ATTACHMENT 1

ENGINEERING EVALUATION

ENGINEERING EVALUATION

S-C-FP-NEE-0936	Rev 0	Date: 12/21/94
TITLE:	FIRE PROTECTION REVIEW OF THE SALEM REACTOR COOLANT PUMP OIL COLLECTION SYSTEM	

1.0 **REVISION SUMMARY**

Original Issue

2.0 **PURPOSE**

This evaluation reviews Reactor Coolant Pump (RCP) oil collection systems installed at Salem to assure that their failure will not lead to a fire (a requirement of 10 CFR 50, Appendix R, Section III.O). The evaluation also considers equipment that is available to mitigate the consequence of a postulated fire.

3.0 **SCOPE**

This evaluation is applicable to RCP oil collection systems installed in both units of the Salem Generating Station.

4.0 **DISCUSSION**

4.1 BACKGROUND

Specific requirements for providing fire protection at commercial nuclear power plants originated with 10 CFR 50, "Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 3, "Fire Protection," which was issued on February 20, 1971. Criterion 3 reads:

> Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Fire-fighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components.

The Nuclear Regulatory Commission (NRC) published a proposed Fire Protection Rule (10 CFR 50.48), along with a proposed Appendix to 10 CFR 50 (Appendix R), in the Federal Register on November 19, 1980 (Federal Register 45 FR 76602). The proposed rule required all plants receiving an operating license prior to January 1, 1979, to comply with (backfit) Sections III.G, III.J, and III.O of Appendix R. The rule was approved by Congress and became law effective February 19, 1981. Section III.O of Appendix R requires oil collection systems for RCP motors and reads as follows:

> O. **Oil Collection System for Reactor Coolant Pumps**
>
> The reactor coolant pump shall be equipped with an oil collection system if the containment is not inerted during normal operation. The oil collection system shall be so designed, engineered, and installed that failure will not lead to fire during normal or design basis accident conditions and that there is reasonable assurance that the system will withstand the Safe Shutdown Earthquake.
>
> Such collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leak sites in the Reactor Coolant Pump lube oil systems. Leakage shall be collected and drained to a vented closed container that can hold the entire lube oil system inventory. A flame arrester is required in the vent if the flash point characteristics of the oil present the hazard of fire flashback. Leakage points to be protected shall include lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and lube oil reservoirs where such features exist on the reactor coolant pumps. The drain line shall be large enough to accommodate the largest potential oil leak.

On August 16, 1994, the NRC issued Information Notice (IN) 94-58, to inform Licensees of a RCP lube oil fire which occurred at the Haddam Neck plant on July 11, 1994. This IN also describes an event that occurred at the Millstone Nuclear Power Station, Unit No. 2 on July 27, 1994. The IN states that in both instances, the "design of the existing oil collection system was inadequate to contain existing and potential oil leakage paths." Failure of the RCP oil collection system at Haddam Neck resulted in a fire, the details of which are discussed in the IN (Attachment 9.1).

4.2 RCP MOTOR LUBE OIL SYSTEM

Four air cooled, vertical induction, RCP motors are required in each unit during operation. Bearings for these motors are of a conventional design with each motor using a thrust bearing and two radial (or guide) bearings. Each motor contains 200 gallons of oil which resides in two independent lube oil systems (Reference 6.3.8). Both lube oil systems provide a potential for the leakage of lube oil.

4.2.1 Upper Lube Oil System

The upper lube oil system contains approximately 175 gallons of lube oil. The upper oil reservoir provides lube oil to the upper radial bearing and the thrust bearing which are submerged in the oil. An Oil Lift System is available to supply high pressure lube oil to the thrust bearing to prevent bearing damage during motor starts. The Oil Lift System is only pressurized during motor starts. Once the RCP motor is rotating the Oil Lift System no longer requires pressurization so the lift pump is de-energized.

The upper radial bearing is lubricated by an impeller integral to the thrust runner. The upper lube oil system is cooled by an external oil cooler mounted to the motor. Component Cooling Water is supplied to this oil cooler.

4.2.2 Lower Lube Oil System

The lower lube oil system is contained within the lower lube oil reservoir which provides lubrication to the lower radial bearing. The lower reservoir, which contains approximately 25 gallons of oil, is cooled by an oil cooler installed in the reservoir. Component Cooling Water is also used to cool oil in the lower lube oil system.

4.3 RCP OIL COLLECTION SYSTEM

The RCP oil collection system is provided to collect oil which leaks from both pressurized (Oil Lift System) and unpressurized (bearing lubrication system) leak sites of the RCP motor. Most of the RCP lube oil system is unpressurized with the exception of piping in the RCP Oil Lift System which is pressurized when the oil lift pump is operating. Discussions concerning both the pressurized and unpressurized portions of the RCP oil collection system follow.

4.3.1 RCP Motor Oil Lift System Ruptures and Leaks

The Oil Lift System is considered to provide the most significant risk for the leakage of lube oil from the RCP motors. During operation of the oil lift pump, the piping of this system operates at high pressures and is subject to leaks and ruptures. In addition, the Oil Lift System is part of the upper lube oil system which contains approximately 88% of the lube oil inventory for the RCP motor (175 of the 200 gallons of lube oil contained in each motor).

Piping for each RCP Oil Lift System is fully enclosed in a shroud that will collect oil from the rupture or leakage of a lube oil pipe regardless of the location. Drains are provided in each shroud to transfer any oil that leaks from the Oil Lift System to oil collection tanks.

The Oil Lift System is only operated for short periods of time during start-up of the RCP motors limiting the potential for ruptures and high pressure oil leaks in this system. Pressures within the Oil Lift System are low when the oil lift pump is not operating.

4.3.2 RCP Motor Lube Oil System Leaks

Potential leak sites in low pressure portions of the RCP motor lube oil system (such as overflow lines, lube oil cooler, oil fill and drain lines, or the flanged connections of this system), are provided with pans strategically placed to collect the oil and direct it to the collection tanks.

4.4 EVALUATION TO ASSURE FAILURE WILL NOT LEAD TO FIRE

As previously presented, 10 CFR 50 Appendix R, Section III.O, requires the design and installation of an RCP oil collection system such that "failure will not lead to fire during normal or design basis accident conditions..." This evaluation will consider lube oil which leaks from the RCP motor that may not be collected by the RCP oil collection system. Any oil released from the RCP motor lube oil system that is not collected by the oil collection system would be expected to accumulate on, or near, the RCP motor and pump assembly. For a fire to occur, oil would need to be exposed to an ignition source or come in contact with surfaces that have temperatures in excess of the ignition temperature of the oil. Attributes which prevent ignition of the oil in the vicinity of the RCP motor and pump assembly include:

1) The thermal design parameters of the Reactor Coolant System (RCS) are based on a cold leg temperature of approximately 545°F (the RCP's are in the cold leg of the RCS). Although this temperature exceeds the flash point of the lube oils currently being used in the RCP motors, piping surfaces in the vicinity of the RCP motors are insulated such that lube oil which leaks would only contact relatively cool surfaces of the insulation (Reference 6.3.5).

2) The pipe insulation in the vicinity of the RCP's is metallic and will not absorb lube oil. This prevents the oil from reaching the hot surfaces of the RCS piping (Reference 6.3.6).

3) There are no apparent sources for electrical ignition in close proximity to the RCP's. Cable terminations in the area are protected with junction/splice boxes. Use of these boxes is required (Reference 6.3.7).

4) The RCP's have induction (brushless) type motors which limit the potential for the ignition of any oil drawn into the motor through the ventilation system (Reference 6.3.8).

As a result of these considerations, failure of the RCP motor lube oil collection system should not lead to a fire so compliance with III.O is achieved.

4.5 ADDITIONAL CONSIDERATIONS WITH A POSTULATED FAILURE OF THE RCP MOTOR OIL COLLECTION SYSTEM

4.5.1 Design Considerations

If one of the RCP motor lube oil systems had a substantial oil leak, the instrumentation which monitors the oil level in each of the lube oil reservoirs would alert the operators of the leak by triggering a low oil level alarm in the Control Room. If the low oil level was not detected and oil continued to leak from the lube oil system, bearing temperatures would be expected to increase (Reference 6.3.8).

Bearing temperatures of each RCP motor are monitored at both the upper and lower shoes of the RCP motor thrust bearing and both the upper and lower radial bearings. Temperature data is provided to the data logging computer for monitoring and a high temperature alarm is provided to alert operators in the Control Room of problems with the thrust bearings (Reference 6.3.8).

These design features reduce the possibility for appreciable amounts of oil to accumulate at the RCP motor and pump assembly without being recognized in the Control Room.

In addition, a review of work orders associated with oil leakage from the RCP motors since 1985 identified only one with leakage from the RCP motor lube oil system (WO 930324145). This leakage was observed at the flange connection of the upper bearing oil cooler for the No. 14 RCP motor. Therefore, oil leakage from RCP lube oil lines is not a common occurrence.

4.5.2 Detection and Suppression of a Postulated Fire

Fire detection and suppression capabilities are provided in the vicinity of the RCP motors in the event that a fire occurred in this area.

As discussed previously, the Oil Lift System is considered the most significant risk for the leakage of lube oil from the RCP motors due to pressure and volume considerations. Piping of the Oil Lift System is fully enclosed in a shroud that will collect oil which is discharged from the RCP motor Oil Lift System and carry it to the oil collection tanks. A fire suppression system is installed internal to each shroud which will detect a fire and alert the control room of its presence. The normally closed fire water Containment Isolation Valve, which is used to isolate fire water from the Containment Structure, can be opened by a Control Room Operator from Panel 1RP5 (Unit 1) or 2RP5 (Unit 2). These panels are located in the Control Rooms to allow operation of the system to suppress and extinguish the fire.

If a fire were to occur outside the shroud, but in the vicinity of the RCP motor and pump assembly, it would be quickly detected by the smoke detectors that are installed in the area. Four early warning ionization detectors are installed above each RCP motor. These ionization detectors respond to the presence of smoke and are capable of detecting a fire in it's incipient stage. The detectors will alert the Control Room of any fire in the area and the fire brigade will be summoned (Reference 6.3.3).

4.5.3 Effect of a Postulated Fire in Containment

The consequences of fire within containment is analyzed in the Salem Fire Protection Report Safe Shutdown Analysis. The analysis concludes that a containment fire will not jeopardize the ability of the plant to effect a safe shutdown (Reference 6.3.1).

5.0 CONCLUSION/RECOMMENDATIONS

This evaluation concludes that failure of an RCP oil collection system will not lead to a fire because:

1) Hot piping surfaces have been insulated in the vicinity of the RCP motors.

2) The insulation used on the RCS piping is metallic.

3) There are no apparent ignition sources in close proximity to the RCP's.

4) The RCP motors are brushless.

As a result, the RCP motor oil collection system complies with the requirement of Appendix R, Section III.O, that "the oil collection system shall be so designed, engineered, and installed that failure will not lead to fire . . ."

In addition, if a fire event were to occur, features installed that would limit the duration and extent of the fire include:

1) Oil loss sufficient to constitute a significant fire hazard would trigger an alarm in the Control Room.

2) Piping of the Oil Lift System is enclosed in a shroud with an internal fire suppression system which can be used to suppress and extinguish a fire.

3) Smoke detectors installed above each RCP motor would alarm in the Control Room alerting it of fire in the area. The fire brigade would be summoned.

Finally, fires in containment are analyzed in the Safe Shutdown Analysis which concludes that a fire will not effect the ability to perform a safe shutdown of the plant.

6.0 REFERENCES

6.1 REGULATORY DOCUMENTS

6.1.1 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities"

6.1.2 10 CFR 50.48, "Fire Protection"

6.1.3 10 CFR 50 Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979"

6.1.4 Generic Letter 86-10, "Implementation of Fire Protection Requirements"

6.1.5 Information Notice 94-58, "Reactor Coolant Pump Lube Oil Fire"

6.2 SALEM REGULATORY DOCUMENTS AND CORRESPONDENCE

USNRC Docket Nos 50-272, 50-311, "Salem Generating Station Units 1 & 2, Updated Final Safety Analysis Report"

6.3 RELATED REFERENCES

6.3.1 DE-PS.ZZ-0001(Q)-A3-SSA, "Salem Fire Protection Report - Safe Shutdown Analysis"

6.3.2 DE-PS.ZZ-0001(Q)-A6-GEN, "Salem Fire Protection Report - General"

6.3.3 SC.FP-EO.ZZ-0001(I), "Control Room Fire Response"

6.3.4 Salem Incident Report No. 94-362

6.3.5 PSE&G Standard Specification 71-6100, "Heat Insulation"

6.3.6 PSE&G Detail Specification 72-6223, "Thermal Insulation of Nuclear Piping and Equipment"

6.3.7 SC.DE-TS.ZZ-2034(Q), "Technical Requirements for Construction of Electrical Installations, Salem Generating Station"

6.3.8 DE-CB.RC-0042(Q), "Salem Configuration Baseline Document, Reactor Coolant System"

6.3.9 Drawing No. 218225, "Unit No. 2 - Reactor Containment, Reactor Coolant Pump Oil Lift Pump Enclosure Drain - Plans & Sections"

6.3.10 Drawing No. 240165, "Unit No. 1 - Reactor Containment, Reactor Coolant Pump Oil Lift Pump Enclosure Drain - Plans & Sections"

6.3.11 Drawing No. 250850, "No. 1 Unit - Reactor Containment, Reactor Coolant Pump No. 11, Oil Collection Pans, Pan Supports"

6.3.12 Drawing No. 250851, "No. 1 Unit - Reactor Containment, Reactor Coolant Pump No. 12, Oil Collection Pans, Pan Supports"

6.3.13 Drawing No. 250852, "No. 1 Unit - Reactor Containment, Reactor Coolant Pump No. 13, Oil Collection Pans, Pan Supports"

6.3.14 Drawing No. 250853, "No. 1 Unit - Reactor Containment, Reactor Coolant Pump No. 14, Oil Collection Pans, Pan Supports"

6.3.15 Drawing No. 250854, "No. 2 Unit - Reactor Containment, Reactor Coolant Pump No. 21, Oil Collection Pans, Pan Supports"

6.3.16 Drawing No. 250855, "No. 2 Unit - Reactor Containment, Reactor Coolant Pump No. 22, Oil Collection Pans, Pan Supports"

6.3.17 Drawing No. 250856, "No. 2 Unit - Reactor Containment, Reactor Coolant Pump No. 23, Oil Collection Pans, Pan Supports"

6.3.18 Drawing No. 250857, "No. 2 Unit - Reactor Containment, Reactor Coolant Pump No. 24, Oil Collection Pans, Pan Supports"

6.3.19 Drawing No. 239852, "No. 1 & 2 Units - Reactor Containment, Reactor Coolant Pump, Motor Oil Lift Assembly Enclosure"

6.3.20 Drawing No. 250272, "No. 1 Unit - Reactor Containment, Reactor Coolant Pump 12 & 14 Oil Collection Pans & Drains, Plans and Sections"

6.3.21 Drawing No. 250273, "No. 1 Unit - Reactor Containment, Reactor Coolant Pump 11 & 13 Oil Collection Pans & Drains, Plans and Sections"

6.3.22 Drawing No. 250274, "Details"

6.3.23 Drawing No. 250275, "Details"

6.3.24 Drawing No. 250276, "No. 2 Unit - Reactor Containment, Reactor Coolant Pump 21 & 23 Oil Collection Pans & Drains, Plans and Sections"

6.3.25 Drawing No. 250277, "No. 2 Unit - Reactor Containment, Reactor Coolant Pump 22 & 24 Oil Collection Pans & Drains, Plans and Sections"

6.3.26 Drawing No. 250297, "No. 2 Unit - Oil Pan Details"

6.3.27 Drawing No. 250298, "No. 2 Unit - Reactor Containment, Reactor Coolant Pumps - Oil Collection Pans, Details and Sections"

6.3.28 PSBP 301102, "Reactor Coolant Pumps and Motors"

7.0 EFFECTS ON OTHER TECHNICAL DOCUMENTS

None

8.0 ATTACHMENTS

NRC Information Notice 94-58, "Reactor Coolant Pump Lube Oil Fire"

9.0 REVIEW AND APPROVAL

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

August 16, 1994

NRC INFORMATION NOTICE 94-58: REACTOR COOLANT PUMP LUBE OI

Addressees

All holders of operating licenses or construction permits for pressurized-water reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to a problem that may exist with the oil collection system for the lube oil system components of reactor coolant pumps. 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

Haddam Neck Plant

On July 11, 1994, while operating at 100 percent power, the licensee for the Haddam Neck Plant received a low oil level alarm for the upper lube oil reservoir of reactor coolant pump No. 3. The licensee later observed that the upper bearing temperature for reactor coolant pump No. 3 had been increasing for approximately 6 hours prior to receiving the low oil level alarm and reached 82 °C [180 °F]. The licensee began a controlled power reduction to bring the plant to a power level condition which would allow the reactor coolant pump to be taken out of service. Simultaneously, a maintenance crew was entering containment to fill the oil reservoir. Upon entering containment, the maintenance crew observed smoke just inside the airlock. At this time, the upper bearing temperature reached nearly 93 °C [200 °F], and the licensee manually tripped the reactor from approximately 50 percent power. The heat detectors installed above the reactor coolant pump went into alarm approximately 50 minutes later. At about the same time, the fire brigade entered containment and reported a fire in the insulation around the pump casing and nearby piping of reactor coolant pump No. 3. The fire brigade removed insulation and extinguished the fire using portable dry chemical fire extinguishers. A relief crew later observed a reflash on the remaining insulation, removed this insulation, and extinguished the second fire.

The licensee determined that the oil leak and subsequent fire resulted from a crack in a 1-inch diameter, schedule 80, threaded PVC fitting in the pump lube oil system. The PVC fitting was installed between the reactor coolant pump oil reservoir and the oil lift pump to electrically isolate the oil lift pump from the reactor coolant pump motor. The oil leaking from the crack was not properly collected and routed away from high velocity cooling air, which blew the oil onto the insulation on the pump casing and pipe. The cooling air came from the reactor coolant pump motor and the area ventilation system. The high temperature of the reactor coolant system (approximately 282 °C [540 °F]) ignited the oil-soaked insulation. (The flash point of the lube oil is approximately 204 °C [400 °F].) The reservoir retained about 455 liters [120 gallons] of the approximately 755 liters [200 gallons] of oil originally in the reservoir. About about 150 liters [40 gallons] of oil was collected by the oil collection system, and 150 liters [40 gallons] leaked onto the insulation and the containment floor.

Millstone Nuclear Power Station, Unit 2

On July 27, 1994, the lube oil low flow alarm for the 'A' reactor coolant pump annunciated at Millstone Unit 2. Plant operators began reducing reactor power in accordance with plant procedures. Licensee personnel inspected all of the reactor coolant pumps and found that oil had dripped from the tops of the 'A' and 'D' pump motors, coating the outside of the motors. Most of the oil was contained by the oil collection drip pans; however, some of the oil that leaked from the 'A' pump motor was not contained. Based on the observed fire hazard in containment, the licensee shut down the plant.

After the plant was shut down, an NRC inspector examined the lube oil collection system and the area around the reactor coolant pumps. There were a number of small oil leaks on each pump motor although there was more leakage from the 'A' pump motor. The inspector observed that various equipment around the 'A' reactor coolant pump was coated with a film of oil and he estimated that several gallons of oil had collected in various areas outside the oil collection system. The inspector also noted that portions of the lube oil system were outside the oil collection system and that the collection system piping did not appear to be large enough to accommodate the largest potential oil leak.

Discussion

In pressurized-water reactors, each reactor coolant pump motor typically contains between 530 and 830 liters [140 and 220 gallons] of oil. Oil leaking from the lube oil system may come in contact with either (1) surfaces that are hot enough to ignite the oil, or (2) an electrical source of ignition. Appendix R to Part 50 of Title 10 of the *Code of Federal Regulations* requires the installation of an oil collection system to collect oil from all potential pressurized and unpressurized leakage sites. An adequately designed, installed, and maintained oil collection system is necessary to contain any oil released because of leakage or failure of the lubrication system and to minimize fire hazards by draining the oil to a safe location.

There are a number of differences between the reactor coolant pump motors and their associated lube oil systems at Millstone Unit 2 and Haddam Neck. For example, the Millstone Unit 2 motors do not use PVC or other synthetic couplings in the lube oil system. The Millstone Unit 2 reactor coolant pump motors are manufactured by General Electric Company while the motors at Haddam Neck are manufactured by Westinghouse Electric Corporation. However, the oil collection systems at the two plants are similar.

The Haddam Neck oil collection system is intended to collect lube oil from all potential leakage sites and to drain it to a vented, closed container to prevent a fire during normal conditions or design basis accident conditions. However, in this event the catch pan design, which relied on an unshielded vertical flow of oil, was not adequate. This design allowed the air flow around the motor to affect the vertical movement of the dripping oil and allowed it to escape the collection system. To a lesser extent, the ventilation system also created air currents in the vicinity of the pump, which prevented some of the oil from being collected.

The licensee is installing a steel dielectric union on each reactor coolant pump motor at Haddam Neck to replace the PVC fitting which failed and caused the leak in this event. The licensee is also modifying the oil collection system to account for air currents near the reactor coolant pumps.

The ventilation system for the Millstone Unit 2 containment does not contribute to the air flow around the reactor coolant pump motors. The only air flow in this area is caused by the motor itself. In addition, Millstone Unit 2 has installed mirror insulation on some of the piping in the vicinity of the reactor coolant pumps. This type of insulation would prevent oil from coming in contact with and igniting on the high temperature piping it insulates. These factors reduce, but do not eliminate, the likelihood of leaking lube oil reaching an ignition source. However, the design of the existing oil collection system was inadequate to contain existing and potential oil leakage paths. The licensee is evaluating modifications that can be installed during the current forced outage to ensure that the lube oil collection system for the reactor coolant pump motors meets the requirements of Appendix R.

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 Grimes

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Attachment:
List of Recently Issued NRC Information Notices

ATTACHMENT 2

RCP OIL COLLECTION SYSTEM
COMPLIANCE WITH 10CFR50, APP. 'R'

ATTACHMENT 2

Reactor Coolant Pump Motor Lube Oil

Appendix R, Section III.O requires that each reactor coolant pump be equipped with an oil collection system if the containment is not inerted during normal operation. Since the Containments of Salem Generating Station (SGS), Units 1 and 2 are not inerted, Appendix R, Section III.O applies. Section III.O of Appendix R specifically requires that such collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leak sites in the reactor coolant pump lube oil systems. An oil collection system for each reactor coolant pump was installed in SGS Units 1 & 2.

The reactor coolant pump oil collection system installed in *SGS* is comprised two separate elements. One element is a shroud that fully encloses the piping for each reactor coolant pump motor oil lift system. Although installation of these shrouds predates issuance of Appendix R, they are credited for containing any oil that may leak from the motor oil lift system. The second is a series of drip pans that were installed shortly after issuance of Appendix R. These drip pans are strategically placed to collect oil from potential leak sites in the low pressure portions of the reactor coolant pump motor lube oil system.

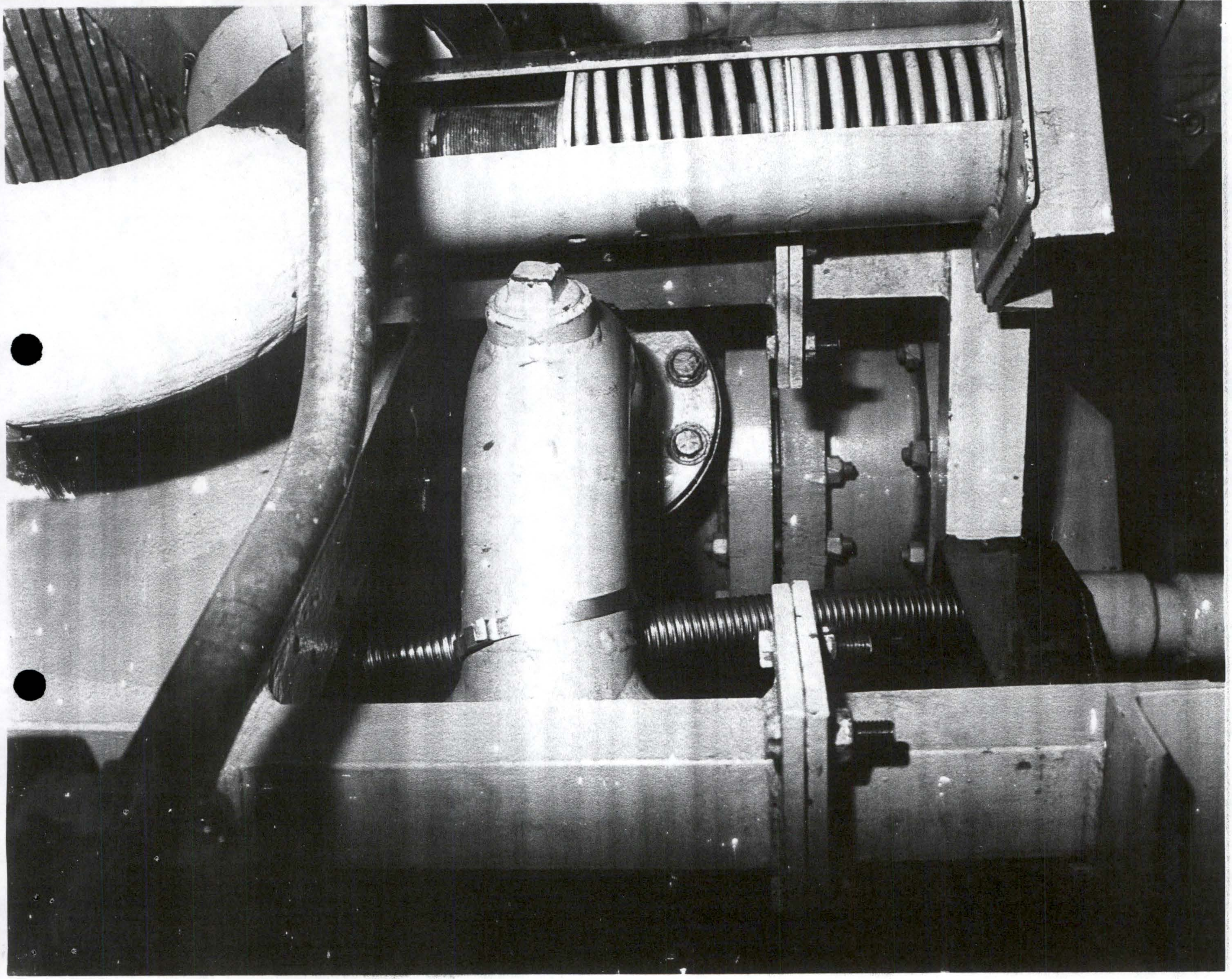
A recent inspection of the locations of the drip pans relative to potential leak sites identified two locations in the lube oil system that did not appear to have been provided with drip pans. These locations included a plug located in the lower lube oil cooler line and a flanged valve connection in the oil line to the upper oil level switch. Refer to the attached photograph of the plug taken at the #21 reactor coolant pump motor and flanged valve connection taken at the #24 motor. Based on inspections of all four reactor coolant pumps in SGS, Unit 2, these photographs are considered to represent typical configurations.

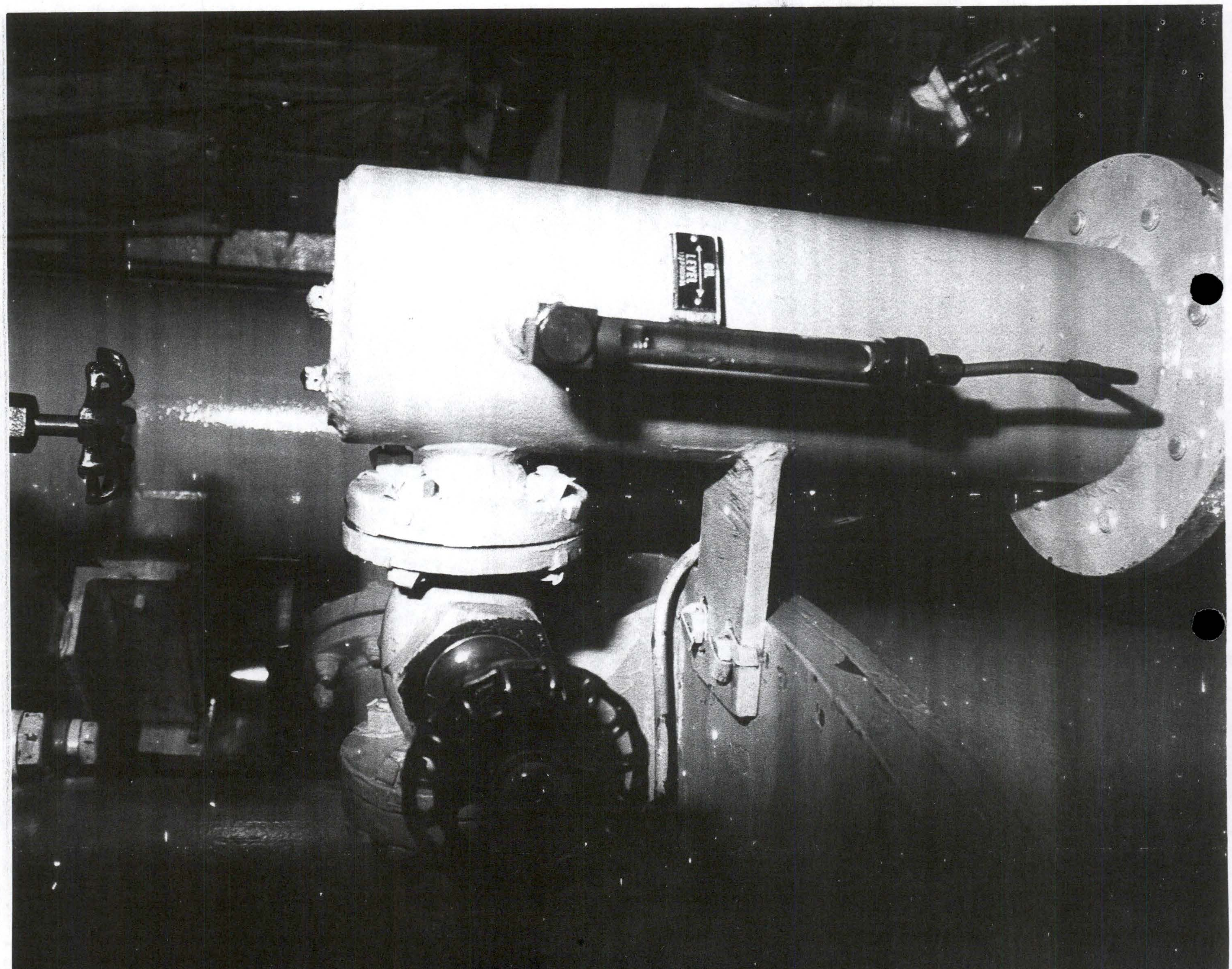
Upon further evaluation of the configurations of the plug and the flanged valve connection, it has been determined that they are not credible potential leak sites. Considering first, the plug: this plug is not an oil fill or drain line plug; there is currently no known system requirement to remove this plug and no credible reason or mechanism for this plug to be loosened.

The valve flange connection is located in a short section of piping between the reactor coolant pump motor and the upper oil level switch. The level switch is securely anchored to the motor with a bracket located above the piping and valve. In this fashion, the level switch would not be expected to vibrate at a different frequency than the reactor coolant pump motor. Consequently, vibrational stresses at this connection are not a concern. In addition, locking devices are provided on the flange bolts and the anchor connection to the reactor coolant pump motor. Finally, the upper level switch is located near the top of the reactor coolant pump motor such that it is subject to only static pressure.

Utilizing design drawings for Unit 1, it is reasonably concluded that similar configurations exist in Unit 1.

Based on this discussion, it is concluded that the plug and flanged valve connection are not credible potential leakage sites and would, therefore, not be required to be provided with an oil collection system. It is PSE&G's position that SGS complies with Section III.O of Appendix R.




OIL
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DEC 22 1994

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United States Nuclear Regulatory Commission
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Gentlemen:

RADIATION MONITORING SYSTEM UPGRADE UPDATE
SALEM GENERATING STATION
UNIT NOS. 1 AND 2
DOCKET NOS. 50-272 AND 50-311

Public Service Electric & Gas Company (PSE&G) hereby provides a status update for the upgrade of the Salem Generating Station, Unit Nos. 1 and 2, Radiation Monitoring System (RMS). During a meeting with NRC Region 1 personnel on April 18, 1991, PSE&G presented plans to upgrade the RMS. Upgrades were necessary due to spurious Engineered Safety Feature (ESF) actuations and the significant resources necessary to maintain the RMS operable.

To date, the following improvements have been implemented:

- In 1991, new inverters were installed in Unit No. 2 to improve conditioning of the instrument power supply for the RMS. This installation improved reliability by providing a more stable and reliable power source. This change was not required on Unit No. 1 due to different RMS equipment vendors.

- In 1991, the electronics for fifteen RMS channels (four for Unit No. 1 and eleven for Unit No. 2) were replaced. These modifications were the result of a task force study to eliminate the numerous invalid ESF actuations generated from the RMS channels.

- In 1993, the RMS upgrade project identified and developed design change packages to eliminate eight channels (six for Unit No. 1 and two for Unit No. 2) that were not required.

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- From 1992 through 1994, RMS task forces were created to optimize reliability through improved maintenance focus and minor modifications. The results from the task forces have been favorable in improving reliability and establishing the most meaningful upgrade schedule.

- Since 1993, the RMS upgrade project has issued the RMS Manuals as an engineering controlled document. Additionally, there is an ongoing effort to validate all secondary source decay tables for use within the RMS manuals.

For Salem Unit No. 1, PSE&G has developed and approved an implementation schedule for the RMS upgrade. For Salem Unit No. 2, the schedule has been developed and is in the approval cycle. A pilot project to replace the plant vent monitor is scheduled for the Salem Unit No. 1 refueling outage 1R12 (Spring 1995). The purpose of the pilot program is to evaluate the vendor's ability to supply equipment to the PSE&G specifications and to evaluate the engineering support that would be used to implement the modifications. The high priority channels were identified in the project planning documents. For Unit No. 1, these channels will be completed during the 1R13 refueling outage (Fall 1996). For Salem Unit No. 2, the high priority channels are planned for the 2R9 refueling outage (Spring 1996). Additional RMS enhancements will continue following 1R13 and 2R9, to continue to reduce corrective maintenance and further improve system reliability.

Should there be any questions with regard to this submittal, please do not hesitate to contact us.

Sincerely,

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