

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401  
400 Chestnut Street Tower II

August 26, 1983

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USNRC REGION II  
ATLANTA, GEORGIA

U.S. Nuclear Regulatory Commission  
Region II  
Attention: Mr. James P. O'Reilly, Regional Administrator  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2 - REVISED RESPONSE TO DEVIATIONS 50-438/83-10-01, 50-439/10-01, PORTIONS OF THE FIRE PROTECTION SYSTEMS DO NOT CONFORM TO THE DESIGN CRITERIA OF THE APPLICABLE NFPA CODE - 50-438/83-10-03, 50-439/10-03, EXTERIOR FIRE PROTECTION WATER SYSTEM WAS NOT INSTALLED UNDER A QA/QC PROGRAM - 50-438/83-10-05, 50-439/83-10-05, IMPROPER FIRE DAMPER INSTALLATION

This is in response to the TVA/NRC telecons of July 19 and July 21, 1983, concerning activities at Bellefonte Nuclear Plant which appeared to have been in violation of NRC regulations as discussed in R. C. Lewis' letter to H. G. Parris dated May 23, 1983.

The NRC has requested that TVA provide additional information to supplement our initial response as stated in my letter to you dated July 7, 1983 to the alleged violations. Enclosed is a revision to the initial response with supplemental changes and/or corrections. Please note that a two-week delay of the submittal was discussed with Bill Miller of your staff on August 12, 1983.

TVA has denied deviation 50-438/83-10-01 and 50-439/83-10-01. The NRC staff has taken the position with TVA on other nuclear plants that for the preaction sprinkler system (1) control valves should be electrically supervised and (2) piping be provided with air supervision per standard industry practices. TVA maintains that NFPA 13 does not require these types of supervision. TVA has elected to request formal code interpretations from the appropriate NFPA code committees. We expect to receive the results of both interpretations by December 1, 1983. The NRC will be apprised of these findings at that time and, if as a result it becomes necessary, TVA will modify its deviation response appropriately.

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

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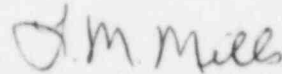
U.S. Nuclear Regulatory Commission

August 26, 1983

To the best of my knowledge, I declare the statements contained herein are complete and true.

Very truly yours,

TENNESSEE VALLEY AUTHORITY



L. M. Mills, Manager  
Nuclear Licensing

Enclosure

cc (Enclosure):

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

Records Center  
Institute of Nuclear Power Operations  
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Atlanta, Georgia 30339

ENCLOSURE

BELLEFONTE NUCLEAR PLANTS UNITS 1 AND 2  
REVISED RESPONSE TO DEVIATION 50-438/83-10-01, 50-439/83-10-01  
PORTIONS OF THE FIRE PROTECTION SYSTEMS DO NOT CONFORM TO  
THE DESIGN CRITERIA OF THE APPLICABLE NFPA CODE

Description of Deficiency

FSAR Section 9.5.1.1 states that the codes and standards of the National Fire Protection Association (NFPA) will be used in the design of the fire protection system.

Contrary to the above, the following NFPA code deficiencies were identified:

1. Fire Pumps

- a. The fire pump starting circuits are not of the normally closed type and arranged such that breakage, disconnection, shorting of wires, or loss of power to the starting circuits would cause automatic continuous operation of the fire pump which is not in accordance with NFPA-20, Centrifugal Fire Pump, Sections 9-5.2.2 and 9-5.2.5.
- b. The fire pump relief valves are not provided with a means of detecting flow of water through the relief valves as required by NFPA-20 Section 2-12.6.

2. Automatic Sprinkler Systems (Fire Pump and Diesel Generator Buildings)

- a. The electrical circuits from the fire detection control panels to the sprinkler system actuation panels for the preaction control valves are not electrically supervised as required by NFPA-13, Sprinkler Systems, Section 5-3.5.4.
- b. The sprinkler piping systems are not supervised as required by NFPA-13 Section 5-3.5.4.

TVA Response 1(a)

Admission or Denial of Deviation

TVA denies the deviation occurred as stated.

Note: NRC's reference to NFPA-20 Section 9-5.2.5 is based on a more recent issue of the code than the code of record (1976). TVA believes that our reference to NFPA-20 Section 9-5.2.4 is identical.

## Reasons for Denial

The fire pump actuation circuits are routed from two fire detection control panels in the auxiliary instrument rooms through the Solid-State Control System (SSCS) cabinets to the pump controllers. The starting circuits from the SSCS cabinets to the pump controllers are wired to normally closed contacts and are arranged such that breakage, disconnection, or loss of power to the starting circuits will cause automatic continuous operation of the fire pumps. Circuits from the fire detection panels to the SSCS cabinets are wired to normally open contact, and failure of these circuits will not cause automatic start of the fire pumps. However, if an input signal to the detection panels requiring fire pump start fails to generate a corresponding output to the SSCS, the control room operator is notified that an alarm condition exists on that panel. This is transmitted over a common alarm circuit from the detection panels to the Data Acquisition and Control, Operation Recording, Annunciation, Data Logging, Access Control, and Fire Detection System (DACOADA). Appropriate manual actions will then be taken to start the fire pumps. All input signals to the detection panels are supervised. In addition, the fire pumps can be started from the main control room through the SSCS. If the SSCS should fail, the fire pumps can also be started by an emergency bypass switch located in the immediate vicinity of the SSCS cabinets. This switch is a normally closed contact and the circuit is arranged such that any breakage, disconnection, or loss of power will cause automatic continuous operation of the fire pumps. The fire pump controller is also wired so that a loss of power to the controller will cause automatic continuous operation of the fire pumps.

TVA believes that the unique arrangement of the Bellefonte Nuclear Plant's SSCS in conjunction with the level of supervision of fire detection input circuitry to the detection panels and plant operating procedures provide a level of protection that meets the intent of NFPA 20-1976, Section 9-5.2.4 (FSAR Code of Record).

The following Fire Pump Start Block Diagram (Figure 1) with accompanying explanatory notes illustrates the fire pump start circuitry inputs.

# FIRE PUMP START BLOCK DIAGRAM

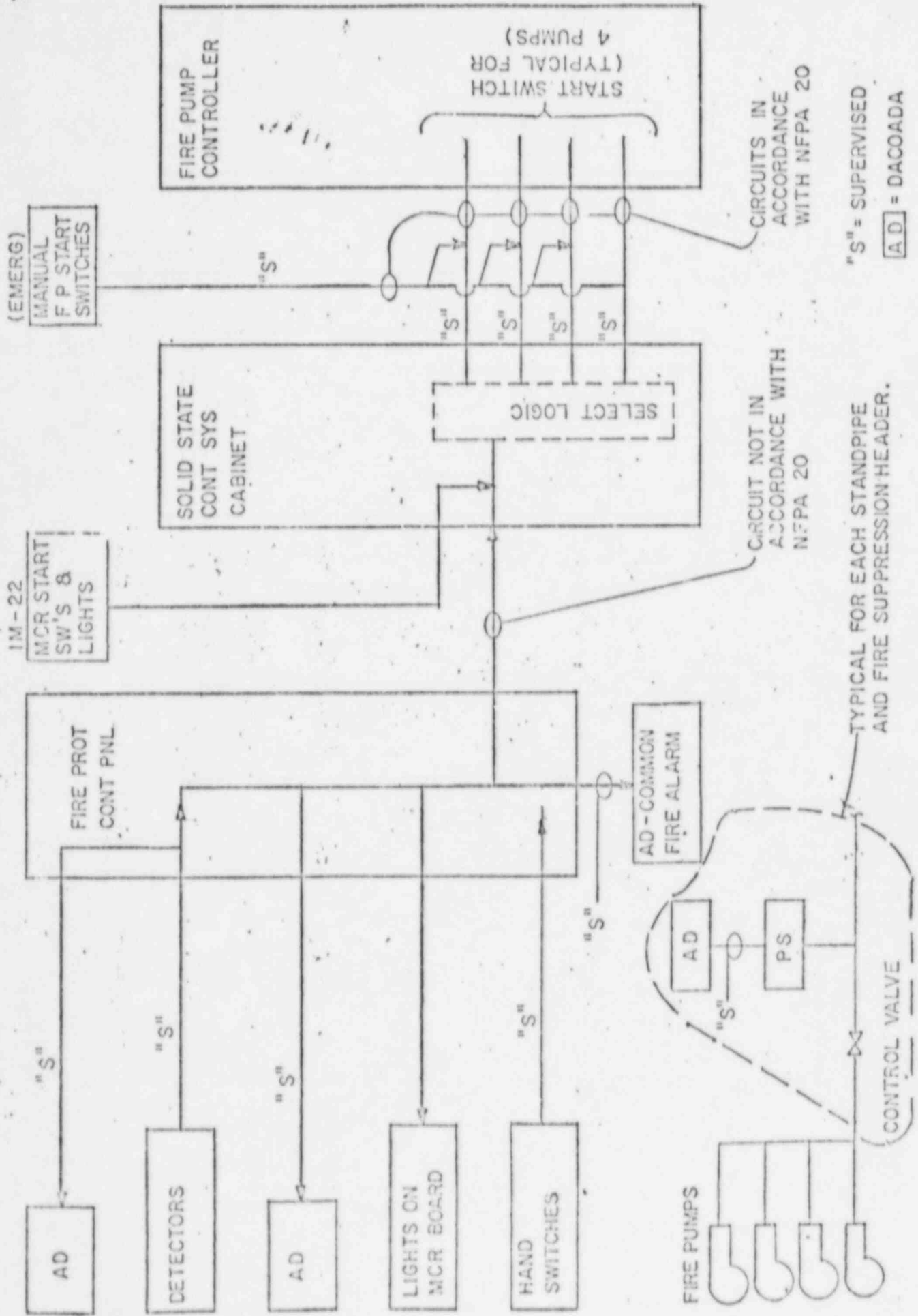


FIGURE 1

FIGURE 1  
EXPLANATORY NOTES

1. In event of either a detector actuation or manual fire pump start initiation, there is an alarm on DACOADA (supervised) for the individual condition and a common alarm (supervised).
2. There is a pressure-switch indication downstream of each valve (supervised) which can be compared with the alarm in item 1 to ensure pumps have started and valve has opened. (Exceptions are standpipes which do not have valves).
3. If pumps start, there will be indication on main control room board (MCR) IM-22. If not started, operator can attempt to start them from: (1) MCR (nonsupervised circuit), (2) manual fire pump start switch downstream of solid state control system (SSCS) (supervised), or (3) at the fire pump controller.
4. In summary, there are supervised circuits to alarm the operator that the pumps should be started and status (most of which is supervised) to show that they have started. If they did not start, there is both nonsupervised start circuits in MCR and supervised start circuits at the SSCS cabinet.
5. There are 20,000-gallon tanks on top of the turbine building which would gravity-feed most areas which would automatically fill from the four electric pumps.

TVA Response 1(b)

Admission or Denial of Alleged Deviation

TVA admits the deviation occurred as stated.

Corrective Steps Taken and Results Achieved

The present configuration allows the relief valves to discharge into a short run of 6-inch piping that connects to an overhead 12-inch common header which carries the discharge to yard drainage. A 1/2-inch open-ended line taps into the 6-inch line and releases a portion of the relief valve discharge into an open funnel that also discharges to the yard drainage system.

In the event of relief valve discharge, it could be difficult to visually determine which pump relief valve(s) was discharging when more than one fire pump was in operation. To alleviate this potential problem, TVA will install a flanged enclosed waste cone in the 6-inch relief valve discharge line of each pump at a location downstream of the existing one-half drain line. This will provide a visual means of determining operation of a relief valve.

### Corrective Steps Taken to Avoid Further Deviations

The fire pump installations designed in accordance with NFPA 20 at other TVA nuclear plants have been provided with a visual means of determining relief valve operation. The fire pumps that were designed to standards other than NFPA 20 have been accepted by NRC-NRR. Therefore no actions to prevent recurrence of the subject deviation are necessary.

### Action to be Taken or Planned to Improve

#### Management Control Effectiveness

This deviation occurred as a result of misinterpretation of the code rather than a breakdown in the management control process. Therefore no additional action is required to improve management control.

#### Date When Full Compliance Will Be Achieved

TVA's Division of Engineering Design (EN DES) Engineering Change Notice (ECN) 2330 will document this change. The corresponding design drawing and bill of materials will be revised and issued by October 31, 1983. Installation should be completed by January 15, 1984.

#### TVA Response 2(a)

#### Admission or Denial of Alleged Deviation

TVA denies the deviation occurred as stated.

Note: NRC's reference to NFPA 13 Section 5-3.5.4 is based on a more recent issue of the code than the code of record (1976). TVA believes that our reference to NFPA 13 Section 5-3.5.2 is identical.

#### Reasons for Denial

NFPA 13-1976 (FSAR Code of Record) section 5-3.5.2 only requires fire detection devices to be supervised. It is TVA's position that this section does not require electrical supervision of the circuits from the fire detection control panels to the sprinkler system preaction control valves. At Bellefonte, the fire detectors, pressure switches, and fire pump start switches associated with the preaction and deluge systems are monitored by class A supervised circuits in accordance with NFPA 72D-1975 and NFPA 72E-1974. TVA feels that this level of supervision meets the requirements of NFPA 13-1976, section 5-3.5.2.

In addition, the contacts of the breakers which supply power to the solenoids that actuate the preaction and deluge valves, the circuits providing power to the fire protection panels, and the circuits from the panels to the pressure switches downstream of the valve are all electrically supervised. The pressure switches provide control room indication of valve status. Therefore, failure of any suppression valve to open in a fire alarm condition will be indicated in the main control room. Appropriate actions would then be taken by the fire brigade to manually actuate the valve at the local control valve station.



## TVA Response 2(b)

### Admission or Denial of Alleged Deviation

TVA denies the deviation occurred as stated.

Note: NRC's reference to NFPA 13 Section 5-3.5.4 is based on a more recent issue of the code than the code of record (1976). TVA believes that our reference to NFPA 13 Section 5-3.5.2 is identical.

### Reasons for Denial

All preaction sprinkler systems at Bellefonte, including those in the diesel generator and fire pump buildings, are supervised by pressure switches downstream of the system control valves. The switches provide annunciation in the main control room anytime a control valve opens and water is admitted into the sprinkler systems.

The preaction sprinkler systems covering areas of the plant containing class 1E motor control centers and auxiliary control panels are also provided with low pressure air supervision. The systems have pressure switches that provide main control room annunciation indicating when the integrity of the piping systems have been lost.

Both types of supervision were provided in the sprinkler system design out of concern for release of water in safety-related areas of the plant. Pressure switch supervision coupled with normally dry headers downstream of the control valves, closed sprinkler heads, seismically designed components, and control valve actuation by cross-zone fire detector provides a high degree of assurance that water damage to safety-related equipment cannot occur due to spurious sprinkler system operation. Air supervision was provided as an added degree of assurance around critical electrical equipment that is very susceptible to water damage. This philosophy was part of the original fire hazard analysis and was based on a defense in-depth approach instead of a rigorous analysis.

Therefore, it is TVA's position that adequate supervision of all sprinkler system piping is provided in accordance with NFPA 13-1976, Section 5-3.5.2 (FSAR Code of Record).



BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2  
REVISED RESPONSE TO DEVIATION 50-438/83-10-03, 50-439/83-10-03  
EXTERIOR FIRE PROTECTION WATER SYSTEM WAS NOT  
INSTALLED UNDER A QA/QC PROGRAM

Description of Deficiency

FSAR Appendix 9.5A, Section C, identifies the quality assurance program to be applied to the design and construction of the fire protection systems at Bellefonte to ensure a reliable and quality product. TVA drawing 7YW0400-RS-01 is marked to indicate that the exterior fire protection water system is to be installed under a quality assurance program.

Contrary to the above, the exterior fire protection water system was not installed under a quality assurance program.

TVA Response

Admission or Denial of Alleged Deviation

TVA admits the deviation occurred as stated.

Corrective Steps Which Have Been Taken and Results Achieved

TVA acknowledges that construction activities for all the exterior fire protection piping systems shown on TVA drawing No. 7YW0400-RS-01 have not been installed in accordance with a fire protection quality assurance program. It is our position that the program applies only to those features which may affect fire protection for safety-related areas of the plant. Thus, only those features required for the performance of the fire protection system in the safety-related structures or adjacent nonsafety-related structures where an uncontrolled fire could affect safety-related structures should fall under the quality assurance program.

1. TVA has initiated the designation of Q\* (which denotes a limited quality assurance for systems not requiring complete compliance with 10CFR50 Appendix B) on all applicable fire protection system drawings in accordance with TVA's Division of Engineering Design Engineering Procedures (EN DES-EP) 4.25, revision 3 (issued March 24, 1980), and EN DES-EP 3.09, revision 2 (issued October 28, 1980), and defined the Q\* boundaries on the applicable design criteria diagrams under engineering change notice (ECN) 1357 on September 14, 1981. In addition, TVA has issued General Construction Specification G-73 (G-73), "Inspection, Testing, and Documentation Requirements for Fire Protection Systems and Features," dated March 16, 1982.
2. EN DES has issued EN DES-EP 1.55, Limited Fire Protection Quality Assurance Program, which defines what organizations are responsible for defining fire protection quality assurance boundaries on design drawings and states the general criteria for establishing these boundaries. A review of all Bellefonte drawings that fall under the fire protection quality assurance program for conformance to the procedure will be made. Any deficiencies will be corrected through drawings revisions.

3. EN DES has reviewed the construction procedures and instructions in effect during the period from December 1, 1977, to March 16, 1982, for compliance with the intent of G-73. The procedures and instructions have been determined to satisfy the requirements established in G-73.
4. The Division of Construction (CONST) will review all Bellefonte drawings under Fire Protection Quality Assurance Program and will verify that adequate quality assurance records exist in compliance with G-73 for installations after March 16, 1982, and in compliance with the intent of G-73 for installations between December 1, 1977, and March 16, 1982. In the event that adequate records cannot be identified to serve as "QA documentation," nonconformances will be written describing the corrective actions that will be implemented (performance of tests, inspections, etc.). These nonconformances will provide a method for documenting, scheduling, tracking, and closing out any deficiencies.

In addition, all significant nonconformances will be handled in accordance with EN DES-EP 2.02, "Handling of Conditions Potentially Reportable Under Title 10 of the Code of Federal Regulations, Parts 21, 50.36, and 55.55(e)," which requires that these nonconformances be evaluated for reportability to the NRC.

#### Corrective Steps Taken to Avoid Further Deviations

Full implementation of EN DES-EP 1.55 and the existing general construction specification should prevent further deviations at Bellefonte.

TVA is currently evaluating the adequacy of the fire protection quality assurance boundaries and the required documentation on other active nuclear plants. If problems are identified, they will be corrected in a manner similar to the actions outlined above.

#### Date When Full Compliance will be Achieved

The review of drawings and identification of nonconforming areas as discussed above will be completed for Bellefonte by July 1, 1984.

Corrective actions as required by the nonconformances will be completed by February 1, 1985.

#### Action to be Taken or Planned to Improve Management Control Effectiveness

As previously stated in the TVA response above, TVA attempted to initiate the requirements of the fire protection quality assurance program through the issuance of TVA memorandums. At the time, this appeared to be the most expedient method to establish QA requirements consistent with our commitment in Bellefonte FSAR Appendix 9.5A, section C. TVA acknowledges that memorandums are not appropriate to establish a formal quality assurance program. Consequently, TVA initiated action to correct this problem by establishing Fire Protection Quality Assurance requirements in the Office of Engineering Design and Construction (OEDC) Program

Requirements Manual (PRM) No. 2QAI-2 issued on June 29, 1982. Additionally, TVA issued EP 1.55, "Limited Fire Protection Quality Assurance Program," on August 4, 1983. The issuance of these documents will formally establish a quality assurance program beginning with the upper tier OEDC level program requirements. EN DES-EP 1.55 formally established the requirements for design and procurement activities within EN DES, and G-73 formally establishes the requirements for control of these activities within CONST. These actions are considered adequate to prevent recurrence, and no additional action beyond those listed above and the corrective actions for this specific finding are planned.

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2  
REVISED RESPONSE TO DEVIATION 50-438/83-10-05, 50-439/83-10-05  
IMPROPER FIRE DAMPER INSTALLATION

Description of Deficiency

FSAR Appendix 9.5 A Section C.2 states that the design, installation, inspection, and tests associated with the fire protection systems are accomplished in accordance with written and approved instructions, procedures, and drawings. TVA drawing 3AW0910-00-01 note 29 states that the fire dampers and sleeve assemblies for fire barrier penetrations will be installed per vendor installations and Sheet Metal and Air Conditioning Contractors National Association (SMACNA) standards. The vendor's fire damper documents require the dampers to be attached to the damper sleeve by welds, bolts, screws, or rivets spaced no more than 8 inches on center on all sides of the damper assembly.

Contrary to the above, the fire dampers are not installed in accordance with manufacturer's specifications in that the dampers are attached to the sleeve by tack welds spaced 12 inches on center and located only on one side of the damper assembly in lieu of the required 8-inch spacing on all sides of the assembly.

TVA Response

Admission or Denial of Deviation

TVA admits the deviation occurred as stated.

Corrective Steps Which Have Been Taken

TVA's Division of Construction (CONST) has been instructed to install fire dampers in the future in accordance with approved manufacturer's instructions. In addition, CONST has generated nonconformance report (NCR) 2391 which documents the as-built configuration of the installed dampers.

TVA's Division of Engineering Design (EN DES) has requested the damper manufacturers to evaluate the as installed configuration against the approved vendor installation method for possible equivalency. If a vendor is unable to make this determination, TVA will request an Underwriters Laboratories' (UL) test to demonstrate the adequacy of the installed configuration. If this test does not demonstrate adequacy, construction will rework the dampers to conform to the vendor installation procedure.

Corrective Steps Taken to Avoid Further Deviations

CONST personnel installed fire dampers per SMACNA standards which were referenced on TVA drawings. TVA considered this adequate requirements for installation of fire dampers. This interpretation of the requirements for installation was not a failure to meet these requirements but rather an incorrect decision that 'SMACNA' would satisfy vendor installation requirements.

Date When Full Compliance will be Achieved

- A. EN DES anticipates vendor's response on equivalency by December 1, 1983.
- B. Any rework required by the disposition of NCR 2391 should be corrected by December 3, 1984.

Action to be Taken or Planned to Improve management Control Effectiveness

TVA G-73, issued March 16, 1982, includes requirements to ensure that CONST personnel use all applicable EN DES-approved design drawings and/or the EN DES-approved manufacturer's instructions when installing fire dampers.