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

Report Nos.: 50-390/93-48 and 50-391/93-48

Licensee: 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 1 and 2

Inspection Conducted: June 19 through July 16, 1993

Inspectors: G. A. Walton 8/11/93
G. A. Walton, Senior Resident Inspector, Construction — Date Signed

M. M. Glasman, Resident Inspector, Watts Bar
P. G. Humphrey, Resident Inspector, Watts Bar
K. D. Ivey, Resident Inspector, Watts Bar
J. F. Lara, Resident Inspector, Watts Bar
J. J. Lenahan, Reactor Inspector, Region II

Consultant: D. O. Myers, Beckman and Associates (paragraphs 8 and 10)

Approved by: P. E. Fredrickson 8/11/93
P. E. Fredrickson, Section Chief, Division of Reactor Projects — Date Signed

SUMMARY

Scope:

This routine resident inspection was conducted in the areas of electrical construction activities, modification workplan reviews, preoperational test program implementation verification, system plant acceptance evaluations, emergency operating procedure reviews, emergency lighting, review of 10 CFR 50.55(e) report, follow-up on NRC Information Notices, and action on previous inspection findings.

Results:

The licensee's performance of electrical work activities and documentation continued at a generally acceptable level. No deficiencies were identified in reviews of startup testing activities.

One violation was identified involving the failure to perform a bounding condition analysis for a sampling plan which included discrepant items. This resulted in the acceptance of instrument line supports without an evaluation of the effectiveness of the sample batch used in bounding the reasonable worst case conditions of known discrepancies. Further review determined that the licensee had completed appropriate corrective actions for the violation during the inspection period.

One inspector follow-up item was identified for a discrepancy between the FSAR and the application of Raychem splices for Unit 1 pressurizer heater cables.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*T. Arney, Senior Quality Project Manager
M. Bellamy, Startup Manager
*J. Blackburn, Project Manager, Completion Assurance
K. Boyd, Site Licensing Program Administrator
*M. Brickey, Lead Electrical Engineer
*J. Christensen, Site Quality Manager
S. Crowe, Site Quality Assurance Manager
*T. Dean, Compliance Licensing Engineer
W. Elliott, Engineering and Modifications Manager
*N. Kazanas, Vice President Completion Assurance
*D. Koehl, Technical Support Manager
*F. Koontz, Operations Engineering Manager
A. McLemore, Modifications Field Engineering Manager
L. Maillet, Site Support Manager
*E. Magilley, Project Management, Stone & Webster Engineering Corp.
*R. Milhiser, Vice President & Project Director, Ebasco
*D. Moody, Plant Manager
*W. Museler, Site Vice President
C. Nelson, Maintenance Support Superintendent
*P. Pace, Compliance Licensing Manager
*G. Pannell, Site Licensing Manager
K. Stinson, TVA Project Manager
*S. Tanner, Support Services Manager
C. Whitehead, Project Engineer

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

NRC Inspectors

*M. Glasman, Resident Inspector, WBN
*K. Ivey, Resident Inspector, WBN
*J. Lara, Resident Inspector, WBN

*Attended exit interview

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

2. Management Oversight Meeting (40500)

To monitor the progress of ongoing work activity on site and stay abreast of emergent issues, the inspectors attend morning management oversight meetings. The purpose of these meetings is to discuss progress of ongoing test and modifications activities and any restraints

on completion of these activities in accordance with the schedule. These meetings are widely attended by representatives of most organizations on site including startup, maintenance, all modifications disciplines, operations, QA, work control, materials, engineering, and licensing. In addition, at least one site vice president was present at meetings attended by the inspectors. The inspectors found that representatives of organizations in attendance communicated effectively and that these meetings were conducted in a professional manner and contribute to coordinated, effective completion of modifications and test activities. Within the areas reviewed, no violations or deviations were identified.

3. Electrical Construction Activities (TI 2512/16)

The following work activities were evaluated for compliance with the specified requirements listed in the workplans as discussed below.

a. WP D-110012-46, Install Cables

This workplan pertained to the installation of various system 68, Reactor Coolant System, cables. The inspector witnessed the installation of cable 1PM5566F (Mark No. WVC, #16 AWG 4/C) as it was installed in conduit 1PM8087F. This cable was routed from electrical containment penetration 1-PENT-293-45-F to panel 1-PNL-99-R10. The cable was pulled from a C-condulet on auxiliary building elevation 757 towards the R10 panel located on the control building lower elevation. The cable pull tension was monitored through the use of a breaklink with a qualified strength of 80 pounds. This was below the maximum pull tension limit (Tmax) of 82 pounds. No deficiencies were identified.

b. WP D-11050-55, Install Cables

This workplan pertained to the installation of diesel generator output cables. These cables were designed to be routed through underground ductbanks from the diesel generator building to the auxiliary building. The cables were being replaced due to ampacity concerns.

The inspector observed the in-progress installation of cable PP351A (Mark No. WNF-1). The cable was installed from manhole MH-27 to manhole MH-25. The cable set consisted of three single conductor 500 MCM cables rated at 8 kV. The cable set was installed through the use of pull ropes attached to a truck winch providing a steady continuous pull. The cable pull tension was monitored through the use of a calibrated dynamometer (M&TE 564315). The measured pull tension was observed to be well below the pull tension limits specified in the pull calculations (Tmax = 2587.95 pounds). The calculations were reviewed and determined to be acceptable in considering the proper cable characteristics and conduit size. No deficiencies were identified.

c. WPs D-10682-03 and D-10685-03, Install, Splice, and Terminate Cables

These workplans pertained to the replacement of system 68 cables due to inadequate ampacity concerns. The cables provide power to the pressurizer heater backup groups.

The inspector observed ongoing work following the cable installations and during the cable splicing. The pressurizer heater cables are routed from the pressurizer heater transformers (6900/480 V) through electrical containment penetrations to the bottom of the pressurizer. Approximately 15 feet below the pressurizer a splice junction box was installed to facilitate Y-splices to the heaters. The inspector observed preparations for the splices and noted that some splices had already been performed. The inspector expressed concerns regarding the adequacy of the splices due to the terminal lug size and the type of cable.

The splices were observed to be made with the cable conductors being crimped with size 2/0 lugs. The installed pressurizer heater cables are also size 2/0 but contained flexible strands which resulted in a larger cross-sectional area than other types of stranded 2/0 conductors. The result was that the lugs appeared to be undersized for the type of cable being spliced. At the time the inspector expressed concern, the licensee had already proceeded to review the adequacy of the installation. Laboratory tests were performed to establish the adequacy of the crimping. The tests were performed by TVA Central Laboratories and were documented in Final Report, Testing for Determination of Pullout Force and Continuity for Terminations of Rockbestos MicaTemp PHC Cable with Thomas & Betts 2/0 Terminal Lugs, dated July 8, 1993. Tests were performed on 15 samples of Rockbestos cables with crimped T&B 2/0 terminal lugs. The samples were visually inspected, continuity checked, and subjected to 300 pounds of tension for one minute. All tested samples passed the testing. The test results resolved the inspector's concerns.

The inspector also observed that the above splices were made using Raychem heat shrink material for providing the splice insulation. The spliced cables were Rockbestos - Micatemp Pressurizer Heater Cable (250 degrees C, 600 V, Class 1E Nuclear, Non-LOCA Rated). These cables are constructed of flexible strand, nickel coated copper with a high grade reinforced MICA tape insulation and a glass braid overall covering. The Raychem heat shrink was applied over the outer glass braided jacket. The inspector raised two concerns regarding the adequacy of the splices:

1) Raychem heat shrink material applied over glass braided jacket and in high temperature environment.

The inspector expressed a concern that the application of the Raychem heat shrink material may not be acceptable since it was being applied over an unsuitable substrate and installed in a high temperature area.

Raychem installation instructions required that the heat shrink material be applied over suitable substrates and identify braided material as an unsuitable substrate. Prior to performing this splice, TVA discussed this application with Rockbestos but not with Raychem. The inspector requested that TVA provide a basis for the acceptability of this splice considering the Raychem installation requirements.

The licensee contacted Raychem Corporation regarding the adequacy of the Raychem heat shrink application. Raychem indicated via telecon (July 15, 1993, RIMS T41930716871) that the application was acceptable provided three conditions were satisfied:

a) The maximum conductor temperature does not exceed 90 degrees C.

b) LOCA qualification is not required.

c) Class 1E certification is not required.

The pressurizer heater cables are not required to be LOCA qualified for accident conditions and also are not classified as Class 1E circuits. Therefore, conditions b) and c) were met. Additional evaluations were performed to confirm condition a) above.

Environmental data drawing 47E235-42, Revision 2, specified that the containment lower compartment (includes pressurizer area) may experience a maximum temperature of 120 degrees F (49 degrees C) and maximum relative humidity of 80 percent during normal operational modes. The subject splices were located in a junction box approximately 15 feet above the lower compartment area and 15 feet under the pressurizer. Therefore, the inspector expressed a concern that the Raychem heat shrink material's temperature rating may be exceeded during normal, non-accident operation. This concern was based on consideration of the ambient containment temperature at the junction boxes' elevation, the localized hot-spot temperature inside the junction box, the temperature rise due to normal cable loading and the Raychem temperature rating of 90 degrees C (194 degrees F).

The licensee performed calculations to show that the temperature rise for the affected cables would not result in the conductor temperature exceeding 90 degrees C. The

licensee relied on operational data from SQN temperature elements located below the pressurizer and by correlating the element elevation to a corresponding elevation at WBN. The temperature of the conductors entering the junction box was calculated to be 140 degrees F (60 degrees C). In addition, the licensee also considered the temperature rise inside the junction box and conservatively assumed that the backup group heaters were continuously energized. Based on the results of the evaluation, the licensee concluded that condition a) above was satisfied. The inspector reviewed the evaluation and concluded that it addressed the identified concerns.

2) FSAR Chapter 8 Commitments Contradict Field Installed Pressurizer Heater Cables.

The inspector identified a discrepancy between the FSAR and the application of Raychem splices for the pressurizer heater cables. WBN FSAR Chapter 8.3.1.2.3, Safety-Related Equipment in Potentially Hostile Environment, states:

> "The safety-related electrical equipment that must operate in a hostile environment during and/or subsequent to an accident is identified below.
>
> <u>Pressurizer Heater Cable</u>
>
> The low-voltage power cable, not exceeding 600 volts between conductors, is insulated with silicone rubber for 200 C conductor temperature. The cable is jacketed with asbestos braid."

Note: The above section will be revised through a planned FSAR Amendment submittal to identify the high temperature MICA Rockbestos cable (250 degrees C) as also providing power to the pressurizer heaters.

The above FSAR commitments state that the pressurizer heater cables must operate in a hostile environment during and/or subsequent to an accident. However, the installed pressurizer heater cables are not rated for a LOCA environment and splices were installed in a configuration that is unqualified during and/or subsequent to an accident. Therefore, the installed cable circuit for the pressurizer does not meet the commitments stated in the FSAR.

The licensee stated that the FSAR commitments would be reviewed and an FSAR Amendment would likely be submitted. Therefore, this issue is identified as inspector follow-up item IFI 390/93-48-01, Pressurizer Heater Cables, pending

TVA submittal of an FSAR Amendment to revise the stated commitment.

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

4. Modification Workplan Reviews (TI 2512/16)

During this inspection period, the licensee's primary contractor (Ebasco) issued a memorandum to electrical superintendents, dated June 23, 1993, regarding second party verification requirements during the performance of modification activities. The inspector expressed concern that the memorandum provided guidance that was contrary to established procedural requirements regarding verification of work activities.

MAI-1.3, General Requirements for Modifications, Revision 5, defined the responsibilities of personnel involved with modification activities. These included the following:

a. Craftsman performs first party verification to indicate that a work activity has been satisfactorily completed. This is documented by a signature in the work implementing document (i.e. workplan or work order).

b. Foreman (or designee) performs second party verification to indicate that a work activity has been satisfactorily completed. This is also documented by a signature in the work implementing document.

c. Quality control inspector performs a QC verification of the work activity.

The MAI defined "Verification" as:

> "An act of confirming, substantiating, and ensuring that an activity or condition has been implemented in conformance with the specified requirements."

Attachment A of the MAI further stated:

> "A second additional verification signifies that a work activity, attribute, or grouping of attributes has been satisfactorily completed in accordance with the work implementing document, referenced instructions, and applicable design output documents. Work is ready for verification and acceptance by a QC inspector for safety-related and applicable quality related items."

The Ebasco memorandum stated that it was not the intent of MAI-1.3 (nor procedure SSP-7.53, Modification Workplans) to imply that the second party verifier need be qualified and/or certified to the same requirements as the individual performing the activity. The memorandum stated this was also true since special processes like Raychem splicing were verified by QC after the second party verification was completed.

The inspector concluded that the memorandum provided guidance which was contrary to the established procedure requirements and would allow a non-qualified individual to perform second party verifications without knowing any applicable requirements. On July 6, 1993, this concern was discussed with TVA representatives who were unaware of the issued memorandum. A subsequent memorandum dated July 7, 1993, clarified the guidance by removing reference to the qualification of second party reviewers. Therefore, such verifications will be performed by qualified personnel (have received training to procedure requirements for that activity) but are not required to be certified to perform the work. The licensee interviewed craft foremen and reviewed in-progress workplans and was able to verify that second party verifications were performed by qualified personnel.

The inspector reviewed in-progress WPs D-11885-12 and D-10684-03, Volumes 2 and 3, and verified that 12 individuals who performed second party verifications were qualified and/or certified to perform such verifications. The licensee's review and the results of the NRC workplan review addressed the inspector's concern.

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

5. Preoperational Test Program Implementation Verification (70302)

The inspector reviewed activities associated with system testing and completion during the reporting period. These activities included reviews of JTG meetings, system and component testing, pipe flushing, and associated documentation for both safety and non-safety related systems. Although less emphasis was placed on the non-safety systems, random inspections were performed to ensure that these systems were properly tested and that each will function as designed to prevent system failure and unnecessary challenge to safety systems.

a. Joint Test Group Meetings

The JTG meetings were held to provide technical oversight of the WBN system testing program. The meetings included review and evaluation of test procedures prior to testing and review and evaluation of completed test data. The inspector attended JTG meeting 1-93-052, held on June 25, 1993, to evaluate test procedures, PTI-030C, Auxiliary Building ESF Equipment Coolers Electrical, Revision 0, and PTI 030L-01, Containment Air Return Fans, Revision 0. The licensee had identified some concerns with both procedures at a previous JTG meeting and those concerns had been dispositioned and found acceptable by the committee members. As a result, the test procedures were approved by the JTG.

The inspector determined that the JTG activities were performed in accordance with procedure SMP-3.0, Joint Test Group Charter, Revision 7.

b. Component Testing

Component testing included a scheme check of individual components within the system and verification of the logic diagrams for the component. The inspector observed the following component test in progress:

- GTEXXX-02, Scheme Verification, Component WBN-1-BKR-063-0026A, System 480V RX MOV BD, 1A1/11D for 1-FCV-63-26A, Revision 3

The observed work activities were performed in accordance with the generic test specified.

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

6. System Plant Acceptance Evaluations (70302)

Nuclear Engineering performed evaluations of each available system to determine acceptability for testing (Phase I) and evaluated each system after testing and prior to turnover from the startup group to the plant for operation (Phase II). The following SPAE documents were reviewed by the inspectors:

a. SPAE Phase I

Phase I of the SPAE was performed to identify all remaining engineering items that would not be completed prior to system testing and included an evaluation of the impact that the engineering incomplete items would have on testing the system. Phase I SPAE documents were reviewed for the following system:

- System 39: CO2, Storage, Fire Protection, and Purging

b. SPAE Phase II

Phase II of the SPAE was performed by NE after system testing and prior to turnover from the startup and test organization to the plant for operation to verify that design, modification, and documentation efforts were completed. However, areas that could not be completed prior to the system turnover to the plant were evaluated and tracked on a master tracking system with a required completion based on plant completion milestone events. Phase II SPAE documents were reviewed for the following systems:

- System 232: Reactor Vent Power System

- System 214: Control and Auxiliary Vent Power

The engineering evaluations reviewed for the SPAE program were determined to have been performed in accordance with EAI-3.07, System Plant Acceptance Evaluation, Revision 4. In addition, the

deferrals and exceptions were found to be acceptable and the required completion dates were assigned to plant completion and startup milestones. The open items were documented on the master tracking system for the applicable system.

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

7. Emergency Operating Procedure Reviews (42001)

The inspector performed a follow-up inspection for 61 of the items identified during the EOP inspection (IR 390, 391/93-30). The purpose of this follow-up was to verify that the licensee had taken appropriate action on the items essential to be completed prior to administering operator licensing examinations. These 61 items were identified in a letter from TVA to the NRC, dated June 18, 1993, Subject: Watts Bar Nuclear Plant (WBN) - NRC Inspection Report Nos. 50-390/93-30 And 50-391/93-30, Watts Bar Emergency Operating Procedures (EOPs).

The inspector found that each of the 61 items identified in the letter as essential had been addressed by the licensee. Where the items applied to both the simulator and the main control room, only the simulator revisions were addressed since only the simulator would be utilized for the examinations.

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

8. Emergency Lighting (37301)

During a tour of auxiliary building elevation 757.0, the inspector noted that the four 125 V vital battery board rooms did not have emergency lighting fixtures installed. The rooms contained the eight 120 VAC vital instrument power boards (four for each Unit) and the four common 125 VDC vital battery boards. The inspector also noted that very few rooms on auxiliary building elevation 757.0 did not have emergency lighting fixtures.

The inspector discussed the requirements for emergency lighting with NE personnel and reviewed system description N3-228-4003, Plant Lighting, to determine the design configuration for the four rooms in question. Engineering personnel indicated that emergency lighting was not required for the board rooms in question, but the rooms did have fixtures powered by the standby lighting system. The plant lighting system description indicated that 125V DC emergency lighting and/or 8-hour DC battery pack lighting was required in areas where equipment must be attended for safe shutdown, and egress/ingress routes to and from the equipment. The board rooms in question were not listed in the system description as requiring emergency lighting.

FSAR Section 9.5.3.1, Lighting, describes the three basic lighting systems for WBN: normal, standby, and emergency. The standby lighting system provides adequate illumination for the safe shutdown of the reactor and the evacuation of personnel from vital areas of the plant

upon loss of the normal lighting system. The standby system is fed from 480V AC C&A vent boards to 3-phase AC transformers to standby lighting cabinets. The 480V AC C&A vent boards are fed by the DGs in the event of a loss of offsite power. The emergency lighting system consists of two parts: 1) a 125V DC system which is designed to provide the immediate minimum illumination in areas vital to the safe shutdown of loss of all AC auxiliary power; and (2) individual 8-hour battery pack lighting which is used to supplement the 125V DC system in areas that must be manned for safe shutdown and for access and egress to and from all fire areas.

From review of drawings 45W1418-1, Auxiliary and Reactor Building - Unit 1 Lighting Floor El 757.0 Plan, Revision 19, and 45W2418-1, Auxiliary and Reactor Building - Unit 2 Lighting Floor El 757.0 Plan, Revision 22, the inspector confirmed that the four board rooms included fixtures powered by the normal and standby lighting systems.

The inspector concluded that the lack of emergency system lighting for the four rooms in question was in accordance with the FSAR, system description, and approved plant drawings.

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

9. Review of 10 CFR 50.55(e) Report (92700)

(Closed) CDR 390/86-22, 391/86-18, Incorrect Use of Typical Supports on Instrument Sense Lines

The licensee initiated NCR 6597 on January 27, 1986, to document Unit 1 deficiencies in the installation of typical instrument line supports. The deficiencies resulted from the misinterpretation of attributes, such as the number of instrument lines attached to a support, shown on design drawings 47051-35 and 47051-35A. The CDR final report, issued on February 13, 1986, stated that the licensee would perform rework and reinspection of all instrument line supports that did not meet design.

The NRC reviewed the CDR and associated corrective actions in IR 390, 391/92-26 and issued DEV 390, 391/92-26-02 for the failure to notify the NRC of a change in commitments made in the CDR (see paragraph 11 for further discussion of the deviation). The licensee issued a revision to the CDR final report on April 8, 1993, to document the change in corrective actions. The revised final report reflected the changed corrective actions and stated that after evaluation of the results of a partial inspection of supports, a random sample would provide adequate confidence for the technical review of the supports.

During this inspection period, the inspector reviewed the revised CDR final report and associated NRC concerns documented in IR 390, 391/92-26. The NRC concerns involved the documentation of the as-built condition of supports and the adequacy of sampling as a means to accept the deficiencies identified with the installation of the 1277 instrument line supports. The inspector found that the reconciliation of

inaccurate permanent plant inspection records that existed for the instrument line supports with a valid technical acceptance would be addressed in the QA Records CAP. The adequacy of the QA Records CAP will be addressed by future NRC inspections and was not considered to be within the scope of this CDR.

SCAR WBN9200115SCA was initiated to track completion of the corrective actions for the CDR. The SCAR initially implemented the actions from NCR 6597; however, the SCAR corrective actions were revised in May 1992 to allow the use of a random sampling plan for the acceptance of supports. This led to a revision of the CDR response as discussed above.

The inspector reviewed the results of the random sampling plan, Sample Plan P002, Verification of Technical Adequacy of 47A051-35 Typical Supports, Revision 2, which was initiated in accordance with EAI-8.04, Reverification/Reinspection Sampling. The plan required that a statistically valid sample of 58 random supports be evaluated against the attributes contained in the design drawings. Any discrepant items found would cause the support to be evaluated by engineering.

The sampling plan results were that 48 of the 58 selected supports had discrepant items and failed to meet all of the attributes contained in the acceptance criteria. These findings resulted in the initiation of DNE Calculation TEACEBEMG77, Resolution of SCAR WBP900115SCA. The objective of the calculation was to determine the significance of the discrepant items and to determine if any defects existed such that the supports would not meet their design safety function. The results of the calculation indicated that no defects existed in the supports (i.e., all those evaluated would have met their intended design function). The conclusion of the calculation, in effect, stated that since no defects were found in any of the 58 supports reviewed (10 that met all attributes and 48 reviewed in the calculation with no defects), the entire population of supports was adequate.

Section 4.5.1 of EAI-8.04 states that the lead engineer:

> "Upon completion of the engineering evaluation of discrepant items in the sample items and the determination that no defective items exist in the sample, causes the performance of a bounding analysis to assess the underlying cause of the discrepancies observed, and to assess the application of the results to the entire population. This analysis should address the extrapolation of sampling results to reasonably anticipated limiting cases."

The purpose of a bounding analysis would have been to validate that the sample selected reasonably captured the most limiting conditions of discrepant items that existed in the 1277 supports.

The inspector found that minimum margin factors were the primary means of establishing that a support would meet its design safety function. A

minimum margin factor is determined as the allowable stress divided by the actual calculated stress on a given support. The inspector found that the minimum margin factors were as low as 1.03 for the 48 supports that were analyzed by engineering as part of the sample. This places a support within a 3 percent margin of being considered defective and, as such, could cause a more expansive review of the 1277 supports. The inspector could find no evidence that a bounding analysis was performed consistent with the requirements of EAI-8.04. The inspector notified the licensee of this concern and licensee personnel indicated that the "conclusion section" within the engineering calculation was intended to be the bounding analysis. The inspector considered the "conclusion section" to be inconclusive. The inspector also noted that PER WBPER930183 was issued on July 6, 1993, to document that the requirements of EAI-8.04 were violated because an adequate bounding analysis had not been performed.

The Nuclear QAM implements the requirement of ANSI N45.2, Section 11, which states:

> "Where a sample is used to verify acceptability of a group of items, this sampling procedure shall be based on recognized practices and shall provide adequate justification for this sample size and selection process."

EAI-8.04 is the site approved sampling procedure upon which the sample was based. The failure to accomplish the bounding analysis of Sample Plan P002 in accordance with EAI-8.04 is identified as a violation of 10 CFR 50, Appendix B, Criteria V, Instructions, Procedures, and Drawings (VIO 390/93-48-02, 391/93-48-01, Failure to Follow Procedures for Sampling).

Based on further review of this issue, the inspector concluded that the licensee took prompt corrective actions for the violation during the inspection period. The corrective action document that was initiated to identify the problem (PER WBPER930183) was completed and addressed the violation cause, corrective actions, actions to prevent recurrence, and evaluation of the generic implications of the violation. The cause for the violation was attributed by the licensee to personnel-lack of attention to detail.

The inspector reviewed the corrective actions completed by PER WBPER930183 for the resolution of the violation. The closure actions stated that the subject calculation, TEACEBEMG77, would be revised to include a bounding analysis; that the licensee would review previously implemented sampling plans, performed in accordance with procedure EAI-8.04, to verify that a section 4.5 bounding analysis had been properly completed and correct any problems; and that a memorandum would be issued to all NE personnel to highlight and emphasize the requirements of procedure EAI-8.04, section 4.5.

The inspector reviewed each of the corrective action items as discussed below:

- The revised calculation contained an expanded discussion and justification of the validity of the sample size which was used as the basis to accept the instrument line supports. The inspector found that while each of the attributes used to justify the sample selection were not clearly tied to establishing how they were associated to the limiting conditions, sufficient facts were available to constitute a valid argument. The most significant fact presented was that the licensee had performed an earlier evaluation of supports of three major systems. In that effort 340 supports were evaluated and found to be acceptable. The licensee stated that this acceptance was based on the minimum margin factors greater than one. The inspector concluded that the revised calculation was in accordance with EAI 8.04, Section 4.5.

- The memorandum to all WBN Nuclear Engineering personnel addressing the recurrence controls for failure to perform a bounding analysis was issued on July 16, 1993.

- The licensee review of other sample plans for the adequacy of bounding analysis was completed and determined that no other examples were identified. Four other sample plans had been executed in civil and mechanical engineering branches.

Corrective actions for VIO 390/93-48-02, 391/93-48-01 were completed by the end of this inspection period, and the actions reviewed by NRC representatives were found acceptable. No further deficiencies were identified.

One violation was identified.

10. Follow-up on NRC Information Notices (92701)

a. IN 92-15, Failure of Primary System Compression Fittings

This IN was issued to alert licensees to inadequate installation of compression fittings resulting from inadequate procedures or inadequate training of craft personnel who install compression fittings.

In 1985, the licensee identified numerous problems with compression fittings on instrument tubing. These problems were documented on NCR WBN 6278. This deficiency was also reported to the NRC as CDR 390/85-43 and 391/85-42. The inspector reviewed the licensee's revised final report for the CDR dated May 11, 1990. The problems with installation of compression fittings identified by the licensee and documented in the NCR were very similar to those described in the IN. The problems included fittings in which the ferrules were installed backwards, or omitted, nuts not tightened properly, failing to bottom the tubing

in the fitting, interchanging fitting hardware from different manufactures, and failing to deburr tubing cuts.

The licensee's corrective action to disposition the NCR included revision of specifications and installation procedures, training of craft personnel on the revised procedures, and performance of a testing program to determine the effect of the installation discrepancies on the integrity of the fittings. The conclusions of the testing program were that if a compression fitting did not leak during the hydrostatic test, the fitting was satisfactory. In a SER dated September 8, 1989, the NRC staff accepted the licensee's corrective actions and concurred with the conclusions of the testing program.

During the current inspection, the inspector reviewed procedures and specifications which controlled the installation of compression fitting. The following documents were reviewed:

- Specification G29-P.S.3.M.13.1, Installation and Verification of Compression Fitting Joints in Mechanical Tubing Systems, Revision 1

- Site Instruction IMI-110, Installation Procedure for Compression Tube Fitting, Revision 0

- MAI-4.4A, Instrument Line Installation, Revision 4

- Engineering Specification N3E-934, Instrument and Instrument Line Installation and Inspection, Revision 3

Review of the procedures and specifications showed that these documents addressed the vendor's installation recommendations, addressed the problems summarized in the IN, and required that the craft (installers) be trained and certified prior to installing fittings. During review of IMI-110, the inspector noted that this procedure was revised with a temporary procedure change notice, dated August 21, 1992, to incorporate a precaution to ensure that the tubing does not move (back-out) of the fitting when the nut or the fitting is tightened. The reference note for this was noted as IN 92-15. Based on review of the above procedures and specifications, the inspector concluded that they contained adequate instructions for installation and inspection of compression fittings.

The inspector also reviewed the craft training program lesson plans which covered installation of instrument tube fittings. The lesson plans reviewed were mechanical maintenance training course numbers MTS 328 and MTS 341. Course MTS 341 was for retraining of instrument maintenance technicians who had received the initial training and certification on installation of compression fittings. Course MTS 328 covered initial training on tube fitting. The inspector noted that vendor requirements for proper

fitting installations were covered in the courses, problems of the type summarized in IN 92-15 were specifically addressed in the training, and drawings were included to identify the four types of fittings used at WBN. Training aids were also used, which included cut-a-way models of the Swagelok, Parker CPI Type BZ, Parker Ferulok Type BU, and Imperial-Eastman fittings currently used on site. The training also covered the procedure for retightening the fittings. To become certified, the craft personnel were required to pass a written exam after completing their training, complete a practical exercise to demonstrate the ability to properly assemble the four types of fittings, and identify the different manufacturer's compression fitting components. The inspector concluded that the training program was comprehensive, well defined, and provided understanding of requirements for installation of compression fittings.

The inspector examined the results of the testing program performed for instrument tubing/compression fittings at the Singleton Material Engineering Laboratory. Testing was only performed on Parker CPI fittings and Imperial-Eastman fittings. Discussions with licensee engineers disclosed that the other two types of fittings were not subject to the testing program since only a small number of these types of fittings had been installed during the original plant construction, and the concerns were not identified with these fittings. During testing, the installation deficiencies were duplicated as the Parker CPI and Imperial-Eastman fittings and subjected to axial tension and dynamic testing. The results of the testing program show that if the fittings could pass a hydrostatic test, they could withstand service loads due to internal pressure, vibration, and seismic loads.

The inspector examined the results of the hydrostatic (pneumatic) testing performed on the safety-related control air system (system 32). These tests were performed in accordance with MAI-4.7B, Pneumatic Testing of Pipe. The test data showed that one fitting failed the hydrostatic test due to a ferrule which was installed backward. This fitting was repaired and retested. One other fitting was found to be leaking. However, when tightened in accordance with paragraph 6.8.1 of MAI-4.7B, the fitting still leaked. This fitting was replaced and retested. Two other leaking fittings were observed during testing. These fittings stopped leaking when they were tightened in accordance with MAI-4.7B, and successfully passed the pneumatic test.

The inspector concluded that the licensee adequately addressed the recommendations of IN 92-15. Additional inspections of compression fitting installation will be completed by the NRC during future inspection of the Instrument Line CAP, and review of

hydrostatic test data performed on various systems. This issue is considered resolved; however, the referenced CDRs will remain open pending completion of hydrostatic testing on the instrument lines.

b. IN 92-66, Access Denied to NRC Inspectors at Five Star Products, Inc, and Construction Products Research, Fairfield, Connecticut

This IN was issued as a result of a vendor, Five Star Products, Inc., and their contract laboratory refusing access to NRC inspection personnel who were attempting to audit the vendor and their laboratory to determine if Five Star and their contract laboratory complied with the requirements of 10 CFR 50, Appendix B. Five Star certified that their products were being manufactured and controlled in accordance with these requirements.

After being denied access to the facility, the NRC subpoenaed the vendor's records and determined that at least seven licensees and one licensee contractor had purchased grout and concrete products which specified compliance to 10 CFR 50, Appendix B, from Five Star. Following the NRC inspection, Five Star notified their customers that they were suspending their Appendix B program and, in the future, would sell their products as commercial grade material.

The inspector discussed IN 92-66 with licensee design engineers and procurement engineers and found that TVA QA personnel were not able to review sufficient data during their audit of Five Star Products to ascertain that the Five Star QA program complied with Appendix B requirements. As a result, TVA classified the Five Star materials as commercial grade items. Therefore, Five Star had never been on the TVA's ASL for QA purchase. However, the company had been on the TVA ASL for a certificate of conformance program under their former name, U.S. Grout Corporation. U.S. Grout Corporation, which changed its name to Five Star Products on January 1, 1989, was removed from the ASL on September 1, 1988.

Requirements for grouting, including materials, installation, and testing were specified in TVA specification G-51, Requirements for the Grouting and Dry Packing of Baseplates and Joints During Construction, Modification, and Maintenance. The inspectors reviewed Revision 4, the current revision, of specification G-51 and determined that the requirements for purchase of preblended grout materials from a commercial source for safety related use are specified in paragraph 3.2.3. These requirements included performance of verification tests in a TVA-approved laboratory. Verification tests included bleeding, shrinkage, height change, strength, expansion, and percent chlorides. Testing was performed in accordance with standard ASTM procedures.

The inspectors reviewed the engineering procurement documentation for the Five Star grout purchased for use after construction restart in November 1991. Records examined were those for

material purchase under TVA contract numbers 92NNS-44389C (Lot number WC 10071), 92NNB-43813C (Lot number WC 03252) and 92NMB-41465F (Lot number BA 06022 and BA 07152). The inspectors verified that the materials were purchased as QA Level II (commercial grade) and were tested at an approved TVA laboratory. The testing was performed at Singleton Laboratory, which was the former TVA laboratory in Knoxville, TN, now privately owned. Review of the test data indicated the required tests were performed, and the test data showed the grout materials met or exceeded specification requirements.

The in-process quality control testing requirements for grout materials were specified in TVA MAI-5.4, Concrete Removal, Repair, Grouting, and Drypacking, Revision 5, and determined that in-process quality control tests for grout materials were required to be performed at a minimum of once a day for shrinkage, bleeding, and strength. The inspectors reviewed the results of in-process grout tests performed since construction restart. These were sample numbers 10171, the first sample tested after construction restart, through 10232, the last sample of the Five Star grout material. Two samples failed the requirements for bleeding. One of these samples, 10204, was for non-safety related work in the hot machine shop. The remaining sample, 10187, was evaluated and determined to be acceptable. The inspectors concurred with the evaluation. The test data showed that for all grout samples the strength exceeded minimum design requirements.

Discussion with licensee engineers disclosed that TVA has discontinued the purchase of Five Star grout. In the future, TVA plans to purchase preblended grout materials from another vendor who has a TVA and Nuclear Utility Procurement Issues Council approved QA program. However, these materials will still be subjected to the daily in-process tests, as specified in MAI-5.4.

The inspector also reviewed earlier revisions of specification G-51 and determined that the requirements to perform verification testing of commercial grade preblended grout materials and for in-process testing of grout materials have remained unchanged since the initial issue of G-51, Revision 0, in July 1977. The inspector also reviewed correspondence relating to testing of preblended grout materials purchased from U.S. Grout Corporation in 1977. A memorandum dated October 6, 1977, from R. Lane, Singleton Materials Laboratory, to T. Northann, Watts Bar Project, Subject: Watts Bar Nuclear Plant - Testing of Preblended Grout - Reference No. 54-551623, stated that Five Star Grout materials supplied by U.S. Grout Corporation met TVA requirements.

The inspectors concluded that the preblended grout materials used at Watts Bar met specification requirements. The licensee's procurement programs for procurement and independent testing of preblended grout materials was considered a strength. This issue is considered resolved.

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

11. Action on Previous Inspection Findings (92701)

(Closed) DEV 390, 391/92-26-02, Failure to Meet Commitments Identified in CDR 50-390/86-22, 50-391/86-18

This deviation was issued for a change in a commitment to the NRC which occurred without prior notification when corrective actions completed by the licensee were different than those which were documented in a CDR. The commitments made in CDR 390/86-22, 391/86-18, required the full reinspection and rework of all instrument line supports that failed to meet design requirements. SCAR WBN9200115SCA was issued to track the subject CDR and contained the corrective actions that were proposed to the NRC. The corrective actions for the SCAR were changed in May 1992 to allow the use of a sampling plan instead of a 100 percent review of the approximately 1300 instrument line supports. The licensee stated that sampling was appropriate after the partial completion of the full review indicated that all hangers reviewed, while not meeting all design specifications, would have performed the required safety functions.

The licensee responded to the Notice of Deviation in letters dated November 14, 1992, and February 11, 1993. The second letter contained actions to enhance the commitment tracking at WBN. These actions were to revise procedure SSP-3.04, Corrective Action Program, to require notification of site licensing when the corrective action plan of a SCAR was changed so that an evaluation of the effect on licensing commitments could be made. In addition, a review of open CDRs and associated corrective action tracking documents was to be performed to ensure that any identified inconsistencies were identified and necessary revisions submitted to the NRC, as appropriate.

The inspector reviewed procedure SSP-3.04, Revision 8, and found that the change adequately addressed the licensee commitment to require notification of licensing when a SCAR corrective action plan is changed. The inspector concluded that the program change was appropriate to prevent recurrence of inconsistencies between commitments and actual corrective actions associated with CDRs.

The inspector reviewed the results of the licensee review of open CDRs. The licensee determined that the responses of four CDRs needed revision to be clearly consistent with corrective actions as implemented. The revisions were forwarded to the NRC in a letter dated April 30, 1993.

The licensee submitted a revised final report for the subject CDR to the NRC on April 8, 1993. The implementation of the revised corrective actions for the subject CDR resulted in additional enforcement action by the NRC as discussed in paragraph 9 of this report.

The inspector found that the actions taken by the licensee met the commitments accepted by the NRC for this item, and this item is closed.

Commitment tracking for other sources of NRC commitments was not reviewed during this inspection.

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

12. Exit Interview

The inspection scope and findings were summarized on July 16, 1993, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report.

Item Number	Status	Description and Reference
390/86-22 391/86-18	Closed	CDR - Incorrect Use of Typical Supports on Instrument Sense Lines (paragraph 9)
390/92-26-02 391/92-26-02	Closed	DEV - Failure to Meet Commitments Identified in CDR 390/86-22, 391/86-18 (paragraph 11)
390/93-48-01	Open	IFI - Pressurizer Heater Cables (paragraph 3.b)
390/93-48-02 391/93-48-01	Open\Closed	VIO - Failure to Follow Procedures for Sampling (paragraph 9)

13. List of Acronyms and Initialisms

AC	Alternating Current
ANSI	American National Standards Institute
ASL	Approved Suppliers List
ASTM	American Society of Testing and Materials
C	Centigrade
C&A	Control and Auxiliary
CAP	Corrective Action Program
CAQR	Condition Adverse to Quality Report
CDR	Construction Deficiency Report
CFR	Code of Federal Regulation
DC	Direct Current
DEV	Deviation
DCN	Design Change Notice
DG	Diesel Generator
DNE	Division of Nuclear Engineering
EAI	Engineering Administrative Instruction
EOP	Emergency Operating Procedure
ESF	Engineered Safety Feature
FSAR	Final Safety Analysis Report
IFI	Inspector Follow-up Item
IMI	Instrument Maintenance Instruction
IN	Information Notice

IR	Inspection Report
JTG	Joint Test Group
kV	kilovolts
LOCA	Loss of Coolant Accident
MAI	Modification and Addition Instruction
MCM	Thousand Circular Mils
M&TE	Measuring & Test Equipment
MTS	Master Tracking System
NCR	Nonconformance Report
NCV	Non-cited Violation
NE	Nuclear Engineering
NRC	Nuclear Regulatory Commission
PER	Problem Evaluation Report
PTI	Preoperational Test Instruction
QA	Quality Assurance
QAM	Quality Assurance Manual
QC	Quality Control
RCS	Reactor Coolant System
RIMS	Records Information Management System
SCAR	Significant Corrective Action Report
SCR	Significant Condition Report
SER	Safety Evaluation Report
SMP	Startup Manual Procedure
SPAE	System Plant Acceptance Evaluation
SQN	Sequoyah Nuclear Plant
SSP	Site Standard Practice
SUT	Startup Test
T&B	Thomas and Betts
TI	Temporary Instruction
Tmax	maximum allowable pulling tension
TN	Tennessee
TVA	Tennessee Valley Authority
WBEP	Watts Bar Engineering Project
WBN	Watts Bar Nuclear Plant
WO	Work Order
WP	Workplan
VIO	Violation