, and 83). The inspector concluded that based on the above reviews, TVA Management needed to complete; (1) revising the 10 CFR 50.49 Lists, and the EQ Binders to reflect as constructed plant configuration, and (2) establishing EQ baseline for the systems impacted by the plant modifications reviewed during this inspection. The documentation that provided objective evidence of the equipment/component being qualified to the requirements of 10 CFR 50.49 was incomplete at the time of the inspection.

The inspector performed field inspections of the following EQ equipment to verify material traceability and compliance with installation drawings and instructions specified in the DCN Packages:

1-FT-3-163A-A
1-FT-3-163B-B
1-TS-30-202A-B
1-FCV-1-17A
1-FCV-1-18B
Cable Numbers 1PL4540A, and 1PL4895B

With the exception of 1-FCV-1-17A and 1-FCV-1-18B, the walkdowns verified configuration and equipment identification without opening the equipment. The FCV's were opened for an internal inspection of the limit/torque switch compartment. No deficiencies were identified, and implementation of the plant modifications specified in the applicable DCN Package appeared to have been adequately implemented.

## 3.5 EQ Procurement

### 3.5.1 Spare and Replacement Parts for EQ Applications

The inspectors reviewed applicant activities involving the procurement of spare and replacement parts for use in harsh environments. The activities were reviewed to verify compliance with 10 CFR 50.49 requirements and the applicant's administrative controls for procurement. Requirements for the procurement of spare and replacement parts are specified in SSP-10.05, Technical Evaluation for Procurement of Materials and Services. The inspectors selected components that were procured for use in EQ applications and were installed under various DCNs. Procurement packages were also reviewed for some of the components that were selected from the EQ Binders for field verification as part of this inspection effort. The following procurement packages were reviewed:

| DCN No. | Procurement Contract No. | Equipment ID |
|---|---|---|
| M-20879A | 87PLB-839155 | 1-FT-3-147A-A, -147B-B 1-FT-3-155A-A, -155B-B |

| | | |
|---|---|---|
| M-07894C | 90NLC-75727A | 1-PDT-30-126 |
| M-15529B | 90NLB-75385A | 1-ZS-3-148A, 1-ZS-62-76A 1-ZS-1-4A, 1-ZS-30-146AA 1-FSV-30-8, 1-ZS-62-72A |
| M-15529B | 86XNQ-838100 | 1-FCV-1-17A, 1-FCV-1-18A 1-MTR-1-15A, 1-MTR-1-16A 1-MTR-1-17A, 1-MTR-1-18A |
| M-15529B | 93NNS-75771B | 1-JB-292-6655B, -6656B 1-JB-292-6657B, -6659B |
| M-16180A | 87XLF-839158 | 1-TS-30-201A, -202A 1-TS-74-0043, -0044 1-TS-74-0045, -0046 |
| M-23283A | 82K29-830702 | 2-FSV-43-250, -309, -310 (Note: These Unit 2 valves were transferred to Unit 1) |
| M-07383A | 89NLC-75460A | 1-FSV-1-147, -148, 1-FSV-1-149, -150 |
| N/A | 93N3F-42110E | 1-CSC-62-0077B |
| N/A | 84KK1-835541 | 1-FSV-81-0012A |

During review of the above procurement packages, the inspectors verified that applicable technical and quality requirements required for equipment designated for EQ applications were appropriately specified in the applicable procurement documents. Additionally, the reviews were performed to verify that references to applicable EQ Test Reports and 10 CFR Part 21 requirements had been included. The inspectors also verified that supplier exceptions to any of the procurement packages were evaluated and adequately addressed by TVA. The inspectors noted one instance, involving the procurement of replacement auxiliary feedwater system flow transmitters under Contract No. 87PLB-839155, where additional modifications were performed to add shielding around the transmitters so they could perform their intended function under accident conditions. No deficiencies were identified.

The inspectors concluded that procurement activities were being adequately implemented for spare and replacement parts designated for use in 10 CFR 50.49 applications. Procurement engineering personnel were knowledgeable of the requirements and procedures involving procuring parts for EQ use. Violations or deviations were not identified in the areas inspected.

3.5.2 Storage of Spare and Replacement Parts

The inspectors selected spare and replacement components from the DCN packages and the EQ binders to verify that the parts were stored in accordance with requirements specified in applicable industry standards, vendor documents, EQ Binders, and administrative procedures. The inspectors also reviewed the storage requirements for components that were selected for field verification as part of this inspection effort. TVA Procedure SSP-10.03, Handling, Storing, and Shipping specified requirements for the various storage levels.

The inspectors inspected various warehouse storage areas and verified that selected spare and replacement parts designated for use in 10 CFR 50.49 applications were stored in accordance with applicable requirements. However, the inspectors did note one example, which involved a Static "O" Ring temperature switch, that was stored under conditions less stringent than those specified in the EQ Binder and by the vendor. Both the EQ Binder and the vendor specified that the temperature switch (equipment ID No. 1-TS-30-5236-A) be stored under conditions where the temperature would not exceed 100 °F. The applicant was storing the switch in a Level B storage area. SSP-10.03 specifies the temperature range for Level B storage areas as 40 °F - 140 °F. The inspectors discussed this item with applicant personnel who indicated that deficiencies involving storage requirements for EQ components had been previously identified in PER WBPER940707. The inspectors noted that the applicant was already taking actions to address the storage issue involving EQ components.

The inspectors further noted that the switch was in Level B storage in an area where all the material was considered "indeterminate" (as defined by Procedure SSP-10.04, Material Issue, Control, and Return). Procedure SSP-10.05 provided controls requiring additional considerations to be included in engineering evaluations prior to removing an item from the "indeterminate" storage area. One of the additional considerations included evaluating previous and present storage conditions. The inspectors determined that the applicant had adequate controls in place to prevent the temperature switch from being installed in the plant prior to an evaluation to determine whether it was acceptable for use in EQ applications.

The inspectors concluded that spare and replacement parts designated for use in EQ applications were generally being stored in accordance with applicable requirements. Deficiencies identified in the storage of EQ components were being addressed by the applicant. Violations or deviations were not identified in the areas inspected.

## 3.6 EQ Maintenance Program

10 CFR 50.49(j) requires that a record be maintained that documents each item is qualified and meets its specified performance requirements when subjected to the conditions predicted to be present when it must perform its safety function up to the end of its qualified life. In order to meet this requirement, WBN must identify, implement, and record all EQ-required maintenance.

For this inspection, the following WBN procedures pertaining to EQ maintenance were reviewed:

| | |
|---|---|
| PAI-10.12 | "QMDS Verification, Implementation and EQ Baseline Activities" |
| SSP-6.02 | "Maintenance Management System" |
| SSP-6.03 | "Preventative Maintenance Program" |
| SSP-6.05 | "10 CFR 50.49 - Maintaining Electrical Equipment Environmental Qualification" |
| TI-95 | "Field Verification of Plant Equipment" |

Implementation of these procedures was reviewed for 19 components in nine EQ Binders listed in Table 5. The development and implementation of EQ maintenance instructions were reviewed. For each component, the Qualification Maintenance Data Sheet (QMDS), Qualification Maintenance Instructions (QMI), and maintenance history were reviewed. Details of the review are provided in the following sections.

### 3.6.1 Implementation of EQ Maintenance

Plant Administrative Instruction PAI-10.12, "QMDS Verification, Implementation, and Baseline Activity," delineates processes by which the activities described in the QMDS are incorporated into the EQ Program. This includes establishment of the methodology for: 1) QMDS implementation; 2) recording activity completion data; 3) documenting and maintaining the EQ baseline; and 4) using the Harsh Environment Record System (HERS) computer data base. It also establishes the interface with other applicable plant programs such as Preventive Maintenance, Work Plans, Work Orders, and Surveillance Instructions.

HERS is a data processing system which assists in documenting the Environmental Qualification of 10 CFR 50.49 equipment. HERS provides a data base containing EQ equipment and cable identifiers, delineates QMIs which implement the QMDS, maintains performance history of all QMIs, maintains dates of whole device and piece part installation and replacement, documents QMI due date extensions, and identifies QMIs with approaching performance due dates. The HERS data base is reviewed at weekly intervals for upcoming qualified life expiration dates and periodic QMI due dates.

The HERS EQ List File contains a data base of EQ information similar to the WBN 10 CFR 50.49 Lists for Equipment and Cables. Performance of repetitive EQ maintenance activities are tracked and controlled through HERS. However, work initiating documents are generated in accordance with the site procedures for repetitive tasks (Site Standard Practice (SSP)-6.02 and SSP-6.03).

Procedure SSP-6.02, "Maintenance Management System," described the Work Order process, which was used as an administrative control program to repair equipment failures and to restore features to their intended design function. Special Planning Considerations were included in development of work orders for 10 CFR 50.49 equipment. The maintenance planner was to review Tab G of the EQ Binder in preparing the work instructions and to include requirements for a degradation inspection and sign-offs that each QMDS activity had been completed. Field verification data sheets were to be completed for parts, material, or component replacement.

Every work order on EQ equipment included a degradation inspection. In order to document the equipment condition and to support degradation trend evaluations, an inspection was to be conducted each time a piece of EQ equipment was opened for a maintenance or modification activity. A visual inspection of the exterior of the equipment was to be performed. An internal degradation inspection was also performed when the work scope involved opening an EQ component. The degradation inspection checklist described the specific types of degradation to look for during the inspection. If any degradation was found, it was noted, and the maintenance foreman initiates corrective action within one working shift by writing a new work request or by changing the scope of the current work order to correct the degraded condition.

Procedure SSP-6.03, "Preventive Maintenance Program," described requirements for maintenance scheduling. Scheduling of Essential Maintenance was implemented within specified intervals. Recommended Maintenance and Recommended Surveillance was scheduled along with Essential QMIs in HERS.

Nine equipment binders were reviewed to verify that vendor recommendations were incorporated into the QMDS. QMDS Essential Maintenance, Recommended Maintenance and Recommended Surveillance were verified to be incorporated into QMIs. For 19 components, it was verified that the QMIs had been performed within the established schedule. Five completed work packages for maintenance of EQ components that documented degradation of EQ equipment were reviewed. Each degradation inspection was properly documented, the degraded condition was described, and corrective action was initiated. In each case, the work scope included corrective action or the work order was replanned to include repair of the degraded equipment if necessary. No deficiencies were identified.

### 3.6.2 Essential Maintenance and Recommended Maintenance/Surveillance

Each EQ Binder contained a Qualification Maintenance Data Sheet (QMDS) in Tab G. The QMDS specified a frequency for piece-part/whole device replacement, and the start of qualified life. The QMDS defined maintenance and surveillance activities which are essential for maintaining the qualified status of EQ equipment. Also identified were maintenance and surveillance activities which are not essential but are recommended as good practice for maintaining the qualified status of EQ equipment.

Essential requirements generally dealt with critical test program details, special storage considerations, essential vendor instructions, identification of essential equipment interfaces, maintenance intervals, equipment or component replacement intervals (i.e., qualified life), and identification of certain hardware and material considerations. Recommended surveillance parameters were those which aided in detecting degrading materials or equipment performance. These surveillance parameters have been identified by review of the qualification documentation, evaluation of degrading mechanisms, and by the use of engineering judgment. Preventive maintenance activities and good practices for maintaining the equipment based on review of the vendor documentation and industry experience are also included. The recommended surveillance parameters and preventive maintenance activities are not Essential requirements; however, these activities are important in establishing equipment operability and ensuring proper equipment performance and must be considered within the context of an overall EQ maintenance program.

For the 19 EQ components reviewed, the EQ binder Tab G and Tab H were reviewed to verify that vendor recommendations were incorporated into QMDS as Essential or Recommended Maintenance/Surveillance, as appropriate. The QMI listing for each binder was reviewed to verify that each QMDS Essential Maintenance item, Recommended Surveillance Parameter, and Preventive Maintenance Activity is included. The QMIs were complete for each of the binders reviewed. No deficiencies were identified.

### 3.6.3 EQ Baseline

EQ Baseline is a process used to establish the effective date of installation of 10 CFR 50.49 equipment and to verify that environmental qualification requirements have been implemented. This process consists of record searches to locate auditable documentation of equipment installation, maintenance, and operation. These documents are used to substantiate compliance with EQ program requirements and verify that modifications, maintenance, and field verifications are complete. Usually a walkdown is performed to supplement the documentation review. The EQ Baseline documents that all QMDS criteria have been addressed.

For EQ equipment, completed field verification data sheets (TI-95 appendices) are used to assess the qualification status of EQ equipment

(e.g., unqualified parts removed, EQ qualified devices installed, design change work completed, etc.). For each EQ device, the data sheets are grouped into an EQ Field Verification Package (EQFVP). EQFVPs are used to maintain an "As-constructed" EQ Binder. The completed data sheets provide EQ information including device location and WBN ID tag information, nameplate data, subcomponent nameplate data, a sketch of the component's exact location, and other specific information for each qualified item.

The HERS Maintenance History was reviewed for 19 components to verify that the QMIs are complete for EQ Baseline. For each component reviewed, the Essential Maintenance was complete, and Recommended Maintenance and Surveillance were complete or were deferred with documented justification. No deficiencies were identified.

### 3.6.4 Conclusion

The applicant has developed procedures for maintenance of EQ equipment that are consistent with the intent of 10 CFR 50.49 and has implemented them appropriately up to the point of this inspection. For the binders reviewed, vendor recommendations were incorporated into the QMDS Essential or Recommended Maintenance/Surveillance, as appropriate. QMDS Essential Maintenance, Recommended Maintenance and Recommended Surveillance were incorporated into QMIs, and the QMIs were performed within the established schedule. EQ Baseline was complete for the components reviewed. Degradation inspections were performed in accordance with procedure. No deficiencies were identified with the EQ maintenance program.

TABLE 5

| Components Reviewed | ID | Binder |
|---|---|---|
| Namco Limit Switch | 1-ZS-030-0146AB | 0-IZS-003 |
| SOR Temperature Switch | 1-TS-074-0044A | 0-ITS-002 |
| | 1-TS-074-0043A | |
| | 1-TS-030-5236B-B | |
| | 1-TS-030-5236A-A | |
| Barton Level Transmitter | 1-LT-063-0182-F | 0-XMTR-001 |
| | 1-LT-063-0181-E | |
| ASCO Solenoid Valve | 1-FSV-081-0012-A | 0-SOL-006 |
| Namco Conduit Seal Assembly | 1-CSC-081-0012-A | 0-CSC-002 |
| Namco Limit Switch | 1-ZS-081-0012A-A | 0-IZS-005 |

| Components Reviewed | ID | Binder |
|---|---|---|
| | 1-ZS-081-0012B-A | |
| Cutler Hammer Handswitch | 1-HS-074-003B-A | O-HS-002 |
| Reliance Motor | 1-MTR-030-0180-A | O-MOT-003 |
| | 1-MTR-030-0146-A | |
| | 1-MTR-030-0175-A | |
| | 1-MTR-030-0177-A | |
| Limitorque Valve Operator | 1-MVOP-063-0172-B | O-MOV-001 |
| | 1-MVOP-074-0003-A | |
| | 1-MVOP-074-0008-A | |
| | | |

3.7 EQ Training

The inspector reviewed the applicant's lesson plan for environmental qualification training provided to NE employees. This lesson plan consisted of a written description of the contents of a video that is shown to the employees. The course number was EQP010, and the course title was "Consolidated EQ Program V-1021 Video. The course had a duration of approximately 4 hours with the requirement that the course participants demonstrate a knowledge of the course material by obtaining a score of seventy percent or greater on the course examination. The inspector concluded that the training module appeared to identify and describe adequately the regulatory requirements for the development and maintenance of the 10 CFR 50.49 program. Station Management presented signed copies of "Training and Attendance Records", which provided objective evidence of the EQ training completed by NE employees. Review of these records revealed that initial training was completed in October, 1991. A refresher training was also completed on February 23, 1995, as part of the corrective action for WBPER950508.

Other lesson plans reviewed were CCG311 and CEG311, Principles of Environmental Qualification, which are the EQ courses provided to Modification's craft and field engineering personnel, respectively. Both of these courses are approximately 4 hours in duration. These courses include the EQP010 video presentation. Field engineers were required to demonstrate a knowledge of the material by obtaining a score of eighty percent or greater. These courses were also found to be acceptable.

In addition to the above, EQ training records were requested and reviewed for 5 field engineers and 3 craft personnel in Modifications, and 4 plant maintenance personnel. No deficiencies were identified.

3.8 Followup on EQ PERs, CAQs, and SCAR

The inspector reviewed WBN's recurrence control and corrective action plans for the following problem action plans:

WBPER940737- Changes to EMS system and 50.49 lists were uncontrolled.
WBPER940693- Subcomponents of qualified equipment not designated as Quality (Q) or safety-related (SR).
WBF880062SCA- Redesignating areas A3 and A12 on elevation 737 of the auxiliary building from mild to harsh environments.

Plans to address the issues in the PERs and SCAs listed above were found to be reasonable and proceeding in accordance with the WBN plan. No discrepancies were found. Recurrence controls and proposed corrective actions appeared adequate.

3.9 Followup on NRC Notices

a. IN 84-90: MSLB Effect on EQ of Equipment

The inspector reviewed the applicant's evaluation of the above NRC notice. Action plans for the resolution of issues are proceeding and almost complete. Re-analysis of the affected portions of the plant have been performed by the applicant, environmental drawings have been updated, and adjustments to EQ binders completed. Some final modifications to the plant remain outstanding (e.g., insulating flex conduit in the Main Steam Valve Vault).

b. IN 92-81: Potential Deficiency of Electrical Cables with Bonded Hypalon Jackets

IN 93-33: Potential Deficiency of Certain Class 1E Instrumentation and Control Cables

The above two Notices discuss results of EQ testing performed on several manufacturers cables. This testing was sponsored by NRC and conducted by Sandia National Laboratories. The test results indicate that several different cable types failed or exhibited marginal insulation resistance. The inspector determined that the applicant's EQ files addresses one of the manufacturers discussed in both NRC Notices. The EQ Binders were reviewed by the inspector to verify that the Notices had been adequately addressed by the applicant in establishing qualification for these cables at WBN. The Binders reviewed were CABL-027, CABL-063, and CABL-051. The inspector concluded the files adequately addressed each Notice.

4.0 MECHANICAL EQ PROGRAM

The mechanical equipment qualification (MEQ) program is the method used by the applicant to demonstrate that active safety-related mechanical equipment conforms to the applicable requirements of 10 CFR 50 Appendix

A, GDC 1, "Quality Standards and Records," and 4, "Environmental and Dynamic Effects Design Bases", and 10 CFR 50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants". The MEQ Program was similar to the electrical 10 CFR 50.49 EQ Program and included the following attributes:

(a) Provided for identification of safety-related mechanical equipment located in harsh environment areas, including required operating time.

(b) Provided for identification of non-metallic subcomponents of this equipment.

(c) Provided for identification of the environmental conditions this equipment must be qualified. The environments defined in the electrical equipment program are also applicable to mechanical equipment.

(d) Provided for identification of non-metallic material capabilities.

(e) Documented the evaluation of environmental effects.

During the week of February 27, to March 3, 1995, the NRC staff conducted an audit of the qualification files for mechanical equipment in a harsh environment at the Watts Bar site. Watts Bar (the applicant) provided a list of systems and equipment for audit. From this list, the following packages were selected and audited:

- 001, Damper, by American Warning and Vent
- 005, Relief Valve, by Crosby
- 006, Containment Spray Pump, by Babcock and Wilcox
- 017 and 018, Exhaust Fan, by H. K. Porter
- 051, Glove Valve, by Westinghouse

The audit was structured to identify potential weaknesses in the layout of the Mechanical Equipment Qualification (MEQ) program and included reviewing MEQ program procedures, and the list of systems and equipment provided by the applicant, walking down equipment installed in the plant, and inspecting components stored in the warehouse for future use. This audit did not, and was not intended to verify calculations or calculation methodology. The NRC expects licensees and applicants to use acceptable methods previously approved by the NRC staff, such as material data searches for radiation threshold data and the Arrhenius methodology for calculating qualified life where proper testing has been conducted. Nevertheless, this audit focused on results derived from the applicant's data searches and calculations.

The inspector concluded that the MEQ program at Watts Bar was adequate and provided the following comment that was addressed by the applicant. The inspector noted that in the MEQ binders there were several instances where change-out or replacement of lubricants, grease and other equipment was not required for forty years, and no supporting technical justification was provided. However, discussions with the applicant revealed that these items would be replaced periodically in accordance with the plant preventative maintenance (PM) program. The inspector agreed that the PM program was adequate to maintain the qualification of equipment; however, the MEQ binders did not include references to the PM Program. The applicant agreed with the comment and subsequently updated the MEQ binders to include the applicable aspects of the PM program as the governing program for maintenance and surveillance.

## 5.0 QA EFFECTIVENESS

The inspectors reviewed the following Quality Assurance Assessment Reports to evaluate the effectiveness of the applicant's QA program controls during the performance of various activities involving environmentally qualified equipment:

Assessment of Environmental Qualification of Electrical/Mechanical Equipment Programs

Report No NA-WB-94-0145, dated February 27, 1995

Report No NA-WB- 94- 0130, dated December 16, 1994

Report No NA-WB-94-0120, dated December 22, 1994

Report No NA- WB- 94-0013, dated February 28, 1994

The following documents the inspection results for the various activities inspected.

QA Assessment Report No. NA-WB-94-0145 was issued at the beginning of the inspection. This assessment evaluated the processes being implemented by modifications and maintenance that maintains qualified equipment to the EQ engineering and vendor specification requirements. The assessment examined a population of EQ components that were considered to be EQ complete. Maintenance and modification records were reviewed to ensure all required procurement, storage, modification, maintenance, and startup activities that could have an effect on the components EQ status have been performed. The assessment resulted in 10 Findings and 1 recommendation. Four of the findings were still open. The remaining 6 findings were corrected on the spot. The 4 open items are being addressed as part of the extent of condition scope for the following:

1. WBSCA940067 - Failure of field verification activities to document soleniod valve orientation for engineering evaluation will be addressed by existing WBSCA940067.

2. WBPER940753 - Failure to remove shipping covers on temperature switch detectors before installation.

3. WBPER940756 - Failure to complete or reschedule required qualification maintenance during startup testing activities.

4. WBPER940707 - Failure to care for replacement o-rings while in storage in accordance with qualification maintenance requirements will be addressed by existing WBPER940707.

The conclusion from the assessment was that implementation of the EQ program has not been totally adequate. The inspectors reviewed the issues discussed in the assessment report to evaluate the applicant's corrective action plans for resolving the identified findings. The inspectors considered the applicant's corrective action plans to be adequate.

Assessment Report No. NA-WB-94-0145, documented results of evaluations performed to verify that primary and secondary drawings and system descriptions are consistent with the EQ Binder. The assessment concluded that there was consistency among the design output documents. This report also provided the results of field walkdowns performed to compare the as-built configuration of selected EQ equipment with the documented configuration in the EQ field verification packages. Four components were identified as having discrepancies in their vertical locations from the floor elevation. The report concluded that the overall accuracy of field verifications was questionable and this deficiency was documented on WBSCA940067.

Assessment Report No. NA-WB-94-0130 documents the evaluation of the following design engineering requirements: (1) manufacturing data contained on tags/nameplates attached to installed EQ/MEQ components are consistent with field verification data in the EQ Binder, and (2) field configuration resulting from design changes is appropriately implemented. The report concluded that the first design requirement is being adequately implemented. For the second requirement, five valves were identified as not having the T-Drains installed in accordance with the 47W576 drawing series and this deficiency was documented on PER WBPER940675. Assessment Report No NA-WB-94-0120 provided results of evaluations performed of the following objectives: (1) the EQ/MEQ Binders are being updated to reflect design changes, (2) installed components are accurately reflected in the EQ/MEQ Binders, and (3) The EMS is updated to reflect design changes. For objective number 1 numerous examples were identified where EQ Binders were not being revised to reflect as-constructed plant configuration. A conclusion was not provided for objective number 2 because sufficient field data was not available. Objective number 3 was determined to have been adequately implemented.

The inspectors concluded that the narrow scope, in depth evaluations performed by the QA organization of various activities or requirements of the EQ program have been adequately performed. The results of these assessments have revealed substantive deficiencies in implementing the EQ program for which the applicant was undertaking corrective action. It was concluded that this action was effective because of the lack of problems identified by the NRC inspection.

## 6.0 CONCLUSIONS

The team concluded that both the electrical and mechanical EQ programs were being implemented in accordance with program controls and procedures, that completed EQ documentation files were adequate, that QA Assessments had been effective in identifying problems with the EQ Program implementation, and that those identified EQ problems were being adequately addressed by the applicant's corrective action programs. However, the scope of the audit was limited by the number of EQ systems that had been completed. Further inspection will be required to determine if the EQ Program is satisfactorily completed at Watts Bar.

## 7.0 EXIT INTERVIEW

The inspection scope and findings were summarized on March 10, 1995, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results. Dissenting comments were not received from the applicant. Proprietary information is not contained in this report.

## 8.0 ACRONYMS AND INITIALISMS

| | |
|---|---|
| ABGTS | Auxiliary Building Gas Treatment System |
| ANSI | American National Standards Institute |
| CAP | Corrective Action Program |
| CAQ | Condition Adverse to Quality |
| CFR | Code of Federal Regulations |
| CS | Containment Spray |
| CSC | Conduit Seal Assembly |
| dp | Differential Pressure |
| DCA | Design Change Authorization |
| DCN | Design Change Notice |
| DS | Design Standard |
| EAI | Engineering Administrative Instruction |
| EGTS | Emergency Gas Treatment System |
| EMS | Equipment Management System |
| EOI | Emergency Operating Instruction |
| EQ | Environmental Qualification |
| EQCS | Environmental Qualification Change Supplements |
| EQFVP | EQ Field Verification Package |
| EQIR | Environmental Qualification Information Release |
| FCV | Flow Control Valve |
| FSAR | Final Safety Analysis Report |
| FSV | Flow Solenoid Valve |

| | |
|---|---|
| FT | Flow Transmitter |
| GDC | General Design Criteria |
| HELB | High Energy Line Break |
| HERS | Harsh Environment Records System |
| HS | Hand Switch |
| HTR | Heater |
| IEEE | Institute of Electrical and Electronic Engineers |
| IEN | Inspection and Enforcement Notice |
| INEL | Idaho National Engineering Laboratory |
| JB | Junction Box |
| LOCA | Loss of Coolant Accident |
| MEQ | Mechanical Equipment Environmental Qualification |
| MSLB | Main Steam Line Break |
| MTR | Motor |
| NEMA | National Electrical Manufacturers Association |
| NEP | Nuclear Engineering Procedure |
| NP | Nuclear Power |
| NRC | U.S. Nuclear Regulatory Commission |
| NRR | Nuclear Reactor Regulation |
| PAI | Plant Administrative Instruction |
| PAM | Post Accident Monitoring |
| PCV | Pressure Control Valve |
| PER | Problem Evaluation Report |
| PT | Pressure Transmitter |
| PW | Primary Water |
| QA | Quality Assurance |
| QMI | Qualification Maintenance Instruction |
| QMDS | Qualification Maintenance Data Sheet |
| RCS | Reactor Coolant System |
| RHR | Residual Heat Removal |
| SCA | Significant Condition Adverse to Quality |
| SI | Safety Injection |
| SOL | Solenoid |
| SOR | Static-O-Ring |
| SP | Special Program |
| SPOC | System Pre-operability Checklist |
| SR | Safety-related |
| SSP | Site Standard Practice |
| STD | Standard |
| TBLK | Terminal Block |
| TE | Temperature Element |
| TI | Technical Instruction |
| TS | Temperature Switch |
| TVA | Tennessee Valley Authority |
| WBN | Watts Bar Nuclear |
| WBNP | Watts Bar Nuclear Plant |
| WID | Work Initiating Document |
| XMTR | Transmitter |
| ZS | Limit Switch |