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United States Nuclear Regulatory Commission
Document Control Desk
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SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: LER-91-024-01:

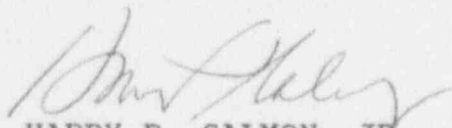
Unsatisfactory Penetration Seals Found During
Inspection

Dear Sir:

This supplementary report is submitted in accordance with 10CFR50.73(a)(2)(i)(B). This supplement provides the root cause for the large number of unsatisfactory fire penetration seals found during a routine inspection of penetration seals begun in November, 1991. Also provided are assessments of safety significance based upon the nature of deficiency identified. This is a final report which also describes the corrective actions implemented to prevent recurrence in the future.

Questions concerning this report may be addressed to Mr. Donald Simpson at (315) 349-6361.

Very truly yours,


HARRY P. SALMON, JR.

HPS:DFS:tlc

Enclosure

cc: USNRC, Region I
USNRC Resident Inspector
INPO Records Center

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NRC FORM 366 (5-92)		U.S. NUCLEAR REGULATORY COMMISSION				APPROVED BY ONE NO. 3150-0104 EXPIRES 5/31/95					
LICENSEE EVENT REPORT (LER)											
(See reverse for required number of digits/characters for each block)											
FACILITY NAME (1) James A. FitzPatrick Nuclear Power Plant						DOCKET NUMBER (2) 05000333		PAGE (3) 01 OF 06			
TITLE (4) Unsatisfactory Penetration Seals Found During Inspection											
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 NAME	DOCKET NUMBER	
11	16	91	91	024	01	03	15	94	FACILITY NAME	DOCKET NUMBER 05000	
OPERATING MODE (9)		N		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100		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	
				20.405(a)(1)(iii)		X 50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)	
				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 Mr. Donald Simpson, Senior Licensing Engineer						TELEPHONE NUMBER (Include Area Code) (315) 349-6361					
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)											
YES (If yes, complete EXPECTED SUBMISSION DATE).					X NO		EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)											
<p>On November 16, 1991, at approximately 1730 hours while the plant was operating at 100 percent power, seven electrical penetration fire seals were found in an unsatisfactory condition during the performance of a penetration seal baseline inspection. As the inspection continued, it became evident that there were programmatic problems with the penetration seal program. Deviations from design were found in approximately 39 percent of the 7200 seals inspected. Minor repairs, cosmetic in nature, were initiated in an additional 15 percent of the seals inspected. All penetration seals were restored to design condition through rework or evaluation as an acceptable configuration. This final report describes the scope and nature of inspection findings. The root cause of the poor condition of the FitzPatrick fire penetration seal program was inadequate training and qualification of staff. Poor administrative controls was a contributing factor. Improved training has been implemented and administrative controls have been strengthened to ensure adequate management oversight of the program.</p> <p>LER 89-007-01 describes similar weaknesses and deficiencies with the penetration fire seal program.</p>											

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TEXT CONTINUATION

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02 OF 06				

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

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Update Report - Previous report date 12/13/91

Event Description

On November 16, 1991, at approximately 1730 hours, seven fire penetration seals were determined to be unsatisfactory during conduct of an engineering baseline inspection which was being conducted to document the presence of three-hour rated design configurations in all fire barriers. To support the baseline inspection, a fire penetration baseline inspection procedure that provided the configuration criteria necessary to ensure a three-hour rated penetration design had been issued. An interim report was written to document unsatisfactory results identified early on in the inspection process. The interim report also described compensatory measures to be taken throughout the remainder of the baseline inspection as defective seals were identified and until those seals were restored to fully operable status. This supplement describes the scope and nature of seal deficiencies and the repairs performed to assure penetration seal operability. The root causes and an assessment of the safety significance of non-functional penetration seals are contained in this supplement.

The inspection involved collecting baseline data on approximately 7200 mechanical or electrical penetration seals. The inspection was also designed to meet the surveillance criteria of Technical Specification 4.12.F. The baseline inspection was conducted between November, 1991, and May, 1992. As defective or unsatisfactory penetration seals were identified, compensatory measures were implemented immediately and corrective action for repair initiated. Corrective actions necessary to restore all penetration seals to a three-hour rated configuration were completed in December, 1992.

Through conduct of the baseline inspection, the approximate 7200 fire penetration seals were identified, inspected and evaluated for conformance to the three-hour fire barrier criteria. All penetration seal configuration data was loaded into a software data base and the drawings used in the conduct of fire barrier surveillance testing were verified and updated. The as-found condition of the 7200 penetration seals were characterized as follows:

- Satisfactory as installed - 46 percent
- Minor cosmetic repairs not affecting operability - 15 percent
- Significant deficiencies affecting seal operability - 39 percent

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Cosmetic repairs performed as a result of the baseline inspection included one or more of the following:

- Minor silicone elastomer or silicone foam seal repair.
- Installation of internal conduit seals.
- Minor grout repair.
- Removal and replacement of caps to inspect spare penetrations.
- Removal of urethane foam to verify seal depth.
- Removal and replacement of pipe insulation to allow for seal inspection.
- Retagging of penetrations incorrectly labeled in the field.

The baseline inspection resulted in 39 percent of the 7200 penetration seals being declared inoperable. The nature of seal failure was characterized and then grouped as follows:

- Inadequate workmanship or procedures including:
 - a. Insufficient or inadequate seal depth.
 - b. Inadequate installation.
 - c. Unqualified sealant.
 - d. Holes in grout.
 - e. No seal.
- Inadequate design for penetrations sealed with Urethane foam.
- Normal aging or wear including:
 - a. Voids or holes.
 - b. Edge curl or separation.
 - c. Other issues affecting seal operability.

All penetration seal repairs were completed in December, 1992. The surveillance test procedure and the penetration installation procedures accurately reflects the locations and requirements for three-hour penetration seals under various configurations.

Cause

The root cause of the penetration seal program weaknesses and significant number of seal deficiencies at FitzPatrick was due to inadequate training and qualification of staff. (Cause Code E). Contributing causes were installation and surveillance test procedure weaknesses (Cause Code D), inadequate organizational interfaces (Cause Code E) and an inadequate level of supervisory and management oversight (Cause Code E).

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Analysis

During conduct of the inspection, penetration seals with significant deviation from their design or tested configuration were conservatively judged to adversely impact the functional integrity of the seal and were declared inoperable. In each case a fire watch was posted as compensatory measure in accordance with Technical Specification 3.12.F. Following repair and satisfactory post work testing, the seals were declared operable.

The type of work or repair necessary on any particular seal was characterized as:

1. Repairs performed to enhance the aesthetics of the seal. The seal is considered functional.
2. Repairs required to restore the seal to a functional status consistent with a tested configuration.

This analysis will focus on those penetration seals conservatively determined to be inoperable until restored to a function status. Approximately 2800 of the 7200 penetration seals were in this category.

Approximately 1500 deficient penetration seals were a result of insufficient or inadequate seal material. This includes those seals which were installed with a material depth less than that required. The decrease in material depth resulted in a decrease in fire rating of the seal, but not a complete loss of fire resistance.

Approximately 100 deficient penetration seals were a result of improper installation, resulting in voids, incorrect material density or similar defects. These defects could have resulted in a decrease in fire rating of the seal, but not a complete loss of fire resistance.

Approximately 100 deficient penetration seals were a result of urethane foam seals having been improperly upgraded to an acceptable fire seal. The improper upgrade was performed by removing a specified depth of urethane foam and installing a specified depth of silicone foam or silicone elastomer. The depth of silicone sealant specified was less than required. This condition resulted in a decrease in fire rating of the seal, but not a complete loss of fire resistance.

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Approximately 600 deficient penetration seals were a result of seals where the installed configuration deviated from a tested configuration. These deficiencies included those which had penetrating items of combustible materials such as fiberglass or PVC piping, also substantial metallic penetrants such that there would be significant heat transfer throughout the seal and seal material that were consistent with tested configurations. Lack of design criteria contributed to the presence of these deficiencies. Depending upon the nature of the deficiency, a configuration defect could have significantly affected the fire rating of the seal.

Approximately 200 fire penetrations were identified which had no seal installed. These were predominately penetrations of barriers established to conform to the guidance of BTP 9.5-1, Appendix A, where divisional separation and Appendix R safe shutdown had been analyzed independent of these barriers. An open penetration in an otherwise three hour rated fire barrier could have significantly affected the passive fire protection mitigation strategy.

Approximately 300 deficient penetration seals were a result of either voids or holes in the seal surface or separation of the seal material. Although conservatively determined to be non-functional, minor voids or holes in the seal surface would have a negligible effect on the capability of the seal to perform its intended function. Separation of seal material would likewise have a negligible effect on the seal capability because both silicone foam and silicone elastomer tend to expand and char during an exposure fire thereby providing an adequate fire seal.

The deficiencies identified through the baseline inspection could have had an adverse impact on the functional integrity of the seal and consequently the fire barrier in which they were installed. Penetrations with no seal installed would have had the most significant impact on the functional integrity of the barrier. Given a postulated fire in the facility, those barriers which are relied upon for divisional separation may have been compromised. It is expected that other fire protection features of the plant, such as installed detection and suppression systems, would have mitigated the significance of the compromise. In addition, a majority of the penetration seals found deficient would have provided some degree of mitigation of barrier compromise based upon the nature of deficiency. The baseline inspection findings were safety significant. The large number of deviations were indicative of the breakdown of a program which is essential to ensuring the ability to conduct a safe shutdown.

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Corrective Actions

1. Penetration fire seal qualification criteria was defined and incorporated into plant procedures prior to conducting the engineering baseline inspection.
2. Fire watches were posted for penetration fire seals that were determined to be inoperable until repaired and satisfactorily post work tested.
3. All penetration fire seal deficiencies were corrected and seals declared operable by December, 1992.
4. The fire penetration surveillance test procedure and the penetration installation procedures were revised to identify the location of all seals, the correct seal configuration, and the test acceptance criteria based upon results of the baseline inspection and engineering evaluations. Fire Protection staff developed and is maintaining a computerized record of inspection and maintenance history for the penetration seal program.
5. A penetration breach permit Administrative Procedure was developed to ensure control of fire barrier penetrations during the conduct of maintenance and plant modification work. This procedure was implemented in August, 1993.
6. Training was completed for penetration seal installers, inspectors and personnel requiring knowledge of the breach permit system.