

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

February 5, 1988

**NRC INFORMATION NOTICE NO. 88-04: INADEQUATE QUALIFICATION AND DOCUMENTATION
OF FIRE BARRIER PENETRATION SEALS**

Addressees:

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

Purpose:

This notice is to alert addressees that some installed fire barrier penetration seal designs may not be adequately qualified for the design rating of the penetrated fire barriers. It is expected that recipients will review this information for applicability and consider actions, if appropriate, to preclude a similar problem and correct existing problems at their facilities.

However, suggestions contained in this information notice do not constitute new NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

The NRC has been reviewing fire barrier penetration seal designs installed in several nuclear power plants. The reviews focused on whether the installed configuration was qualified by adequate testing and documentation.

The current NRC review was prompted by reports, inspection findings, allegations, and other information that indicated the possibility that NRC requirements for fire barrier penetration seals were not being met in all aspects. The review included: evaluations of fire barrier penetration seal specifications and procedures developed by licensees, licensee agents, and licensee contractors; evaluations of various fire barrier penetration seal tests and test data; and inspections of various fire barrier penetration seal designs and installations. The types of concerns identified to date and mentioned below are related to weaknesses in the implementation of NRC requirements and guidelines as related to fire barrier penetration seal design qualification.

The staff identified instances where installed fire barrier penetration seal designs could not be verified as qualified for the design rating of the penetrated fire barrier. In some cases, test qualification documentation was not

available. In other cases, qualification test documentation was available but incomplete or inadequate because all qualification requirements had not been satisfied or the installed seal design configuration or design parameters were significantly different from the tested seal.

The NRC review also has identified a current practice that can affect the qualification status of installed seals. Plant modifications are being made that require running new cable and conduits through existing penetration seals. These modifications are generally being made without an associated technical review to ensure that the resulting penetration seal design configuration or design parameters are consistent with those validated by initial qualification tests. Over a period of time, numerous minor modifications to the same area could cumulatively result in a degraded fire barrier rating.

Discussion:

NRC requirements and guidelines for fire barrier penetration seals are contained in various documents, including Appendix R to 10 CFR 50, Appendix A to Branch Technical Position (BTP) APCS 9.5-1, "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 plant depends on plant age, commitments established by the licensee in developing the fire protection plan, the staff safety evaluation reports (SERs) and supplements, and the license conditions pertaining to fire protection.


The goal is to provide a fire barrier penetration seal that will remain in place and retain its integrity when subjected to an exposure fire, and subsequently, a fire suppressing agent. This will provide reasonable assurance that the effects of a fire are limited to discrete fire areas and that one division of safe-shutdown-related systems will remain free of fire damage.

A number of licensees have conducted a comprehensive assessment of the adequacy of in-plant fire barrier penetration seals. Their efforts began by determining which specific NRC guidelines/requirements apply and which specific commitments were made to respond to those guidelines or requirements. Typically, in-plant seal assemblies were surveyed to catalogue the various types of existing seal configurations. Finally, the documentation was analyzed to confirm that in-plant designs were fully qualified by a fire test and were installed in a proper manner.

If these efforts revealed instances where seals were not installed where required, were not installed properly, or were not qualified by a standard fire test, then the licensees have considered the seals degraded and have implemented compensatory measures, such as fire watch patrols, per the appropriate technical specifications or administrative procedures. These measures remain in force pending final resolution of the issue. Final resolution may include replacing existing penetration seals with fully qualified seals, qualifying in-plant seal assemblies by supplemental fire tests, and justifying in-plant configuration by fire hazards/safe shutdown analysis.

Appendix A contains a summary of various technical considerations that have been used for evaluating the qualification adequacy of fire barrier penetration seal designs and installations, associated testing, and test data.

No specific action or written response is required by this information notice. If you have questions about this matter, please contact one of the technical contacts listed below or the Regional Administrator of the appropriate NRC regional office.


Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contact(s): Dennis Kubicki, NRR
(301) 492-0825

Joseph Petrosino, NRR
(301) 492-0979

Attachments:

1. Appendix A - Summary of Existing Staff
Guidance Related to Fire Barrier
Penetration Seals
2. List of Recently Issued NRC Information Notices

APPENDIX A

SUMMARY OF EXISTING STAFF GUIDANCE RELATED TO FIRE BARRIER PENETRATION SEALS

A. General Considerations Concerning the Use of Test Results To Qualify Fire Barrier Penetration Seal Designs¹

The (fire barrier seal) test specimen shall be truly representative of the construction for which classification is desired, as to materials, workmanship, and details such as dimensions of parts, and shall be built under conditions representative of those obtaining as practically applied in building construction and operation. The physical properties of the materials and² ingredients used in the test specimen shall be determined and recorded.²

B. Seal Acceptance Criteria

1. The fire resistance rating of the penetration seal should be equivalent to the rating of the barrier in which it is installed.³
2. The fire resistance rating of the penetration seal should be determined by a standard fire test (i.e., ASTM E-814, ASTM E-119 or IEEE-634).⁴
3. The test should be conducted by an independent, recognized testing authority. The tested assembly should be representative of in-plant assemblies. The exposure fire should correspond to at least the time-temperature curve of ASTM E-119. Thermocouples should be positioned at representative locations on the cold side of the tested assembly (including the interface of seal material and through penetrations). The cold-side temperature should not exceed 250°F above ambient during the test or 325°F maximum, although higher temperatures at through penetrations are permitted when justified in terms of cable insulation ignitability. There should be no burn-through of the seal during the test, nor the passage of hot gases sufficient to ignite cotton waste material. The assembly should withstand the effects of a hose stream, as stipulated in the standard test method.⁵
4. The seals should be installed by qualified individuals.⁶
5. Appropriate quality assurance/quality control methods should be in force.
6. Fire barrier penetrations that must maintain environmental isolation or pressure differentials should be qualified by test to maintain the barrier integrity under such conditions.⁶

C. Hose Stream Testing⁹

1. Hose stream testing is a requirement for all fire barrier penetration seal qualification testing, regardless of whether the penetration seal is for a wall or a ceiling or a floor.
2. Hose stream testing should be performed on tested specimens that have successfully withstood the fire endurance test requirements.
3. The hose stream shall be delivered in one of the following ways: a 1-1/2-inch nozzle set at a discharge angle of 30° with a nozzle pressure of 75 psi and a minimum discharge of 75 gpm with the tip of the nozzle a maximum of 5 ft from the exposed face; a 1-1/2-inch nozzle set at a discharge angle of 15° with a nozzle pressure of 75 psi and a minimum discharge of 75 gpm with the tip of the nozzle a maximum of 10 ft from the exposed face; a 2-1/2-inch national standard playpipe equipped with 1-1/8-inch tip, nozzle pressure of 30 psi, located 20 ft from the exposed face.
4. The duration of the hose stream test should meet the minimum requirements specified in ASTM E-119 for fire barriers. During hose stream testing, the fire barrier penetration seal should remain intact and should not allow a projection of water beyond the unexposed surface.

D. Deviations¹⁰

Deviations from NRC requirements or accepted industry standards for fire barrier penetration seals should be technically substantiated as part of the review and approval of the fire protection plan or in other separate formal correspondence. Supplemental guidance is provided in Generic Letter 86-10.

References

1. "The design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet the requirements of ASTM E-119, Fire Test of Building Construction and Materials, including the hose stream test." [Section D.3.(d) of Appendix A to BTP APCS 9.5-1].

"Penetration seal designs shall utilize only noncombustible materials and shall be qualified by tests that are comparable to tests used to rate fire barriers." (Section III.M of Appendix R to 10 CFR Part 50).

"The penetration qualification tests should use the time temperature exposure curve specified by ASTM E-119." (Section C.5.a. of BTP CMEB 9.5-1).

2. ASTM E-119, "Fire Test of Building Construction and Materials."
3. Section D.3.(d) of Appendix A to BTP APCS 9.5-1.
4. Section III.M. of Appendix R to 10 CFR Part 50.
5. ASTM E-119, "Fire Test of Building Construction and Materials."
6. Section C of Appendix A to BTP APCS 9.5-1, Section C.4 of BTP CMEB 9.5-1.
7. Ibidem.
8. Section C.5.a.(3) of BTP CMEB 9.5-1.
9. Section III.M of Appendix R to 10 CFR Part 50, Section C.5.a of BTP CMEB 9.5-1.
10. Generic Letter 86-10.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-03	Cracks in Shroud Support Access Hole Cover Welds	2/2/88	All holders of OLs or CPs for BWRs.
88-02	Lost or Stolen Gauges	2/2/88	All NRC licensees authorized to possess gauges under a specific or general license.
88-01	Safety Injection Pipe Failure	1/27/88	All holders of OLs or CPs for nuclear power reactors.
86-81, Supp. 1	Broken External Closure Springs on Atwood & Morrill Main Steam Isolation Valves	1/11/88	All holders of OLs or CPs for nuclear power reactors.
87-67	Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11	12/31/87	All holders of OLs or CPs for nuclear power reactors.
87-66	Inappropriate Application of Commercial-Grade Components	12/31/87	All holders of OLs or CPs for nuclear power reactors.
87-28, Supp. 1	Air Systems Problems at U.S. Light Water Reactors	12/28/87	All holders of OLs or CPs for nuclear power reactors.
87-65	Plant Operation Beyond Analyzed Conditions	12/23/87	All holders of OLs or CPs for nuclear power reactors.
87-64	Conviction for Falsification of Security Training Records	12/22/87	All nuclear power reactor facilities holding an OL or CP and all major fuel facility licensees.

OL = Operating License
CP = Construction Permit

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Appendix A contains a summary of various technical considerations that have been used for evaluating the qualification adequacy of fire barrier penetration seal designs and installations, associated testing, and test data.

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Attachments:

1. Appendix A - Summary of Existing Staff Guidance Related to Fire Barrier Penetration Seals
2. List of Recently Issued NRC Information Notices

*Transmitted by memo to C. E. Rossi from J. G. Partlow dated 12/21/87.

*SEE PREVIOUS CONCURRENCES

(contains majority of below indicated concurrences)

*PPMB:ARM	*C/OGCB:DOEA:NRR	D/DOEA:NRR		
TechEd	CHBerlinger	CERossi		
01/15/88	01/21/88	02/5/88		
*OGCB:DOEA:NRR	*D/DEST:NRR	*ADT/DEST:NRR	*D/DRIS:NRR	*DD/DRIS:NRR
RJKiesel	LShao	JRichardson	JGPartlow	BKGrimes
01/14/88	12/17/87	12/16/87	12/16/87	12/16/87
*VIB:DRIS:NRR	*ASC/VIB:DRIS:NRR	*AC/VIB:DRIS:NRR	*ECEB:DEST:NRR	*BC/ECEB:DEST:NRR
JPetrosino	EBaker	JStone	DKubicki	CMcCracken
12/15/87	12/15/87	12/18/87	12/16/87	12/16/87

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PPMB:ARM	C/OGCB:DOEA:NRR	D/DOEA:NRR		
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01/15/88	01/ /88	01/ /88		
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RJKiesel	LShao	JRichardson	JGPartlow	BKGrimes
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