

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

April 5, 1994

**NRC INFORMATION NOTICE 94-28: POTENTIAL PROBLEMS WITH FIRE-BARRIER
PENETRATION SEALS**

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to potential problems in installed fire-barrier penetration seals that may have gone undetected as a result of inadequate surveillance inspection procedures and inadequate acceptance criteria. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

Nine Mile Point Nuclear Station, Unit 1, (NMP 1)

On April 25, 1988, Niagara Mohawk Power Corporation, the licensee for NMP 1, reported (licensee event report [LER] 88-009) that on March 26, 1988, it had determined that some existing fire barriers were inoperable because the barriers contained potentially nonfunctional penetrations through the fire-barrier. Initially, the licensee verified fire detection on one side of the affected penetrations, established a fire-watch patrol, and walked down additional potentially inoperable fire barriers. When these walkdowns revealed additional potentially nonfunctional fire-barrier penetrations, the licensee took additional corrective actions that included performing a 100-percent visual reinspection of the penetration seals, performing an engineering evaluation of each penetration that did not meet accepted design configurations, and upgrading its surveillance inspection procedure. Supplements 1 and 2 to LER 88-009 (June 8 and August 16, 1990, respectively) attributed the root cause of the event to personnel error due to a lack of understanding of the fire-barrier commitments; a contributing cause was a lack of required documentation and inadequate surveillance procedures. Additional documentation of this event can be found in NRC Region I Inspection Reports 50-220/88-15 and 50-220/89-33 (June 2, 1988, and March 8, 1990, respectively).

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James A. FitzPatrick Nuclear Power Plant (FitzPatrick)

During the performance of fire-barrier penetration surveillance inspections by the licensee at FitzPatrick between May and November 1990, inspectors documented numerous nonconforming conditions. One predominant condition was the lack of adequate damming material. In August 1990, the licensee Quality Assurance group forwarded an adverse quality condition report describing these nonconforming conditions to the Site Engineering group for evaluation. Site Engineering determined that the barriers were acceptable pending further evaluation by the Corporate Engineering group. No compensatory fire watches were established at that time. In December 1990, after additional condition reports were submitted to Site Engineering documenting these nonconforming conditions, an operability determination was performed and 2-hour fire patrols were established. In December 1990, the NRC reviewed the licensee activities (Region I Inspection Report 50-333/90-09, March 1, 1991) and concluded that licensee control of the fire-barrier penetration seals was inadequate because: (1) the licensee had not documented determinations of the ability of the nonconforming penetrations to perform as fire barriers for 3 hours; (2) there was no documented justification for establishing 2-hour fire patrols when the Technical Specifications required continuous compensatory fire watches; and (3) the inspection criteria used by the licensee were inadequate because the criteria did not provide the information necessary to allow inspectors to determine that the seals were not in conformance with the as-built design.

In October 1991 a NRC diagnostic evaluation team noted problems regarding the implementation of the fire-protection program and Appendix R regulations at FitzPatrick. As a result, a special NRC fire-protection review was conducted at FitzPatrick in March 1992 (Region I Inspection Report 50-333/92-80, April 8, 1992). The special NRC fire-protection review team conducted a walkdown of fire barriers and reviewed the corrective actions initiated by the licensee as a result of the concerns identified in Region I Inspection Report 50-333/90-09 and the findings in the licensee July 1991 triennial fire-protection audit. The team noted that some of the existing penetration seals in fire-barrier walls were made of a combustible urethane foam and fiberglass. In addition, several silicone foam seals were degraded or were not well maintained. The licensee initiated a corrective action program that included: (1) reverifying the location of the 10 CFR Part 50, Appendix R, required fire barriers in the plant; (2) performing a baseline inspection of all fire-barrier penetration seals associated with Appendix R and the fire-protection license condition in the plant license; and (3) evaluating the deficiencies, making operability determinations, and completing repairs as required.

Vermont Yankee Nuclear Power Station (Vermont Yankee)

On January 15, 1993, Vermont Yankee Nuclear Power Corporation, the licensee for Vermont Yankee, reported (LER 93-001) that on December 17, 1992, an insulated pipe-penetration seal was identified as potentially not in

compliance with design requirements. The seal was only partially filled with the expected fire-barrier material because it was partially filled with insulation. A second similar insulated pipe penetration seal was identified on December 22, 1992. The following day the licensee declared all similar insulated pipe penetrations inoperable and compensatory measures were instituted. The licensee stated that these conditions had probably existed since the fire-barrier penetration seals were upgraded by a 1979/1980 fire-barrier modification. Supplement 1 to LER 93-001 (March 5, 1993) indicated that certain noninsulated penetrations and the boot-seal design for lines with large displacements were also of concern. The licensee assigned the following root causes: (1) inadequate documentation of assumptions during the 1979 effort to scope the penetration sealing effort, (2) inadequate procedures, (3) inattention to detail, (4) failure to follow procedures, and (5) an inadequate surveillance procedure. Additional documentation of this event can be found in NRC Region I Inspection Reports 50-271/92-24 and 50-271/93-05 (February 1 and April 1, 1993, respectively).

Discussion

This notice alerts addressees to the possibility that some installed fire-barrier penetration seals may contain nonconforming conditions that have not been identified because of inadequate acceptance criteria and inadequate surveillance inspection procedures. Additionally, nonconforming conditions may go undetected if the surface of the seal is covered by thermal insulation or damming material.

NRC requirements and guidelines for fire-barrier penetration seals are contained in various documents, including 10 CFR Part 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979;" Branch Technical Position APCS 9.5-1, Appendix A, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976;" and NUREG-0800, "Standard Review Plan." The extent to which these requirements or guidelines are applicable to a specific nuclear power plant depends on plant age, commitments established by the licensee in developing the fire protection plan, the staff safety evaluation reports and supplements, and the license conditions pertaining to fire protection.

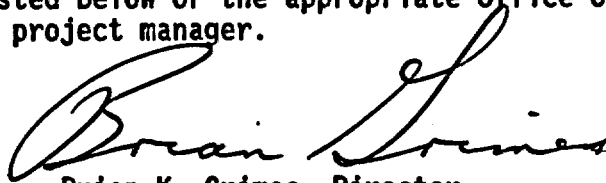
The goal of these requirements and guidelines is to ensure that fire-barrier penetration seals will remain in place and retain their integrity when exposed to a fire. By so doing, there is reasonable assurance that the effects of a fire will be limited to discrete fire areas and that one division of safe-shutdown-related systems will remain free of fire damage.

Related Generic Communications

The NRC has issued other generic communications that have discussed requirements, guidance, and potential problems with fire-barrier penetration seals. For example:

- (1) On April 24, 1986, the NRC issued Generic Letter 86-10, "Implementation of Fire Protection Requirements," to provide information concerning the interpretation and implementation of NRC fire-protection requirements.
- (2) On February 5, 1988, the NRC issued Information Notice (IN) 88-04, "Inadequate Qualification and Documentation of Fire Barrier Penetration Seals," to alert addressees that some installed fire-barrier penetration seal designs may not be adequately qualified for the design rating of the penetrated fire barrier. This IN discussed an NRC staff review which identified some instances where installed fire-barrier penetration seal configurations were not qualified by adequate testing or were not supported by adequate qualification documentation.
- (3) On August 4, 1988, the NRC issued IN 88-56, "Potential Problems With Silicone Foam Fire Barrier Penetration Seals," to alert addressees to potential problems in their installed fire-barrier penetration seals that could result in the reduction of fire-resistive capabilities for protection of safety-related redundant equipment and electrical power and control circuits. The IN discussed a vendor report (10 CFR Part 21, "Reporting of Defects and Noncompliance") which identified the potential for nonconforming conditions, such as splits, gaps, voids, and lack of fill in the sealing material not being detected during routine inspections because the surface of the seal material is typically covered by damming material.
- (4) On August 9, 1988, the NRC issued IN 88-04, Supplement 1, "Inadequate Qualification and Documentation of Fire Barrier Penetration Seals," to alert addressees to problems caused by potential misapplication of silicone foam material used in penetration openings at nuclear power plants.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: Fred L. Bower, III, RI
(610) 337-5328

Jeff Holmes, NRR
(301) 504-2280

Attachment:
List of Recently Issued NRC Information Notices

Computer Presentations See Jacket

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-27	Facility Operating Concerns Resulting from Local Area Flooding	03/31/94	All holders of OLs or CPs for nuclear power reactors.
94-26	Personnel Hazards and Other Problems from Smoldering Fire-Retardant Material in the Drywell of a Boiling-Water Reactor	03/28/94	All holders of OLs or CPs for nuclear power reactors.
93-17, Rev. 1	Safety Systems Response to Loss of Coolant and Loss of Offsite Power	03/25/94	All holders of OLs or CPs for nuclear power.
94-25	Failure of Containment Spray Header Valve to Open due to Excessive Pressure from Inertial Effects of Water	03/25/94	All holders of OLs or CPs for nuclear power reactors.
94-24	Inadequate Maintenance of Uninterruptible Power Supplies and Inverters	03/24/94	All holders of OLs or CPs for nuclear power reactors.
94-23	Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program	03/25/94	All NRC Licensees.
94-22	Fire Endurance and Ampacity Derating Test Results for 3-Hour Fire-Rated Thermo-Lag 330-1 Fire Barriers	03/16/94	All holders of OLs or CPs for nuclear power reactors.
94-21	Regulatory Requirements when No Operations are being Performed	03/18/94	All fuel cycle and materials licensees.

OL = Operating License
CP = Construction Permit

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Original signed by
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Attachment: List of Recently Issued NRC Information Notices
 Transmitted by TTMartin memorandum to TEMurley dated June 9, 1993

*see previous concurrence DOC NAME: 94-28.IN

*OGCB/DORS/NRR	*Tech Editor	*Region I	
RJKiessel	RSanders	FLBower, III	
2/22/94	2/22/94	3/3/94	
*Region I	*Region I	*SPLB/DSSA/NRR	*SPLB/DSSA/NRR
ARBlough	JTWiggins	JHolmes	KWest
3/3/94	3/3/94	3/07/94	3/07/94
*C:SPLB/DSSA/NRR	*D:DSSA/NRR	*AC:OGCB/DORS/NRR	D:DORS/NRR
CEMcCracken	MJVirgilio	AJKugler	BKGrimes
3/09/94	3/14/94	3/17/94	3/1/94

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*Region I	*Region I	*SPLB/DSSA/NRR	*SPLB/DSSA/NRR
ARBlough	JTWiggins	JHolmes	KWest
3/ 3/94	3/ 3/94	3/07/94	3/07/94
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CEMcCracken	MJVirgilio	AJKugler <i>AJK</i>	BKGrimes
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CEMcCracken	ACThadani	AJKugler	BKGrimes
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IN 94-XX
March 3, 1994
Page 5 of 4

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RJKiessel	RSanders	FLBower, III	WHRiland
2/22/94	2/22/94	2/27/94 3/1/94	2/19/94
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JPDurr	JTWiggins	JHolmes	KSWest
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C:SPLB/DSSA/NR R	D:DSSA/NRR	C:OGCB/DORS/NR R	D:DORS/NRR
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2/19/94	2/19/94	2/19/94	2/19/94