



Carolina Power & Light Company

Brunswick Steam Electric Plant

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March 16, 1984

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NRC Document Control Desk

U. S. Nuclear Regulatory Commission

Washington, DC 20555

Gentlemen:

SUBJECT: Preliminary Findings of Investigation Surrounding LER 2-83-95

- References:
1. CP&L Letter No. BSEP/83-3621, dated November 3, 1983 (LER 2-83-95)
 2. CP&L Letter No. BSEP/84-0101, dated January 13, 1984 (C. R. Dietz, CP&L to J. P. O'Reilly, NRC)
 3. CP&L Letter No. BSEP/84-0250, dated January 31, 1984 (C. R. Dietz, CP&L to J. P. O'Reilly, NRC)

By reference (3), it was conveyed that a summary of the findings of our investigation involving LER 2-83-95 would be transmitted to your office by March 16, 1984. This summary addresses the following issues:

- o The conclusion of our investigation into the failure to recognize or correct the mechanical seal penetration (Link-Seal) fire rating deficiency.
- o A summary of the deficiencies between current installation and our current Appendix A commitment relative to the type of fire barrier penetrations in question.

1.0 CONCLUSIONS OF INVESTIGATION SURROUNDING LINK-SEAL FIRE RATING DEFICIENCY OF LER 2-83-95

In support of the investigation into the application of Link-Seals, CP&L's architect engineer (A/E) was requested to provide historical data addressing the original definition of fire barriers and the application of Link-Seals at BSEP. Based on information received from the A/E, a review of in-house documentation and interviews with cognizant CP&L personnel, the following conclusions have been reached:

1.1 LINK-SEAL FIRE RATING

The existing Link-Seals installed at BSEP are not fire rated.

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1.2 BASIS FOR DEFINING LINK-SEALS AS RATED PENETRATION SEALS

As explained by our A/E, Link-Seals are intended to function only as environmental seals and are generally installed only in exterior walls and floors. To date, the findings of a field verification effort by CP&L have supported this statement.

Link-Seals had not been defined as fire-rated penetration seals by original plant design or construction documents. However, in implementing the fire barrier control program, exterior walls and some floors containing Link-Seals were unnecessarily included as fire barriers; in so doing, the Link-Seals were inadvertently assumed to be fire-rated seals.

1.3 OVEREXTENSION OF FIRE BARRIERS

The original Fire Protection Program Review (FPPR), dated January 1, 1977, was developed by our A/E. The fire area boundaries were defined in the FPPR; but, according to the A/E, not all designated fire area boundaries were considered to be rated fire barriers. Rated fire barriers were taken credit for in the BTP 9.5-1, Appendix A, analyses only where necessary to provide separation between redundant safety/shutdown-related equipment trains. Furthermore, according to the A/E, it was not the intent at the time the FPPR was developed to enclose fire areas on all six sides with rated fire barriers.

However, no clear distinction is made in the FPPR (or any subsequent documents) between fire area barriers and fire area boundaries. In 1977, BSEP plant Engineering was in the process of implementing fire protection technical specifications; this effort required that the fire area barriers be clearly defined for purposes of implementing the fire barrier control program.

Recognizing that technical specifications were to be implemented on an expedited basis, cognizant plant Engineering personnel identified the fire barriers without benefit of formal coordination with the A/E. According to cognizant plant Engineering personnel, the A/E was informed of the proposed barriers in a meeting (for which no meeting minutes have been located). The A/E then developed drawings of the proposed fire barriers. Cognizant plant Engineering personnel did not receive these drawings for review and comment. As a result, the identification of fire barriers by plant Engineering was accomplished using the FPPR, knowledge of fire protection principles and standards, review of design documents, and engineering judgment. The deficiency of this approach was the attempt to identify the Appendix A fire barriers without benefit of clearly understanding the philosophy applied by the A/E in developing the fire hazards and safe shutdown analyses. The root cause of the discrepancy is that the CP&L A/E communications loop was not closed to ensure that the definition of fire barriers did not inadvertently include unrated fire seals.

1.4 METHOD OF DETECTION OF DEFICIENCY

The existing surveillance/control program presumes that the defined fire barriers and specific types of penetration seals are qualified to the required rating. The surveillance program is directed only at verifying that seals are installed in identified penetrations and that they are undamaged. Therefore, there has been no reason for BSEP plant Engineering to perform evaluations of the seal designs, and deficient seals are defined only as those deviating from the electrical raceway installation specification or the fire barrier penetration seal work control and installation instructions. Consequently, there is no basis to presume that deficient fire barrier penetration seals were known to CP&L at any time prior to the occurrence of LER 2-83-95.

1.5 REEVALUATION OF FIRE BARRIER DEFINITION

A reevaluation of the Appendix A fire barriers is in progress and will identify those fire area boundaries presently controlled under technical specifications that represent an overextension of the control program. It is planned that any unnecessary boundaries would then be deleted from the technical specification control program. To ensure that only required fire barriers remain in the control program and to ensure that fire hazards and safe shutdown analyses are not adversely impacted, the reevaluation will be closely coordinated with the ongoing BSEP 10CFR50, Appendix R, engineering and licensing efforts and the guidance provided by Generic Letter 83-33 and Information Notice 84-09. It is anticipated that most building floors and exterior walls below grade will be verified to be not required to function as fire barriers in support of BTP 9.5-1, Appendix A, analyses. Upon completion of this task, the scope of the deficiency relevant to Link-Seals will be significantly reduced.

1.6 RESOLUTION OF LINK-SEAL DEFICIENCY

Upon completion of the fire barrier/boundary reevaluation, any Link-Seals installed in fire barriers required to support Appendix A or Appendix R analyses will be clearly identified. Plant modifications (Item 3.5, below) will then be initiated to replace or upgrade these seals to fire ratings consistent with those required of the fire barriers.

2.0 SUMMARY OF DEFICIENCIES IDENTIFIED

As noted in Reference 2, the scope of our investigation of fire barrier penetration seals was broadened significantly beyond that originally identified by LER 2-83-95. The discrepancies identified are largely attributable to the lack of suitable fire test or analytical data to substantiate the installed seal or damper configurations. The findings are listed below by penetration seal type:

2.1 PIPING-TO-PIPE SLEEVE, CONDUIT-TO-PIPE SLEEVE, AND CABLE-TO-CONDUIT SEALS

- 2.1.1 The penetration seal designs described by the electrical raceway installation specification or the fire barrier penetration seal work control and installation instructions do not accurately reflect the site-specific tested configurations described in the available fire test reports for three-hour rated seals.
- 2.1.2 No evidence has been found to indicate that a conclusive engineering evaluation was performed to assess the acceptability of using the same fire sealant materials and configuration for all types and sizes of piping-to-pipe sleeve, conduit-to-pipe sleeve, and cable-to-conduit seals.
- 2.1.3 The existing penetration seal designs were apparently based on recommendations from the sealant material manufacturers. In each case, there is some evidence that fire testing of specific configurations had been performed by the manufacturers or other end users. Although similar to some of the tested configurations, the seal designs implemented for BSEP do not precisely reproduce the tested configurations.
- 2.1.4 The existing penetration seal design documents do not provide sufficiently definitive instructions to ensure the construction of consistent penetration seal assemblies.

2.2 HVAC FIRE DAMPERS

The HVAC fire damper installation design was reevaluated in accordance with the manufacturer's recommendations, NFPA 90A-1976, and the guidance of NRC Information Notice 83-69.

- 2.2.1 The investigation to date has indicated that the damper assemblies are installed in accordance with the A/E's design documents. However, the existing design is not fully consistent with the damper manufacturer's recommendations and, therefore, the applicable code, NFPA 90A-1976. In addition, specific installation details provided on the design drawings are not sufficiently restrictive to ensure the construction of consistent damper installations.
- 2.2.2 In some cases, insufficient provision has been made for expansion of the damper frames in the event of a fire. Without adequate expansion space, damper frame buckling may result. Where dampers are installed on the face of a fire barrier, they are rigidly bolted to support brackets, which are rigidly fastened to the fire barrier, restraining the damper frame from movement. Where dampers are installed within a fire barrier, the gap between the damper sleeve and the surrounding penetration may have been packed with sealant materials that could prevent proper expansion.

- 2.2.3 Few ventilation fans are provided with automatic shutdown interlocks to the Fire Detection System. Preliminary calculations indicate that many curtain-type fire dampers may not close properly under conditions of sustained air flow through the duct.

3.0 COMPENSATORY AND PREVENTIVE INTERIM MEASURES

Appropriate measures have been implemented to compensate for the seal deficiencies identified during the interim prior to permanent resolution of these deficiencies. Long-term corrective actions are currently under development and evaluation.

3.1 FIRE WATCHES

Currently, areas with potential fire barrier penetration seal inadequacies have fire watches provided in accordance with technical specifications until final resolution of the penetration seal adequacy is reached.

3.2 TRACKING OF ONGOING PENETRATION WORK

A new tracking program is now being developed to monitor any new penetration work impacting fire barriers to ensure that the results of field verification efforts are kept current.

3.3 UPGRADING OF PENETRATION SEAL INSTALLATION INSTRUCTIONS

CP&L will upgrade the existing electrical raceway installation specification and the fire barrier penetration seal work control and installation instructions to include interim instructions for the installation of (qualified) fire-rated penetration seals in new penetrations. This action is intended to prevent additional potentially deficient penetration seals from being installed as a result of ongoing work.

3.4 CONTINUED DOCUMENTATION REVIEW AND LITERATURE SEARCH

The review of in-house design documents, correspondence, and other documentation is continuing at this time in an effort to establish whether specific penetration seal designs are traceable to fire test reports or analyses not located to date. This effort includes the solicitation of other industry sources for fire test data for seal configurations comparable to those installed at BSEP.

3.5 REEVALUATION OF FIRE BARRIER DEFINITION

A reevaluation of the Appendix A fire barriers is in progress and will identify those fire area boundaries presently controlled under technical specifications that represent an overextension of the control program. It is planned that any unnecessary boundaries would then be deleted from the technical specification control

program. To ensure that only required fire barriers remain in the control program, and to ensure that fire hazards and safe-shutdown analyses are not adversely impacted, the reevaluation will be closely coordinated with the ongoing BSEP 10CFR50, Appendix R, engineering and licensing efforts and the guidance provided by Generic Letter 83-33 and Information Notice 84-09. It is anticipated that most building floors and exterior walls below grade will be verified to be not required to function as fire barriers in support of BTP 9.5-1, Appendix A, analyses. Upon completion of this task, the scope of the deficiency relevant to Link-Seals will be significantly reduced.

CP&L is presently investigating long-term measures for correcting any deficiencies. Due to the large magnitude of work and cost anticipated to be incurred to resolve potential and real deficiencies, as well as the present Unit 2 outage work commitments, CP&L will not be in a position to submit an action plan by May 1, 1984, as stated in Reference 3. A project of this magnitude will have to be integrated into our long-range planning and budgeting process before a firm action plan is established. We will submit an update report on our progress by January 31, 1985.

Very truly yours,

C. R. Dietz

C. R. Dietz, General Manager
Brunswick Steam Electric Plant

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Enclosure

cc: Mr. J. P. O'Reilly