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

Report Nos.: 50-390/94-82 and 50-391/94-82

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 1 and 2

Inspection Conducted: November 20 through December 17, 1994

Inspectors: G. A. Walton — Jan. 12, 1995
G. A. Walton, Senior Resident Inspector Construction — Date Signed

M. M. Glasman, Resident Inspector, Watts Bar
J. F. Lara, Resident Inspector, Watts Bar
W. H. Miller, Jr., Reactor Inspector, RII

Contractors: K. W. VanDyne (paragraph 9.1)

Approved by: P. E. Fredrickson — 1/12/95
P. E. Fredrickson, Chief — Date Signed
TVA Construction Branch
Division of Reactor Projects

SUMMARY

Scope:

This routine resident inspection was conducted in the areas of construction work activities, applicant engineering assessment, installation of Thermo-lag, construction fire prevention/protection program, operational fire protection program, fire protection corrective action program, containment coating repair, and actions on previous inspection findings.

Results:

In the area of construction activities, elimination of the DG Battery Exhaust Hood Exhaust System was reviewed with satisfactory results (paragraph 2.1).

Enclosure

Cable splices and cable terminations were inspected, including RT examination of 6900 V splices and internal cleanliness of electrical panels, and internal panel separation were inspected. Reviews made in the areas of cable splices resulted in the identification of another example of previously issued violation, VIO 50-390/94-72-02, Failure to Follow Procedure for Installing 6900 V Splices (paragraph 2.4).

Conduit and conduit supports, attachments to high density concrete, and installation of Thermo-lag were reviewed with acceptable results (paragraph 2.6 and 4.0).

A review of the Construction Fire Protection Program, the Operational Fire Protection Program, the Fire Protection CAP, and containment coating repair program was also conducted with acceptable results (paragraphs 5.0, 6.0, 7.0, and 8.0).

Three open items were closed during this report period.

REPORT DETAILS

1.0 Persons Contacted

1.1 Applicant Employees:

M. Bajestani, Startup Manager
*K. Boyd, Site Licensing Program Administrator
*R. Brown, Licensing Engineer
*A. Capozzi, Program for Assurance of Completion and Assurance of Quality Manager
*T. Dean, Compliance Licensing Engineer
*R. Drake, Plant Completion Manager
W. Elliott, Engineering and Modifications Manager
*L. Ellis, Project Manager
*T. Harrison, Project Manager
*J. Hubbuch, Quality Assurance Specialist
*D. Kehoe, Quality Assurance Manager
*M. Lalor, Project Manager
L. Maillet, Site Support Manager
*D. Malone, Quality Engineering Manager
*R. Mays, Regulatory Licensing Manager
C. Nelson, Maintenance Support Superintendent
*D. Nunn, Vice President, New Plant Completion
*J. Ojala, Components and Procedures Supervisor
*P. Pace, Compliance Licensing Supervisor
*L. Parscal, Project Manager
*T. Price, Environmental Qualification Manager
*B. Schofield, Site Licensing Manager
*M. Singh, Modifications Compliance Manager
*L. Spiers, Site Quality Assurance Manager
S. Tanner, Special Projects Manager
*W. Taylor, Project Director, Raytheon Constructors, Inc.
J. Vorees, Regulatory Licensing Manager

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

1.2 NRC Personnel:

*J. Coley, Jr., Reactor Inspector, RII
*P. Fredrickson, TVA Construction Branch Chief, RII
*M. Glasman, Resident Inspector
*K. Ivey, Resident Inspector
*J. Lara, Resident Inspector
*G. Walton, Senior Resident Inspector, Construction

*Attended exit interview

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

2.0 Construction Activities (TIs 2512/16, 2512/18, and 2512/20)

Various construction activities were reviewed by the inspectors during the inspection period to evaluate the work effort to applicable procedures, codes, and standards. The results of the more significant inspection efforts are summarized below.

2.1 WOs 94-21423-00 and 94-21423-02, Disable DG Battery Hood Exhaust System

During an inspection tour of the DG rooms, the inspector noted that all four of the DG battery exhaust systems were disabled by the installation of blind flanges above each exhaust hood. The purpose of the battery exhaust systems was to provide a means of purging any accumulated hydrogen gases from the DG rooms. The inspector performed further reviews as detailed below to determine the adequacy of this configuration.

DCN W-32302-A was issued on August 28, 1994, to provide design output to abandon the existing exhaust systems for all four DG batteries because of discharge fan failures. The technical basis for this change was also discussed in the DCN and adequately considered the possible accumulated hydrogen without the exhaust system. The DCN documented that it would take approximately 52 days to achieve a two percent hydrogen concentration limit. Since the DGs are required to be tested monthly during plant operations, credit was taken for the DG ventilation system. This system provided adequate ventilation to prevent hydrogen accumulation above the two percent limit.

The inspector reviewed DCN W-32302-A and WOs 94-21423-00 and-02 that implemented a portion of the modifications that abandoned the battery exhaust system in DG Rooms 1A-A and 2A-A. A field inspection of the completed work was also performed during this review. The inspector determined that the field work specified in the WOs was acceptable in that it implemented the DCN requirements. In addition, the inspector reviewed DCN S-32409-A which provided the required FSAR changes that described the installed battery ventilation system.

During the above review, it was noted that abandoning the battery ventilation system nullified the approved and implemented corrective actions for closed CATD 23105-WBN-01. This CATD, which took credit for the battery exhaust fans running, was previously reviewed and closed by the NRC as documented in IR 50-390, 391/94-50, dated July 27, 1994. Further review indicated that the applicant identified that the use of DG ventilation system negated the CATD corrective action. As a result, PER WBPER940642 was issued on November 23, 1994.

2.2 WO 94-23641-11, Inspect and Rework Splices

This WO pertained to the inspection and rework of 6900 V splices as part of the corrective actions in SCAR WBSCA940063. This SCAR documented deficiencies associated with the quality of 6900 V splices. As part of the corrective

actions, the applicant performed RT examinations of electrical splices to examine the installed configuration.

During the applicant's review of RT results for Splice WBN-SPL-8572, it was determined that Phases A and C of Cable 1PP612B (SI Pump Motor 1-MTR-63-0015-B) contained questionable crimping. The conductor splices were opened, and it was found that the wire strands on the motor pigtail leads were partially cut. The applicant proceeded to install new lugs on the two phases.

The inspector witnessed the crimping of the new lugs on Phases A and C and verified that the work activities were performed in accordance with the requirements in Procedure MAI-3.3, Cable Terminating, Splicing, and Testing For Cables Rated Up To 15,000 Volts, Revision 12. Inspection attributes included correct size and type of lug, proper filing of sharp edges on the crimped lug, proper gap between the lug and wire insulation, correct crimping tools, and acceptable QC coverage of the splicing work. The inspector noted that T&B lugs (catalog 54105) rated for 600 V, which are vendor certified for up to 15KV applications, were used in this 6900 V application as provided for in General Engineering Specification G-38, Installation, Modification, and Maintenance of Insulated Cables Rated Up to 15,000 Volts, Revision 13.

The inspector reviewed the engineering basis for this application and determined it was acceptable. The WO documentation was also reviewed and was determined to be acceptable in that it reflected the status of the on-going work. The inspector also verified that the splicing activities were identified within SCAR WBSCA940063 as being approved by the site QA manager. Personnel performing the splice work activity were verified to have attended specific medium-voltage splice training developed as part of the corrective actions for SCAR WBSCA940063. M&TE used during the work activities was also verified to be within the calibration intervals.

2.3 WP D-11411-31, Terminate Cables

This WP pertained to the termination of cables associated with System 65 (Emergency Gas Treatment System). This WP involved the termination of cables located in local panel L430-S and in control room panel M27B. In addition, the work scope required the installation of instrument line compression fittings.

The inspector reviewed WP D-14114-31 which provided the installation instructions for the performance of the above work. With respect to the installation of compression fittings, the WP documented that QC elected to waive the inspection of the compression fitting make-up. This was documented in Procedure MAI-4.4A, Instrument Line Installation, Revision 8, Data Sheet 5, for non-ASME Class 1 Instrument Lines 1-PDM-65-80 and 1-PDM-65-82. The inspector verified that Procedure MAI-4.4A, paragraph 6.5.2.A, allowed waiving QC inspection of the compression fitting make-up provided QC was notified in advance of the work activity. The inspector reviewed the QC surveillance inspection log for instrumentation compression fittings and verified that the above WP and these two instrument lines were called in for inspection, and QC chose to waive the inspection. Therefore, the inspector determined that this activity was performed in accordance with established procedure requirements.

With respect to the termination of cables in the panels, the WP documented the termination at Panels 0-PNL-276-L430-S, 0-PNL-70-M27B/2, and 0-PNL-70-M27B/4. The inspector reviewed the WP documentation for Cables 1PM4716A and 1PM4719B. The WP identified the cable mark number (MFR67), megger readings, and minimum bend radius of 1.5 inches. The documentation was determined to be acceptable, and a field inspection for the installed configurations was performed at the three panels. The inspector verified that the cables were properly terminated via a plug-in connection and that the cables were adequately trained. Independent bend radius measurements were not performed by the inspector because of the inaccessible physical location of these cables within the panels. However, the cables appeared to be properly trained, with no visible bend radius violations. Therefore, the inspector concluded that these installations were acceptable and met the cable termination requirements in Procedure MAI-3.3.

During the above inspection, conformance to internal panel separation requirements was also assessed. Wiring separation violations were identified during the inspection of Panels 0-PNL-276-L430-S and 0-PNL-70-M27B. Within panels, a minimum free air space distance of six inches is required between redundant division cables and non-Class 1E cables as specified in Drawings 45W1640 and 45W3000. The identified separation violations included the following:

- Class 1E Cables PL27A and 1PM4720B separated by less than six inches of free air space in Panel 0-PNL-276-L430-S;

- Class 1E Cable 1PM4716A laying across Class 1E Division B cables in 0-PNL-70-M27B;

- Class 1E Cable 2PL3767B with inadequate separation from Class 1E Cable 2PL3743A in Panel 0-M-27A5;

- Internal wiring metal braids for 0-HS-65-28B (B Train) and 2-HS-65-9 (A Train) were in physical contact contrary to requirements in Drawing 45W1640;

- Class 1E wiring in Panel 0-M-27B was not enclosed with metal braid contrary to requirements in Drawing 45W1640.

In addition, field cables with spare conductors were not properly taped or end-capped in Panel 0-M-27B. The applicant initiated PER WBPER940731 to document the above conditions. The above panels were previously inspected via WOs to implement the corrective actions for CAQ WBP870927SCA. CAQ WBP870927SCA documented separation violations between redundant division wiring within electrical panels. The inspector reviewed WOs 94-17133-10 and 94-17133-11 which documented the inspection of control room panels 0-M-27A and 0-M-27B, respectively. Based on the review of the completed WOs, the inspector concluded that the WO scope did not ensure that the problems identified in CAQ WBP870927SCA would be identified and corrected since the WOs only required inspection of wiring between the component or terminal blocks and the wireways and did not require separation inspection of installed field

cables. In addition, it was evident that personnel implementing the WO were not fully aware of the requirements for internal panel separation as delineated in Drawing 45W1640.

At the time of this inspection, QA was also performing a field assessment of the corrective actions to resolve the internal panel separation issue. This assessment was being performed as part of the QA IVP to support closure of the Electrical Issues CAP. The inspector observed that internal panel separation issues identified by the NRC were also being identified through the on-going QA assessment being conducted by the applicant. Therefore, no new violation of NRC requirements is being identified based on the fact that the findings are part of the QA assessments. The inspector concluded that the QA assessments were properly focused by assessing compliance with the internal panel separation requirements within the entire panels.

2.4 Cable Splices in Cable Trays

During this inspection period, the inspector performed a walkdown inspection of the IPS. Two cable splices, installed in conduit boxes adjacent to and on top of existing cable trays were identified, and subsequently examined in detail as discussed below.

Class 1E Cable 1PP687A (6900 V cable) is routed through Cable Tray Node 5A3521 and also through a condulet box identified as 1-PBX-297-1A. This box is located and supported above the cable trays. Phase B of this cable is spliced and is located within the condulet box. This splice was identified as WBN-SPL-12627. This conductor was spliced because of the identification of cable damage on the B phase conductor. The splice was installed by WO 94-12326-19. The inspector reviewed this WO and FDCN F-28815-A which provided the box and support installation details. The inspector determined that the splice was installed in accordance with the WO and FDCN requirements. The installed configuration also met the requirements for splice installations as prescribed in Procedure MAI-3.3, Cable Terminating, Splicing, and Testing For Cables Rated Up To 15,000 Volts. Verified requirements for Procedure MAI-3.3 included proper sizing of the heat shrink material, WO documentation, and proper selection of splice connector (T&B 54010). The inspector also reviewed the WO and verified that the cable megger and hi-potential test results met the requirements in Procedure MAI-3.3, Appendix H.

Class 1E Cable 2V1828B was spliced in a conduit box which was supported adjacent to the cable tray. The multi-conductor splice was identified as WBN-SPL-5611 and was installed in accordance with FDCN F-20648-A (DCA M-08515-39). The inspector reviewed the installed splice configuration and observed that the condulet box did not contain fire stop material as specified in Standard Drawing SD-E12.5.9. Specifically, Note A4 requires that the voids around the cable at the box entry be filled with Kaowool or cerafiber. The applicant reviewed the inspector's concerns and determined that the FDCN did not require the installation of the fire stop material contrary to the approved standard drawing for installing splices in cable trays. As a result, PER WBPER940701 was initiated by the applicant to document this condition.

In IR 50-390/94-72, the NRC identified an example of failure to follow procedures for not installing fire stop material in accordance with Standard Drawing SD-E12.5.9. This was identified as VIO 50-390/94-72-02, Failure to Follow Procedures for Installing 6900 V Splices. The above failure to provide fire stop material as required by Standard Drawing SD-E12.5.9 will be identified as an additional example of a violation of 10 CFR 50 Appendix B, Criterion V, VIO 50-390/94-72-02, Failure to Follow Procedures for Installing 6900 V Splices.

As part of the corrective actions to resolve concerns regarding the quality of Class 1E 6900 V cable splices, the applicant has performed thermography inspection of the splices routed from DG 2A-A to its respective shutdown board. These inspections were performed while the DG was under rated load. The inspector witnessed the thermography inspection of the splices located in the DG cable interface room. Preliminary results indicated that the observed temperatures were relatively low. Further reviews of this issue are planned in future NRC inspections.

2.5 Inspection of Electrical Boards

As documented in IR 50-390, 391/94-48, paragraph 5.b, Electrical Board Fire Event, the applicant developed corrective actions to address the principal causes which resulted in an electrical fire at 480 V Board 2A2-A. These causes included ineffective implementation of housekeeping requirements and gaps found in the exterior sheet metal of electrical boards. These gaps allowed debris to enter the interior of some electrical boards. The event and corrective actions were documented in TVA-WB's II-W-94-022.

The applicant's extent of condition review determined debris was present in electrical boards. Corrective actions included sealing board gaps and revision of existing site procedures to provide further guidance and requirements for the protection and cleaning of electrical boards. The inspector reviewed revised Procedure SSP-12.07, Housekeeping/Temporary Equipment Control, Revision 9, and determined that the additional guidance was acceptable. The inspector also reviewed Procedure MI-57.020, 6900 Volt Switchgear Inspection, Revision 15, and determined that the instructions for inspection and cleaning of the switchgear were adequate. During this inspection period, the inspector performed visual inspections of accessible electrical board panels during the course of inspection of normal plant/modifications work activities. The boards were determined to be free of foreign debris and material. The boards inspected included 480 V shutdown boards and 6900 V switchgear (circuit breaker and busbar compartments). The NRC also performed additional electrical board inspections for housekeeping and general cleanliness during inspections as documented in IR 50-390, 391/94-81, paragraph 2.1.4. Based on the above sample inspections, the inspector concluded that the applicant had adequately implemented the corrective actions associated with II-W-94-022.

2.6 Inspection of Electrical Conduit Supports

The inspector conducted a walkdown inspection of conduit supports installed in accordance with WP D-12070-72, and Procedure MAI-3.1, Installation of

Electrical Conduit Systems and Conduit Boxes, Revision 12. These supports were installed on the walls of the fuel transfer canal just inside the cranewall in the lower containment. These walls are made of high density concrete. Inspection attributes included proper support hardware, proper concrete anchor bolt installation, proper support span, and properly tagged supports and conduit spans.

The supports inspected were:

Support ID

D 1207072-3-47A056-206
D 1207072-4-47A056-206
D 1207072-5-47A056-206
D 1207072-6-47A056-206
D 1207072-7-47A056-201
D 1207072-8-47A056-201
D 1207072-9-47A056-201
D 1207072-10-47A056-201

The inspected supports were installed in accordance with Procedure MAI-3.1, and the inspector had no concerns regarding workmanship. Anchor bolts set in high density concrete such as the above conduit supports were qualified by the applicant in Calculation WCG-1-966, issued in October 1991. The inspector reviewed this calculation and found that the concrete anchor bolt installation configurations inspected were bounded by this calculation. The inspector found, however, that engineering approval was not obtained prior to installation of these concrete anchor bolts in accordance with Procedure MAI-5.1B. Paragraph 6.1.2.D of Procedure MAI-5.1B indicates that installation of expansion anchors in high density concrete requires prior engineering approval. The applicant initiated PER WBPER940734 to document the failure to obtain engineering approval prior to installation of concrete anchor bolts in high density concrete. The applicant's extent of condition determinations will be reviewed in future NRC inspections. Based on the inspector's review of the above-cited calculation, these supports are adequate for their intended safety function. The inspector had no further concerns on this issue.

2.7 Walkdowns of Existing Conduit Installations

The inspector performed a walkdown inspection in the DG building of accessible conduit support installations associated with conduit span PLC1896B. The applicant was in the process of applying Thermo-lag fire barrier material to this conduit span and associated supports. Prior to application of the Thermo-lag, the applicant performed walkdown inspections of this conduit span and associated supports in accordance with Procedure WD-039, Electrical Conduit and Conduit Support Walkdown Instruction, Revision 2, to ensure the conduit span and supports were constructed in accordance with Design Criteria WB-DC-40-31.10, Seismically Qualifying Conduit Supports, Revision 8. Inspection attributes included proper support hardware, tightness of hardware and fasteners, span between supports, and proper tagging of conduit and supports.

The inspector found that 15 one-hole strap supports from 0-JB-296-1335 were accessible for inspection, and these supports were satisfactory. Support tags, however, were temporarily removed to facilitate Thermo-lag installation. The applicant indicated that conduit support tags would be reinstalled following completion of Thermo-lag installation. Application of Thermo-lag over this conduit span and associated supports is discussed in paragraph 4.0 of this report. The inspector had no further questions concerning the adequacy of conduit supports or support tagging.

Within the areas reviewed, an additional example of VIO 50-390/94-72-02 was identified as discussed in paragraph 2.4 of this section.

3.0 Applicant Engineering Assessment

In a letter to the NRC dated November 14, 1994, the applicant stated that in order to assist in assessing the extent of electrical system construction deficiencies, electrical design and installation would be verified through a technical review. In addition, the RHR system would be verified during the review. The review was to be multi-discipline and would also evaluate the various other construction programs. The assessment would focus on whether the installation activities adequately and consistently conformed to design output requirements. The scope of the review team was also discussed during a TVA/NRC management meeting held at WBN on November 29, 1994.

During this inspection period, the inspector met with applicant representatives to discuss the purpose and scope of the technical re-evaluation. The scope and objectives were described in the Watts Bar Independent Engineering Assessment book. The scope of review includes an RHR system assessment, calculation reviews (electrical, mechanical, civil), electrical engineering specification review, and field assessments. The scope and extent of reviews were discussed with applicant representatives.

4.0 WP D11727-06, Installation of Thermo-lag (TI 2512/22)

The inspector observed in-process work activities associated with installation of Thermo-lag fire barrier material on Conduits PLC-1896 and PLC-1895 and Junction Box 0-JB-296-1335 located in Intake Room 1A-A on 760.5' elevation of the DG building. The Thermo-lag material was being installed in accordance with Procedure MAI-03.10, Application of Thermo-lag, Revision 5. This installation required two layers of Thermo-lag material to be installed on the conduits and junction box. QC was noted to be providing continuous monitoring of the installation and verifying that the first layer of Thermo-lag was installed in accordance with the construction documents. QC was also scheduled to provide an inspection of the final Thermo-lag installation in accordance with pre-described attributes. Oversight of the installation activities was being provided by QA.

The inspector reviewed oversight activities of the Thermo-lag installation program with QA. These oversight activities included assignment of a QC inspector to perform a 100 percent inspection of all Thermo-lag materials released for construction. Prior to installation, all affected components, conduit, and conduit supports were to be inspected for adequacy prior to being

covered by the Thermo-lag material. Inspection of conduit and conduit supports is discussed in paragraph 2.7 of this report. All Thermo-lag installers and QC inspectors received special training in the correct installation of this material. QC verification was being provided by QC inspectors from Stone and Webster Engineering Corporation. The inspector verified that these QC inspectors had received training for the correct installation of Thermo-lag.

No discrepancies were noted in the work observed or in the installation documentation records reviewed. However, the Thermo-lag material being installed provided a one-hour fire rating, whereas, for the application under review, 10 CFR 50, Appendix R, Section III.G.2.a, requires a three-hour rating. A one-hour rating is permitted if the area is provided with automatic fire detection and suppression systems. The room was provided with an automatic smoke detection system, but an automatic suppression system was not provided. Engineering informed the inspector that a formal deviation request will be issued for this item. The Fire Protection Report, dated November 18, 1994, Sections IV.3.49 (Fire Hazards Analysis), V (Deviations), and VII (Appendix R Comparison) will be revised by the applicant to identify this deviation from an NRC requirement. The inspector will verify that these revisions have been made and approved by the NRC during future inspections. This item is identified as an additional example of IFI 50-390, 391/92-45-03, Qualifications of Thermo-lag Insulation.

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

5.0 Construction Fire Prevention/Protection Program (64051B)

Implementation of the construction fire prevention/protection program at WBN is discussed in NRC IR 50-390, 391/94-62. The site fire brigade was composed of a fire protection shift supervisor and at least two, but normally a minimum of three, fire protection personnel per shift. There were four 12-hour rotating shifts. Procedure TRN-0031, Fire Brigade Training, Revision 2, dated January 28, 1993, describes the training program that was implemented for the fire brigade at WBN.

The inspector reviewed the training records for two fire protection supervisors and four fire protection personnel and noted that these employees had received the applicant's three-week initial fire brigade training, quarterly training for 1994, and participated in at least one drill per quarter for 1994. (The applicant conducts approximately four drills per quarter.) Also, the medical and physical examinations for the fire employees were up to date.

Within the areas inspected no violations or deviations were identified.

6.0 Operational Fire Protection Program (64704)

On December 14 and 15, 1994, the inspector and representatives from NRC/NRR met with the applicant to discuss the operational fire protection program. Items discussed included the applicant's fire protection organization, compliance with 10 CFR 50 Appendix R requirements, Thermo-lag installation,

upgrades to the fire suppression systems, safe shutdown analysis, previously identified open items in NRR's fire protection review, and the upcoming fire protection team inspection of WBN proposed for March 1995. The open items were associated with a proposed deviation from NRC guidelines for continuous fire watch coverage, test and inspection frequency for fire protection systems, smoke control, combustible control program, fire protection water supply and control of MIC, equivalent fire barriers, internal conduit seals, alternative compensatory measures to be used when fire suppression or detection systems are out of service, and plant equipment required to be used for safe shutdown in the event of fire. NRR will document the results of this meeting in a meeting summary and will use the information in the preparation of the fire protection safety evaluation report.

During this visit, the inspector accompanied the NRR representatives on a plant tour and reviewed the status of the fire protection features.

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

7.0 Fire Protection Corrective Action Program (TI 2512/22)

The objective of the Fire Protection CAP is to complete remaining fire protection work and provide assurance that the applicant's fire protection program satisfies the NRC licensing requirements. The applicant identified five major CAP objectives. These CAP items are included in the overall description of the fire protection program and are documented in the fire protection report dated November 18, 1994.

The inspector reviewed TVA's action on the CAP objectives and found the status of each item to be as provided in the following paragraphs. An NRC inspection is scheduled for early 1995 to review and evaluate the fire protection program which addresses objectives of the CAP.

7.1 Unprotected HVAC Openings

The applicant identified a number of fire barriers which were penetrated by ventilation ducts. These ducts were not provided with fire dampers at the penetration of the fire barriers. The applicant issued fire compartmentation drawings which identified the penetrations through fire barriers which were not provided with fire dampers. An analysis was performed by TVA of the redundant shutdown components on each side of these unprotected openings which verified that these components were adequately separated or provided with appropriate fire protection features. This item is identified in the fire protection report.

7.2 Evaluation of Sequoyah Fire Protection Findings for Applicability to WBN

TVA performed a detailed review of all the Sequoyah fire protection findings to determine if these items were applicable to Watts Bar. The applicable items have been addressed by the fire protection report dated November 18, 1994. These items will be reviewed during the NRC fire protection inspection scheduled for early 1995.

7.3 Fire Protection Compliance Review

By an internal memorandum dated April 30, 1993, the applicant documented that a compliance review of the WBN Fire Protection Program had been completed. The objective of this review was to verify that the fire protection features at WBN met the requirements of 10 CFR 50, Appendix R, NRC Branch Technical Position 9.5-1, Appendix A, and applicable NRC Generic Letters, Bulletins, and Information Notices. Several discrepancies were identified which have not been resolved. Otherwise, the review found that the applicable fire protection requirements were incorporated into the fire protection report. The open items include resolution of manual operational requirements in the event of a fire, completion of fire protection modifications, etc.

7.4 Revise the Safe Shutdown Analysis Based on As-constructed Information

The applicant is currently revising the Safe Shutdown Analysis based on the as-constructed information; therefore, this item is incomplete.

7.5 Consolidation of WBN Fire Protection Documentation

A description of the fire protection program requirements and commitments were incorporated into a single document entitled Fire Protection Report, dated November 18, 1994. This document will be used as part of the licensing basis for WBN. NRC inspections to review the applicant's compliance with this document are ongoing.

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

8.0 Review of Containment Coating Repair (TI 2512/34)

The applicant is presently removing the coating from the containment floor and adjacent walls and supports due to a concern regarding its durability when "305 Topcoat" used on the final coating application. The coating has also experienced chipping due to extended construction activity in the area. Therefore, although qualified, the applicant is removing and replacing the coating inside the containment on the floor and six feet (maximum flood level during an accident) up on the walls and associated supports in the flood areas.

During this inspection period, the applicant has completed the removal of most of the coatings on the floor and is presently working on the walls and supports. The inspector performed visual inspections of the work activities,

interviewed craft working on the old coating removal process, and reviewed the applicable work controlling documents listed below:

- G-55 Technical Requirements for Protective Coating Program for TVA Nuclear Plants;

- N3A-932 Special Protective Coatings Systems Approved For Use in Coating Service Levels I and II and Corrosive Environments;

- Procedure MAI-5.3, Protective Coatings, Revision 8.

Regarding the adequacy of work activity, the inspector noted the applicant was doing a thorough job of removing the old coating. The inspector had a concern regarding the removal of the coating from beneath the scaffolding uprights in the area; however, the applicant advised the inspector that the scaffolding would be moved and the remaining coating would be removed prior to recoating the floor. The inspector also noted that numerous surface cracks were evident in the concrete to be recoated. The applicant indicated to the inspector that these surface cracks would be repaired prior to recoating. The inspector also found the concrete cracking repair method was described in the documents referenced above. Last, the inspector questioned the applicant about protection of sensitive, safety-related equipment in the areas while work was ongoing. The applicant provided the following:

> During the coating removal process, all equipment in the areas was covered with plastic to prevent dirt and dust intrusion. If Operations or Pre-Ops needed access to the equipment, they were instructed to open the cover, perform their activity, then replace the cover.

The inspector noted some minor discrepancies with covers over Foxboro transmitters; however, no apparent dirt or debris was present on the equipment indicating the covers were recently opened.

The inspector reviewed the above-listed documents to determine the technical adequacy of the instructions. This review included verification that the procedures provided instructions for cleanness, application methods, curing practices, wet film and dry film measuring processes, and acceptance standards for thickness, pinholes, and appearance such as runs sags and orange peel, etc.

The inspector also verified the various employee concerns and CATD corrective actions were considered in the procedures.

All areas reviewed by the inspector were found acceptable. Further inspections are planned as coating applications work progresses.

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

9.0 Actions on Previous Inspection Findings (92700, 92901, 92902, 92903, 92904)

9.1 (Closed) VIO 50-390/94-11-01, Examples of Failure to Follow Procedures

This VIO involved two examples of failure to follow procedures.

Example 1 involved the failure to perform adequate technical reviews to ensure the adequacy of procedure reference lists. The following procedures and instructions contained references to other site procedures and instructions that were cancelled:

- Procedure EAI-3.09, Incorporation of Change Documents Into Drawings, Revision 9;

- Procedure MI-0.011, Safety/Relief Valve, Revision 13;

- Procedure PAI-10.05, Post Maintenance Test Program, Revision 4;

- Procedure SMP-7.0, Control of System Cleanliness, Layup, and Flushing, Revision 6;

- Technical Instruction TI-16, Plant Systems' Sampling and Chemical Criteria, Revision 37.

In response, the applicant initiated PER WBPER940101 to document and resolve this finding. Review of this PER indicated that additional deficiencies regarding the use of source notes originally documented in CAQR WBFIR940029 were subsequently incorporated into PER WBPER940101. Corrective actions associated with these source note deficiencies were not complete at the time of this review. Consequently, the applicant had not closed the PER. The inspector, however, verified resolution of this example by a review of corrective actions in the applicant's responses to this violation, dated April 15, 1994, and September 30, 1994. As stated in these responses, the corrective actions are as follows:

1) This violation will be discussed with the procedure preparers, sponsors, and technical reviewers involved with the cited examples to emphasize the need to ensure references are valid (due April 29, 1994).

2) Retraining will be conducted for procedure sponsors to emphasize the importance of ensuring that procedure references remain valid (due June 30, 1994).

3) In the interim, this violation example will be discussed with senior site management who will be requested to communicate these expectations for ensuring references are correct to procedure sponsors and reviewers in their departments (due April 29, 1994).

4) A note will be added to Procedures SSP-2.03 and EAI-1.02 explaining that procedures approved prior to April 29, 1994, may have improper

references which are to be corrected during the next procedure revision (due June 10, 1994).

5) The SMPs will be reviewed and any invalid references corrected (due May 16, 1994).

6) Nuclear Assurance will perform an assessment to verify effective compliance in this area (due September 30, 1994).

This review identified that all committed actions had been completed with one exception. On September 27, 1994, during commitment completion verification activities, the applicant's review of applicable training rosters identified that all departments had not participated in the training of procedure sponsors to emphasize the importance of ensuring procedure references remain valid. Nevertheless, this commitment was verified as complete by reliance on completion of the remaining violation response commitments. The inspector considered that this commitment was not completed as stated in the violation response and that it was inappropriately verified to be complete. In response, the applicant issued a clarification to the previous responses for this violation, dated December 15, 1994. This clarification acknowledged that the September 30, 1994, revision to the violation response should have withdrawn or revised the commitment to provide training to procedure sponsors by June 30, 1994. The clarification also explained that the applicant's objective, which was to provide sufficient information to procedure sponsors on the expectations for use of references during procedure changes and revisions, was accomplished by the satisfactory implementation of the other corrective actions.

The inspector reviewed the action taken by TVA in response to this violation for adequacy and effectiveness of cause determination, extent of condition, corrective action, and recurrence control and determined that it was adequate to resolve this deficiency. Example 1 is closed.

Example 2 involved NRC's identification of nine obvious deficient material conditions during the performance of a DLMH confirmatory walkdown of the upper containment area. Subsequently, the NRC identified six additional DLMH deficiencies in Accumulator Room 1 and Fan Room 1, both located in lower containment, as documented in IR 50-390, 391/94-18. These 15 deficiencies are tabulated below.

Item	ID Number	Location	Deficiency	Work Documents
1	Flex Conduit 1R2243	Upper Cont. Cooler 1D	Loose End Connector	WR C138144 WO 093-21965-29
2	Flex Conduit 1M3114	Upper Cont. Cooler 1D	Loose End Connector	WR C138144 WO 093-21965-29
3	Conduit 1R2242	Upper Cont. Cooler 1D	LB Cover Missing	WR C138144 WO 093-21965-29

Item	ID Number	Location	Deficiency	Work Documents
4	Flex Conduit 1PM7182	Upper Cont. Cooler 1D	Loose End Connector to 1-TE-67-140	WR C138144 WO 093-21965-29
5	Flex Conduit 1R2253	Upper Cont. Cooler 1A	Loose Union	WR C138144 WO 093-21965-29
6	Instrument Tubing 1-FS-30-95	Upper Cont. Cooler 1A	Tubing Bent Between Supports	WR C242903 WO 093-26446-04 WR C261857 WO 094-01997-00 WR C304711 WO 094-20652-00
7	Instrument Tubing 1-FS-30-100	Upper Cont. Cooler 1D	Tubing Bent Between Supports, Clamp Loose	WR C261857 WO 094-01997-00
8	12-inch Elbow	Above Cont. Air Return Backdraft Damper 1-BKD-543	Elbow Missing from Cont. Hydrogen Return Duct	WO 090-16457-79
9	Missing Spray Cover	Upper Cont. 808 ft elev. 88 degrees Az.	Hydrogen Igniter 1-HTR-268	WR C261858 WO 094-02470-00
10	1-ISV-32-1380 1-ISV-32-1382	Accumulator Room 1	Copper lines crossed/rubbing	WR C253043 WO 094-02470
11	Instrument Line	Fan Room 1 5 ft above 1-EOI-43-54B	Bent	WR C261841 WO 094-07105-00
12	Instrument Line	Fan Room 1 at support 1-43-AN-037	Bent	WR C261841 WO 094-07105-00
13	Instrument Line	Fan Room 1 Between supports 1-43-AQ-052 and 053	Bent	WR C261841 WO 094-07105-00
14	Cooling Units	Fan Room 1	Nipples bent, minor leakage	WR C261843 WO 094-07138-00 WR C247847 WO 094-24179-00 WR C247720 WO 094-07962-00
15	1-CKV-565D	Fan Room 1 Horiz. Strut	Cotter pin broken, can be removed by hand	WR C261842 WO 094-07266-00

The inspector reviewed the associated work documents and performed field inspections to verify implementation of corrective action for each of the deficiencies. The results of these reviews and inspections identified the following:

Item 1: Field inspection identified that the end connector threads appeared to be fully engaged but could be turned by hand in the loosening direction about 1/4 inch. The inspector was unable to determine whether this condition remained uncorrected after implementation of WO 093-21965-29 or due to on-going work activities in the area. The applicant initiated WR C185779 to resolve this discrepancy.

Item 6: Work document review identified that WO 094-01997-00 was initiated to resolve this discrepancy. However, the responsible engineer, apparently assumed this deficiency was corrected by WO 93-26446-00 for rework of instrument line slope deficiencies identified previously, deleted this item from the scope of WO 094-01997-00. Subsequently, WO 094-20652-00 was initiated, and verified by the inspector, to resolve this deficiency.

Item 8: This item was removed for maintenance under WO 090-16457-79. During this inspection the inspector verified that it had been reinstalled.

Item 9: Field inspection identified that although the spray cover had apparently been installed since identification of this finding, it was subsequently damaged and required repair. The applicant initiated WR C185780 to resolve this deficiency.

Item 10: As documented in WO 094-07407-00, the applicant determined this item was acceptable in accordance with the commodity clearance requirements of N3E-941. Consequently, no work was required.

Items 11 thru 13: As documented in WO 094-07105-00, the applicant determined this item to be acceptable in accordance with Specification N3E-934. Consequently, no work was required.

Item 14: WO 094-24179-00 documented only cleaning and debris removal from the lower compartment coolers. The applicant's inspection, as documented in the remaining listed work documents, identified no deleterious damage or leakage. The inspector also verified by field inspection that no such damage or leakage existed.

The inspector also verified implementation of action taken to prevent recurrence of this example, as stated in the applicant's response to this violation dated April 15, 1994. These actions involved the following:

- rescheduling the DLMH program activities to minimize the overlap with ongoing work activities;

- emphasizing the need for personnel to protect installed equipment and to be accountable for minimizing DLMH occurring during work activities;

- performance of a QA evaluation of the implementation of area completion walkdowns;

- encouragement of employees to identify and report deficiencies.

The inspector considered the corrective actions and recurrence control actions implemented for Example 2 to be adequate to resolve the specific deficiencies. The adequacy of the DLMH program was previously identified as a concern in CDR 50-390/89-11, 50-391/89-09, Significant Trend Associated With Damaged, Loose, Or Missing Hardware. This CDR identified a significant adverse trend regarding deficiencies associated with DLMH. The adequacy of the DLMH program will be evaluated in accordance with the NRC review of corrective actions for CDR 50-390/89-11, 50-391/89-09 and during on-going reviews of area turnovers.

Example 2 of VIO 50-390/94-11-01 is closed.

9.2 (Open) VIO 50-390/94-61-02, Inadequate Corrective Action

This violation documented examples of inadequate corrective actions to resolve deficiencies associated with damaged Kapton insulated wires at electrical penetrations. During this inspection, the inspector continued inspections of the ongoing repairs of the damaged wires. Previous inspection of corrective actions in this area were documented in IR 50-390, 391/94-75.

During this inspection, the inspector reviewed in-progress repairs of the damaged Kapton wires, and reviewed completed repairs which included the use of Raychem sleeves and Raychem NJRT tape. The inspector inspected the in-progress and completed repairs at electrical penetration 1-PENT-293-0017-B (OB). This work was performed in accordance with WO 94-20914-11. The Kapton repairs were performed on Wires 27-01 (two damaged areas) and 10-1 (four damaged areas). Inspection attributes included proper Raychem shrinking, correct size, length, and adequate tape overlap, multiple layers, and length. Training records for two electricians were reviewed, and it was determined that both had received specific training on the Kapton repair methods provided in Appendix F to Procedure MAI-3.3, Cable Terminating, Splicing, and Testing For Cables Rated Up To 15,000 Volts, Revision 12. The inspector concluded that the wire repairs were performed in accordance with the requirements of Procedure MAI-3.3.

The inspector also performed a detailed review of the five options for repairing damaged Kapton leads as provided for in General Engineering Specification G-38 and Procedure MAI-3.3. The five options for repairing damaged Kapton wires are listed below.

1) Dow RTV-3140

This option is limited to damage locations less than two inches from feedthroughs and cannot be applied in 10 CFR 50.49 circuits. The technical basis for the use of this repair method is currently under NRC review pending the applicant's completion of qualification testing.

2) Raychem NJRT

This is a low-voltage, heat-shrinkable jacket repair and insulating tape. This repair method is limited to non-10 CFR 50.49 circuits.

3) 3M Scotch 33+ Tape

This option is limited to non-10 CFR 50.49 circuits provided that environmental limits are maintained. At the time of the inspector's review, Procedure MAI-3.3 specified the tape operating limits at 80 degrees C. In addition, if used for insulation replacement, such as for Kapton wire repairs, the temperature rating of the tape could not be less than the rated temperature of the cable. On November 30 the inspector questioned the basis for using 3M Scotch 33+ tape on the electrical conductors insulated with Kapton since the Kapton wires were rated for greater than 100 degrees C and the tape was rated for 80 degrees C. Based upon the applicant's discussions with the tape manufacturer and technical reviews, the temperature rating of the tape was increased to 90 degrees C. Also, General Engineering Specification G-38 and Procedure MAI-3.3 were revised to allow for cable temperature ratings to exceed the temperature rating of the tape. This is applicable only when the actual operating temperature of the cable (in this case where the cable conductors were protected with Kapton) was specified and engineering calculation showed the cable operating temperature would not exceed the tape rating. The applicant documented this technical basis in SRN-G-38-162. The SRN documented that for voltage levels V1 through V4 (low voltage power), the operating temperatures of the cables routed through the electrical penetrations did not exceed 90 degrees C. The inspector reviewed the SRN, and no deficiencies were identified.

4) Raychem WCSF-N Tubing

This repair method is approved for use on any circuit, including 10 CFR 50.49, provided that the required seal length is maintained.

5) Use of Another Conductor or Feedthrough

This option is to be used whenever Option 4 above cannot be implemented on 10 CFR 50.49 circuits.

As stated above, the NRC is continuing its review of the technical basis for the use of Dow RTV-3140 as an acceptable repair method. Qualification test results will be reviewed as part of the NRC's followup review. No violations or deviations were identified during this review.

9.3 (Closed) URI 50-390/94-62-01, Sensitivity Tests for Smoke Detectors

The code of reference for the WBN installation of fire detection systems is National Fire Protection Association Code 72E, Automatic Fire Detectors, 1974 Edition. As previously noted, this edition of the code does not specify the frequency of sensitivity tests for smoke detectors, whereas, the 1990 edition

of the code requires the sensitivity of the smoke detectors to be checked and adjusted, if necessary, at least every two years. The inspectors discussed this item during a meeting between NRR and TVA conducted at WBN on December 14, 1994. From the meeting, the NRC's position was that normally smoke detectors become more sensitive due to dust accumulation and that the smoke detectors would probably respond faster to a fire indication. Thus, a more sensitive detector would activate faster and was, therefore, acceptable. The detector's increased sensitivity would probably cause more frequent false alarms and the response to more frequent alarms was the applicant's prerogative. Therefore, the NRC concurs with the applicant's position that sensitivity testing is not required, and this item is closed.

9.4 (Open) VIO 50-390/94-72-02, Failure to Follow Procedures for Installing 6900 V Splices

This VIO included an example of failure to follow procedures for installing 6900 V splices. Specifically, examples were identified where splices were installed in cable trays without the required enclosures. During this inspection, a similar violation example was identified as discussed in paragraph 2.4. The applicant was informed of this additional example, and the applicant's violation response to 50-390/94-72-02 will address this additional example. This VIO remains open pending completion of applicant's corrective actions and subsequent NRC inspections.

10.0 Exit Interview

The inspection scope and findings were summarized on December 16, 1994, 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 applicant. Proprietary information is not contained in this report.

Item Number	Status	Description and Reference
390, 391/92-45-03	Open	IFI - Qualifications of Thermo-lag Insulation (paragraph 4.0)
390/94-11-01	Closed	VIO - Examples of Failure to Follow Procedures (paragraph 9.1)
390/94-61-02	Open	VIO - Inadequate Corrective Action (paragraph 9.2)
390/94-62-01	Closed	URI - Sensitivity Tests for Smoke Detectors (paragraph 9.3)
390/94-72-02	Open	VIO - Failure to Follow Procedures for Installing 6900 V Splices, another example (paragraphs 2.4 and 9.4)

11.0 List of Acronyms and Initialisms

ASME	American Society of Mechanical Engineers
Az.	Azimuth
C	Celsius
CAP	Corrective Action Program
CAQ	Condition Adverse to Quality
CAQR	Condition Adverse to Quality Report
CATD	Corrective Action Tracking Document
CDR	Construction Deficiency Report
CFR	Code of Federal Regulations
DCA	Drawing Change Authorization
DCN	Design Change Notice
DG	Diesel Generator
DLMH	Damaged, Loose, or Missing Hardware
EAI	Engineering Administrative Instruction
FDCN	Field Design Change Notice
FSAR	Final Safety Analysis Report
HVAC	Heating, Ventilation, and Air Conditioning
IFI	Inspector Follow-up Item
II	Incident Investigation
IPS	Intake Pumping Station
IR	Inspection Report
IVP	Independent Verification Plan
M&TE	Measuring and Test Equipment
MAI	Modifications and Addition Instruction
MIC	Microbiologically Induced Corrosion
NJRT	Nuclear Jacket Repair Top
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation, Office of (NRC)
OB	Outboard
PAI	Plant Administrative Instruction
PER	Problem Evaluation Report
QA	Quality Assurance
QC	Quality Control
RHR	Residual Heat Removal
RT	Radiographic Test
RTV	Room Temperature Vulcanizing
SCAR	Significant Corrective Action Report
SD	Standard Drawing
SI	Surveillance Instruction or Safety Injection
SMP	Startup Manual Procedure
SRN	Specification Revision Notice
SSP	Site Standard Practice
T&B	Thomas and Betts
TI	Temporary Instruction or Technical Instructio
TVA	Tennessee Valley Authority
URI	Unresolved Item
V	Volt
VIO	Violation
WBN	Watts Bar Nuclear Plant
WO	Work Order

WP	Workplan
WR	Work Request