

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

July 30, 1984

BLRD-50-438/83-40  
BLRD-50-439/83-34

U.S. Nuclear Regulatory Commission  
Region II  
Attn: Mr. James P. O'Reilly, Regional Administrator  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

Dear Mr. O'Reilly:

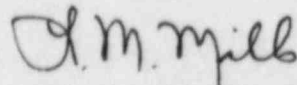
BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2 - FIELD CABLES NOT TERMINATED IN  
PENETRATIONS PROPERLY - BLRD-50-438/83-40, BLRD-50-439/83-34 - FINAL  
REPORT

The subject deficiency was initially reported to NRC-OIE Inspector  
Linda Watson on June 14, 1983 in accordance with 10 CFR 50.55(e) as NCRs  
2383, 2384, 2385, and 2395. This was followed by our interim reports  
submitted on July 14 and December 23, 1983. NCR 2494 (BLRD-50-438/84-04,  
BLRD-50-439/84-04), which documented a similar condition was subsequently  
reported on December 28, 1983 and was followed by our interim report dated  
January 26, 1984. Enclosed is our final report on both NCRs.

If you have any questions, please get in touch with R. H. Shell at  
FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY



L. M. Mills, Manager  
Nuclear Licensing

Enclosure

cc: Mr. Richard C. DeYoung, Director (Enclosure)  
Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Records Center (Enclosure)  
Institute of Nuclear Power Operations  
1100 Circle 75 Parkway, Suite 1500  
Atlanta, Georgia 30339

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ENCLOSURE

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2  
FIELD CABLES NOT TERMINATED IN PENETRATIONS PROPERLY  
BLRD-50-438/83-40, BLRD-50-439/83-34  
NCRs 2383, 2384, 2385, 2395, AND 2494  
10 CFR 50.55(e)  
FINAL REPORT

Description of Deficiency

NCRs 2383, 2384, 2385, and 2395

Nonconformance reports (NCRs) 2383, 2384, and 2385 identify that in several electrical cable penetration terminations the correct application of Raychem tubing, end caps, or cable breakouts was not adhered to per TVA drawings. This has resulted in incorrect lengths of Raychem tubing on cable splices, insufficient distance between Raychem 2- and 3-point cable breakouts, and no end caps on spare conductors. NCR 2395 was issued to identify the generic implication of the three previously mentioned NCRs and a possible generic deficiency in the electrical quality control (EQC) training and inspection program. The apparent cause of these deficiencies is a lack of proper interpretation of TVA drawings by TVA Construction (CONST) craft and EQC inspectors.

NCR 2494

While cable 2VE-ECA3-14-A was being spliced, it was noted that the splice kit used (Raychem NPKV-2-14) was not installed according to the manufacturer's instructions. An uncoated WCSF-U Raychem sleeve is provided with the kit to be used as a lug and bolt cover sleeve. A WCSF-200-U Raychem sleeve is provided with the NPKV splice kit to be used as a shim. However, the uncoated WCSF-U Raychem sleeve was being used as the lug and bolt cover sleeve. The shim was being omitted. Without the shim, the diameters of the two No. 14 conductors (2VE-ECA3-14-A) are below the minimum acceptable diameter which the Raychem breakout body will accept. This deficiency may be characteristic of all terminations (greater in number than 100) made using the Raychem NPKV splice kits. The cause of this deficiency is the failure of construction craft personnel to correctly follow Raychem's instructions contained in TVA electrical standard drawing SD-E12.5.7.1 R2, notes 6B and 11 (attached).

Safety Implications

NCRs 2383, 2384, 2385, and 2395

The lack of adequate lengths of Raychem tubing on cable splices or on spaces between the legs of Raychem cable breakouts could result in moisture penetration to the cables or splices. This could lead to an electrical short between circuits and could result in a failure of safety-related equipment. The lack of end caps could diminish the long-term use of a conductor and result in its unavailability during the life of the plant. These conditions could have adversely affected the safe operation of the plant if left uncorrected.

The Raychem NPKV-2-14 splice kit is used specifically to terminate solenoid valve cable-to-condulet mounts on walls. It was discovered that the shim was being omitted when the Raychem sleeve (which was intended to be used as a shim) was being used as the lug and bolt cover sleeve. The shim seals the mismatch of connections and has a "use range" or value that it shrinks to. The terminations cannot be qualified with the shim omitted. Therefore, since the terminations cannot be qualified it is possible that inadequate or improper splicing could inhibit proper operation of safety-related solenoid valves. Thus, the safe operation of the plant could be adversely affected.

Corrective Action

NCR 2383

TVA has determined that the subject applications of Raychem tubing identified by this NCR are adequate, and the deficiency has been dispositioned to "use as is." TVA electrical standard drawing SD-E12.5.6 has been revised to provide clarification of the minimum acceptable seal length for Raychem tubing, after shrinking. Training in the proper installation procedures for Raychem heat shrinkable sleeves and shims, for all affected Bellefonte Nuclear Plant (BLN) EQC, craft, and engineering personnel, has been accomplished.

NCRs 2384 and 2385

All of the in-line cable terminations requiring Raychem breakout tubing, which were previously installed per the TVA SRA0216-N1 series drawings, have been reinspected and reworked. All heat shrinkable end caps on spare conductors of reactor building electrical penetration modules which were previously installed have also been reinspected and reworked as necessary. All affected craft and EQC personnel have received training on electrical penetration termination procedures.

NCR 2395

All EQC personnel have been retrained to the requirements of BLN Quality Control Procedure (QCP) 3.4 R6, "Electrical Cables and Jumpers Installation (Pulling) and Preparation (Terminating)," and to the requirements of the TVA SRA0216-N1 series drawings. Also, all EQC personnel have been trained to the requirements of 10 CFR 50 Appendix B, with an emphasis on the role of the quality organization in the construction activity.

The corrective actions taken and retraining of affected personnel are adequate to prevent recurrence of these deficiencies. However, to further assure that electrical penetration terminations at BLN are adequate, a documented audit program will be implemented for random surveillance of penetration terminations, until such time that a trend of acceptable installations can be documented.

TVA has examined a sample of the affected terminations and has determined that the splice does seal properly without the shim being installed. Therefore, all completed class 1E installations with this condition which are located in a mild environment will be used as is. TVA has reviewed terminations made before this condition was identified on class 1E installations located in a harsh environment. These installations are being reworked to the proper configuration.

To prevent recurrence of this condition, all applicable personnel have been trained to ensure that all future installations using Raychem splice kits comply with the manufacturer's instructions as required by notes 6B and 11 on SD-E12.5.7-1 R2.

All corrective actions for these deficiencies will be completed by October 1, 1984.

