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SUBJECT: Responds to request for info on environ qualification of
 taped electrical splices.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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October 18, 1989
Docket No. 50-397
G02-89-185

U.S. Nuclear Regulatory Commission
Document Control Desk
Attn: Mr. R. P. Zimmerman, Director
Division of Reactor Safety & Projects, Region V
Mail Station P1-137
Washington, DC 20555

Gentlemen:

Subject: RESPONSE TO REQUEST FOR INFORMATION ON ENVIRONMENTAL
QUALIFICATION OF TAPED ELECTRICAL SPLICES

Reference: Letter, R. P. Zimmerman to G. C. Sorensen, Subject: Request
for Information, dated October 11, 1989.

The referenced letter requested Supply System responses to five questions or requests related to the environmental qualification of taped electrical splices used on motor power leads in Limitorque motor operators and for certain fan coolers.

In previous conversations, we have stated our belief that the splices in question on equipment in containment were qualifiable when installed. Further information on the basis for this opinion is provided in the attachment to this letter. The attachment also provides our response to your questions from the referenced letter.

We believe that it is important to consider the tape splice issues in context. The splices in question were originally made in 1982 in accordance with Supply System procedures during the plant startup phase. As discussed in response to Question 5, both the Supply System Startup organization and the Equipment Qualification Engineering organization were of the opinion that qualified splices were installed. However, when questions regarding qualification were raised in 1986, the taped splices were replaced with known qualified splices prior to plant startup from the refueling outage. The Supply System does not view the current tape splice issue to be safety significant. The significance hinges on the question of what the Supply System "clearly should have known" about those splices on November 30, 1985.

We trust that the attached responses to your questions will provide the detail needed by the NRC staff to close this issue.

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Mr. R. P. Zimmerman

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October 18, 1989

RESPONSE TO REQUEST FOR INFORMATION ON ENVIRONMENTAL QUALIFICATION OF TAPED ELECTRICAL SPLICES

Your letter indicated that an enforcement conference may be needed to discuss actions related to the tape splice issue. The Supply System does not believe that an enforcement conference nor escalated enforcement action is appropriate in this instance because (1) the potential deficiencies occurred over three years ago and adequate corrective actions were taken prior to the NRC's review; (2) there are no lessons to be learned by taking escalated enforcement action in that the Supply System had previously assessed several procedural deficiencies and has implemented corrective actions several years ago where appropriate; (3) the enforcement policies (10 CFR Part 2, Appendix C and Generic Letter 88-07) allow enforcement discretion under similar circumstances (i.e., corrective actions taken prior to or during the inspection); and (4) the Supply System should not have clearly known that unqualified splices may have been used.

If there are any questions regarding our responses, please contact me on (509) 372-5344.

Very truly yours,

for 

G. D. Bouchey, Director
Licensing & Assurance (MD 280)

GCS/tlr

Attachment

cc: Mr. C. J. Bosted, Resident NRC Inspector (901A)
Mr. G. W. Knighton, NRC
Mr. J. B. Martin, Region V NRC
Mr. N. S. Reynolds, Bishop, Cook, Purcell & Reynolds
Mr. R. B. Samworth, NRC
Mr. D. L. Williams, BPA (399)

The following is provided in response to the NRC request for information on tape splices, dated 11 October, 1989. The numbered items are a repeat of the questions from the October 11th letter.

1. In 1986, what was your basis for qualification of the 480V splice configuration? Was this basis documented in 1986? Please provide the documentation.

During plant startup, splices were performed in accordance with Supply System procedures and directions provided in the "Electrical Test Guide" (References 1 and 2). This guide provided optional splice configurations that were acceptable for 480 volt EQ-related applications. The acceptability of these options was based on test reports referenced in the Test Guide (References 3 and 4 to this letter) which were in the Supply System's files at the time of the NRC inspection.

With regard to the Okonite test report (Ref. 3), the report described testing conducted on a 5000-volt splice using a combination of T-35 and T-95 tapes. Application of these test results to a 480 volt splice was based on engineering judgement during the development of the Electrical Test Guide. Subsequent testing by Commonwealth Edison confirmed that our judgement was correct (Ref. 5). This subsequent testing was completed in March 1987.

The Scotch tapes allowed by the Electrical Test Guide included Scotch 33, Scotch 23, and Scotch 70. These tapes are vinyl plastic, self fusing EPR and self fusing silicon rubber, respectively. Splices with combinations of Scotch tapes have been widely tested. Most of the samples tested (Ref. 4) utilized Scotch tape combinations. The appropriateness of the various Scotch splices allowed by the Test Guide was based on engineering judgement and the referenced tests. The test report (Ref. 4) is part of a qualification package done by St. Lucie Unit 2 (Ref. 6) which also included a Franklin Labs test (Ref. 7) which provides a basis for concluding that Scotch splices using a combination of vinyl tape and self-fusing sealing tape would perform adequately during a design basis accident. As discussed in response to Question 4 some Scotch tape splices, a combination of Scotch 33 and Scotch 23, may have existed in the steam tunnel. The steam tunnel environmental conditions are milder and of shorter duration than those of the containment. The engineering judgement that the Scotch tapes allowed by the Test Guide were qualified is also confirmed by the subsequent testing of similar tapes (Ref. 5). The weakest splice allowed by the Test Guide would be 3 layers of Scotch 33 tape. It is our belief that such a splice was never used in the containment or steam tunnel. We acknowledge that a specific similarity analysis was not contained in the file in April 1986 to support our engineering judgement-based conclusion.

Copies of the Test Guide and Test Reports are attached.

2. List and describe, or provide, the procedures and revisions that implemented the qualification basis for the splices at issue.

The procedures used for the splices at issue were:

Electrical Test Guide, Rev. 5, 12/4/78 (Ref. 1)
Electrical Test Guide, Rev. 7, 9/7/83 (Ref. 2)
PPM 10.25.19 - Termination and Splicing Instruction, Rev. 0, 9/8/82
(Ref. 8)
PPM 10.25.19 - Rev. 1, 2/1/83 (Ref. 9)
PPM 10.25.19 - Rev. 2, 6/27/84 (Ref. 10)

The Electrical Test Guide was the document used by the startup organization in providing direction to the test engineers who directed the craft making the splices. The Guide was developed based on available test reports and engineering judgement of those involved in its development. The Guide allowed the use of optional splice configurations using tapes provided by various manufacturers (see response to question #4 below). The Electrical Test Guide provided direction which was consistent with what the startup organization understood to be qualified splices.

At the same time, plant procedure (PPM) 10.25.19 was being developed by the plant staff for use during plant operation. This procedure called for the use of Raychem shrink tubing for low voltage applications, consistent with direction on splices provided by the equipment qualification engineering organization in 1982. A later revision of the PPM (Rev. 2, 6/27/84) allowed tape splices but required Okonite or Raychem in high radiation areas.

Copies of the Electrical Test Guide (Rev. 5 and Rev. 7) and the PPM (Rev. 0, 1, and 2) are attached for your information. (Ref. 1, 2, 8, 9, 10)

3. Did practices used in the field exceed the requirements of the procedure? If so, were the practices documented? Where? What was the substance of that documentation?

In the 1986 refueling outage during which the EQ audit was conducted, the Supply System completed a significant previously planned field effort to bring the Limitorque motor operators into the configuration that was most unquestionably qualified. As part of this effort, all of these tape splices were replaced with Raychem splices, including those on the fan motor leads.

When removing the tape splices, we did not dissect any splices to establish whether field practices exceeded the procedural requirements. Therefore, we are unable to make any judgement as to whether or not field practices exceeded the procedural controls. In interviews with personnel involved in the removal of the splices, they noted that they removed "large balls" of tape, indicating that field practice may have exceeded the procedural requirements.

However, there is no documentation available which would support practices beyond the Test Guide. Therefore, we have not claimed credit for anything more than the minimum requirements.

4. Did your splice installation procedures and practice allow for use of tape from various manufacturers? If so, is it your position that only one manufacturer's tape was used? If so, what is your basis for so concluding? Is this basis documented? Where? Please provide examples of this documentation.

The Test Guide provided the option to use tapes from three different manufacturers (Okonite, Scotch and Bishop). Previously, our EQ engineers had been under the impression that most, if not all, of the tape splices used inside containment were Okonite. Based on recent discussions with some of the electricians who were involved in removal of the tape splices in 1986, we have confirmed this judgement with respect to containment. We also believe that some Scotch tape splices may have existed in the steam tunnel. These splices were allowed by the Test Guide and were considered qualified when installed. Based on a review of our Standard Material Stock records and interviews with craft and their supervision, we do not believe that Bishop splices were used.

5. State why you consider that you clearly should not have known by November 30, 1985, that your technical basis for considering the 480V splice configuration qualified was insufficient.

Prior to the inspection of Limitorque motor operators in May 1986 during the refueling outage, Supply System personnel who were involved in either the EQ activities or who had been involved in the test and startup activities associated with these splices were of the opinion that the subject splices were qualified. Because our Equipment Qualification Engineering personnel had provided direction to the Startup organization in 1982 to use Raychem splices in those areas where environmental qualification was required, Engineering was under the impression that Raychem splices had been installed. We acknowledge that Startup personnel were aware that tape splices existed, however, on the basis of their engineering judgement in review of the available test reports, they were of the understanding that the tape splices, installed in conformance with the Electrical Test Guide, were qualified. It is significant that (1) both organizations had in their files what they believed was adequate information to support qualification, and (2) neither organization was aware of any information that created significant doubt in their engineering judgement. Thus, when questioned prior to November 30, 1985 if they were aware of any unqualified electrical equipment, both groups responded negatively, but for different reasons.

In our review of the tape splice issue, we do not find information which would indicate that either organization clearly knew that unqualified splices were used. The startup organization had test reports which, in their judgement, demonstrated qualification of the splices allowed by the Test Guide. Both organizations (equipment qualification and startup) were acting in good faith and believed that qualified splices were installed.

When the inspection was conducted by Supply System personnel in 1986, and deficiencies were identified, prompt action was taken to assure that qualified materials were used. The findings were documented (LER 86-019) and corrective actions were taken prior to plant restart. In addition to the hardware changes, changes were made in our processes and procedures to prevent the recurrence of equipment qualification deficiencies of this nature.

REFERENCES

1. Electrical Test Guide, Revision 5, Washington Public Power Supply System, November 30, 1982.
2. Electrical Test Guide, Revision 7, September 7, 1983.
3. LOCA Qualification Report for Okoguard Insulated Cables and T-95 & No. 35 Splicing Tapes, Okonite Report No. NQRN-3, The Okonite Company.
4. Termination for Ebasco, Spec #1214-78, St. Lucie II, Electro-Products Division 3M, January 19, 1981.
5. Qualification Test Program on Raychem Nuclear Cable Splices, Okonite Splices, Kerite Splices, Scotch Splices, and Amp Butt Splices as Installed on Various Wire Insulations at Commonwealth Edison Company's LaSalle, Dresden, and Quad Cities Generation Stations, Wyle Report No. 17859-02B, March 11, 1987.
6. St. Lucie Plant Unit No. 2 EQ Documentation Package DWG No. 2998-A-451-16.2.
7. Qualification Tests of Terminal Blocks and Splice-Insulating Assemblies in a Simulated LOCA - Phase B, F-C5022-2 Franklin Labs.
8. Termination and Splicing Instruction, WNP-2 Plant Procedure (PPM) 10.25.19, Revision 0, September 8, 1982.
9. PPM 10.25.19, Revision 1, February 1, 1983.
10. PPM 10.25.19, Revision 2, June 27, 1984.

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