



UNITED STATES  
**NUCLEAR REGULATORY COMMISSION**  
 REGION II  
 101 MARIETTA ST., N.W.  
 ATLANTA, GEORGIA 30323

Report Nos.: 50-338/88-13 and 50-339/88-13

Licensee: Virginia Electric and Power Company  
 Richmond, VA 23261

Docket Nos.: 50-338 and 50-339

License Nos.: NPF-4 and NPF-7

Facility Name: North Anna 1 and 2

Inspection Conducted: July 18-22, 1988

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SUMMARY

Scope: This was an announced Triennial Postfire Safe Shutdown Capability Reverification and Assessment (Module 64150). The team assessed whether the licensee has a functioning configuration management program as it relates to fire protection and postfire safe shutdown capability. The inspection verified whether the licensee has properly maintained the postfire safe shutdown capability achieved during the initial validation inspection previously conducted at North Anna on September 9-13, 1985.

The inspection covered four major areas as they relate to Appendix R compliance and postfire safe shutdown capability including plant modification review; reverification of Appendix R fire protection features; review of postfire safe shutdown procedures and equipment; and, review of Generic Letter 86-10 engineering evaluations.

Emphasis was placed upon review of the plants configuration control program procedures as they relate to maintaining Appendix R compliance and the postfire safe shutdown capability. This inspection included review of postfire shutdown procedures; plant fire protection features and safe shutdown systems walkdowns; review of Generic Letter GL 86-10 engineering evaluations for fire protection, and interviews of personnel at various corporate and site levels. The inspectors also reviewed NRC Information Notice No. 88-04, Inadequate Qualification Documentation of Fire Barrier Penetration Seals, and evaluated the licensee's short term and programmatic actions in this area.

Results: During this inspection, the NRC inspectors discussed the plant Appendix R configuration management program history with plant and corporate management. The licensee's responses to these discussions and results of this assessment indicate that the single weakness identified by the inspectors had been previously identified by licensee management and that actions necessary to assure that similar problems with the configuration management control program for Appendix R fire protection do not reoccur.

In general, the licensee's configuration management program as it relates to maintaining Appendix R compliance and post fire safe shutdown capability was found to be adequate with several strong features. Management appears to be taking the appropriate actions to maintain Appendix R fire protection long term compliance. Therefore, based upon the satisfactory results of this inspection, a detailed 10 CFR 50 Appendix R compliance reverification inspection for North Anna is not warranted at this time.

Strengths and weaknesses are summarized below:

#### Strengths

- It is apparent that VEPCO management has made a strong commitment to ensure long term compliance with Appendix R and to maintaining the postfire safe shutdown capability. This is evident by the VEPCO managements approval and implementation of design control procedures which include a detailed review to determine if the change will impact Appendix R compliance and the postfire safe shutdown capability.
- The licensee has included a detailed Appendix R Checklist in a plant Standard. Design Change Packages and Engineering Work Requests must be reviewed to ensure compliance to the design criteria in the checklist. The checklist is of sufficient detail to provide guidance to evaluate Appendix R and postfire safe shutdown capability concerns.

- The licensee's approach to the resolution of technical fire protection concerns indicates a clear understanding of the issues. This is evident by the quality of the engineering evaluations prepared by the licensee's staff to document acceptability of deviations from NFPA codes.
- The onsite engineering organization personnel are well-informed on Appendix R design criteria. This was evident in the design change documents reviewed during the inspection.

#### Weaknesses

A single weakness in the configuration management program was identified during the inspection. The weakness was in the area of Design Change Packages prepared by VEPCO contractors. These contractors may not be fully aware of the potential impact of a design change on Appendix R compliance since they may not be familiar with the postfire safe shutdown capability at North Anna. This weakness appears to have been corrected by the licensee prior to the inspection. Plant procedures now require all Design Change Packages to be reviewed by VEPCO's Nuclear Engineering/Design Control Group who is responsible for ensuring long term compliance with Appendix R. This weakness appears to be the root cause for an inadequate Appendix R Checklist review of two Design Change Packages which resulted in the issuance of the enclosed violation.

One violation was identified, Inadequate Evaluation of Appendix R Checklist By VEPCO Contractor, Paragraph 2.a.(2).

One unresolved item was identified, Entry Into Fire Area for Manual Operations of Safe Shutdown Equipment, Paragraphs 2.e.(5) and 2.e.(6).

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*W. Adams, Supervisor Plant Engineering
- \*M. Bowling, Assistant Station Manager
- \*R. Carroll, Senior Staff Engineer, Nuclear Engineering/Design Control
- \*R. Champagne, Configuration Control Engineer
- \*J. Downs, Supervisor, Administrative Services
- \*K. Driscoll, Manager Quality Assurance
- \*G. Flowers, Nuclear Specialist
- \*G. Gordon, Supervisor Electrical Maintenance
- \*D. Heacock, Superintendent Technical Services
- \*J. Hegner, Licensing Engineer
- \*B. Jacobs, Supervisor Training
- \*G. Kane, Station Manager
- \*J. Kansler, Superintendent Maintenance
- \*P. Lienhart, Training
- \*G. MocarSKI, Station Loss Prevention Coordinator
- \*M. Phillips, Senior Engineer
- \*W. Robbins, Senior Engineer Corporate Loss Prevention
- \*L. Narnicki, Power Station Engineer, Fire
- \*J. Wroniewicz, Supervisor Site Nuclear Engineering

Other licensee employees contacted during this inspection included engineers, operators, technicians, and administrative personnel.

#### Other Organizations

- \*N. Hanley, Stone and Webster Energy Corporation
- \*R. Sheets, Stone and Webster Energy Corporation
- \*C. Sinopoli, TENERA Corporation

#### NRC Resident Inspector

- \*J. Caldwell

\*Attended exit interview

### 2. Assessment Of The Licensees Configuration Management Program

Section 50.48 of 10 CFR 50 requires North Anna to comply with Sections III.G, III.J, and III.O of Appendix R, Fire Protection Program for Nuclear Facilities Operating Prior to January 1, 1979. North Anna's Compliance with 10 CFR 50 Appendix R was initially verified by the NRC during an inspection conducted September 9-13, 1985.

The purpose of this inspection was to determine whether the licensee had developed and implemented a configuration management program which insures that Appendix R compliance and the postfire safe shutdown capability is maintained over the life of the plant. If this inspection had determined that such a program did not exist or was not functioning, a detailed inspection to reverify the licensee's continued compliance with the requirements of 10 CFR 50 Appendix R would have been recommended.

a. Configuration Management Program

In order to verify that the configuration management program related to Appendix R compliance and postfire safe shutdown capability was adequate, the inspectors conducted a detailed review of plant and corporate procedures governing the preparation and review of design change documents to determine:

- that these procedures include provisions that ensure all design change documents are reviewed for Appendix R compliance and postfire safe shutdown concerns,
- that these procedures provide adequate guidance for the reviewer to determine if there is impact on Appendix R compliance and the postfire safe shutdown capability, and
- that these procedures include provisions to ensure that all design change documents which do impact Appendix R compliance and postfire safe shutdown capability are incorporated into the analyses, procedures, and programs which support and implement this capability.

In addition, to verify the implementation of these procedures the inspectors selectively reviewed design change documents for modifications to those plant systems required for postfire safe shutdown.

(1) Configuration Control Procedures

Initially in the review of the design change program at North Anna, the inspectors established the methods by which a change to the plant can be made. Through discussions with plant personnel, three types of design change documents were identified.

Design Change Package (DCP)  
Engineering Work Requests (EWR)  
Field Change Request (FCR)

The following procedures governing the preparation and review of DCPs, EWRs and FCRs were reviewed by the inspectors:

<u>Procedures No./Revision</u>	<u>Title</u>
NDCM-3.21/Rev. 4	Design Change Package (DCP) Preparation Guidelines
NDCM STD-GN-0001/Rev. 8	Instructions for DCP Preparation
ADM-3.7/7-7-88	Engineering Work Requests
NASEO-002/Rev. 2	Field Change Processing
STD-GN-0021/Rev.1	Appendix "R" Design Guidelines

Physical changes to the plant are initiated by the preparation of a DCP or EWR. DCPs prepared in accordance with procedure NDCM STD-GN-0001 are required by Section 3.1 to have a review performed to insure the proposed modification conforms with current Regulatory requirements and other VEPCO corporate positions on fire protection. This review is conducted by the preparing engineer using the guidance provided in standard STD-GN-0021 which includes an Appendix R Checklist that must be completed and included in the DCP. Presently, all DCPs are required to be reviewed by Nuclear Engineering/Design Control group. This group, located in the VEPCO Richmond Corporate Office, has been assigned responsibility for long term compliance with the requirements of 10 CFR 50 Appendix R.

EWRs involving a plant modification are also required to be reviewed against the design criteria outlined in the Appendix R Checklist. However, this review is only required to be documented in the checklist if it is determined by the preparing engineer that a change to the Appendix R Report is required.

The inspectors were concerned that EWRs which could effect Appendix R compliance and the postfire safe shutdown capability would not get an adequate level of review since the preparing engineer and the Site Engineering Organization (SEO) are responsible for the Appendix R Checklist review. The administrative procedure governing EWRs does not require reviews by the corporate Nuclear Engineering/Design Control group. The licensee representatives stated that the organization responsible for long term Appendix R compliance not being directly involved in the review of EWRs is not a weakness since the Appendix R checklist is very detailed and provides adequate guidance to the preparing engineer to evaluate Appendix R concerns.

The inspectors review of the Appendix R Checklist, Attachment 5.4 of standard GN-0021, confirmed the licensee's position. The checklist provides the reviewer with guidelines for determining if the modification has impact on:

- the electrical separation of safe shutdown equipment/ components
- the coordinated circuit study
- emergency lighting
- telecommunication system
- cable
- safe shutdown instrumentation
- exemption requests
- combustible loading
- fire area boundaries
- fire protection systems
- fire barriers, fire stops, and radiant energy shields
- safe shutdown required ventilation system
- reactor coolant pump tube oil collection system
- safe shutdown systems/components

The checklist appears to provide adequate guidance to ensure that DCPs or EWRs which do impact Appendix R compliance will be identified.

The inspectors also reviewed the training given to SEO personnel on familiarization and use of the Appendix R program documents and the Appendix R Checklist. This training includes Basic Engineer Training (BET-12) provided for all new engineers entering the SEO. Further training is received through the SEO continuing engineering training and job performance programs. The inspectors reviewed the required reading list for SEO personnel and verified that the subject matter of the Appendix R program documents as referenced in Section 4.1.6 of Standard GN-0021 were included in the required reading for engineering personnel and those persons responsible for reviews of DCPs and EWRs. The inspectors determined the training to be adequate and effective to assure that site engineering organization personnel are knowledgeable of the North Anna Appendix R Report and preparation of DCPs and EWRs.

FCRs are issued against DCPs to revise the DCP after approval by the North Anna Station Nuclear Safety and Operating Committee (SNSOC). Per Chapter V of Standard GN-0001, initiating a FCR against a DCP requires that the entire DCP be reviewed to ensure the change does not adversely impact any section of the DCP. This review includes a reevaluation of the Appendix R Checklist.

Provisions are provided in the procedures for processing DCPs and EWRs to ensure that any changes required to the North Anna Appendix R Report, plant procedures or any other supporting documents as a result of the design modification are incorporated upon completion of the modification.

Based upon the inspector's review of the procedures and standards; Appendix R Checklist; and the SEO training program for Appendix R, the North Anna program established for configuration management of Appendix R compliance and the postfire safe shutdown capability appears to be adequate.

(2) Implementation of Configuration Control Procedures

The inspectors reviewed the following DCPs and EWRs in order to verify that procedures for configuration control are being adequately implemented:

<u>Number</u>	<u>Description</u>
DCP 83-24	Appendix R Emergency Diesel Generator Isolation
DCP 84-56	HPSI Flow Transmitter Modification
DCP 85-08	Inadequate Core Cooling Monitor System Upgrade
DCP 87-01 and 87-02	Units 1 and 2 Steam Supply to Turbine Driven Auxiliary Feedwater Pump Solinoid Operated Valve Relocation
EWR 84-36	Ecotech Study to Insure Non-Safety Equipment Faults Will Not Cause Loss of Safety-related Power Boards and Feeders
EWR 84-785	Replace Fuses On control Transformer 480V MCC
EWR 85-467	Control Circuitry to PORV Block Valves
EWR 86-545	Replacement of Control Room Fire Door
EWR 87-339	Relocated Supply Fan for Unit 1 Chiller Room
EWR 87-605	Replacement of Fuses in Emergency Diesel Generator Circuits

These DCPs and EWRs were prepared and reviewed in accordance with VEPCO procedures except, DCP 87-01 and DCP 87-02. These two DCPs relocated the Solinoid Operated Valves (SOVs), SOV-MS111A and B for Unit 1 and SOV-MS211A and B for Unit 2, associated with the steam inlet valves to the Turbine Driven Auxiliary Feedwater Pump (TDAFWP) from the Main Steam Valve



House (Fire Areas 17-1 and 17-2) to the Quench Spray Pump House (Fire Areas 15-1 and 15-2). Prior to the implementation of this modification Abnormal Procedures (APs) for a fire in the Control Room, Emergency Switgear, or Cable Vault required an operator to be dispatched locally to the Main Steam Valve House to fail the steam inlet valves open. During the period from October 1987 to June 21, 1988, when it was identified in Deficiency Report 88-510 that these valves were required to be operated locally as part of the postfire safe shutdown capability, had a fire occurred in one of the named areas the operator would not have been able to take the local action at the main steam valve house required to establish steam flow to the TDAFWP as described in the AP. However, the licensee presented an evaluation to the inspectors which identified alternative means by which the steam inlet could be operated. Based on the licensee evaluation, the inspectors agreed that alternate methods were available to establish steam flow to the TDAFWP which would have allowed the Auxiliary Feedwater System to accomplish its performance goal of reactor heat removal.

The root cause of the SOVs being relocated without the impact on postfire safe shutdown capability being realized was the result of an inadequate review of the Appendix R Checklist by the preparing engineer and reviewing engineers. The preparer and reviewer failed to recognize that the SOVs were associated with the TDAFWP trip valves. In addition it appears the preparer and reviewer were also unaware of fire area boundaries established for separation of redundant safe shutdown equipment. DCP 87-01 and 87-02 were prepared by a North Anna Contractor and identify an apparent weakness in the configuration control program for DCPs generated by outside contractors who may not be familiar with the postfire safe shutdown capability at North Anna. At the time these DCPs were generated and reviewed VEPCO had discontinued its practice of having all DCPs reviewed by the engineering organization, Nuclear Engineering/Design Control, responsible for ensuring long term compliance with Appendix R.

Failure of the preparing engineer to adequately evaluate the criteria outlined in the Appendix R Checklist is identified as Violation Item 88-13-01, Inadequate Evaluation of Appendix R Checklist By VEPCO Contractor.

The licensee's corrective action to resolve this finding includes:

- ° Upon discovery that the SOV's had been relocated, the licensee initiated changes to the safe shutdown procedures to instruct the operators as to the new location of the SOV's. This corrective action was effective to address the immediate plant operating concerns.

- The licensee initiated an EWR which was implemented on July 13, 1988, which provided additional air stop and bleed valves at the original location in the Main Steam Valve House. This corrective action achieved full compliance with the requirements of plant procedures.
- The licensee has also reinstated the practice of having all DCP's reviewed by the Nuclear Engineering/Design Control group who is responsible for ensuring long term compliance with Appendix R. This corrective action appears to be adequate to ensure similar violations do not occur.

All of the above corrective actions were implemented prior to this inspection and appear adequate to resolve the finding. In addition, subsequent to the completion of the inspection the licensee issued voluntary LER 88-019-00 dated August 10, 1988, which identified additional corrective actions which will be implemented. The implementation of these corrective actions will be followed up on in a future inspection.

The inspectors also reviewed Deficiency Report (DR) that was written when the licensee identified that the SOVs had been relocated from elevation 272 ft. in the Main Stem Valve House to elevation 256 ft. in the Quench Spray Pump House. DR 88-510 was initiated to relocate the emergency lights to insure that the path was lighted in the event a fire with the loss off-site power and operator action was required in this area. The DR was reviewed for reportability and found non-reportable. The engineering review revealed that the relocation of the SOVs was into an area that was separate from the original fire area and it was now possible that all auxiliary feedwater could be lost if a fire in the new location fire area were to occur. The records reviewed by the inspectors indicated that only the original portion of the DR was evaluated for reportability and that the portion added by the engineering section with regard to the loss of auxiliary feedwater had not been evaluated or addressed since this part had been added to the report at a latter time. The licensee presented evidence that even though the original report had been modified it had in fact been evaluated for reportability. The licensee further advised the inspectors that the manner in which this DR had been processed was an isolated case, and this was not the standard or normal method for handling and evaluating DRs.

b. Appendix R Features

Appendix R to 10 CFR 50 requires certain fire protection features to be provided for the separation of redundant safe shutdown systems/components in the same fire area. These features include automatic suppression, automatic detection, fire barriers, radiant energy

shields and spacial separation. If a licensee proposes alternate methods of protecting the redundant systems/components, an exemption from the applicable requirements of Appendix R must be requested. During the NRC's initial Appendix R compliance inspection at North Anna, September 9-13, 1985, many of these fire protection features were inspected. However, the licensee's exemption requests which had been submitted to NRR had not yet been approved. Subsequently, the NRC approved the licensees exemption requests in a November 6, 1986 Safety Evaluation (SE).

During this inspection, the inspectors selectively reviewed those Appendix R fire protection features not addressed during the initial inspection and also verified that the bases for the NRC's November 6, 1986, SE still reflected the plant configuration.

In addition, the inspectors selectively reverified that certain plant areas had adequate emergency lighting for operator access, egress, and manual operations.

(1) November 6, 1986 SE Review

The inspectors selected the following features for inspection to verify the November 6, 1986, SE still reflected the plant configuration:

<u>Exemption Request</u>	<u>Feature</u>
1	A detector is provided in each charging pump cubicle and one in each HVAC return duct from the cubicles.
1	The Unit 2 CCW pump, power cable is wrapped with a one hour fire barrier until 20' separation is achieved.
1	Fire stops are provided in cable trays between the CCW pumps on the 259'-6" elevation of the Auxiliary Building.
3	Detection in the Quench Spray Pump House will be upgraded to provide full area coverage per NFPA 72E.
4	Manual action of the PORVs in the Main Steam Valve House is required. Verify access, egress, and PORVs have adequate emergency lighting.

- 5 and 23 To north wall of the AFW pump house which separates the TDAFWP from the MDAFWP has all penetrations sealed with 3-hour rated seals.
- 10 Emergency ventilation equipment to supply cooling to the charging pumps and component cooling water pump area is provided in a fire rated enclosure in the Auxiliary Building.
- 31, 32, 33 Portable lights are to be provided for use in the Unit 1 and Unit 2 Seal Water Filter Area.
- 25 The two approved unprotected openings are the only unsealed openings in the wall between the Unit 1 and 2 chiller rooms into the turbine building.

All of these features were verified to be in place by field inspection. No discrepancies were noted except, the inspectors found in their field walkdown of the emergency ventilation equipment in the Auxiliary Building that emergency lights ELT-AB009A through D did not appear to provide adequate lighting to the area. The licensee had previously identified this concern in DR 88-542 on July 6, 1988. The licensee has drafted EWR 88-183 to relocate the emergency lights. This item will be followed up on in a future inspection.

In addition, the two following programmatic requirements were verified to have been incorporated into plant procedures:

<u>Exemption Request</u>	<u>Programmatic Requirements</u>
5 and 23	Procedures for using TDAFWP suction pressure to determine CST level. Verified to be Step 12 of AP50.6.
28	Procedures for reestablishing ventilation to CCW pumps and charging pumps shall be proceduralized. Verified EMP-C-EP-11 includes rigging the ventilation.

## (2) Fire Barriers

The following Appendix R fire barrier penetration seals were inspected to verify that they met the requirements of Technical

Specification 3/4.7.15, Penetration of Fire Barriers and Station Administrative Procedure 3.3, Cable and Pipe Penetration Silicone Foam/Installation Repair.

<u>Penetration No.</u>	<u>Location</u>
1CK900RA	Unit 1 Control Room Floor
1WLO02N04	Unit 1 Control Room Floor
1CK900RA	Unit 1 Control Room Floor
2CC0010NA3	Unit 2 Diesel Generator Room
2CCX015NA3	Unit 2 Diesel Generator Room
2CX0015R0	Between Auxiliary Building and Cable Tunnel
2CX0016WF	Between Auxiliary Building and Cable Tunnel
2WC02N06	Between Turbine Building and Switch Gear Room
2WX002N09	Between Turbine Building and Switch Gear Room
2WX002N40	Between Turbine Building and Switch Gear Room
2WX003N48	Between Turbine Building and Switch Gear Room
2WX004N09	Between Turbine Building and Switch Gear Room
2FC001017	Between Turbine Building and Switch Gear Room
2FC005N26	Between Turbine Building and Switch Gear Room
2FK001005	Between Turbine Building and Switch Gear Room
2DK0010B1	Fire Wall Cable Tunnel No. 2
2DX002NA2	Fire Wall Cable Tunnel No. 2
2FC005N26	Fire Wall Cable Tunnel No. 2

Review of the above penetrations indicated that they met the requirements of Technical Specification 3/4.7.1.5 and Station Administrative Procedure 3.3, and were in accordance with the guidelines of Appendix A to Branch Technical Position APCSB 9.5-1. The licensee provided documentation to substantiate the fire rating of the three-hour penetration seals used in the penetrations for cable trays, conduits and piping.

(3) Separation of Redundant Systems/Components

The Units 1 and 2 Control Room HVAC systems are located in the Turbine Building, Fire Area 8, elevation 254'-0" Air Conditioning Chiller Rooms. Either the Unit 1 or Unit 2 equipment is required to remain operable following a fire to ensure adequate Control Room cooling. The equipment is located in separate rooms in the turbine building separated by approximately 150 feet. In addition, a non-rated wall separates each room from the remainder of the turbine building fire area.

The licensee's Appendix R Report shows that the cables associated with the Unit 1 equipment and Unit 2 equipment all run directly from the Air Conditioning Chiller Rooms to each unit's Air Conditioning Rooms. The Air Conditioning Rooms are located in separate fire areas, Fire Area 6-1 for Unit 1 and Fire Area 6-2 for Unit 2. The inspectors verified that the

following cable raceways for the Unit 1 and Unit 2 Control Room HVAC equipment pass directly from the Unit 1 and Unit 2 Air Conditioner Chiller Rooms each units Air Conditioning Rooms.

## UNIT 1 EQUIPMENT

<u>Equipment</u>	<u>Conduit</u>	<u>Cable</u>
1-HV-E-4B Control & Relay Room Chiller	1CLO17PA	1HVCJPL210
1-HV-E-4C Control & Relay Room Chiller	1CLO180D	1HVCUOLO65
1-HV-P-20B Chilled Water Pump	1CK050PA 1CK050PA3	1HVCJPK200
1-HV-P-20C Chilled Water Pump	1CK0790F 1CK0970G3	1HVCHOK210
1-HV-P-22B Condenser Water Pump	1CK050PB 1CK050PB6	1HVCJPK250
1-HV-P22C Condenser Water Pump	1CK0790E 1CK0790E4	1HVCHOK245
MOV-HV-111B Chilled Water Pump Discharge VLV.	1CK050PA 1CK050PA2	1HVCJPK210 1HVCJPK211

## UNIT 1 EQUIPMENT

<u>Equipment</u> (Cont'd)	<u>Conduit</u>	<u>Cable</u>
MOV-HV-111C Chilled Water Pump Discharge VLV.	1CK0790E 1CK0790G2	1HVCHOK260 1HVCHOC261
MOV-HV-113B Condenser Water Pump Discharge VLV.	1CK050PB 1CK050PB8	1HVCJPK260 1HVCJPK261
MOV-HV-113C Condenser Water Pump Discharge VLV.	1CK0790E 1CK0790E1	1HVCHOK075 1HVCHOK076

## UNIT 2 EQUIPMENT

<u>Equipment</u>	<u>Conduit</u>	<u>Cable</u>
2-HV-E-4B Control & Relay Room Chillers	2CLO06PA	1HVZJPL210
2-HV-E-4C Control & Relay Room Chillers	2CLO050C	2HVZH0L065
2-HV-P-20B Chilled Water Pump	2CKO15PB 2CKO15PB3	2HVCJPK200
2-HV-P-20C Chilled Water Pump	2CKO860A 2CKO860A3	2HVCH0K210
2-HV-P-22B Condenser Water Pump	2CKO15PC 2CKO15PC2	2HVCJPK250
2-HV-P-22C Condenser Water Pump	2CKO860E 2CKO860E2	2HVCH0K245
MOV-HV-211B Chilled Water Pump Discharge VLV.	2CKO15PB 2CKO15PB1	2HVCJPK210 2HVCJPC211
MOV-HV-211C Chilled Water Pump Discharge VLV.	2CKO860A 2CKO860A2	2HVCH0K260 2HVCH0C261

## UNIT 2 EQUIPMENT

<u>Equipment</u> (Cont'd)	<u>Conduit</u>	<u>Cable</u>
MOV-HV-213B Condenser Water Pump Discharge VIV.	2CKO15PC 2CKO15PC1	2HVCJPK260 2HVCJPC261
MOV-HV-213C Condenser Water Pump Discharge VIV.	2CKO860E 2CKO860E1	2HVCH0K075 2HVCH0C076

## (4) Emergency Lighting

The following emergency lights installed to illuminate operator access and egress paths and safe shutdown equipment were inspected and verified to be operable and properly aimed.

<u>Emergency Light</u>	<u>Location</u>
2ELT-CV001	Unit 2 Cable Tunnel
2ELT-CV002	Unit 2 Cable Tunnel
2ELT-AB009A	Unit 2 CCW Pump Area
2ELT-AB009B	Unit 2 CCW Pump Area
2ELT-AB009C	Unit 2 CCW Pump Area

In addition, two lights, 2ELT-CV001 and 2ELT-CV002, provided in the east-west corridor of the Unit 2 cable tunnel, were tested under blackout condition. This test verified that there is adequate illumination for operator access through this corridor.

c. Postfire Safe Shutdown Procedures

(1) Procedure Review

The inspectors reviewed operations Appendix R postfire safe shutdown procedures to determine that any revisions made to the procedures did not impact on the licensee's postfire safe shutdown capability as reviewed and accepted during the initial Appendix R inspection. It was noted that procedure, EEMP-C-EP-11 Rigging Of Emergency Ventilation, had been deleted due to modifications having been made which added two air handling units to the top of the Auxiliary Building. Temporary air ducts have been installed and stored in fire rated storage spaces until required. Emergency Electrical Maintenance Procedure EEMP-C-RH-01, Installation Of Emergency Temporary RHR Motor Feeder Cable, was reviewed and a walkdown was conducted to examine the materials that were in special storage areas of the ware house as required by the procedure. The materials were set aside in a caged area and locked to insure proper control.

Abnormal Procedure 1-AP-50.1, Control Room Fire, was revised to reflect the changes discussed and the commitments made to the NRC by the licensees during the original Appendix R inspection.

(2) Licensed Operator Requalification Program for Abnormal Procedures for Fire Events

The inspectors reviewed the documentation outlining the Licensed Operator Requalification Program (LORP) on APs for fire events (AP-50 series) as required in the LORP program guide ADM21-04 dated March 15, 1988. This training consists of the operators review of the AP-50 series procedures during the Cycle 88-6 operator in-service week, continued training on the simulator, and/or other classroom review of these APs.



In lieu of walkthrough of the AP-50 series procedures, the licensed operators view a 1 hour-30 minute video tape outlining the use of safe shutdown equipment described in the AP-50 series procedures during Cycle 88-5 of the LORP. The inspectors reviewed the shift training sheets for the "A", "C" and "D" shifts which indicated this training was completed on June 23, 1988, June 9, 1988, and May 26, 1988, respectively. No shift walk through drill of the AP-50 series abnormal procedures was conducted during this inspection; however, based on the review of the above training records the LORP training on the abnormal procedures for a fire event appeared complete and effective.

d. Associated Circuits Review

A review of maintenance activities was made to insure that relay/fuse coordination was included in the evaluation and planning as part of the Appendix R review of maintenance work orders. The inspectors reviewed the licensee's process for the control of replacement fuses.

Discussions were held with both electrical and I&C maintenance supervisory personnel. It was noted that the only method of replacement fuse control was identified in Administrative Procedure 16.7 which places the responsibility at the cognizant craft foreman level. This procedure also requires an EWR to evaluate and approve a change before substitute components can be used. This must be done prior to the work starting if the EWR does not address the specific application.

During discussions with the licensee, it was pointed out that it might be advantageous to have the replacement criteria and rules expressed/written in some of the training sessions for employees. The licensee agreed to review this possibility.

e. Review of Engineering Evaluations

(1) Engineering Evaluation Number 1, Evaluation of Minor Modifications To Fire Doors

Fire rated doors (3-hour rated U.L. labeled doors) are used to protect personnel openings in fire rated walls, including those required for separation of Appendix R fire areas (in accordance with Section III.G of Appendix R to 10 CFR 50). The Appendix R fire doors were originally visually reviewed and a list was prepared of doors that needed: to be replaced, to have exemption requests developed and submitted to the NRC, to be repaired, or to be evaluated to determine the potential effects of minor modifications to the doors.

The final category is specifically addressed by Generic Letter 86-10 Enclosure 2, Section 3.2.3 which states: where a door is part of a fire area boundary, and the modification does not effect the fire rating (for example, installation of security controls), no further analysis need be performed. If the modifications reduce the fire rating (for example, installation of a vision panel), the fire rating of the door should be reassessed to ensure that it continues to provide adequate margin considering the fire loading on both sides.

This engineering evaluation only considers door originally identified as having minor modifications.

During this inspection, the inspectors conducted a walkdown of the plant and examined modifications that were done on the doors. The fire doors reviewed in the evaluation that separate fire areas containing safe shutdown equipment will provide separation equivalent to that required by Appendix R, Section III.C. The minor modifications to the doors will not adversely effect their performance under fire conditions as shown in the individual evaluation of each modification. This is based on the doors being located in areas protected by fire detection and suppression systems. The minor modifications are similar to those that Underwriters Laboratories have found acceptable in other nuclear power stations. The modifications appeared to be in compliance with the guidance of Section 3.2.3 of Generic Letter 86-10. Therefore, the inspectors found this engineering evaluation to be acceptable.

(2) Engineering Evaluation Number 2, Evaluation of the Seismic Separation (Rattlespace) Between Various Concrete Walls

Several buildings, the Auxillary Building, the Cable Vault/Tunnel, Safeguards, Main Steam Valve Houses, and Quench Spray Pump House, have common walls that have a rattlespace (to allow for a seismic event movement) between the common wall and a perpendicular wall. In some cases, a combustible material was used as a spacer material during the concrete pour.

Seismic gaps or rattlespaces, are standard in the construction of concrete structures. The job of the rattlespace is to leave enough space between walls (especially perpendicular walls) to permit movement without buckling during a seismic event. A standard industry practice is to use styrofoam, as was the practice of North Anna.

The width of the seismic gaps are approximately 2 inches. The thickness of the walls involved are 12 inches to 24 inches.

Angle iron approximately 2½" by 2½" by ¼" thick was bolted to one side of the wall to cover the gap. The same type of angle iron was used on the other side of the barrier.

The evaluation states a number of factors that mitigate the potential of fire spread through the seismic gaps. These factors along with the licensee's justification are provided below:

- Fire Detection - Most of the areas involved in the evaluation have either heat and/or smoke detectors that annunciate to the Control Room. Detection systems provide early warning of a fire condition to permit prompt station action. This early notification provides extra time for the fire brigade to assemble and attack the fire while it is still in an incipient stage, thereby reducing the potential exposure to the seismic gap.
- Fire Suppression - In general, fire areas with a combustible loading that results in an equivalent fire severity of over 60 minutes have a fire suppression system. A fire suppression system is designed to extinguish a fire before it can reach flashover or the point where the fire grows beyond the general area of origin. This will reduce any exposure threat to the barrier.
- Combustibles - In the areas reviewed, the vicinity of seismic gap was free of combustibles on both sides of the barrier. This will reduce the amount of direct flame impingement on the seismic gap on the exposed side of the barrier. This also means that there is little possibility of ignition on the unexposed side, even if the heat did pass through the seismic gap. In addition, the overall level of combustibles in most of the areas when there is no fire suppression where seismic gaps occur is low (an equivalent fire severity of 20 minutes or less). The exception is the Cable Vault/Tunnel which has a suppression system. The type of combustibles in the vicinity of the seismic gap is also an important factor. Although there are few, if any, combustibles in the direct vicinity (up to 5 ft.) of the seismic gap, those that were present were primarily cable insulation. Cable insulation requires a substantial amount of concentrated heat to ignite, and it is unlikely that this would occur via the seismic gaps.
- Area Configuration - As stated earlier, most of the areas with seismic gaps are on the primary side of the plant. These rooms are large concrete structures with high ceilings that will allow heat to rise and dissipate.

- Seismic Gap Configuration - There are several factors in the seismic gaps that will prevent the passage of heat and flame through the gap. This barrier is installed on both sides of the gap. This barrier will prevent the passage of heat and flame for most fires in the area. There are no conduits or other items which penetrate through this barrier and the seismic gap since the seismic gap is only 2 inches wide. If the fire is close enough to directly impinge on the barrier, the rubber gasket will fail, but the barrier on the other side shielded by the reinforced concrete wall will prevent passage of heat and flame. The combustible fill within the seismic gap may also actually serve to block the passage of flame if there is insufficient oxygen in the gap to permit total combustion.

Secondly, as mentioned above, the thickness of the walls are an important consideration. The walls involved are a minimum of 12 in. thick, and some go up to 24 in. This thickness will shield the barrier on the unexposed side and permit the fire gases to cool as they pass through the wall. This will also provide extra time for fire detection and action.

- Safe Shutdown Equipment - There are no major components of the safe shutdown or alternate shutdown systems in the direct vicinity (5 ft.) of the seismic gap. On the gaps that were field verified, the closest component to a gap are the RHR power feeds where they enter containment in the electrical penetration area of the Cable Vault and Tunnel (CV/T). These cables are approximately 8 ft. away. The CV/T has detection and suppression.
- Fire Code Comparison - The passage of limited amounts of gases and even flaming is acceptable for other barrier penetrations. For example, fire door testing as outlined in NFPA-252 paragraphs 6-1.1.1, 6-1.1.2, and 6-1.1.4 permits flaming of up to six (6) inches along the edges of the door.

During the course of the evaluation it was determined that this concern had been discussed during the Appendix A evaluation of the late 1970s. NRC question 16, which is answered in supplement 3 of the North Anna Fire Protection Systems Review (FPSR) dated October 1, 1978, specifically addresses the use of styrofoam filler in the rattlespace. The Virginia Electric and Power response appears to adequately cover this NRC concern. The Fire Protection Safety Evaluation Report (SER) issued by the NRC in February of 1979 specifically references the VEPCO FPSR

Supplement 3 as a source document. The SER in Section III - A found that North Anna was in compliance with the guidelines of Appendix A to BTP-9.5-1 in terms of fire barriers and penetration seals.

According to the NRC's Generic Letter 86-10, Enclosure 2, Section 3.1.2, this configuration does not need to be reviewed by the NRC. The proposed Generic letter states that: a) if openings in fire area boundaries are specifically identified and justified in the fire hazards analysis performed in the Appendix A process and b) if these boundaries are evaluated and accepted in a published SER, then the fire area boundary does not need to be reviewed for compliance with Section III.G of Appendix R. The seismic separation (rattlespace) meets these guidelines.

The seismic gap rattlespace configuration will provide adequate separation between adjacent fire areas. The technical bases which justify this conclusion can be summarized as follows:

- The fire areas (which contain shutdown components) have fire detection systems that alarm in the Control Room on both sides of fire barriers with seismic gaps.
- The fire areas with the seismic gaps in general have combustible loadings that result in an equivalent fire severity of approximately 20 minutes or less. The notable exception, the Cable Vault and Tunnel, has a fire suppression system.
- The barrier presently installed over the seismic gap on both sides of the barrier will provide some degree of separation, especially on the unexposed side.
- The configuration of the structures involved (primarily heavy concrete with high ceilings and cubicles) will limit exposure to the gaps.
- There are few combustibles and safe shutdown components within the direct vicinity of the seismic gaps, and there are no penetrations through the seismic gap.
- The passage of limited amounts of heat and even flame is permitted by NFPA codes for such barrier penetrations as fire doors.
- This configuration has been previously described to the NRC via the Fire Protection System Review submittal. The Fire Protection SER issued by the NRC did not raise further

concerns. According to guidance in the NRC's proposed Generic Letter 86-10, this configuration does not need to be reviewed again by the NRC.

During this inspection, the inspectors conducted a walkdown and examined the rattlespace areas and verified that the above referenced requirements were being met. Therefore, the inspectors found this engineering evaluation acceptable.

(3) Engineering Evaluation #5; Evaluation Of Sprinkler Head Placement For the Partial Area Sprinkle System In the Auxiliary Building North Anna Power Station

In response to the guidance provided in Appendix A of BTP 9.5-1 and in order to comply with 10 CFR 50 Appendix R section III.G separation requirements, VEPCO has installed a sprinkler system on the 244'-6" and 259'-6" elevation of the Auxiliary Building. The purpose of this sprinkler system is to provide protection to the charging pumps and their associated cables and the component cooling water pumps and their associated cables. Since this system does not provide coverage to the entire fire area VEPCO requested an exemption from the requirements of 10 CFR 50 Appendix R Section III.G from providing full area coverage. This exemption was granted in the SE enclosed in the November 6, 1986, letter from the NRC.

Subsequently, the licensee had determined, that due to the great deal of congestion at the ceiling in these elevations, many of the sprinkler heads are partially obstructed and do not strictly comply with the guidance in NFPA-13.

In accordance with the guidance provided in Generic Letter 86-10, the licensee has identified the partial obstruction of these sprinklers as deviations from NFPA-13 and has provided an evaluation for each partially obstructed sprinkler.

The licensee bases their evaluation of the acceptability of these obstructions on:

- NFPA-13 guidance on location of sprinkler heads in relation to obstructions,
- the design basis of the system to protect the charging pumps, component cooling water pumps and their associated cables,
- and good engineering practice since the spacing of the sprinkler heads is such that there is a great deal of overlap in coverage.

Using this basis, 28 of the 50 sprinkler heads were evaluated. All 28 heads were found to provide adequate coverage by the licensee's staff.

The inspectors' review of the licensee's evaluation included a review of the technical bases for the code deviations and a walkdown of selected sprinklers to insure the configuration was within the parameters of the engineering evaluation. Based on this review the inspectors found that although the sprinklers are partially obstructed, adequate protection is provided for the safe shutdown systems/components in the area. Most of the obstructions are minor and in cases where large obstructions exist another adjacent sprinkler is available to protect the area. Therefore, the inspectors found the engineering evaluation to be acceptable.

(4) Engineering Evaluation #6, Evaluation of the Potential for Flooding In the Emergency Switchgear Rooms North Anna Power Station

In accordance with the NRC's Safety Evaluation Report dated February 1979, VEPCO installed hose stations in each unit's Emergency Switchgear Room and a sprinkler system in each unit's Cable Vault/Tunnel. In order to prevent damage to vital electrical equipment in the emergency switchgear room due to flooding the piping for these systems is maintained dry by closing the isolation valve to the systems. However, the isolation valve is located in the Emergency Switchgear Room air conditioning area. Therefore, the potential for a pipe break below the isolation valve to result in flooding of portions of the Emergency Switchgear Room was evaluated. The purpose of the licensee's evaluation was to evaluate this flooding level.

The bases for this evaluation is:

- the criteria outlined SRP Section 3.6.1 and BTP ASB Section 3-1 for postulating piping failure in moderate energy pipe systems and
- the assumption that the duration of the leak will be 30 minutes

Using this bases the licensee evaluation established that in 30 minutes 3480 gallons of water would be released into the Air Conditioning Room.

The configuration of the potentially flooded area is the Air Conditioning Room an elevation 254' separated from the Emergency Switchgear Room one elevation 254' by the Instrument Rack Room which is at a lower elevation 252'. Therefore, a line break in

the Air Conditioning Room would first have to fillup the Instrument Rack Room to reach any vital switchgear. The licensee's evaluation shows that if 3480 gallons of water accumulated in the Instrument Rack Room the water level would be 2.7" in Unit 1 and 3" in Unit 2. These values were obtained by assuming no drainage from floor drains in the air conditioning rooms and instrument rack rooms.

In addition, the licensee's evaluation shows that hose failure during fire fighting activities in the Emergency Switchgear Room would drain to the Instrument Rack Room. The floor is sloped from the Emergency Switchgear Room to the Instrument Rack Room.

Based on the inspectors' review of the licensee's evaluation, a pipe failure would not have adverse impact in the Emergency Switchgear Room. Therefore, this engineering evaluation was found to be acceptable.

(5) Engineering Evaluation #7; Evaluation Of Operator Access to the Charging Pump Cubicles North Anna Power Station

The North Anna plant design includes the capability to crosstie the discharge of each units charging pumps such that Unit 1 pumps could supply Unit 2 or Unit 2 pumps could supply Unit 1. The licensee has elected to use this methodology to satisfy the requirements of 10 CFR 50 Appendix R. Therefore, in the fire safe shutdown analysis, the licensee postulates that all three charging pumps for a single unit will be lost in a fire and charging flow will be provided by the opposite units pumps. The crosstie of the charging pumps requires an operator to enter the 2A or 1C charging pump cubicles from the 259'-6" elevation and manually open the crosstie valve.

This manual action would require the operator to enter the same elevation as the postulated fire within 30 minutes. The purpose of the licensee's evaluation is to provide a justification for this entry.

The licensee justification for operator entry is based upon

- the division of the 259'6" elevation into two separate fire zones based on separation of the Unit 1 and Unit 2 charging pump cables. There is not a physical barrier,
- access is available from opposite zones and emergency lighting are provided,
- operators are familiar with the area,
- breathing apparatus is available,



- combustible loading is low and configuration of combustibles will reduce exposure to the pathways,
- ionization smoke detectors are provided,
- an automatic sprinkler system is provided for protection of the power cables for the charging pumps and component cooling water pump on the 244'-6" and 259'-6" elevations, and
- the station fire brigade will control or extinguish a fire in the area within 30 minutes.

Traditionally, the NRC has not approved the entry into a "fire" area to take manual operations to mitigate the consequences of a fire within 60 minutes of a fire event. This position is based on the number of uncertain variables which can occur during an actual fire situation. In addition, the inspectors questioned whether the engineering evaluation actually constituted an exemption request from the requirements of 10 CFR 50 Appendix R, Section III.L.3 which requires alternate shutdown capability for specific fire areas to be independent of that fire area.

Based upon these concerns the inspectors elected to identify this engineering evaluation as Unresolved Item 88-13-02, Entry Into Fire Area for Manual Operation of Safe Shutdown Equipment, and a request for technical assistance from NRR has been generated to determine the acceptability of the licensee's proposed operator action.

In addition, the inspectors expressed concern to the licensee that the compensatory measures outlined in plant Technical Specifications for action to be taken when detection is inoperable in this area may not be adequate. The inspectors concern is based on the fact that the manual action is required within 30 minutes of a fire event. The purpose of the detection system in this area is to provide early warning of a fire. Should the detection system become inoperable the Technical Specification action statement requires an hourly roving fire watch. The inspectors felt this compensatory measure was inadequate for this area due to the importance of a prompt fire brigade response. Therefore, the inspectors recommended that if detection becomes inoperable in this area a continuous fire watch be established.

The licensee agreed to issue a Standing Order which would require a continuous fire watch in this area if detection becomes inoperable. The Standing Order will remain in effect until NRC determines if the licensee's proposed operator actions are acceptable.

(6) Engineering Evaluation #8; Evaluation of Operator Access To the Motor Driven Auxiliary Feedwater Pump Room North Anna Power Station

A fire in the Unit 1 or Unit 2 Motor Driven Auxiliary Feedwater Pump (MDAFWP) Rooms would result in a loss of both MDAFWPs for each unit. Under this scenario the Turbine Driven Auxiliary Feedwater Pump (TDAFWP) would be used to satisfy the reactor heat removal performance goal via feedwater flow to one steam generator. By this mechanism adequate heat removal can be accomplished for approximately 30 minutes. After 30 minutes the TDAFWP must be realigned to the other steam generator for adequate heat removal. The realignment of the AFW system requires an operator to enter the MDAFWP room, the area of the postulated fire, and manipulate a number of valves. This operator action is required within 30 minutes of the fire event.

The licensee's justification for operator entry is based upon:

- low combustible loading in the rooms and lack of exposed fixed combustible,
- ionization smoke detectors are provided,
- portable fire extinguishers and fire hydrants are available for manual fire fighting,
- the station fire brigade will control or extinguish a fire in the MDAFWP room within 30 minutes, and
- breathing apparatus is available.

Traditionally, the NRC has not approved the entry into a "fire" area to take manual operations to mitigate the consequences of a fire within 60 minutes of a fire event. This position is based on the number of uncertain variables which can occur during an actual fire situation. In addition, the inspectors questioned whether the engineering evaluation actually constituted an exemption request from the requirements of 10 CFR 50 Appendix R Section III.L.3 which requires alternate shutdown capability for specific fire areas to be independent of that fire area.

Based upon these concerns the inspectors elected to identify this engineering evaluation as another example of Unresolved Item 88-13-02.

In addition, the inspectors expressed concern to the licensee that the compensatory measures outline in plant Technical Specifications for action to be taken when detection is inoperable in this area may not be adequate. The inspectors concern is based on the fact that the manual action is required

within 30 minutes of a fire event. The purpose of the detection system in this area is to provide early warning of a fire. Should the detection system become inoperable the Technical Specification action statement requires an hourly raving fire watch. The inspectors felt this compensatory measure was inadequate for this area due to the importance of a prompt fire brigade response. Therefore, the inspectors recommended that if detection becomes inoperable in this area a continuous fire watch be established.

The licensee agreed to issue a Standing Order which would require a continuous fire watch in this area if detection becomes inoperable. The Standing Order will remain in effect until NRC determines if the licensee's proposed operator actions are acceptable.

(7) Engineering Evaluation #9; Evaluation of Smoke Detector Design Criteria - Emergency Switchgear Rooms North Ann. Power Station

The smoke detection systems in the Unit 1 and Unit 2 Emergency Switchgear Rooms are installed to satisfy the requirements for area wide detection in 10 CFR 50 Appendix R Section III.G.3. In reviewing these systems for compliance with the spacing requirements outlined in NFPA-72E, Automatic Fire Detectors, the licensee found that detector locations do not meet the spacing criteria outlined in the NFPA Code.

Generic Letter 86-10 states that licensees should identify deviations from NFPA codes and provide a justification for the deviations. In accordance with this guidance the licensee's engineering evaluation documents the acceptability of the smoke detector installation in the Emergency Switchgear Rooms.

NFPA-72E requires the installation of smoke detectors in all beam pockets formed by beams exceeding 18 inches in depth and greater than eight feet on centers. However, a detector has not been placed in every beam pocket in the Emergency Switchgear Rooms as required by the code. The licensee states that the present detection system installation is equivalent in effectiveness and safety to NFPA-72E based on the following:

- The ceiling space in the room is very congested and therefore it is highly unlikely that smoke from a fire would accumulate in a single beam pocket.
- All of the beam pockets where detectors would be required by NFPA-72E are formed by 21 inch beams.
- Spacing per smoke detector is approximately 250 ft.<sup>2</sup>, far below the 900 ft.<sup>2</sup> per detector allowed for smooth ceilings construction.

- The volume of the beam pockets is relatively small. Thus, even if the smoke accumulated in a beam pocket without a detector the delay would not be substantial.

The inspectors reviewed the technical basis for the deviations and conducted a walkdown of the detection systems. The inspectors found that the majority of the room did have detectors spaced in accordance with NFPA 72E. The exception to the NFPA 72E spacing requirements occurred mainly between Column Lines 7-9 and C-D. In this area there were six beam pockets which are not presently provided with detectors. The inspectors were concerned that a small fire could occur under these beam pockets and go undetected until it had grown to a significant size. The Emergency Switchgear Rooms are fire areas which would require plant shutdown from outside the control room in the event of a significant fire.

The inspectors found by field walkdown, the ceiling space below these beam pockets is highly congested. The smoke from a fire would be greatly dispersed as it travels to the ceiling. Therefore, it is not feasible to assume the smoke would accumulate in a single beam pocket without a detector.

Based on the inspectors' review of the licensee's evaluation and the field walkdown of the detectors placement, the addition of detectors to comply with NFPA-72E would not significantly improve detector response in the Emergency Switchgear Rooms. Therefore, the inspectors found this engineering evaluation to be acceptable.

(8) Engineering Evaluation Number 11, Evaluation of Pipe Tunnel Penetrations

A rated barrier or seal is not provided at the ends of several pipe tunnel penetrations located below grade which provide an access for pipes to be routed between buildings. These pipe tunnels are addressed in an engineering evaluation since GL 86-10 Section C specifically states that the licensee may develop an evaluation for items such as a fire area boundary, as long as the evaluation is performed by a fire protection engineer and retained for a future NRC audit.

The pipe tunnels penetrations addressed in this evaluation are:

- a) Tunnel between Unit 1 Quench Spray Pumphouse and Unit 1 Turbine Building
- b) Tunnel between Unit 2 Quench Spray Pumphouse and Unit 2 Turbine Building

- c) Tunnel between Unit 1 Quench Spray Pumphouse and Unit 1 Auxiliary Feedwater Pumphouse
- d) Tunnel between Unit 2 Quench Spray Pumphouse and Unit 2 Auxiliary Feedwater Pumphouse
- e) Tunnel between Wastes Disposal Building and Fuel Building

The QSPH - Auxiliary Feedwater Pumphouse tunnels and QSPH - Turbine Building tunnels are sealed on all but one end of each tunnel. The penetration seals are 3 hour fire-rated except for the steel plates used at the following locations:

- o Two plates in the Unit 1 QSPH basement
- o One plate in the Unit 1 TDAFW Pump Room
- o One plate in the Unit 2 TDAFW Pump Room

The Fuel Building - Waste Disposal Building tunnel is sealed on one end with a non fire-rated penetration seal.

The steel plates and penetration seal are evaluated below:

The steel plates used to seal the pipe penetrations are made of approximately 3/8 inch thick steel which is bolted to the concrete wall. A high temperature rated caulk is applied around the edges of the steel plates in order to provide an airtight seal. The caulk is rated to stay pliable up to approximately 500°F. The steel plates and caulk arrangement used to seal these pipe tunnel penetrations provides an acceptable seal against the passage of smoke and hot gases from one fire area to another. The steel plate is not fire rated, but this is acceptable due to the following factors:

- The pipe tunnels contain no combustibles so a fire could not travel through the tunnel.
- The combustible loading in the QSPH's, TDAFWP Room, and MDAFWP Room are all low, so, if a fire does occur in one pump room, it is expected to be a small fire.
- If a fire occurs in the Turbine Building, it would not affect the steel plate in the QSPH due to the long length of the tunnel.
- The tunnel openings form a labyrinth configuration between the Unit 1 MDAFWP Room and the Unit 1 TDAFWP Room. There is a sump in each pump room. The openings to the tunnel are raised about 14" high so that the wall forms a dike between the sump areas and the tunnel. The size of this dike, in coordination with the open drain pipe in the sump

area, is such that the postulated flammable liquid spill will be contained in the MDAFWP Room, thereby confining all combustibles to this area. This will prevent direct flame impingement on the steel plate in the adjacent TDAFWP Room and, therefore, the steel plate is adequate to prevent the passage of smoke and hot gases.

- If a fire occurs in the OSPH or TDAFWP Room which exposes the steel plate or caulk to direct flame impingement, smoke and hot gases may be able to pass around the plate, but flame would not be able to pass to the adjoining fire area due to the length of and lack of combustibles in the pipe tunnels.

The Fuel Building-Waste Disposal Building tunnel does not need a 3 hr. fire-rated seal at either end due to the following factors:

- There is no safe shutdown equipment in the Waste Disposal Building, so, even if a fire spread from the Fuel Building, both units could be safely shutdown.
- The pipe tunnel is over 140 ft. long and contains no combustibles, so a fire cannot travel through the tunnel.
- The combustible loadings in both the Fuel Building Basement and the Waste Disposal Building are low, so, if a fire does occur in either area, it is expected to be a small fire.

During this inspection, the inspectors conducted a walkdown and inspected the areas discussed in the above paragraphs. This inspection verified that the fire areas separated by the pipe tunnels have separation equivalent to that required by Appendix R Section III G.2.(a). The technical bases which justify this conclusion are summarized as follows:

The Turbine Building-QSPH Tunnels and QSPH-AFW Pumphouse are sealed on all but one end of each tunnel. The pipe tunnels contain no combustibles. The steel plates which seal the ends of some tunnels have a high temperature rated caulk applied around the edges of the steel in order to provide an airtight seal against the passage of smoke and hot gases. The combustible loading are low in the rooms where steel plates are installed. The tunnel configuration between the Unit 1 MDAFWP and TDAFWP rooms is such that a flammable liquid spill will be contained in the MDAFWP Room ramp. There is no safe shutdown equipment in the Waste Disposal Building. The distance between the Fuel Building and Waste Disposal Building fire areas through the tunnel is approximately 140 feet. Therefore, the inspectors found this engineering evaluation to be acceptable.

## f. NRC Information Notices

- (1) Information Notice No. 88-04, Inadequate Qualification and Documentation of Fire Barrier Penetration Seals, February 5, 1988.

During this inspection the inspectors asked the licensee how they had responded to Information Notice No. 88-04. The licensee indicated a preliminary engineering review was done on March 31, by Engineering and Construction. This review by Engineering and Construction was completed on April 13, 1988, and it was determined that there was a possible station impact. The preliminary review recommended further review to concentrate in four areas: correlation of fire seals, temporary seals (Surry only), training of installers, inspection repair modification.

The station response to the preliminary engineering review was to attempt to form a multidiscipline working group at the station to address recommendations. The task was assigned on June 18, 1988. On July 20, 1988, the Supervisor of Project Engineering concluded that station resources would not be sufficient to address all of the concerns in the notice and recommended to the Superintendent of Technical Services that Engineering Construction (power engineering services) be reinvolved Type 1 turnover of work. On July 21, 1988, the Superintendent of Technical Services agreed to authorize such a Type 1 turnover. The Type 1 turnover to power engineering services to perform the applicable portion of the preliminary engineering recommendations will be issued by July 22, 1988. Based upon the results of this work station procedures may or may not require revision.

## 3. Action On Previous Inspection Findings (92701)(92702)

- a. (Closed) Violation 338,339/87-37-01, Failure to Develop and Implement Surveillance Procedures for Appendix R Fire Barrier Wrap Enclosures, Fire Stops, and Radiant Energy Shields.

The inspectors reviewed the following fire protection maintenance procedures which have been developed for surveillance of the Appendix R separation fire barriers:

<u>Procedure No. (Revision)</u>	<u>Title</u>	<u>Inspection Interval</u>
1-FPMP-0.0 (3/31/88)	Visual Inspection Unit 1	18 months
2-FPMP-9.0 (3/31/88)	(Unit 2) Containment Fire Retardant Wraps, Radiant Energy Shields and Cable Tray Firestops Required By Appendix R	
1-FPMP-9.1 (3/31/88)	Auxiliary Building Fire Retardant Coatings, Cable Tray Fire Stops, and Penetration Seals Required By Appendix R	18 months
2-FPMP-9.2 (3/31/88)	Appendix R Vent Duct Fire Wraps	18 months
1-PT-105.1.4 (4/14/88)	Fire Protection Systems Fire Barriers - Revision: 3	18 months

Based on this review, it appears that these surveillance procedures for Appendix R separation barriers are complete and accomplish the required testing and inspection for the North Anna Fire Protection Program. This item is closed.

- b. (Closed) IFI 338,339/87-37-02, Emergency Lighting Surveillance Procedure Does Not Include Light Beam Aiming Details for Safe Shutdown Equipment Illumination. The procedures for periodic inspection of Appendix R emergency lights, E11-ELT/M-1 and E21-ELT/M-1, did not contain adequate information regarding the aiming of the lights and the safe shutdown equipment to be illuminated.

The licensee has now generated a procedure deviation to these two procedures which includes a revised table which gives detailed instructions on pathways and equipment to be illuminated by each Appendix R emergency light. The procedure deviations will remain in effect until a permanent change is made to the procedures. This item is closed.

- c. (Closed) Violation 338,339/87-37-03, Failure to Implement Fire Brigade Training and Timely Corrective Action for Fire Protection QA Audit Findings. Review of training records indicated fire brigade shifts did not participate in the required number of quarterly drills. This item had also been identified as a finding in the licensee's Triennial Fire Protection Audit. No corrective action was taken to correct this audit finding.



Corrective actions taken included drills conducted for the shifts that had not met the minimum requirements of the North Anna Fire Protection Plan and development of a fire protection maintenance procedure to proceduralize the conduct of fire brigade drills and provide formal transmittal of records to the training department. The North Anna Fire Protection Plan was also revised to specify that drills are to be pre-approved by station management and shall only be cancelled with the station management approval.

During this inspection the inspectors reviewed the fire protection maintenance procedure and verified that members of the A, B, C, D, E, and F shifts had participated in the required number of drills conducted from October 1987 through July 1988. The inspectors also verified that all members assigned to the brigade had received the required amount of training. This item is closed.

#### 4. Exit Interview

The inspection scope and results were summarized on July 22, 1988, with those persons indicated in Paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. In response to inspectors concerns regarding the acceptability of operator access into a "fire" area to manually operate plant equipment within 30 minutes of a fire event in the area (URI 338,339/88-13-02), the licensee committed to initiate a Standing Order to establish a continuous fire watch if detection becomes inoperable in the changing pump cubicles, Auxiliary Building 244' elevation or 259' elevation, or the Unit 1 or Unit 2 Motor Driven Auxiliary Feedwater Pump Rooms. These compensatory measures will ensure that if detection is inoperable prompt notification of the fire brigade can be achieved by the fire watch. This Standing Order will remain in effect until the NRC determines the acceptability of the licenses proposed manual actions. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

<u>Item Number</u>	<u>Description and References</u>
328,339/88-13-01	Violation - Inadequate Evaluation of Appendix R Checklist by VEPCO Contractor
338,339/88-13-02	URI - Entry Into Fire Area for Manual Operation of Safe Shutdown Equipment