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December 28, 1992
RDM-574-92

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555

Gentlemen:

Licensee Event Report No. 92-26, Revision 4, is attached. This supplemental report discusses additional degraded three-hour fire barriers and barrier penetrations discovered during the 1992 eighteen month fire barrier penetration surveillance being conducted per Trojan Technical Specification 3/4.7.9.

As a result of the number and diverse nature of problems with fire barrier penetration seal deficiencies identified in 1992, the various types of deficiencies will be evaluated by our engineering organization from a programmatic effectiveness stand point. These evaluations, to be performed within our quality assurance program, will determine on a generic basis program effectiveness in the following areas: 1) grouted penetrations, 2) silicone foam penetration seals, and 3) penetration seals for piping that is insulated up to the barrier. These evaluations will also determine the need for further actions beyond those committed to in LER 92-26. These evaluations will be completed and provided in a supplement to LER 92-26 by July 1, 1993.

Sincerely,

R. D. Machon
General Manager
Trojan Nuclear Plant

c: Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission

Mr. David Stewart-Smith
State of Oregon
Department of Energy

Mr. R. C. Barr
USNRC Resident Inspector
Trojan Nuclear Plant

LER Distribution

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Trojan Nuclear Plant										DOCKET NUMBER (2) 0 5 0 0 0 3 4 4				PAGE (3) 1 of 28		
TITLE (4) Fire Barrier Deficiencies Identified As Result of Ongoing Fire Barrier Surveillance Program																
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		
05	09	92	92	-	0 2 6	-	0 4	12	28	92				0 5 0 0 0		
OPERATING MODE (9)		1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11)												
POWER LEVEL (10) 1 0 0		20.402(b)		20.405c		50.73(a)(2)(iv)		73.71(b)								
		20.405(a)(1)(i)		50.38(c)(1)		50.73(a)(2)(v)		73.71(c)								
		20.405(a)(1)(ii)		50.38(c)(2)		50.73(a)(2)(vi)		X OTHER (Specify in Abstract below and in Text, NRC Form 355A)								
		20.405(a)(1)(iii)		X 50.73(a)(2)(i)		50.73(a)(2)(vii)A		Special Report								
		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)(ix)										
LICENSEE CONTACT FOR THIS LER (12)																
D. L. Claridge, Compliance Engineer										AREA CODE 503		TELEPHONE NUMBER 556-5541				
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC						
N/A																
SUPPLEMENTAL REPORT EXPECTED (14)										EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR		
X YES (If yes, complete EXPECTED SUBMISSION DATE)										NO		07	01	93		
ABSTRACT (16)																
<p>Visual inspections conducted between September 30, 1991 and December 3, 1992, for the 1992 eighteen month fire barrier surveillance required by Trojan Technical Specification (TTS) 3/4.7.9, "Fire Barrier Penetrations," identified eleven fire barrier penetrations and eight fire barriers that did not provide the required three hour fire barrier rating. The subject penetrations and fire barriers were declared inoperable and appropriate compensatory measures taken in accordance with TTS 3/4.7.9. The penetrations and five of the barriers have been repaired. Four of the degraded penetration seals resulted from personnel errors, but the root cause investigations for the remaining penetrations have not been completed. Corrective action includes retraining of inspection and Plant personnel. Inconsistent fire barrier information contained on engineering drawings was the cause of deficiencies in one fire wall. A root cause evaluation is continuing for five of the barriers. The remaining two barrier degradations are attributed to inadequate seal installation. Compensatory measures will remain in place for the non-functional fire barriers until they are repaired. There were no safety consequences resulting from these events. This report is being submitted to fulfill the requirements of 10 CFR 50.73(a)(2)(i) and as the Special Report required by TTS 3/4.7.9.</p>																

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

INTRODUCTION

Trojan Technical Specification (TTS) 3/4.7.9, "Penetration Fire Barriers," requires that all 3-hour rated fire penetration barriers protecting safety-related areas be functional at all times. It has been determined that Fire Barrier Penetrations [PEN] No. 422, No. 594, No. 1108, No. 2299, an unnumbered penetration in Fire Barrier No. C-061-22, No. 3140, No. 1092A, No. 1093A, No. 1094A, No. 1095A, No. 1096, and Fire Barriers No. E-045-01, T-045-20, T-063-01, T-063-02, C-105-22, C-105-23, C-077-22, and C-117-01, could have been non-functional for greater than seven days without having the required compensatory measures in place. This report is submitted to fulfill the requirements of 10 CFR 50.73(a)(2)(i)(B), as a condition prohibited by TTS 3/4.7.9. This report is also submitted to fulfill the TTS 3/4.7.9 Action Statement requirement to submit a Special Report when a non-functional penetration barrier required per TTS 3/4.7.9 is not restored to functional status within seven days.

DISCUSSION

Penetration 422

Penetration 422 is a grouted conduit penetration in the wall between Battery Room B (Room 40/Fire Area C4) and the Train B Electrical Auxiliaries Room (Room 38/Fire Area C2), in the Control Building, Elevation 61' 0". The penetration consists of a core-bored hole above the door in the west wall of Battery Room B, through which passes a one and one-half inch conduit. The design for this type of penetration specifies that grout is to be installed around the conduit to a minimum thickness of six inches, to provide a 3-hour rated fire barrier.

On May 9, 1992, a visual inspection of Penetration 422 was performed as part of the eighteen-month fire barrier surveillance (visual inspection required by TTS 3/4.7.9). The visual inspection indicated that it appeared approximately one inch of the grout was missing from the Battery Room side of the penetration. This side of the penetration was partially blocked by a junction box, and the visual inspection did not adequately determine the condition of the penetration fire barrier seal [SEAL] behind the junction box. Design details from the installation drawing indicated that Penetration 422 had an installed thickness of eight inches. At that time, the inspection personnel believed that only approximately one inch of grout was missing from an eight inch grouted fire barrier seal. Therefore, the inspection personnel determined that the penetration fire barrier seal was damaged, but still functional, based on design drawing measurements. A maintenance request was written to repair the fire barrier seal face. Penetration 422 was determined to be nonfunctional on August 25, 1992, when personnel

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

working the maintenance request determined that the thickness of the grout was less than the required six inches.

Penetration 594

Penetration 594 is a silicone foam sealed cable penetration in the east wall of the Cable Spreading Room (Room 45/Fire Area C7), which is the west wall of the North/South Corridor of the Auxiliary Building (Room 209/Fire Area A4) on elevation 77'. This wall is approximately eighteen inches thick, and the penetration seal is recessed approximately seven inches on the Cable Spreading Room side of the penetration. The seal is, therefore, approximately eleven inches thick. The design for this type of penetration specifies a minimum silicone foam thickness of 9-3/4 inches to provide a 3-hour rated fire barrier. A one inch damming board may also be provided, but is optional.

On September 24, 1992, a visual inspection of Penetration 594 was performed as part of the eighteen month fire barrier surveillance (visual inspection) required by TTS 3/4.7.9. This visual inspection identified a hole, approximately 1/2 inch in diameter and eleven inches deep, through the silicone seal. The seal has a one inch damming board on the Auxiliary Building side of the penetration, which covered the hole on that side of the seal. Penetration 594 was determined to be degraded and nonfunctional.

Fire Barrier No. E-045-01

Fire Barrier E-045-01 is a masonry wall which encloses the electrical penetration area (EPA) and supports the basis for the 10 CFR 50 Appendix R III.G.2.b exemption in Fire Area E1. A large opening exists at the top of the main wall and two inch gaps exist between the masonry walls and the Containment wall. The opening and gaps are not deviations to Section III.G of Appendix R, since the wall does not constitute a boundary between fire areas. The opening and gaps were accepted by the NRC in an Exemption to Section III.G.2 of Appendix R to 10 CFR 50 dated November 12, 1987, and thus are not considered deficiencies. The following deficiencies that do render the wall nonfunctional were identified during a barrier surveillance performed on September 24, 1992:

Unsealed Instrument Line Penetrations

The subject penetration consists of four (4) overlapping three inch core bores that results in approximately a three-by-nine inch hole through the south wall of E-045-01. The penetration is located approximately twelve feet off the floor, approximately sixteen inches west of the south fire door to the

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

EPA. The open penetration is occupied by seven (7) sample lines.

Conduit Empty and Uncapped at Both Ends

Approximately thirteen feet above the elevation 45' floor near the fire door access to the EPA on the north side, an empty conduit installed at a 45 degree angle forms an open penetration through the wall. Routed on top of the conduit is a 3/8 inch tube that has also been retired in place. The conduit has been cut flush with the wall and is uncapped at both sides.

Unanalyzed Void Area

A portion of the south section of the wall is constructed above a void area such that the wall does not provide the minimum six inches of through wall thickness required. This condition represents an unanalyzed barrier configuration. An engineering investigation indicated that the void area is the same width as the wall. Fire resistant caulk is used to seal the floor/wall interface directly above the void area inside the EPA.

Penetration 2299

Penetration 2299 is a single conduit penetration, grout-sealed in a core bored hole through a thirty-four inch block wall. Penetration 2299 is in the east wall of the Waste Gas Decay Tank Room (Room 197/Fire Area A4a) on the 61' elevation of the Auxiliary Building, and is approximately ten feet from the floor. The other side of the penetration is in the Pipeway Room (Room 193/Fire Area A1) in the Auxiliary Building, also approximately ten feet from the floor. The design for this type of penetration specifies that grout is to be installed around the conduit to a minimum thickness of six inches.

On October 6, 1992, a visual inspection of Penetration 2299 was performed as part of the eighteen-month fire barrier surveillance (visual inspection required by TTS 3/4.7.9). The inspectors noted that the grout on the A-side (Pipeway Room) of the penetration was recessed and, although flush with the wall on the B-side (Waste Gas Decay Tank Room), did not meet the six inch minimum thickness requirement. The penetration was declared inoperable and compensatory measures initiated. Personnel working under the maintenance request to repair the seal noted when they chipped out the existing grout that a depth of only three inches of grout existed.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 28
		92	- 0 2 6	- 0 4	

TEXT (17)

Penetration 1108

Penetration 1108 is a single pipe penetration, grout-sealed in a core bored hole through a thirty-four inch block wall. Penetration 1108 is in the west wall of the Valve Closet (Room 59/Fire Area C12) in the Control Building, approximately eight feet from the floor. This is also the east wall of the Turbine Bay (Room 113/Fire Area T1) on the 93' elevation of the Turbine Building. The original design for this penetration specifies that grout is to be installed around the two-inch pipe for the entire depth (thirty-four inch thickness of the wall) of the six-inch diameter penetration.

On May 9, 1992, a visual inspection of Penetration 1108 was performed as part of the eighteen-month fire barrier surveillance (visual inspection required by TTS 3/4.7.9). The visual inspection indicated that there surface damage of 3/8-inch depth in the grout on the Turbine Building side of the penetration. Both sides of the penetration were partially blocked by insulation on the pipe. Original design details from the installation drawing indicated that Penetration 1108 had grout installed to a thickness of thirty-four inches. The inspection personnel determined that the penetration fire barrier seal was damaged, but still functional, based on the depth of the damage located on the surface of the seal. A maintenance request was written to repair the damaged grout. Penetration 1108 was determined to be nonfunctional on October 12, 1992, when personnel working the maintenance request determined that a pipe sleeve was in the penetration that was not shown on the as-built drawing, and that the space between the pipe and the sleeve was not sealed. This condition had been blocked by the pipe insulation on both sides of the penetration, such that visual inspection would not have identified it.

Unnumbered Penetration in Fire Barrier C-061-22

The unnumbered penetration is a single-pipe penetration, grout sealed in a core bored hole through Fire Barrier C-061-22, which is an eight-inch masonry block wall. Fire Barrier C-061-22 is the south wall of the B Switchgear and Electrical Auxiliaries Room (Room 38/Fire Area C2) in the Control Building, elevation 61'. This is also the north wall of the Elevator Equipment Room on the 61' elevation of the Control Building. The design for this type of penetration specifies that grout is to be installed around the pipe to a minimum thickness of six inches.

On October 23, 1992, Maintenance personnel performing the 1992 eighteen month visual inspection of fire barriers and fire barrier penetrations required by TTS 3/4.7.9 discovered the unnumbered penetration. The inspectors noted that an abandoned section of copper pipe was completely grouted over on the Elevator Equipment Room side of the penetration, such that the presence of the pipe was

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)
Trojan Nuclear Plant	05000344	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 of 28	
		92	- 026	- 04		

TEXT (17)

not evident on that side. The end of the pipe segment on the Fire Area C2 side of the penetration was exposed, had been cut off near the wall, and the end hammered in an apparent attempt to crimp it closed. The fire protection engineer who examined the penetration determined that the pipe segment did not have an internal seal, and was approximately six and one-half inches through the penetration. The penetration was declared inoperable and appropriate compensatory measures initiated. Personnel working under a subsequent maintenance request to repair the seal noted when they chipped out the existing grout that a depth of approximately one inch of grout existed on the Elevator Equipment Room side of the penetration.

Penetration 3140

Penetration 3140 is a single-conduit penetration in a concrete-slab floor. The floor is in the Laydown Area (Room 281/Fire Area A5) on the 93' elevation of the Fuel Building. This barrier is also the ceiling of the Component Cooling Water Surge Tank Room (Room 219/Fire Area A1) on the 77' elevation of the Auxiliary Building. The slab is approximately twenty-four inches thick. The design of Penetration 3140 specifies that it is a grout-sealed, single conduit penetration, with a grout seal of at least six inches. The empty conduit in Penetration 3140 is recessed approximately one inch on the Fire Area A5 side of the barrier, and extends approximately two feet past the Fire Area A1 side of the barrier.

On October 30, 1992, Maintenance personnel were performing the 1992 eighteen month visual inspection of fire barriers and fire barrier penetrations required by TTS 3/4.7.9. The inspectors discovered that the conduit in Penetration 3140 did not meet an acceptable configuration for open-ended conduits, as specified in Plant Modifications Procedure PMP-13, that would provide the required three-hour fire barrier rating. Specifically, the conduit was capped on the Fire Area A1 side of the barrier, but did not have an internal plug or foam seal on the Fire Area A5 side of the barrier. The penetration was declared inoperable and appropriate compensatory measures were taken.

Fire Barrier T-045-20

Fire Barrier T-045-20 is the east wall of the 45' el. of the Turbine Building (Room 87/Fire Area T1), which is also the west wall of the 45' el. of the Electrical Penetration Area of the Main Steam Support Structure. The portion of the wall in the area of the two degradations found is a precast concrete panel construction, six inches thick. This type of wall is required to have a minimum thickness of six inches in order to provide the required 3-hour fire rating.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	05000344	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	7 OF 28
		92	- 026	- 04	

TEXT (17)

On November 25, 1992, Maintenance personnel were performing the 1992 eighteen month visual inspection of fire barriers and fire barrier penetrations required by TTS 3/4.7.9. The inspectors discovered two damaged areas on barrier T-045-20. The first was a six-inch long, 3/4 inch deep gouge in the grout in the expansion joint between two precast concrete panels. The second was a gouge (size indeterminate at that time) beneath a one-inch thick steel plate used in a through-bolt penetration in the barrier. This gouge exposed a portion of the corebore made for the bolt. The penetration was declared inoperable, appropriate compensatory measures were taken, and a maintenance request was initiated to repair the barrier.

On December 13, 1992, while conducting the evaluation for this barrier, it was discovered that an additional section of grout, approximately 1-1/2 inches deep by 2-1/2 inches long, was missing along the width of the opposite side of the same expansion joint found degraded on November 25, 1992. A through-wall crack was also discovered at the top of the precast panels. A continuous fire watch was already in place in th's area for an unrelated issue, so a maintenance request was initiated to repair the additional degraded area.

Penetrations 1092, 1093, 1094 and 1095

Penetrations 1092, 1092, 1094 and 1095 are four-inch diameter embedded sleeves, located in the ceiling of the Cable Spreading Room (Room 45/Fire Area C7) on the 77' el. of the Control Building. This is also the floor of the Valve Closet (Room 59/Fire Area C12) on the 93' el. of the Control Building. The sleeves protrude above the floor approximately 3-1/2 inches and below the ceiling approximately four inches. Penetration 1095 contains a two-inch diameter pipe; the other three penetrations contain no penetrants.

On December 3, 1992, Maintenance personnel performing the 1992 eighteen month fire barrier/penetration inspection required by TTS 3/4.7.9 noted that the four penetrations appeared to contain inadequate depths of Dow Corning 3-6548 silicone foam sealant to provide a three-hour fire rated barrier. Fire Protection Engineering personnel verified that the four penetrations contained combined depths of foam and optional damming material ranging from approximately 6-1/2 to 8 inches. The design for this type of barrier penetration requires a minimum of 9-3/4 inches of the Dow Corning silicone foam to provide a three-hour fire rating. The penetrations were declared inoperable, appropriate compensatory measures were put into place, and a maintenance request to repair the seals was initiated.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEA:	SEQUENTIAL NUMBER	REVISION NUMBER	8 OF 28
		92	- 0 2 6	- 0 4	

TEXT (17)

Penetration 1096

Penetration 1096 is a four-inch diameter sleeve located in the ceiling of the Cable Spreading Room (Room 45/Fire Area C7) on the 77' el. of the Control Building. This is also the floor of the Valve Closet (Room 59/Fire Area C12) on the 93' el. of the Control Building. This penetration contains a three-inch diameter drain pipe.

On December 3, 1992, Maintenance personnel performing the 1992 eighteen month fire barrier/penetration inspection required by TTS 3/4.7.9 noted that the penetration appeared to contain an inadequate depth of grout sealant to provide a three-hour fire rated barrier. Fire Protection Engineering personnel verified that the penetration contained a depth of approximately one inch of concrete between the sleeve and the drain pipe, on top of a metal plate. The other side of the penetration had no type of sealant visible. The design for this type of barrier penetration requires a minimum grout thickness of six inches to provide a three-hour fire rating. The penetration was declared inoperable, appropriate compensatory measures were put into place, and a maintenance request to repair the seal was initiated.

Fire Barriers T-063-01 and T-063-02

Fire Barriers T-063-01 and T-063-02 are floor slabs on the 69' el. of the Turbine Building. These slabs are partially bordered by fire-rated seismic gap seals along the wall separating the Turbine Building from the Control Building, and along the north, south and east walls of the Train A Switchgear Room. These seals are installed to prevent; (a) a fire in the 45' el. east corridor, which contains the normal EDG ventilation intakes, from affecting Train A safe shutdown cables on the 69' el., and (b) a fire on the 69' el. affecting the Train A cables and the normal air intake for the Train B EDG. The design of the seals consists primarily of a minimum depth of two inches of an intumescent putty (3-M Putty 303) to provide a three-hour fire-rated barrier.

On December 1, 1992, Maintenance personnel performing the 1992 eighteen month fire barrier/penetration inspection required by TTS 3/4.7.9 removed several seismic gap cover-plates along the Turbine Building/Control Building wall, and noted through-wall cracks between the putty and the wall. Lateral separation of the putty from the barrier had resulted in two approximately 1/4 inch by four inch through-floor cracks. Fire Protection Engineering personnel examined the barrier and declared the penetration inoperable. Fire detection equipment was verified to be operable on the 69' el., and an hourly fire patrol was initiated.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		9 of 28
		92	- 0 2 6	- 0 4		

TEXT (17)

On December 4, 1992, the seismic gap cover plates around the Train A Switchgear Room were removed and the inspectors noted several areas where significant void formation had occurred in the putty along the north and east walls. This phenomenon was not present in the gap along the south wall.

Fire Barriers C-105-22 and 23, C-077-22 and C-117-01

Fire Barriers C-105-022 and C-105-23 are the east and north walls of the elevator shaft at the 105' el. of the Control Building, located in the Mechanical Equipment Room (Room 77/Fire Area C13). These walls are eight inch thick masonry walls. Fire Barrier C-077-22 is the west wall of the duct chase at the 77' el. of the Control Building (Room 34/Fire Area C6). This wall is a twelve inch thick masonry wall. Fire Barrier C-117-01 is the roof of the Mechanical Room at the 117' el. of the Control Building. The degraded penetration (Penetration 3667, an empty conduit sleeve penetrating the roof) terminates in Room 46, Fire Area C8.

On December 2, 1992, Maintenance Personnel were reviewing maintenance request work packages for close out when it was discovered that the barriers described above had been identified as degraded several months earlier under the 1992 eighteen month fire barrier/penetration inspection required by TTS 3/4.7.9. Although the degraded barriers had been identified to Site Fire Protection and the Shift Manager, a Corrective Action Request was not initiated and these barriers apparently were not evaluated for reportability. These barriers were initially identified as degraded (not Operable) as follows: C-105-22 and 23 on September 30, 1991, due to missing grout in the seams between the walls and the ceiling; C-077-22 on July 27, 1992, due to missing grout in the seam in the southwest corner; and C-117-01 on September 23, 1992, due to an open-ended conduit sleeve (Penetration 3667) through the barrier that did not appear to have an internal conduit seal. The sleeve was open-ended on the roof side of the barrier. The other end of the sleeve was capped with a stainless steel cap that was partially covered with grout, such that the cap could not be removed for inspection. The inspectors conservatively declared the penetration inoperable without conducting additional inspections to determine the existence or operability of a conduit seal.

IMMEDIATE ACTIONS TAKEN

Penetration 422

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the fire barrier seal for Penetration 422 did not provide the required 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	10 OF 28
		92	- 0 2 6	- 0 4	

TEXT (17)

side of the penetration was operable, and to initiate an hourly fire patrol. The fire barrier seal was repaired under a maintenance request on August 26, 1992. The barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Penetration 594

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the fire barrier seal for Penetration 594 did not provide the required 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. The fire barrier seal was repaired under a maintenance request on September 30, 1992. The barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Fire Barrier No. E-045-01

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the fire barrier wall did not provide the required 3-hour rated fire barrier. The actions taken were to verify fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery.

Penetration 2299

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the fire barrier seal for Penetration 2299 did not provide the required 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. The fire barrier seal was repaired under a maintenance request on October 12, 1992. The barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Penetration 1108

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the fire barrier seal for Penetration 1108 did not provide the required 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. The fire barrier seal was repaired under a maintenance request on October 19, 1992. The

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	05000344	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	11 of 28
		92	- 026	- 04	

TEXT (17)

barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Unnumbered Penetration in Fire Barrier C-061-22

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the unnumbered penetration did not provide the required 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. The fire barrier seal was repaired under a maintenance request on October 29, 1992. The barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Penetration 3140

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that Penetration 3140 did not provide the required 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. The fire barrier seal was repaired under a maintenance request on November 5, 1992. The barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Fire Barrier T-045-20

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that Fire Barrier T-045-20 did not provide a 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. The gouge problems with the fire barrier were repaired under a maintenance request on December 2, 1992, within the seven days specified in the action statement for TTS 3/4.7.9. A maintenance request was initiated to repair the additional problems found, after verifying that a continuous fire watch was in place.

Penetrations 1092, 1093, 1094 and 1095

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the penetrations did not meet the design requirements for a 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol,

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	92	- 0 2 6	- 0 4	12 of 28

TEXT (17)

within one hour of the discovery. The fire barrier seals were repaired under a maintenance request on December 10, 1992. The barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Penetration 1096

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the penetration did not meet the design requirements for a 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. The fire barrier seal was repaired under a maintenance request on December 9, 1992. The barrier was repaired within the seven days specified in the action statement for TTS 3/4.7.9.

Fire Barriers T-063-01 and T-063-02

The action statement of TTS 3/4.7.9 was implemented within one hour of the discovery that the seismic gap seals did not meet the design requirements for a 3-hour rated fire barrier. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery.

Fire Barriers C-105-22 and 23, C-077-22, and C-117-01

The action statement of TTS 3/4.7.9 was implemented within one hour of the discoveries that the subject fire barriers did not provide 3-hour rated fire barriers. The actions taken were to verify that fire detection equipment on at least one side of the penetration was operable, and to initiate an hourly fire patrol, within one hour of the discovery. Each of the barriers was repaired and restored to functional status within the seven days specified in the action statement for TTS 3/4.7.9.

CAUSE OF DEFICIENCIES

Penetration 422

A review of applicable Trojan records did not indicate that maintenance activities had been performed on Penetration 422 that would account for the degraded fire barrier seal. Therefore, it is assumed that the fire barrier seal had been non-functional since original installation in 1981. The cause of the event was a

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)
Trojan Nuclear Plant	05000344	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	13 OF 28	
		92	- 026	- 04		

TEXT (17)

personnel error, failure to properly install the required amount of grout needed to provide a 3-hour fire rated barrier seal.

A contributing factor to this event is that personnel performing the fire barrier penetration visual inspection did not adequately identify the actual condition of the inadequately grouted penetration seal. This is attributed to the fact that the individuals performing the inspection did not meet the training requirements of the procedure used for performing the inspections.

Penetration 594

Penetration 594 passed its last eighteen month surveillance on October 31, 1991. Since Penetration 594 is accessible for visual inspection on both sides of the barrier, the 1991 inspection should have identified the hole, had it existed at that time. A review of Fire Protection Patrol and Outage Worksheets initiated between October 1, 1991 and September 24, 1992, was performed. This review indicated that work was performed on Penetration 594 in February, 1992. The penetration had been repaired in accordance with applicable Trojan procedures. A review of Maintenance Requests identified that a repair was made to the seal in June 1990. There was no further evidence that any other work was performed on this penetration between June, 1990 and September 24, 1992. Therefore, the cause of this event has been attributed to personnel error, failure to properly reseal a fire barrier penetration following the breach of the penetration, although the root cause of the personnel error, and the date on which it was made, is not known.

Fire Barrier No. E-045-01

These deficiencies are attributed to inconsistent fire barrier information and inadequate configuration controls provided in the fire area boundary and fire barrier rating drawings contained in the Trojan Fire Protection Plan (PGE-1012), and the omission of pertinent information from construction note 28 of FP-906 (the Trojan Fire Barrier List used for barrier surveillances). The inconsistencies and omissions were caused by cognitive personnel errors. The deficient configuration controls have been resolved. The Fire Protection fire area boundary drawings (C-2100 series) and the General Plant Floor Plan drawings (A-115 through A-118) now reflect the Plant's fire protection design basis and are included in PGE-1012. Therefore no further corrective actions are required.

A contributing cause involves the methodology used in NPE civil file C-FP-1.3.24, in which Appendix R fire barriers are added to FP-906 and thereby surveyed in accordance with TTS 3/4.7.9 prior to determining the condition of the barrier and the ability of the barrier to satisfy the TTS surveillance requirements. This cause is

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	14 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

also attributed to cognitive personnel errors. Corrective action has been assigned to resolve this problem.

Penetration 2299

A review of applicable Trojan records between 1988 and 1992 did not indicate that maintenance activities had been performed on Penetration 2299 that would account for the as-found condition of the penetration. Penetration 2299 was identified in a Request for Design Change (RDC 84-087), as a three-hour, Standard Technical Specification fire barrier penetration. The inspection conducted under RDC 84-087 did not identify this penetration as requiring modification to meet the installation requirements for a grouted three-hour fire penetration. Therefore, the most probable cause of this event is personnel error, failure to properly seal a fire barrier penetration; the date on which it was made is not known.

A contributing factor is that past inspections (from 1986 to 1992) did not verify that as-found seal configurations met minimum installation requirements, particularly items such as the depth of seal recesses or protrusions.

Penetration 1108

A review of applicable Trojan records between 1988 and 1992 did not indicate that maintenance activities had been performed on Penetration 1108 that would account for the as-found condition of the penetration not matching the as-built drawing for the penetration. The penetration, as installed, did not provide the three-hour rated fire barrier, as required. The cause of this event was a personnel error, failure to properly install a grouted three-hour rated fire barrier penetration seal. The as-built drawing for this penetration was made after the pipe insulation was installed. Therefore, it has been assumed that the individuals involved with creating the as-built drawing did not realize that this penetration had a sleeve in it, due to the sleeve being hidden under the insulation.

Unnumbered Penetration in Fire Barrier C-061-22

The root cause of this event is under investigation and will be reported in a supplement to this LER.

Penetration 3140

The root cause of this event is under investigation and will be reported in a supplement to this LER.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	15 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

Fire Barrier T-045-20

The root cause of this event is under investigation and will be reported in a supplement to this LER.

Penetrations 1092, 1093, 1094 and 1095

These penetrations were original installations. As-built documentation prepared in 1980 indicate that the penetrations did not meet three-hour fire rated barrier requirements, and were identified to be upgraded. However, these penetrations were not included in the fire barrier upgrade efforts conducted in the early 1980's. Therefore, these deficient seals have been attributed to personnel errors involving inadequate original installation and failing to ensure that these seals were included in the upgrade efforts. The root cause of these personnel errors is not known.

Penetration 1096

The root cause of this event is under investigation and will be reported in a supplement to this LER.

Fire Barriers T-063-01 and T-063-02

The through-floor cracks most likely resulted from lateral expansion of the 3-M Putty 303, due to internal and/or external stresses. This type of degradation is typical of materials that harden in the fashion of 3-M Putty 303, and may have occurred over several years (i.e., age-related failure). These barriers were not added to the barrier/penetration surveillance program (FP-903) until 1992. Now that these barriers are included in the FP-903, future crack development should be detected and repaired prior to barrier degradation.

In discussions with the vendor, the vendor representative indicated that void formation has been experienced with 3-M Putty 303, and that previous instances of void formation were attributed to improper installation techniques. Based on discussion with the vendor, the root cause of the void problem appears to be improper installation caused by inadequate installation instructions. The vendor did not specify that no voids/air pockets could be present in the putty when applied, or that the putty should not be applied in thick layers.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	YEAR	SERIAL NUMBER	REVISION NUMBER	PAGE (3)
Trojan Nuclear Plant	05000344	92	-026	-04	16 of 28

TEXT (17)

Fire Barriers C-105-22 and 23, C-077-22, and C-117-01

The root cause for the missing grout in barriers C-105-22 and 23 and C-077-22 is under investigation and will be reported in a supplement to this LER.

It is not known whether the conduit (Penetration 3667) contained a qualified conduit plug or seal at the time of inspection. The inspectors probed from the roof side for a depth of approximately three feet (the penetration is approximately four feet thick) without encountering any type of seal. They were not able to examine the plugged side of the sleeve because the plug was partially embedded in grout. Therefore, instead of performing a destructive examination of the penetration, the inspectors conservatively declared the penetration to be degraded. Since the as-found configuration of the penetration is not known, a root cause determination cannot be made.

The reason why reportability determinations were not performed when the degraded barriers were first discovered is under investigation. This will be reported in a supplement to this LER.

PLANS FOR RESTORING THE PENETRATIONS TO FUNCTIONAL STATUS

Penetration 422 was restored to functional status following repair on August 26, 1992.

Penetration 594 was restored to functional status following repair on September 30, 1992.

Penetration 2299 was restored to functional status following repair on October 12, 1992.

Penetration 1108 was restored to functional status on October 19, 1992, following installation of the required foam seal.

The unnumbered penetration in Fire Barrier C-061-22 was restored to functional status on October 29, 1992, by removing the pipe segment and sealing the penetration with grout.

Penetration 3140 was restored to functional status on November 5, 1992, by installing foam sealant inside the conduit to provide an internal conduit seal.

Fire Barrier T-045-20 was repaired and restored to functional status on December 17, 1992.

Penetrations 1092, 1093, 1094 and 1095 were restored to functional status following repair on December 10, 1992.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	17 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

Penetration 1096 was restored to functional status following repair on December 9, 1992.

Fire Barriers T-063-01 and T-063-02 will be repaired by removing portions of the putty in the deficient areas and resealing the gaps with a fire barrier caulk (3-M CP25 self-leveling caulk). The barriers are expected to be restored to functional status by July 20, 1993.

Fire Barriers C-105-22 and 23, C-077-22, and C-117-01 were restored to functional status within seven days of the determinations that the barriers did not provide 3-hour fire rated barriers.

CORRECTIVE ACTIONS

Penetration 422

Personnel used to perform fire barrier penetration surveillances were retrained on the procedure and on management expectations regarding seal operability determination. This training was completed on September 30, 1992.

Penetration 594

A Lessons Learned Notice was issued on December 9, 1992, to Trojan Nuclear Plant personnel to re-emphasize the importance of fire barriers and procedures to be followed to ensure fire barriers are not degraded without initiating appropriate compensatory measures.

Fire Barrier No. E-045-01

Repairs were completed on November 24, 1992, to the through wall penetration (i.e., the retired conduit) identified in the wall barrier inspection.

A fire hazard analysis was completed on November 17, 1992, documenting the acceptability of the unsealed sampling line core bore penetrations. Note 28 of FP-906 was updated accordingly.

A fire hazard analysis was completed on November 17, 1992, for the void area (pipeway tunnel) below north and south sections of the wall. Note 28 of FP-906 was updated accordingly.

Civil file C-FP-1.3.24 was revised on November 11, 1992, to add steps that require fire door, damper, and penetration lists and their procedures to be updated when adding a fire barrier to FP-906. A step was also included to perform a barrier inspection and do

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)				PAGE (4)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	18 OF 28	
		92	- 0 2 6	- 0 4		

TEXT (17)

required evaluations and upgrades prior to adding the barrier to FP-906.

Penetration 2299

The Plant Modifications Procedure (PMP-13), used for barrier penetration inspections, was revised (and issued) on December 15, 1992, to enhance instructions provided for the determination of degraded and damaged penetration seals with respect to meeting minimum installation requirements.

Penetration 1108

An inspection of a representative sample of this type of penetration will be completed by September 1, 1993, in order to determine if there are similar problems with other penetration seals which are partially blocked by pipe insulation. If this inspection identifies additional degraded penetrations, the results of the inspection and additional corrective actions deemed necessary will be reported in a supplement to this LER.

Unnumbered Penetration In Fire Barrier C-061-22

No additional corrective actions have been identified to be necessary for this event. The root cause investigation currently in progress will determine if additional corrective actions are necessary.

Penetration 3140

No additional corrective actions have been identified to be necessary for this event. The root cause investigation currently in progress will determine if additional corrective actions are necessary.

Fire Barrier T-045-20

No additional corrective actions have been identified to be necessary for this event. The root cause investigation currently in progress will determine if additional corrective actions are necessary.

Penetrations 1092, 1093, 1094 and 1095

A review of the as-built documentation for Penetrations 101 through 1214 will be conducted and walkdowns performed to identify other

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	19 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

penetrations that may have been identified in the early 1980's for upgrading, but subsequently were not upgraded. This action will be completed by March 31, 1993.

Penetration 1096

No additional corrective actions have been identified to be necessary for this event. The root cause investigation currently in progress will determine if additional corrective actions are necessary.

Fire Barriers T-063-01 and T-063-02

The fire barriers will be repaired with a fire barrier caulk and restored to functional status by July 20, 1993.

Fire Barriers C-105-22 and 23, C-077-22, and C-117-01

No additional corrective actions have been identified to be necessary for this event. The root cause investigation currently in progress will determine if additional corrective actions are necessary.

SAFETY CONSEQUENCES AND IMPLICATIONS

Penetration 422

There were no safety consequences resulting from Penetration 422 being nonfunctional since its installation in 1981. There has not been a fire in either of the affected fire areas, since Penetration 422 was installed, that would have challenged the barrier.

The implication of this event is that this penetration was not able to provide the 3-hour fire barrier, had a fire occurred in either of the affected rooms. The postulated fire duration in each of the affected rooms on either side of the barrier is low (approximately ten minutes for the battery room and thirty minutes for the switchgear room). The closest combustibles to either side of the penetration are cable trays (approximately 2 and 1/2 feet horizontally on either side of the penetration). There are no other combustibles located between the penetration and these cable trays. The penetration itself is a 1 and 1/2 inch single conduit with an internal conduit seal on both sides of the penetration. Therefore, it would be unlikely that a fire would have been able to have propagated to the penetration on either side of the wall.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)
Trojan Nuclear Plant	05000344	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	20 OF 28	
		92	- 026	- 04		

TEXT (17)

Additionally, there are no combustibles in the penetration to facilitate fire propagation to the other room. The junction box positioned just in front of the penetration on the Battery Room side would have presented a tortuous path of travel in order for a fire to propagate into the other room. The area wide fire detection systems in either room would be expected to alarm in the control room, allowing sufficient time for the fire brigade to respond before the fire could propagate into the other room.

Both affected rooms contain Train B equipment required for achieving safe shutdown, but neither room contains any Train A safe shutdown equipment. Therefore, a fire in either room would not have been able to affect both safe shutdown trains.

Penetration 594

There were no safety consequences resulting from Penetration 594 being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas since Penetration 594's last eighteen month inspection, in October, 1991, that would have challenged the barrier.

The implication of this event is that Penetration 594 was not able to provide the 3-hour fire barrier, had a fire occurred in either of the affected rooms. The postulated fire duration in each of the affected rooms on either side of the barrier is moderate (approximately 1 and 1/2 hours for each room). The closest combustibles to either side of the penetration are cables in cable trays that penetrate the barrier.

The hole in the seal is located below the cable tray. Although propagation through this hole could have been possible, it would be unlikely. To propagate from the Cable Spreading Room to the Auxiliary Room, a fire from the cable insulation on the Control Building side (only combustion source) would have had to travel down to the hole, through the eleven inch deep hole, then would have had to burn through the damming board on the Auxiliary Building side. Similarly, a fire on the Auxiliary Building side would have had to burn through the damming board before it could propagate through the hole. In addition, the cable tray on the Auxiliary Building side has a cover that separates the cables from the hole in the seal, and would have provided an additional deterrent to fire propagation.

Both rooms 45 and 209 are provided with area wide smoke detection. The cable trays in the Cable Spreading Room are also provided with linear heat detection. The Cable Spreading Room also has an area wide deluge spray suppression system. The area wide fire detection systems in either room would be expected to alarm in the control room, allowing sufficient time for the fire brigade to respond before the fire could propagate into the other room. In addition, a

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Trojan Nuclear Plant	05000344	92	-026	-04	21	of 28

TEXT (17)

fire in the Cable Spreading Room would be detected and the suppression system automatically actuated, which would allow response by the fire brigade before the fire propagated through the penetration.

The Cable Spreading Room contains power and control cables for both trains of safe shutdown equipment. However, due to the considerations discussed above, it has been concluded that safe shutdown capability and ability to prevent fire propagation between the affected rooms was not compromised by Penetration 594's as-found condition.

Fire Barrier No. 2044

This wall is located entirely within fire area E1 and is accordingly not a fire area barrier/boundary. The wall separates the EPA in fire area E1 from the main E1 area. It does, however, separate potential combustibles in the EPA from redundant safe shutdown cables in the open/main E1 area. For this reason, the EPA wall has been described and credited in the Appendix R Section III.G.2.b exemption request for E1.

With one train of safe shutdown cables protected with one-hour rated fire wrap and with installed fixed suppression and detection systems inside the EPA, Appendix R separation requirements are satisfied in this particular area of E1. The separation deficiency outside the EPA shield wall establishes the need for the Appendix R exemption in E1.

The wall is credited with separating potential combustibles in the EPA from the redundant exposed cables in the area addressed in the NRC exemption request. Since an incipient fire must be postulated in E1 at the specific location where the exemption is required/requested, separating the combustibles inside the EPA from the open E1 area does not add significantly to technical justification of the NRC exemption. The high density open-head sprinkler system is the dominant fire protection feature that is credited with suppressing postulated fires at their incipient stage such that both trains of safe shutdown cables are not affected. Therefore, the unsealed penetrations did not compromise nuclear safety or affect the Plant's ability to achieve safe shutdown.

Penetration 2299

There were no safety consequences resulting from Penetration 2299 being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas, since Penetration 2299 was installed, that would have challenged the barrier.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	05000344	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	22 of 28
		92	- 026	- 04	

TEXT (17)

The implication of this event is that this penetration was not able to provide the 3-hour fire barrier, had a fire occurred in either of the affected fire areas. Test data indicates that three inches of grout would equate to approximately a 1 hour and 48 minute fire rating. The combustible loading in the affected fire areas is less than fifteen minutes in Fire Area A1 and less than thirty minutes in Fire Area A4a. Therefore, based on combustible loading in both fire areas and the estimated fire rating of the as-found seal, a fire would not have been able to propagate through the penetration from either side of the wall.

Penetration 1108

There were no safety consequences resulting from Penetration 1108 being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas, since Penetration 1103 was installed, that would have challenged the barrier.

The implication of this event is that this penetration was not able to provide the three-hour fire barrier, had a fire occurred in either of the affected fire areas (C12 and T1). The postulated fire duration in each of the affected fire areas on either side of the barrier is low (less than fifteen minutes for either fire area) due to the type and amount of combustibles in each area. In addition, both fire areas are provided with sprinkler systems, as well as portable extinguishers and hose stations. A postulated fire, after reaching the penetration on either side by burning through the sheet metal and pipe insulation surrounding the pipe, would have had to travel through the thirty-four inch penetration (which contains no combustible material) in the block wall to the other side of the penetration, then burn through the sheet metal and pipe insulation on that side in order to propagate through to the other fire area. Therefore, it would be unlikely that a fire would have been able to propagate through the penetration from either side of the wall. Even if it had, there is no safety-related or safe-shutdown related equipment in Fire Area C12. While there are safe-shutdown related cables near the penetration in Fire Area T1, they are located more than 20 feet below the penetration. Due to the considerations discussed above, it has been concluded that safe shutdown capability and ability to prevent fire propagation between the affected rooms was not compromised by Penetration 1108's as-found condition.

Unnumbered Penetration in Fire Barrier C-061-22

There were no safety consequences resulting from the unnumbered penetration being nonfunctional for more than seven days. There has not been a fire in either of the affected areas that would have challenged the barrier.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Trojan Nuclear Plant	05000344	92	-026	-04	23 of 28

TEXT (17)

The implication of this event is that this penetration was not able to provide the 3-hour fire barrier, had a fire occurred in either of the affected areas. Test data indicates that one inch of grout would equate to approximately a 45 minute fire rating. Based on a review of the Trojan Permanent Combustible Loading Table (FP-902) and a walkdown of each area performed on November 16, 1992, by a fire protection engineer, the combustible loading in each affected fire area is less than thirty minutes. Therefore, based on combustible loading in both fire areas and the estimated fire rating of the as-found seal, it is unlikely that a fire would have been able to have propagated through the penetration from either side of the wall.

Penetration 3140

There were no safety consequences resulting from Penetration 3140 being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas that would have challenged the barrier.

The implication of this event is that this penetration was not able to provide the 3-hour fire barrier, had a fire occurred in either of the affected fire areas. Based on review of the Trojan Permanent Combustible Loading Table (FP-902), the combustible loading in Fire Area A1 is less than five minutes and the combustible loading in Fire Area A5 is less than twenty minutes. Therefore, due to the type and amount of combustibles in each fire area, the postulated fire duration in each of the affected fire areas on either side of the barrier is low (less than twenty minutes for either fire area). The combustibles nearest to the penetration are cables in a cable tray located approximately two feet below the penetration in Fire Area A5. Neither fire area is provided with fire detection or automatic suppression systems, although manual fire fighting equipment is available in both areas.

In order for a fire to propagate from one of the affected fire areas to the other, it would have to first reach the penetration, degrade the end cap, then travel through the twenty-four inch penetration. Fire propagation from either room to the other, given the amounts and types of permanent combustibles in each affected room, and the fact that there were no combustibles within the conduit to support fire propagation, would be unlikely.

Fire Area A1 contains the Train "A" Residual Heat Removal Pump, Train "A" Centrifugal Charging Pump, and some safe shutdown-related cables. Fire Area A5 contains no safe shutdown-related equipment. Therefore, a fire in either room would not have been able to affect both safe shutdown trains.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	24 OF 28
		92	- 0 2 6	- 0 4	

TEXT (17)

Fire Barrier T-045-20

There were no safety consequences resulting from Fire Barrier T-045-20 being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas that would have challenged the barrier.

The implication of this event is that this barrier was not able to provide a 3-hour fire rated barrier, had a fire occurred in either of the affected fire areas. The first two problems reduced the wall thickness in the area of the degradations to less than six inches. The missing grout in the expansion joint discovered on December 13, 1992, was the opposite side of the same joint seal with the earlier missing grout problem. The amount of grout missing from both sides of the joint left a thickness of approximately 3-1/2 inches of grout in the joint seal.

Test data indicate that three inches of grout would equate to approximately a 1 hour and 48 minute fire rating. According to Trojan Permanent Combustible Loading Table (FP-902) the combustible loading in the entire fire area E1, from 45' to 93' elevation, equates to a fire duration of less than thirty minutes. Similarly, the fire duration in fire area T1 at 45' elevation is less than 40 minutes. Therefore, based on the permanent combustible loading tables for both fire areas and the estimated fire rating of the as-found barrier, a fire would not have been able to propagate through the penetration from either side of the wall.

Penetrations 1092, 1093, 1094 and 1095

There were no safety consequences resulting from these penetrations being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas that would have challenged the barrier.

The implication of this event is that these penetrations were not able to provide a 3-hour fire rated barrier, had a fire occurred in either of the affected fire areas. Based on review of the Trojan Permanent Combustible Loading Table (FP-902), the combustible loading in the Cable Spreading Room equates to an equivalent fire severity of less than one hour and fifteen minutes. Similarly, the fire loading within Room 59 (Valve Closet) equates to a fire severity of less than eighteen minutes.

The valve closet does not contain a significant amount of combustibles, and is not a normally occupied area. The door to the room is normally locked, and is controlled by Security. The room is protected by an automatic sprinkler system. The fact that the penetrations extend above the floor would make it unlikely that any flammable liquids could leak from Room 59 below to the Cable

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	25 of 28
		92	- 0 2 6	- 0 4	

TEXT (17)

Spreading Room. However, this room is not identified on FP-902 as a flammable liquid storage area. In addition, the four penetrations were sealed with several inches of foam that would provide some degree of fire resistance. Therefore, with the conditions as stated above it is unlikely that a fire would have been able to propagate from Room 59 to the Cable Spreading Room.

The primary combustible in the Cable Spreading Room is cable. The combustibles located nearest to the four penetrations are cables in cable trays approximately eight feet below and ten feet horizontally from the penetrations. Cable Spreading Room cable trays are provided with a linear heat detection system. In addition, the Cable Spreading Room has an area-wide ionization smoke detection system, and an area-wide water deluge system. In the event of a fire in the room, the smoke detection system would alarm in the Control Room, which would result in the Fire Brigade being dispatched to the room. A fire would also be detected by the linear heat detection system, which would automatically activate the water deluge system. These considerations, combined with the fact that the existing foam in the penetrations would have provided some fire resistance, makes it unlikely that a fire would have been able to propagate from the Cable Spreading Room up to Room 59.

Based on the above considerations, safe shutdown capabilities and the ability to prevent fire propagation between the two rooms was not compromised by the as-found condition of the four penetrations.

Penetration 1096

There were no safety consequences resulting from these penetrations being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas that would have challenged the barrier.

The safety implications for Penetration 1096 are the same as discussed above for Penetrations 1092, 1093, 1094 and 1095. The only difference is that Penetration 1096 was sealed with grout instead of foam. The discussion above concerning combustible loading, fire detection and suppression, and flammable liquid storage is valid for Penetration 1096. Therefore, safe shutdown capabilities and the ability to prevent fire propagation between the two rooms was not compromised by the as-found condition of Penetration 1096.

Fire Barriers T-063-01 and T-063-02

There were no safety consequences resulting from these penetrations being nonfunctional for more than seven days. There has not been a fire in either of the affected areas that would have challenged the

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	26 OF 28
		92	- 0 2 6	- 0 4	

TEXT (17)

barrier. The affected areas are all part of Fire Area T1. Fire Area T1 includes the general area of the Turbine Building at the 45', 63', 69' and 93' elevations. Concrete slab and concrete and masonry walls, three-hour fire rated, establish the fire boundaries in Fire Area T1.

The implication of this event is that Fire Barriers T-063-01 and T-063-02 were not able to provide a 3-hour fire rated barrier, had a fire occurred in either of the affected areas in Fire Area T1. As noted earlier in this report, these barriers are required to prevent; (a) a fire in the 45' el. east corridor, which contains the normal EDG ventilation intakes, from affecting Train A safe shutdown cables on the 69' el., and (b) a fire on the 69' el. affecting the Train A cables and the normal air intake for the Train B EDG.

Based on review of the Trojan Permanent Combustible Loading Table (FP-902), the combustible loading in the 45' el. east corridor containing the EDG normal air intake dampers (Room 83/Fire Area T1) equates to a fire severity of approximately sixty-eight minutes. Similarly, the combustible loading in the 69' el. Fire Area T1 (Room 108) equates to a fire severity of less than 45 minutes. Both areas are Transient Combustible Controlled Areas, in accordance with TPP 13-8.

The 45' el. area is provided with an automatic sprinkler system which would extinguish fires in the vicinity of the EDG normal air intakes and limit the temperature of the exposed structural steel underneath the 69' el. slab. The sprinkler system would also limit hot gas and smoke propagation to the ceiling. Based on a walkdown performed by Fire Protection and Compliance personnel during the investigation, there are no significant combustibles near the ceiling and no vertical cable trays running from the 45' el. through the floor slab at the 69' el. in the corridor (Room 83) area. Therefore, there is no means of flame propagation from the Room 83 area through the 69' el. slab.

Although the as-found condition of the putty does not provide a three-hour barrier, its thermal expansion characteristics would reduce the size of the through-floor cracks, thus limiting potential convective heat intensity streaming through the cracks. Since the Train A cables in the 69' el. area are located approximately eight feet above the floor, the cables would not be affected by the small amount of a possible convective heat stream. In addition, the void areas of the seal, although not providing a three-hour fire barrier, would be expected to withstand a worst-case fire on the 45' el. side of the barrier, particularly when the type and location of combustibles and the effects of sprinkler system operation are considered.

The seal, even with the void areas, is expected to provide a fire rating of at least one-hour. Even though the 69' el. area is not

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	27 OF 28
		92	- 0 2 6	- 0 4	

TEXT (17)

provided with an automatic suppression system, the fire severity in this area is less than one hour. The most significant threat in this area would be from a large combustible liquid fire. However, as stated above this area is a transient combustible controlled area, and not subject to flammable liquid storage. In addition, the thermal expansion characteristics of the putty would act to limit crack size, thus restricting potential combustible liquid flow through the 69' el. floor slab. As noted above, there are no vertical cable trays penetrating the 69' el. floor slab down to the 45' level. Thus, there is no means of promoting fire propagation from the 69' level to the 45' level through the inoperable seismic gap floor penetrations.

Therefore, based on the above discussion, safe shutdown capabilities and the ability to prevent fire propagation through the 69' el. slab seismic gap seals was not compromised by the as-found condition of the seismic gap seals.

Fire Barriers C-105-22 and 23, C-077-22, and C-117-01

There were no safety consequences resulting from Fire Barriers C-105-22 and 23, C-077-22 and C-117-01 being nonfunctional for more than seven days. There has not been a fire in either of the affected fire areas that would have challenged the barriers.

The implication of this event is that these barriers were not able to provide a 3-hour fire rated barrier, had a fire occurred in either of the affected fire areas (C6, C8 and C13, as described under the Discussion section of this LER). Based on a review of FP-902, the combustible loadings in the affected fire areas equate to fire severity levels of approximately thirty minutes or less for each area. In each fire area the nearest combustibles to the barriers are either cables in cable trays, lubricant or filter material. In each case, however, the combustibles were located more than ten feet away from the degraded areas of the barriers.

Fire Area C6 is provided with area wide smoke detection, Fire Area C8 is provided with area wide smoke detection, and Fire Area C13 is provided with an area wide water sprinkler system. In addition, each of these areas is provided with Manual Fire-Fighting Equipment.

The type and quantity of combustibles on each side of the affected barriers near the degraded areas of the barriers present fire hazards that would be unlikely to propagate through the degraded barriers, due to the fire severity levels and distance separating the combustibles from the degraded barriers in each fire area. Therefore, safe shutdown capability and the ability to prevent fire propagation between the various rooms/fire areas were not compromised as a result of the degraded barriers.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Trojan Nuclear Plant	050000044	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	28 of 28
		92	- 026	- 04	

TEXT (17)

PREVIOUS SIMILAR EVENTS

Deficiencies in the installation, inspection and maintenance of penetration fire barriers have been the subject of several Special Reports and Licensee Event Reports at Trojan. These deficiencies have received increased management attention. This attention has resulted in development of more rigorous penetration seal and overall barrier surveillance programs. The penetration fire barrier deficiencies detailed in this report were identified as a result of these surveillance improvements.

Two of the fire barrier problems described in this LER involve seismic gap seals in the Turbine Building. Problems with inadequate fire barrier seals in seismic gaps were previously reported in LER 91-28, submitted on August 30, 1991.

Additional fire barrier and fire barrier penetration deficiencies identified as a result of the ongoing 1992 Fire Barrier Surveillance will be provided in supplements to this report.