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TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
5N 157B Lookout Place

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May 28, 1986

BLRD-50-438/84-33
BLRD-50-439/84-31

U.S. Nuclear Regulatory Commission
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Dear Dr. Grace:

BELLEFONTE NUCLEAR PLANTS UNITS 1 AND 2 - FIRE DAMPER INSTALLATION AND CLOSURE PROBLEMS - BLRD-50-438/84-33, BLRD-50-439/84-31 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector Ed Ford on April 11, 1984 in accordance with 10 CFR 50.55(e) as NCR BLN MEB 8403. Our first interim report was submitted on May 9, 1984. Enclosed is our final report.

We consider 10 CFR Part 21 applicable only to the "closure" item of this deficiency.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. L. Gridley, by RHS

R. L. Gridley, Director
Nuclear Safety and Licensing

Enclosure
cc: Mr. James Taylor, 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
FIRE DAMPER INSTALLATION AND CLOSURE PROBLEMS
BLRD-50-438/84-33, BLRD-50-439/84-31
NCR BLN MEB 8403
10 CFR 50.55(e)
FINAL REPORT

Description of Deficiency

Fire dampers are required to be installed in heating, ventilating, and air-conditioning (HVAC) ductwork at fire barrier (walls, floors, partitions, etc.) to maintain separation requirements for redundant, safety-related equipment. The fire dampers must be installed in accordance with the manufacturer's criteria which reflects the test installation that resulted in the fire-resistive rating of the fire damper. Failure to meet the manufacturer's installation criteria will render the fire damper indeterminate in maintaining the 10 CFR 50 Appendix R separation requirements for redundant, safety-related equipment. The following conditions existed on fire damper installations at Bellefonte Nuclear Plant (BLN) and did not meet the manufacturer's installation criteria:

1. Improper attachment of the fire dampers to the field-fabricated sleeve.

2. Sleeve retaining angles did not overlap the opening and adjacent wall or floor surface as required.

3. Fire dampers were undersized using design opening sizes. However, construction tolerances were not considered in damper sizing. Shims were installed between the damper frame and sleeve which reduced or eliminated the thermal expansion clearance. Thus, thermal expansion was indeterminate.

In addition to the installation descrepancies, a possible closure problem existed with the fire dampers. Fire dampers are designed and tested for commercial installations where the prime air movers are shut off upon annunciation of fire or smoke, and thus will not close properly against high velocity air streams and high pressure differentials. TVA's safety-related HVAC systems are not designed for shut-off of the prime air movers during fire or smoke annunciation. Therefore, fire damper closure was questionable.

A final discrepancy with the fire dampers at BLN was that the fusible link temperature rating (release temperature) was established before consideration of high energy line break (HELB). The fire dampers could inadvertently close from the high temperature associated with the HELB, thus rendering safety-related HVAC systems inoperable.

The cause of this deficiency was attributed to a lack of proper and thorough understanding of the application, selection, and installation of fire dampers on the part of TVA personnel in meeting National Fire Protection Association (NFPA) 90A and 90B and thus 10 CFR 50 Appendix R. Specific causes are:

Installation, Thermal Expansion, and HELB Effects

1. Failure by TVA to obtain adequate installation instructions.

2. Failure by TVA to delineate accurate and thorough installation details in fire damper installation drawings.

3. Failure by TVA to install fire dampers in accordance with issued design drawings.

Closure

Inadequate testing by the manufacturer, Ruskin Manufacturing Company Grandview, Missouri, in establishing closure criteria (duct velocities and pressures). Refer to the November 6, 1984, 10 CFR 21 report to the NRC Office of Inspection and enforcement from Ruskin.

This discrepancy applies to Ruskin dampers at other TVA sites and at other utilities and was discovered as a result of the generic evaluation of a similar problem at Watts Bar Nuclear Plant (WBN), reference WBN NCRs 5036 (CDR No. WBRD-50-390/83-53, WBRD-50-391/83-50), WBN MEB 8203 (CDR No. WBRD-50-390/82-113, WBRD-50-391/82-106), and WBN MEB 8402 (CDR No. WBRD-50-390/84-09, WBRD-50-391/84-09). Similar problems have been identified at Sequoyah and Browns Ferry Nuclear Plants and are being corrected with 10 CFR 50 Appendix R modifications.

Safety Implications

Had this Condition Adverse to Quality (CAQ) gone undetected, the fire damper discrepancies could have resulted in breached fire barriers required for separation of redundant safety-related equipment, thus potentially adversely affecting safe operation and emergency shutdown of the plant in the event of a fire.

Corrective Action

Installation -- Fire dampers will be reworked such that they are installed in accordance with the manufacturer's Underwriters Laboratory (UL)-approved installation instructions. This includes (1) welding or bolting the fire dampers and retaining angles to the sleeve using proper weld and bolt sizes and spacing and (2) using retaining angles of adequate size to properly overlap the penetration opening at the perimeter of the fire dampers.

Thermal Expansion -- Each installation has been inspected for proper thermal expansion clearance, and will be reworked (shims or concrete removed or damper replaced by smaller damper) if not in accordance with the manufacturer's criteria.

HELB Effects -- Each HVAC system fire damper has been reviewed for the effects of high energy line breaks (HELB) and the fusible links will be replaced as necessary to be compatible with the HELB temperatures.

Closure -- Positive closure springs will be added to those curtain-type dampers which were procured without them, thus enhancing closure. Ruskin has conducted additional tests of their dampers and has established more accurate closure parameters (duct velocities and pressures). This action precludes the need for additional action required to prevent recurrence on the part of Ruskin. These parameters have been used to establish which system air movers must be shut down to assure fire damper closure. In addition, this data will be included in the appropriate system descriptions which will address fan shutdown procedures, and these will be reflected in the plant operating procedures.

The following actions have been taken in order to prevent recurrence: Mechanical Design Guide DG-M18.2.15, "Fire Damper Application, Selection, and Installation" has been issued for guidance in design and installation of fire dampers. Section 3.3.1.2 addresses closure requirements. Division of Nuclear Engineering (DNE) Standard Specification MES 10.3, "Dampers for TVA Projects", has been revised to require positive closure springs on fire dampers. Training in construction Quality Control Procedure (QCP) 6.4 has assurred that future damper installations will be in accordance with design drawings.

TVA will be in compliance six months before unit 1 and unit 2 fuel load, respectively.