



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

Report Nos: 50-438/83-04 and 50-439/83-04

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

Docket Nos: 50-438 and 50-439

License Nos: CPPR-122 and CPPR-123

Facility Name: Bellefonte

Inspection at Bellefonte site near Scottsboro, Alabama

Inspector: Albert B. Ruff 3/22/83
A. B. Ruff Date Signed

Approved by: T. E. Conlon 3-23-83
T. E. Conlon, Section Chief Date Signed
Engineering Programs Branch
Division of Engineering and Operational Programs

SUMMARY

Inspection on February 7 - 18, 1983

Areas Inspected

This special, unannounced inspection involved 70 inspector-hours on site in the electrical and instrumentation construction areas to inspect/investigate the items identified in the Office of Inspection and Enforcement Construction Appraisal Team's (CAT) report number 50-438, 439/82-32.

Results

Of the two areas inspected, two apparent violations were identified in one area (Failure to follow procedure with regard to cable minimum bend radius, Paragraph 5.a.(3); and Side bolting of electrical panels not accomplished in accordance with procedure, Paragraph 5.a.(7)).

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *L. Cox, Project Manager
- F. Gilbert, Construction Engineer
- *B. Thomas, QA Manager
- *A. Richards, Electrical QC Supervisor
- *W. Storch, Instrumentation QC Supervisor
- *H. Johnson, Assistant QA Manager - Hanger, Mechanical Welding
- *J. Cromer, Civil QC Supervisor
- *P. Mann, Nuclear Licensing Supervisor
- *F. Huffman, Assistant Construction Engineer
- *D. Freeman, Electrical Engineering Unit, Supervisor
- *M. Thompson, Electrical QC
- *W. McCollum Instrumentation Engineering Unit
- T. Brothers, Hanger/Civil Engineering Supervisor
- *J. Brown, Electrical QC
- W. Farmer, Electrical QC
- T. Bowlin, Electrical QC
- P. Cox, Electrical QC
- J. Campbell, Electrical QC

Other licensee employees contacted included five construction craftsmen and three technicians.

NRC Resident Inspector

- *J. D. Wilcox

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on February 16, 1983, with those persons indicated in Paragraph 1 above. The licensee was informed of the inspection findings listed below. The licensee acknowledged these findings with no dissenting comment.

- a. Inspector Followup Item 438, 439/83-04-01, Procedure change to aid in the reinspection of cables that have been moved by cable tray rework, Paragraph 5.a.(1).
- b. Violation 438, 439/83-04-02, Failure to follow procedure with regard to cable minimum bend radius, Paragraph 5.a.(3).

- c. Inspector Followup Item 438, 439/83-04-03, Interference in cable trays, Paragraph 6.a.
 - d. Violation 438, 439/83-04-04, Side bolting of electrical panels not accomplished in accordance with procedure, Paragraph 5.a.(7).
3. Licensee Action on Previous Enforcement Matters
Not inspected.
 4. Unresolved Items
Unresolved items were not identified during this inspection.
 5. Electrical and Instrumentation Construction Area Potential Enforcement Findings Identified by the Office of Inspection and Enforcement (OIE) Construction Appraisal Team (CAT)

As a result of an OIE CAT inspection conducted during the fall of 1982, four items in the electrical and instrumentation areas were referred to Region II for action as potential enforcement findings. These items are discussed in Section V of their report number 50-438, 439/82-32. Region II assigned Unresolved Item (URI) numbers to these findings for identification and tracking purposes, and for further review and investigation. The evaluation and resolution of these items are discussed in paragraphs a. through d., in this section.

- a. URI 50-438, 439/83-02-14 - Installation Conformance Inspection. This URI is closed with this report. Seven potential problems were identified in this area by the CAT inspector. The identification and resolution of these potential problems are as follows:

(1) Cable Spacing in Trays [V.B.1.b in CAT Report]

Potential Problem: Four cable trays (TY5-A569-B, A905-A, D55-A and D604-B) were identified as having medium voltage power cables spaced closer than allowed by TVA General Construction Specification G-38.

Resolution: In June 1982 Work Release (WR) No. 34022 was issued to remove tray TY5-A569-B and other tray segments to allow cleaning of penetration and installation of fire stops. Cables have been moved by this work release. The work release is still open which includes the QC inspection for reworked items. This WR has specific instruction with a QC sign off to insure that cable installation and separation is correct prior to clearing this work release.

A TVA Quality Control Investigation Report (QCIR) No. 24495, dated approximately one month prior to CAT inspection, identifies cable spacing separation problems in tray TY5-A905-A. This QCIR references QA Audit BN-E-80-10 which identifies a generic issue with regard to MV cable spacing separation problems at Bellefonte. This audit finding and this QCIR are still open.

A TVA QCIR No. 23797, dated approximately a month and a half prior to CAT inspection, identifies cable spacing separation problems in tray TY5-D55A. This QCIR also references QA Audit BN-E-80-10 and is still open.

In June 1981 WR# 20299 and 20217 were issued to move cables and cable trays to affect modifications to supports. These WRs included cable TY5-D604B. The work releases, including QC inspection for reworked items, are still open.

Work Release for cable tray work or removal, such as indicated in the above paragraphs, requires a reinspection of the affected tray system in accordance with OCP 3.3 "Cable Tray." When cables are installed in these trays, they are usually moved and appropriately supported as a result of the work. The reinspection of the cables is performed as a matter of course or by special instructions in the work release. This reinspection is required before the Work Release is closed. To insure that all such cables are re-inspected, the licensee is considering a change to the Cable Tray Inspection procedure QCP 3.3. This change will specify that cables in reworked trays are to be reinspected to the applicable requirements in OCP 3.4 "Electrical Cables and Jumpers." This item is identified as Inspector Followup Item 50-438, 439/83-04-01 "Procedure change to aid in the reinspection of cables that have been moved by cable tray rework."

In addition, the licensee is investigating a possible change to General Construction Specification G-38 Section 3.2.1.3 to relax the present strict MV cable separation requirements. The change would allow Medium Voltage (MV) three-phase cable bundles to contact each other in a limited fashion. For example, contact between tie down points due to cable snaking, contact for cables entering and exiting trays, contact because of tray radius and minimum bend criteria for cables.

(2) Cable Tray Over-Fill [V.B.1.c in CAT Report]

Potential Problem: One cable tray, TY2-CJ83-B, located in the cable spreading area for Unit 1 was identified as having been filled so that cables exceed the upper limits of the side rails. TVA Spec. G-38 states that "cable trays must not be filled above the side rails, except at intersections and....".

Resolution: Slight humping was observed such that cables, in one small area of the tray, extended approximately 1/2 inch above the side rails for approximately six inches in length. The width of this humping is approximately six inches. There are valleys in this six inch width that go below the side rails of the tray. In addition, the cable tray has void spaces in other areas of the tray that go well below the side rail. The humping is caused by the cable run changing directions and occurs just before this change in direction. This slight humping is considered to be insignificant with regard to safety aspects of the plant.

(3) Cable Bend Radius [V.B.1.c in CAT Report]

Potential Problem: Five areas were identified by cable tray area as having cables installed that exceed their minimum bend radius as specified by TVA specification G-38.

Resolution: Cable Tray TY5-A561-A as listed in the CAT report does not exist, and cables 2ED-ECA4-217 and 218 are non-safety cables and do not fall under the NRC inspection program.

Cable Trays TY5-A649-A, TY5-A561-B, and TY4-AA91-A are areas where the cables leave a horizontal tray and go to equipment via a vertical riser, or cables leave a conduit and go to a tray system. These cables had bends that exceed the minimum bend radius per TVA specification G-38.

During an inspection in July 1982, Region II identified a generic item concerning cables whose minimum bend radius was exceeded as a result of a design oversight. The plant design specifies that ninety degree vertical cable tray elbows having a 12-inch radius were to be used and are used at Bellefonte. The MV cables, which are the same or similar to those identified by CAT report, are installed in cable runs that have these 12" radius tray segments (See Region II's Report 438, 439/82-22). TVA's G-38 specification indicates these MV cables have a minimum bend radius greater than 12 inches.

As a result of TVA's investigation concerning the above generic issue, the manufacturer of the cables has been consulted. For the cables identified in the CAT report, the manufacturer states that the minimum bend radius can be considerably less than 12 inches without affecting service life of the cable. This item is considered insignificant with regard to the safety aspects of the plant; however, since the specific areas as identified by CAT

inspector were not previously documented or addressed by TVA, this is identified as Violation 50-438,439/83-04-02, "Failure to Follow Procedure with Regard to Cable Minimum Bend Radius."

(4) In-Process Termination [V.B.2.b in CAT Report]

Potential Problem: The termination of a Medium Voltage (MV) cable was observed by the CAT inspector and the 1/2" dimension between the semiconductor stress grading and the cable outer jacket as designated on the manufacturer's "Termination Instructions for Copper Tape Shielded Cables" was exceeded by 1/4".

Resolution: The manufacturer's "Termination Instruction for Copper Tape Shielded Cables" provides instruction for installing a grounding braid to the copper tape shield by soldering, and the 1/2" dimension is associated with this installation. However, these same instructions state "If a Ground Clamp Accessory Kit (GCA) is to be used, refer to instruction with the kit." TVA Bellefonte uses the GCA. The instructions for the GCA Kit are pictorial and written with no dimensions given. The final picture of these instructions shows the position of the stress control tubing with regard to GCA and states "Do not overlap stress control tubing on to GCA coil." In addition, the manufacturer has stated that the only critical positioning tolerance is for the stress control tubing material to be in firm contact with the cable shield. This would actually allow the installer an additional margin of 3/4 of an inch.

Based on the above the MV power cable termination meet the specified criteria.

(5) Cable Tray Attachments (V.B.3.c of CAT Report)

Potential Problem: The CAT inspector identifies two areas in a cable tray run in which three bolts and nuts were loose. This finding resulted from an inspection of approximately 2000 feet of cable tray system.

Resolution: Region II's review confirmed the above finding and noted that the specific tray segment was secured on the opposite side and was located directly over a seismic cable tray support. In addition, the tray segment is supported and secured to seismic supports within a short distance forward and behind the area of concern. The Regional inspector also randomly inspected other cable tray systems during his inspection and no similar findings were observed. Region II considers this insignificant with regard to the safety aspects of the plant.

(6) Inspection Records for Field Run Conduit Supports [V.B.3 e. in CAT Report]

Potential Problem: Class 1E conduits which are field run are secured by unistrut slotted channels [P1000 or P3300 series] and unistrut strap [P2558-5 thru P2558-50 series]. The CAT inspector was concerned with safety-significances and quality control of those items especially in regard to spacing and attachment. In addition, he was concerned that welds which are sometimes used to attach a unistrut slotted channel to another support may not be adequate since inspection results of these welds are not recorded.

Resolution: Region II's review of these items showed that Class 1E conduits are installed in accordance with TVA's Typical Seismic Conduit Support drawings 4BB0892-X2 and 4RA0560-X2. These drawings specify spacing, method of attachment, and material. These supports are inspected as part of the conduit system inspection (QCP 3.2). If there are any welds associated with these supports, the Electrical Quality Control (EQC) inspector checks the spacing of the weld to the plan requirements. The adequacy of the weld is inspected by Welding Quality Control (WQC) inspector and it is indicated to be satisfactory when he affixes his stamp near the weld. TVA stated that all welds in this area are visually inspected in accordance with their G-29C Specification.

When unistrut slotted channels are welded to a uniquely identified support they are also inspected as part of that support before it is released from the fabrication shop. If this welding is done in the field, a work release is required which includes welding inspection by WQC.

The CAT inspector gave no in-field example to support his concerns. Region II personnel, an electrical inspector and a welding inspector, made a field inspection to verify proper installation of conduit supports including spacing and any welds that may be associated with the supports. Of the area inspected, no concerns were identified and all examined welds had a WQC stamp near the weld.

(7) Electrical Equipment Installation [V.B.4.a-e in CAT Report]

Potential Problem: The CAT inspector observed that two motors were not grounded, one motor was not covered and no heat tape was present on the motor, and several panels were not bolted together.

Resolution: Region II's review showed that subject motor frames were grounded, the motor identified as having no heat tape has internal heaters, and that the motor with no protective cover was

operationally released the early part of 1982 to perform system flushes and other tests. It is TVA's practice to protect motors by covering when not in use. It should also be noted that grounding of electrical equipment does not affect the functionality of the equipment with regard to plant safety; however, it is an industry and OSHA standard for personnel safety.

The side bolting of panel was deficient as indicated by the CAT Inspector. This item is identified as a violation 50-438,439/83-04-04, "Side Bolting of Panels Not Accomplished in Accordance with Procedure Requirements."

- b. URI 50-438,439/83-02-15 - Color Coding of Cables. This URI is closed with this report. One potential problem was identified in this area by the CAT inspector. The identification and resolution for this problem is as follows:

- Division/Train Color Coding [V.B.1.e in CAT Report]

Potential Problem: Four cable trays were identified to have Class 1E cables marked with trains A and B colors.

Resolution: TVA does not have the cable jackets color coded for train designation by the manufacturer. This gives TVA the versatility of using the cable in both trains. The cable marking for a specific train is performed just prior to or during installation as allowed by IEEE 384-1974 section 5.1.2 and is accomplished by spray painting portions of the cable.

When a cable reel is designated for a class 1E cable pull, the first layer of the cable reel is painted at various points around the circumference of the reel. This paint is used to identify the train and to insure that the cable is marked at sufficient intervals as the cable is pulled from the reel. When this cable layer has been pulled, the marking process is repeated until the cable is completely pulled.

As a result of a previous pulling operation, there may be occasions when a reel has portion of a cable layer marked for the opposite train. When this occurs the painted portion of the cable is obliterated by over spraying with black paint or with the paint color for the desired train. As this partial cable layer is pulled from the reel, it is possible for some of the overspray to rub off, thereby showing small portions of the previous marking; however, the proper color coding is readily apparent due to its magnitude. The initial verification for correct color coding of the cable is made at the time of cable pull. After the initial verification when the cable color code is questionable at some locations due to rub-off, the cable color code to tray designation can be verified to be in agreement by visually tracing the cable.

The cable color coding upstream and downstream of the rubbed off area should agree with the color of the tray marker. The regional inspector verified that the color coding of cables in the subject trays, agreed with color coding of cable trays by tracing the cables.

IEEE 384-1974 Section 5.1.2 states "Cables installed in Class 1E raceway shall be marked in a manner of sufficient durability and at a sufficient number of points to facilitate initial verification that the installation is in conformance with the separation requirements." In addition and in accordance with this IEEE standard, TVA's Class 1E cables are identified by permanent markers at each end, and exposed Class 1E raceways are marked in a distinct manner at intervals not to exceed 15 feet. Based on the above, it is considered that TVA Bellefonte is meeting the regulatory requirement with regard to cable identification.

- c. URI 50-438,439/83-02-16 - Battery Maintenance. This URI is closed with this report. One potential problem was identified in this area by the CAT inspector. The identification and resolution of this problem is as follows:

- Station Batteries [V.B.4.f in CAT Report]

Potential Problem: The CAT inspector noted that the maintenance procedure, QCP 1.3, and the associated vendor's instruction manual for battery maintenance do not require yearly inspections and records for the following yearly checks that are indicated in Section 3.3.3 of IEEE 450-1972:

- Cell condition (detailed visual inspection)
- Cell to cell and terminal detail connection resistance
- Integrity of battery racks

IEEE 450-1972 is listed as a commitment in the FSAR, Table 8.1.4-1.

Resolution: Region II's review showed that TVA was performing battery maintenance in accordance with their Standard Operating Procedure (SOP) 206, "Inspection and Maintenance of Electrical Equipment During Storage." This procedure considered the inspections requirements of IEEE 450 and the manufacturer's instruction in that Paragraph 6.3.3.1 of this procedure states "Inspection/maintenance of batteries shall be as required in the manufacturer's instructions, and if applicable, as required by IEEE Standard 450-1972..." The SOP procedure requires an inspector to make the following weekly and quarterly checks and to document the results.

Weekly Checks

1. Pilot cell for cell voltage, specific gravity, cell temperature and electrolyte level. A different pilot cell shall be selected monthly.
2. Total Float Voltage
3. Room ambient temperature, ventilation and general cleanliness
4. Any cell leakage
5. Any water addition shall be indicated

Quarterly Checks

1. Each cell specific gravity
2. Each cell voltage
3. Each cell temperature
4. Each cell electrolyte level
5. Each cell plate condition
6. Each cell condition of terminals
7. Total float voltage
8. Room ambient temperature, ventilation and general cleanliness
9. Any cell leakage
10. Any water additions shall be indicated

TVA stated that they factored all of manufacturer's periodic maintenance instructions into their procedure. IEEE requirements were considered and taken as "Recommended Practices" as stated in the title and scope of this document. TVA considers that the intent of IEEE 450 is met by their procedure. TVA also had the following additional comments with regard to yearly checks:

1. Cell Condition - Adequately covered in their quarterly checks
2. Cell to cell and terminal detail connection resistance - A very general recommendation with no acceptance criteria and that inspections performed at Bellefonte are considered adequate to reveal any problems in this area.
3. Integrity of Battery Racks - Battery racks are seismically qualified. The installation and use of these racks at a nuclear plant, after installation, are not affected by vibrations that could affect battery rack integrity and that inspections performed at Bellefonte are considered adequate to reveal any problems in this area.

Based on the above this item is insignificant to safety aspects of the plant.

- d. URI 50-438, 439/83-02-17 - Inspection Record Adequacy. This URI is closed with this report. One potential problem was identified in this area by the CAT inspector. The identification and resolution of this problem is as follows:

- Procedure and Inspection Records [V.B.6 and 7 in CAT Report]

Potential Problem: The CAT inspector concluded that inspection/acceptance criteria are not appropriately defined in the quality control procedures and that inspection/acceptance criteria have been placed in documents which are not appropriately referenced or reviewed. In addition, the CAT inspector expressed concerns with regard to records provision for inspection results in the electrical area, in that most QC inspection records are in the form of verification cards which do not record data, such as, torque values, cable pull tension, etc.

Resolution: TVA has recently reorganized to strengthen their Engineering and QC structure. Prior to reorganization the QC inspection function was in the engineering structure. Engineering and QC are now separated and report directly to the Site Manager. To a great extent, this reorganization was the result of Region II's inspection efforts at TVA sites and meetings/correspondence between management personnel of TVA and NRC. This reorganization, including procedure review, is still in process. In addition, TVA's Nuclear Safety Review Staff (NSRS) Audit R-81-14 item 80 specifies that documents, such as SOPs, should be evaluated to insure they are under the QA program if they prescribe activity affecting quality. TVA Bellefonte is in the process of making changes to procedures to resolve this audit finding.

An acceptable or satisfactory inspection is listed in TVA's acceptance criteria section of the QCPs. Usually one of the first steps in the acceptance criteria section is that installation shall be in accordance with EN DES approved documents (Plans, Procedures, General Construction Specification, etc.). The inspector uses these documents in his inspection. After the inspector has made his inspection he signs a computer card that is identified to agree with the unique piece of equipment, cable, cable tray, conduit system, or hanger, etc. His dating and signing the card indicates that the installation meets the acceptance criteria of the applicable QCP and its revision at the time of inspection.

It is recognized that there are cases when specific inspection values should be recorded and this is usually accomplished, for example, in doing the Storage Battery Maintenance Inspection, cell voltage, specific gravity, water addition, temperature, pilot cell etc., are recorded. This information is necessary to identify trends; however, the recording of cable pull tension or torque values applied to cable tray fasteners are considered to be of little value for record purposes. The important fact is that the maximum cable pull tension was not exceeded and that torque applied to cable tray fasteners was within the acceptable limits.

TVA recognized that there were deficiencies in the above system and had identified this in their NSRS Audit R-81-14 item 55. As a result of the action in this audit finding, the NSRS has concluded that for permanent QA record purposes the present system of computer card sign-off by the QC inspector is sufficient. However, they recommend that check lists should be used to aid the inspector on complex and complicated inspections. The Electrical QC unit intends to implement this recommendation by using check lists developed for in house use.

6. Electrical and Instrumentation Construction Area Concerns Identified in OIE CAT Report 50-438, 439/83-02.

a. Interference in Cable Tray Area (V.B.3.d in CAT Report)

Concern: Six pipe supports, IRI-A042F-R0, 1RI-A581-R0, 2RF-G016-R0, 2RF-G017-R0, 2RF-G018-R0 and one temporary support, were identified as extending into cable tray segments. This was considered to be a poor construction practice.

Resolution: Region II's review of this item revealed that the one temporary support and support 1RI-A581-R0 were 1.5 to 2 inches out of the tray area, the RF supports are for the cable fire protection sprinkler system, and that all supports had not been OC inspected. This item is designated as an Inspector Followup item 438, 439/83-04-03, "Interferences in Cable Trays" for further review after the licensee has completed work and inspection of these supports.

b. Cable Protection (V.B.1.d in CAT Report)

Concern: Two areas, TY2-A651-A and TY5-AA47-A, were identified as having cables not properly protected. These cable segments were not in raceways and were considered to be examples of poor construction practices.

Resolution: Tray area TY2-A651-A. A cable bundle was observed descending from a conduit penetration in the ceiling to TY2-A651-A which is also in the ceiling area. The total distance that the cable bundle takes from the conduit penetration to tray is approximately four feet. This four-foot-cable bundle segment was tied to a large cable support hanger as it made its descent from the conduit penetration to the tray. There are no high energy fluid pipes in the area and routing is in the ceiling area.

Tray area TY5-AA47-A: Two sets of power cables [3 single conductors, 400 MCM] descend from two different conduit penetrations in the ceiling to tray TY5-AA47-A which is also located in the ceiling area. The total horizontal and vertical distance from the conduit penetration to the tray is approximately four feet and two feet respectively. The

sets of three conductors are tied together in a bundle and the total distance the cable bundle takes from conduit to tray is approximately six to eight feet. Part of this length is used to insure that the minimum bend radius of the cable is not exceeded. TVA states that the pipe in this area is not classified as high energy. All conduit and hanger supports in the area are seismic category. The cable is considered to be adequately protected since adjacent supports are seismically mounted and the small distance of cable travel from conduit to raceway is in the ceiling area.

The unsupported length of the cable bundles, in the examples cited, are not considered excessive in that the National Electric Code (NEC) states that conductors of this size, in vertical raceways, can go unsupported for over 40 feet. The CAT examples given with regard to cable protection and support are considered insignificant with regard to the safety aspects of the plant.

c. Electrical Raceway Identification [V.B.3.b in CAT Report]

Concern: The CAT inspector stated that a number of cable tray voltage and/or node markers were missing or damaged. Seven examples were given. This condition was considered a concern in that cables could be misrouted.

Resolution: For the seven examples given, Region II's review revealed that no markers were missing; however, all were damaged but readable. As pointed out by the CAT inspector, the licensee was aware of this issue. The CAT inspector also acknowledged that construction activities have a tendency to damage these markers. The licensee stated that these types of findings are documented and QCIR 9714 was provided as example. TVA-Bellefonte does not consider this issue to be a problem at this time and states that the damaged markers will be replaced as they are identified. However, since these findings are documented, their trend analysis may indicate that additional corrective action may be warranted in the future. TVA considers that misrouting of cables, as related to this issue, is not a problem. Each cable is pulled by the routing designated on the cable pull card. If a cable tray marker is missing, the marker would be replaced. If the marker was sufficiently damaged but readable, it would be replaced or identified for replacement. Region II agrees with TVA's position.

d. Instrumentation [V.B.5.a and b in CAT Report]

Concern: The CAT inspector discussed problems that exist with installation of instrument components and tubing. He expressed concerns with the present inspection status and conditions of the installed instrument tubing. He also indicated that TVA had identified these problems and that Region II was aware of these items.

Resolution: TVA Audit BN-I-80-04 has identified the instrument tubing problem and various reports, (such as, those required by 10 CFR 50.55(e) and TVA nonconformance reports), have identified instrument component problem. Written reports on instrument components are identified by TVA-NCR-BLN-8011, NCR-1795, NCR-1860 (NRC tracking numbers are CDR 80-124, 82-30, and 82-27, respectively), and NCR-111. A discussion with licensee representatives indicates that plans and instructions should be issued in the near future to start resolution of this problem. As indicated in the CAT report TVA management and NRC Region II are fully aware of these unresolved issues and TVA fully intends to correct these problems to insure the safety aspects of the plant.