Duke Power Company
Catawba Nuclear Station
P.O. Box 256
Clover, S.C. 29710

(803) 831-3000

DUKE POWER

March 9, 1990

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Catawba Nuclear Station
Docket No. 50-413
LER 413/90-08

Gentlemen:

Attached is Licensee Event Report 413/90-08, concerning TECHNICAL SPECIFICATION VIOLATION FOR INOPERABILITY OF A FIRE BARRIER PENETRATION DUE TO DESIGN OVERSIGHT.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Tony B. Owen
Station Manager

keb\LER-NRC.TBO

xc: Mr. S. D. Ebneter
Regional Administrator, Region II
U. S. Nuclear Regulator Commission
101 Marietta Street, NW, Suite 2900
Atlanta, GA 30323

M & M Nuclear Consultants
1221 Avenues of the Americas
New York, NY 10020

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, GA 30339

American Nuclear Insurers
c/o Dottie Sherman, ANI Library
The Exchange, Suite 245
270 Farmington Avenue
Farmington, CT 06032

Mr. K. Jabbour
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Mr. W. T. Orders
NRC Resident Inspector
Catawba Nuclear Station

IE22
1/1

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	1 OF 0 9

TITLE (4) Technical Specification Violation For Inoperability Of A Fire Barrier Penetration Due To Design Oversight

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
									N/A	0 5 0 0 0
0 2	0 3	9 0	9 0	0 0 8	0 0	0 3	0 9	9 0		0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)							
POWER LEVEL (10)	0 0 0		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
			20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)
			20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER	
	AREA CODE	
R.M. Glover, Compliance Manager	8 0 3	8 3 1 - 3 2 3 7

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On February 3, 1990, at 1130 hours, Mechanical Maintenance firestop technicians noticed that insulation had been removed from the Main Steam to Auxiliary Equipment (SA) piping to the Auxiliary Feedwater Pump Turbine (CAPT). A 3/4 inch annular gap between the SA pipe and the calcium silicate insulation installed through firestop C-AX-217-F-26 was also noted. The firestop technicians recognized that the firestop was rendered inoperable and promptly installed cerafiber bulk material in the opening to return the fire barrier to operable status per Work Request 4859 SWR. The firestop was rendered inoperable when insulation removal began on January 31, 1990, to support replacement of the Electrical Heat Tracing on the SA pipe. Unit 1 was in Mode 5, Cold Shutdown, from the time of occurrence of the degraded firestop until the firestop was discovered to be inoperable. Previous repair and alteration of the firestop allowed the penetration to be rendered inoperable by removal of insulation adjacent to the firestop penetration. This incident is attributed to design oversight due to unanticipated interaction of systems and components. The Firestop Installation Specification and/or Maintenance procedure will be revised to prevent recurrence.

BACKGROUND

Technical Specification 3.7.11 states that all fire barrier penetrations [EIIS:PEN] separating safety related areas shall be operable at all times. With any of the required fire barrier penetration or sealing devices inoperable, within one hour either establish a continuous fire watch on at least one side of the affected penetration, or verify the operability of fire detectors [EIIS:XT] on at least one side of the inoperable penetration and establish an hourly fire watch patrol.

The Fire Detection [EIIS:IC] (EFA) System monitors unattended areas of the plant for smoke or fire, and alerts personnel of the existence and location of a fire. The EFA System is equipped with a Central Fire Detection Panel that alerts Operators, via an alarm [EIIS:ANN], for specific zones within the plant.

Specification number CNS-1206.03-01-0002, Installation Specification for Mechanical Piping Penetration Firestops, specifies installation methods and approved materials for the construction of fire barriers for mechanical penetrations. Typically, piping [EIIS:PSP], duct, conduit, etc. that penetrates walls, floors and ceilings of fire barriers is smaller in diameter than the penetration opening. The void between the penetrating pipe conduit or duct and the penetration opening is filled with an approved silicone foam sealant material (see Figure 1). Temporary dam materials are utilized to form the firestop during application of the silicone foam and removed following curing. The manufacturer of the Dow Corning RTV silicone foam used at Catawba Nuclear Station states that degradation of the foam may occur if it is exposed to temperatures greater than 400 degrees F for long term (greater than 10 days). The manufacturer also states that surfaces contacting the foam must be maintained between 50 and 100 degrees F for at least 12 hours following disbursement of the RTV silicone foam. These temperature parameters were added to Specification CNS-1206-03-01-0002 following the issuance of Problem Investigation Report (PIR) 0-C88-0263 per exempt variation notice CE-2364.

Firestop C-AX-217-F-26 is located in the floor/ceiling fire boundary between the Unit 1 Auxiliary Feedwater (CA) [EIIS:BA] Pump [EIIS:P] Room and the Auxiliary Feedwater Pump Turbine [EIIS:TRB] (CAPT) #1 Pit. Firestop C-AX-200-W-33 is located in the fire barrier wall between the Unit 1 Mechanical Penetration Room and the Unit 1 CA Pump Room. These firestops allow penetration of the Main Steam to Auxiliary Equipment [EIIS:SA] (SA) System piping to the CAPT #1. The CAPT is a part of the Emergency Core Cooling System to supply sufficient feedwater to the Steam Generators [EIIS:HX] to maintain decay heat removal to place the plant in shutdown conditions following loss of normal feedwater and essential power to the Motor [EIIS:MO] Driven CA pumps. The SA lines to the CAPT are insulated and equipped with Electrical Heat Trace [EIIS:FD] (EHT) elements arranged 90 degrees apart on the outside of the SA pipe under the insulation. The purpose of the EHT is to prevent condensate accumulation in the

normally depressurized SA line that might cause damage or trip of the CAPT on an automatic start. The EHT controllers are set at 550 degrees F to maintain the pipe at the normal steam supply temperature to prevent thermal stresses. The SA EHT is required to maintain SA line temperature above 220 degrees F to consider the CAPT operable.

On August 24, 1988, with Unit 1 in Mode 4, Hot Shutdown, smoke was discovered in the CA Pump Room. The smoke was originating from the Dow Corning 3-6548 silicone foam firestop material in fire barrier penetration number C-AX-217-F-26. Mechanical Maintenance firestop personnel were contacted to investigate and repair the firestop per the penetration and firestop standing work request 4859 SWR. The Maintenance personnel found that the firestop foam would flame up when the firestop dam board was removed. The dam board was replaced and the fire brigade was dispatched to extinguish the burning foam so that removal of the firestop could proceed. After the fire brigade extinguished the burning foam, a fire watch was established and the firestop material was removed. The problem was determined to be caused by excessive EHT temperature at the penetration during the curing of the firestop material that was replaced nine days earlier on August 15, 1989 per 4859 SWR. After consulting with Design Engineering, it was decided to insulate the SA line through the penetration with calcium silicate insulation material which had previously stopped at the firestop boundaries. This was accomplished using an exempt variation notice modification to allow insulation to penetrate the firestop. The firestop specification was revised to allow insulation to pass through the firestop on piping with temperatures greater than 400 degrees F. (Firestop C-AX-217-F-26 was the only firestop modified in this manner prior to February 1990.) By August 25, the SA line had been insulated through the penetration and RTV silicone foam was applied in the remainder of the penetration (around the insulation) per Work Request 4859 SWR. The fire watch was secured following the curing of the foam in the penetration.

On August 24, 1988, Problem Investigation Report (PIR) 0-C88-0263 was originated by Maintenance Engineering Services (MES) Production Specialist A, responsible for fire barrier penetrations, to investigate the problem with firestop C-AX-217-F-26 burning. The corresponding firestop on Unit 2 was inspected and no problem was found. A follow-up investigation by DE was documented on the PIR resolution on September 20, 1988, following discussions with the silicone RTV foam manufacturer. DE indicated that Specification CNS-1206.03-01-0002 would be revised to require that surfaces contacting the foam be within 50-100 degrees F during and at least 12 hours following the disbursement of the foam. The foam manufacturer also stated that degradation of the foam could occur if the foam was exposed to temperatures greater than 400 degrees F for an extended period (greater than 10 days). The PIR resolution recommended the initiation of a design study to identify all foamed penetrations that are affected by this temperature limit and propose a solution. Based on the information the MES Production Specialist A perceived this problem to be restricted to excessive

heat present during the curing of the penetration on August 15, 1988. The 400 degrees F temperature limit was not considered to be a problem since the SA piping isometric drawings indicated the piping at this penetration was electrically heat traced to maintain the pipe surface temperature at 220 degrees F. The MES Production Specialist A was not aware that the EHT drawings specify a 550 degrees F EHT controller setpoint on the SA line at this penetration. Also, since previous problems of this nature had not been experienced with the SA line firestops, the problem was attributed to the temperature of the SA piping during cure time. PIR-0-C88-0263 was not evaluated to be reportable to the NRC since the action requirements of Technical Specification 3.7.11 was complied with.

EVENT DESCRIPTION

On January 31, 1990, Unit 1 was in Mode 5, Cold Shutdown, for the End of Cycle 4 (EOC4) refueling outage. At 0736 hours, vendor insulation craft personnel entered the CA Pump Room to begin insulation removal from the SA lines per Work Request 5088 SWR. The insulation removal was required in order to complete Work Request 3276 PLN to replace EHT elements on the SA lines to the CAPT. Fire barrier penetration C-AX-217-F-26 became technically inoperable when the insulation removal began due to an approximately 3/4 inch annular opening between the SA pipe and the calcium silicate insulation at the fire barrier penetration. This opening was made necessary due to the diameter of the four heat trace elements that are spaced 90 degrees apart around the circumference of the pipe (see Figure 2). After contacting MES Production Specialist A, the vendor insulation craft supervisor was instructed to leave the insulation in penetration C-AX-217-F-26 and was told the firestop technicians would remove the insulation and foam in the firestop later. The insulation crew followed these instructions, however they did not recognize that the fire barrier was rendered inoperable due to the removal of the insulation up to the fire barrier penetration. The insulation removal was completed on February 2, 1990.

On February 3, 1990, at 1130 hours, with Unit 1 in Mode 5, firestop technicians working in the CA Pump Room noticed that insulation had been removed from the SA piping and that there was a 3/4 inch annular gap between the SA pipe and the calcium silicate insulation installed in the firestop. The firestop technicians recognized the fire barrier penetration as inoperable and promptly installed cerafiber bulk in the opening per Work Request 4859 SWR to return the fire barrier to operable status. The fire barrier was subsequently removed and reinstalled on February 14, 1990, to facilitate the replacement of the EHT element. During the reinstallation, cerafiber bulk was installed between the insulation and the SA pipe to prevent recurrence of the problem due to insulation removal. This problem was documented on PIR 1-C90-0041 on February 9, 1990, and was evaluated to be reportable to the NRC since a fire watch was not established when the insulation was removed.

On February 23, 1990, Unit 1 was in Mode 0, Defueled, when firestop technicians discovered damaged firestop foam at penetration C-AX-200-W-33 during removal of the firestop for EHT replacement. A fire watch was established and a Technical Specification Operability Notification Sheet was issued to Operations for the inoperable fire barrier penetration. The damaged firestop foam had become hard and brittle due to the high EHT temperature. The fire barrier penetration was subsequently repaired by installing 4 inches of calcium silicate insulation and cerafiber bulk in the penetration between the EHT element and the foam. This is not a reportable event as corrective action was taken upon discovery of the problem. However, to incorporate the necessary corrective actions for both events, it was included in this report.

CONCLUSION

This incident is attributed to unanticipated interaction of system or component to design oversight in that the Installation Specification for Mechanical Piping Penetration firestops did not include allowable, sustained temperature limits for the materials used in Mechanical Firestop penetrations nor temperature limits for foam installation and curing. These temperature limits were added to the specification on September 17, 1989, per Exempt Variation Notice CE-2364 following the issuance of PIR O-C88-0263. It should be noted that the firestop material is capable of withstanding much greater short term temperature which are induced during testing for the required 3 hour fire rating. The remaining SA line fire barrier penetrations are being reinstalled with insulation and cerafiber bulk extending through the penetration. A design study is being initiated to determine if any other mechanical firestop penetrations are exceeding the 400 degrees F long term temperature limitation.

In addition to the original Design oversight involving the long term temperature limits of the RTV Silicone foam material, Design oversight was involved in the subsequent alteration on August 24, 1988, of the fire barrier to correct the temperature problem at firestop C-AX-217-F-26. The annular space between the calcium silicate insulation and the SA line, which was caused by the interference of the EHT elements, was not recognized by DE or MES Production Specialist A as a potential problem if the insulation was removed adjacent to the firestop. This discrepancy was also not noted by the firestop technicians since after vendor insulation personnel insulated the line through the penetration the discrepancy was not visible when the firestop was sealed with foam. The Firestop Installation Specification and/or the Firestop Maintenance Procedure will be revised to specifically address the installation of insulated pipes through firestops. Also, other penetrations had not been identified as having the potential for high, long term temperature leading to degradation of sealant foam.

The insulation crew responded properly by consulting MES about who would be responsible for insulation removal in the penetration because the discrepancy was not identified by the insulators during insulation removal up to the fire boundary, vendor insulation personnel have received instruction on identification and reporting of fire barrier discrepancies.

A review of the Operating Experience Program Database during the preceeding 24 months shows that four previous Technical Specification violations have occurred due to missed fire watches (see LER 413/88-001, 413/88-021, 413/89-008, 413/89-024). These LERs, with the exception of LER 413/89-024, were attributed to inappropriate action and management deficiencies. LER 413/89-024 was attributed to design deficiency due to the design selection of a fire door latch bolt mechanism that was not capable of withstanding the frequent use encountered in the door application. This design deficiency is not related to this incident, therefore this design deficiency is not considered to be a recurring problem.

McGuire and Oconee Nuclear Stations have been advised of this event.

CORRECTIVE ACTION

SUBSEQUENT

1) The discrepancy in firestop C-AX-217-F-26 was repaired using cerafiber bulk firestop material per Work Request 4859 SWR.

2) After the discovery of the discrepancy in firestop C-AX-200-W-33, a fire watch was established and the EHT in the penetration was insulated and the firestop was reinstalled.

3) The insulation supervisor discussed this incident with the insulation crew to report indication of fire barrier discrepancies and re-emphasized the need to contact MES when working around fire barrier penetrations.

PLANNED

1) All four remaining heat traced SA penetrations on Units 1 and 2 will be insulated through the penetrations to prevent sustained temperature damage.

2) Steam Generator Blowdown [EIIS:WI] and Nuclear Sampling [EIIS:KN] System penetrations in the Mechanical Penetration Room will be evaluated to determine if firestop temperature limitations are affecting these penetrations.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	9 0	— 0 0 8	— 0 0	0 7 OF 0 9

TEXT (If more space is required, use additional NRC Form 366A's) (17)

3) A design study will be initiated to determine if other firestop penetrations are affected by the 400 degrees F sustained temperature limit due to system design temperature or EHT temperature and propose resolution to any problem found.

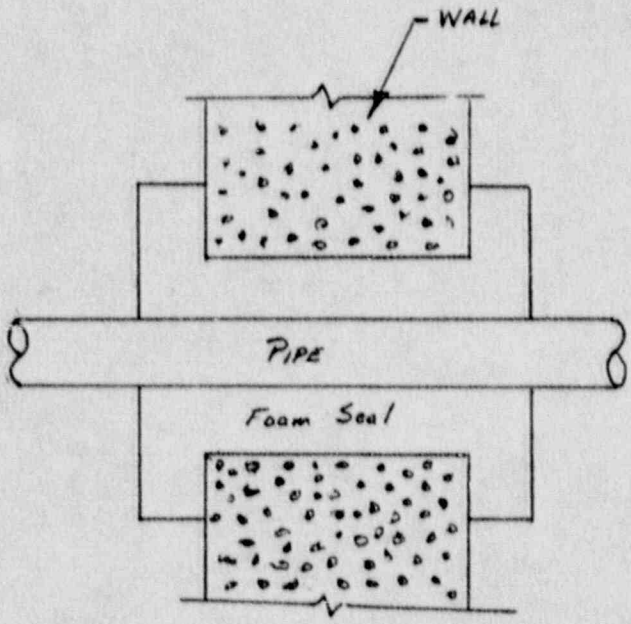
4) Revision of Specification CNS-1206.03-01-0002, Installation Specification for Mechanical Piping Penetration Firestops, to provide specific information regarding the installation of insulated high temperature firestops particularly with regard to filling of voids between the insulation and the pipe will be evaluated.

5) Revision of MP/0/A/7650/09, Installation and Maintenance of Fire Boundaries, to provide more specific instruction with regard to installation of insulated high temperature firestops will be evaluated.

SAFETY ANALYSIS

With respect to the fire impairment caused by insulation removal from the SA line which affected firestop C-AX-217-F-26, the firestop is conservatively assumed to be inoperable from the beginning of insulation removal on January 31, 1990, until impairment discovery and repair on February 3, 1990. During this time, Unit 1 was in Mode 5 and Mode 6 where operability of the CA components is not required. Also the fire detection and monitoring were operational during this period in the affected rooms as well as the carbon dioxide fire extinguishing system. For these reasons the likelihood of fire spread through this firestop discrepancy was small. With respect to firestop C-AX-200-W-33 a fire watch was established upon discovery of the degraded firestop, therefore the Technical Specification action was complied with. Therefore, the health and safety of the public were unaffected by this incident.

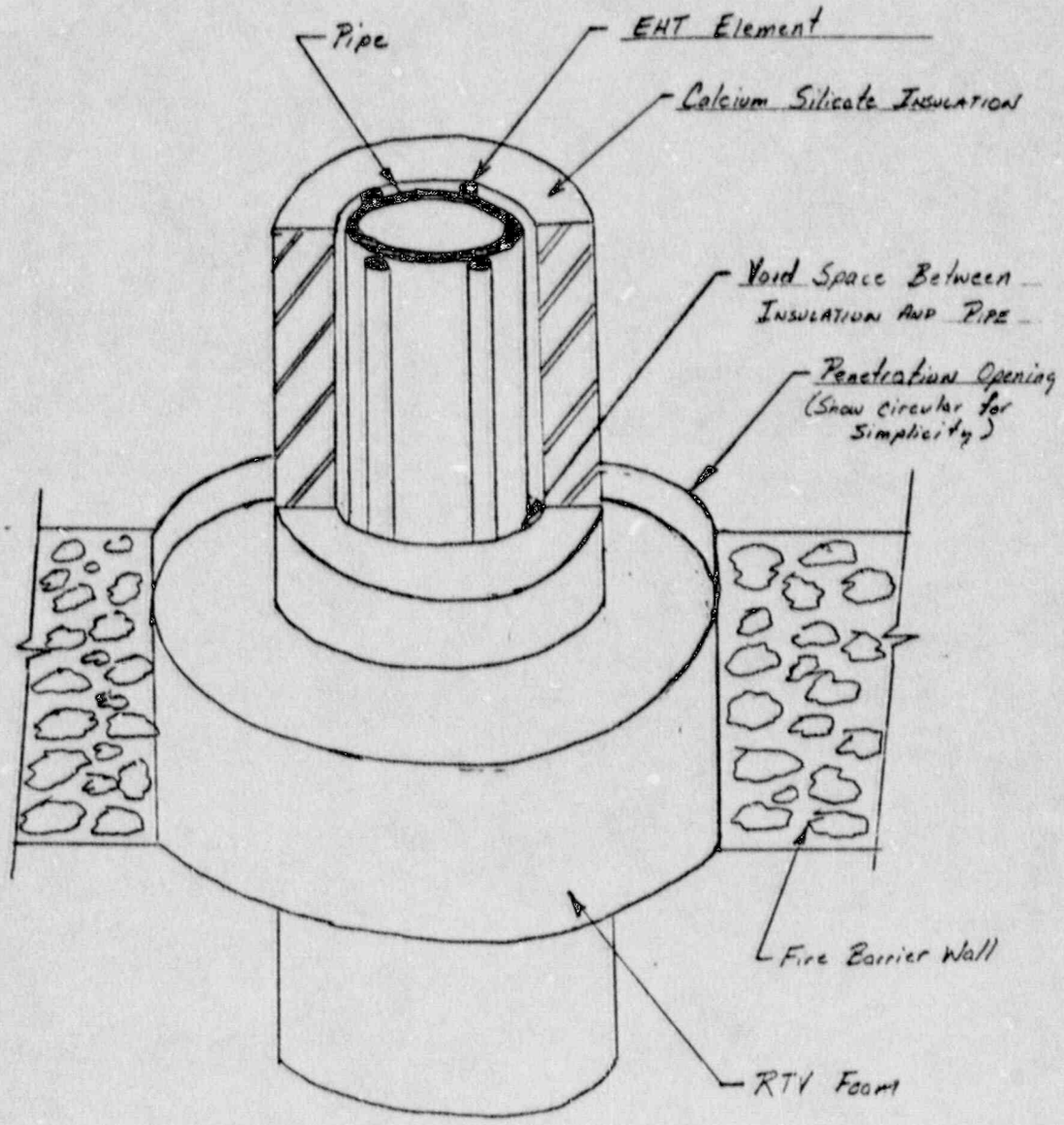
FIGURE 1



FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	9 0	— 0 0 8	— 0 0	0 9 OF 0 9

TEXT (If more space is required, use additional NRC Form 366A's) (17)

FIGURE 2



CUTAWAY REPRESETATION OF SA Line With Insulation Passing Through Firestop