

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/88012(DRS)

Docket No. 50-255

License No. DPR-20

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, Michigan

Inspection Conducted: May 9-13, 18, 31, June 14, 29 and 30, 1988

Inspectors: *Joseph M. Ulie for*
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8-5-88
Date

Inspection Summary

Inspection on May 9-13, 18, 31, June 14, 29, and 30, 1988 (Report No. 50-255/88012(DRS))

Areas Inspected: Special, announced inspection of licensee action on previous inspection findings which included Sections III.G, J and L of 10 CFR Part 50, Appendix R. In addition, a review of the fire protection organization was performed. The inspection was performed in accordance with NRC Manual Chapter Procedures 30703, 64100, 64704, 92701 and 92702.

Results: Of the areas inspected, one apparent violation and one deviation were identified. Weaknesses in the licensee's compliance to Appendix R were evidenced by the licensee's apparent failure to complete required associated circuits analyses, as discussed in Paragraphs 3.b and 3.c. A deviation from a FSAR commitment regarding fire brigade member drill attendance is discussed in Paragraph 8.

DETAILS

1. Persons Contacted

Consumers Power Company (CPCo)

- +K. Berry, Director, Nuclear Licensing - General Office
- *S. C. Cote, Property Protection Supervisor
- D. Day, Engineering Analyst
- *D. H. Denoff, Senior Nuclear Assurance Consultant
- *R. W. Doan, Sr., Senior Plant Technical Analyst
- *E. A. Dorbeck, Staff Engineer - General Office
- *J. S. Erickson, Senior Engineer
- +*R. J. Frigo, Staff Support Supervisor
- *D. W. Joos, Administrative and Planning Manager
- *D. J. Malone, Nuclear Licensing Analyst
- E. Olhier, Staff Engineer
- *R. W. Phillips, Jr., Property Protection Operations Supervisor
- R. Pienkos, Senior Engineer
- *R. G. Rank, Burns Security - Post Commander
- *G. Slade, Plant General Manager
- +*R. W. Smedley, Staff Engineer, Nuclear Licensing - General Office
- +*K. A. Toner, Supervisory Engineer

Nuclear Regulatory Commission (NRC)

- C. D. Anderson, Enforcement Staff
- B. L. Burgess, Chief, Reactor Projects Section 2B
- J. A. Grobe, Director, Enforcement
- R. Kazmar, Project Manager, RIII
- +*E. R. Swanson, Senior Resident Inspector
- +T. Wambach, Licensing Project Manager, NRR

*Denotes those persons present at the exit interview of May 13, 1988.

+Denotes those participating in the telecon meeting on May 18, 1988.

●Denotes those participating in the telecon meeting on May 31, 1988.

-Denotes those participating in the telecon meeting on June 14, 1988.

○Denotes those participating in the telecon meetings on June 29 and 30, 1988.

The inspectors also contacted other licensee personnel during the course of the inspection.

2. Background Information

According to an NRC letter to Consumers Power Company dated November 24, 1980, the provisions of Appendix R that are applicable to the fire protection features of the Palisades Plant are divided into two categories. The first category consists of Sections III.G, Fire Protection of Safe Shutdown Capability, III.J, Emergency Lighting, and III.O, Oil Collection Systems for Reactor Coolant Pump. These Sections are required by the rule to be backfitted in their entirety regardless of whether or not alternatives to the specific requirements of these Sections have been previously approved by the NRC staff. The second category of Appendix R provisions applicable to the fire protection features of the facility consist of requirements concerning the "Open" items of previous NRC staff fire protection reviews of the Palisades Plant. An "Open" item is defined as a fire protection feature that has not been previously approved by the NRC staff as satisfying the provisions of Appendix A to Branch Technical Position APCS 9.5-1, as reflected in a staff fire protection Safety Evaluation Report (SER). The fire protection features of the Palisades facility that are in this category must satisfy the specific requirements of Appendix R by the dates established by Paragraph 50.48(c), unless an exemption from the Appendix R requirements for those features were approved by the Commission. Those "Open" items regarding Appendix R for the Palisades Plant included the Alternate Shutdown Capability performance goals of Section III.L as related to Section III.G of the Rule. Due to the interrelationship between Sections III.G and L, the inspectors' followup review of these Sections has been documented together in this report.

By NRC letters dated February 8 and May 26, 1983, July 12 and July 23, 1985, January 29, 1986 and December 3, 1987, six of seven licensee requested exemptions and the alternative shutdown capability analysis were approved. Certain of these exemptions, the alternative shutdown capability analysis and other applicable Appendix R requirements, were reviewed and evaluated during this inspection as detailed in this report. The one licensee requested exemption, dated June 19, 1985, which is still pending completion, regards an analysis to show that it is not necessary to relocate redundant instruments for the air room inside containment.

According to 10 CFR Part 50.48(c)(4), those fire protection features that require prior NRC approval by Paragraph (c)(5) of this section shall be implemented before startup after the earliest of the events given in Paragraph (c)(3) commencing 180 days after NRC approval. 10 CFR Part 50.48(c)(3) specifies those events as the following: (i) the first refueling outage; (ii) another planned outage that lasts for at least 60 days; (iii) an unplanned outage that lasts for at least 120 days. The NRC issued approval of specific licensee fire protection/safe shutdown features by the SER dated May 26, 1983. According to the licensee, the actual plant outages subsequent to NRC approval were as follows: (1) began August 12, 1983, before the 180 day time period had expired; (2) September 16, 1984 to November 21, 1984, an unplanned outage

which lasted less than 120 days; and (3) November 30, 1985 to March 3, 1986, the first refueling outage subsequent to the 180 day time period expiring after NRC approval was granted. Therefore, it was determined by the inspectors that the required features were scheduled to be completed by March 3, 1986.

3. Licensee Action on Previous Inspection Findings

a. (Open) Open Item (255/86022-01): The licensee indicated that the following three support systems and redundant equipment are not required for safe shutdown.

- (1) Heat tracing from the boric acid tanks (BATs) to the charging pumps;
- (2) Seal cooling for primary coolant pumps (PCP's); and
- (3) Heating, ventilating and air conditioning (HVAC) for areas involving safe shutdown equipment.

The licensee was asked to provide technical justification that these systems are not required for safe shutdown.

With regard to Item (1), under certain fire scenarios, heat tracing capability, which is used to maintain the boric acid solution in the BAT and associated piping to the charging pumps above the precipitation temperature of 120°F (10% solution), is lost.

In order to preclude a problem as the solution cools, the licensee intends to cycle the charging pumps every 20 minutes for a period of 1 minute and 45 seconds drawing warmer solution from the BAT's, thereby keeping the solution in the lines from cooling down to the precipitation temperature.

During the previous Appendix R inspection (July 1986), the inspectors determined that the supporting analysis for this methodology did not assume worst case ambient temperature and flowpath.

The licensee provided a reanalysis to the inspectors during this inspection (May/June 1988) which was reviewed and found to be acceptable. This reanalysis provided more conservative assumptions for ambient temperatures and flowpath. Further, Off-Normal Procedure (ONP) No. ONP 25.2 was reviewed and determined to include the actions necessary for the operator to initiate periodic charging pump operation. Step 4.7.1 of the procedure contains the instructions necessary to initiate this cycling by realigning, if necessary, charging pump suction with a BAT, closing the Volume Control Tank (VCT) outlet valve, opening a Boric Acid pump feed valve and starting a Boric Acid pump.

This portion of the open item is considered closed.

With regard to Item (2), during the previous Appendix R inspection, test data from the Byron Jackson Pump Division was reviewed concerning loss of cooling water to the coolant pump seals. The seal cartridge was tested under static conditions in a fixture with water at 550°F at a pressure of 2250 psig. The water was circulated to duplicate the system condition. The test was started with cooling water until stable temperature and pressure operating conditions were achieved (13 hours). Cooling water was then shutoff for 39 hours. At this point cooldown procedures were followed for 14 hours. Maximum seal leakage was 0.27 gpm after 24 hours without cooling water. An inspection of the parts after the test disclosed some cracking of the seal face and slight extrusion and hardening of the nitrile "U" cups.

This was considered an open item because the portion of the test without cooling water was run for 39 hours and not the 72 hours required by Appendix R. The licensee's position as specified in the October 14, 1986 letter from Consumers Power Company to NRC Region III was that the test was considered applicable to the Palisades PCP's.

According to the NRR Licensing Project Manager, this item is being reviewed by NRC Headquarters as part of Generic Issue 23 regarding PCP Seal Failure. Therefore, this portion of the item will remain open pending NRC review of Generic Issue 23.

With regard to Item (3), documentation was not available during the previous Appendix R inspection to support the licensee's contention that HVAC for safe shutdown equipment was not required. The licensee's analysis, designated EA-A-PAL-86-148-01, dated December 5, 1986, evaluated the effect of the loss of HVAC on safe shutdown equipment in the following areas:

- | | |
|--|---|
| • West Safeguards Room | Room 5 |
| • Auxiliary Feedwater (AFW) Room | Room 7 |
| • Charging Pump Room | Room 104A |
| • Component Cooling Water (CCW) Room | Room 123 |
| • West Electric Penetration Room | Room 250 |
| • Service Water Screen House | Room 136 |
| • Cable Spreading, IC Switchgear Room
and Battery Rooms | Fire Areas 1,
4 and 8,
respectively |
| • Containment Area | Fire Area 14 |
| • Diesel Generator (DG) Room | Room 1-1 |

The results of the analysis indicated that:

- The West Safeguards Room, based on a 590' elevation corridor fire damaging the fan cooler circuits, could reach the equipment qualification temperature of 135°F in approximately 35 hours, with the primary heat input into the room from pumps P-66B (HPSI) and P-54B (Containment Spray). This fire could also

affect operation of the Service Water valve CV-0878. Procedures to restore operability of the valve and one room fan cooler were not in place at the time of this inspection.

On June 30, 1988, during discussions with the licensee regarding the "piggy backing" of the containment spray and the high pressure safety injection pumps, the licensee indicated that the pumps did not need to be operated continuously for 35 hours, and that a reactor cooldown (assuming normal plant conditions) could be accomplished between 12-24 hours. However, without charging pumps, and assuming that the cooldown would last for 35 hours, room temperatures could exceed 135°F in the West Safeguards Room, as was indicated in the licensee's analysis. Based on the fact that plant cooldown must be accomplished within 35 hours and assuming that a fire renders the charging pump inoperable; it was recommended that the licensee place into Procedure No. ONP 25.2 a statement alerting plant operators of the need to achieve cold shutdown conditions within the 35 hours stated in their analysis.

On June 29 and 30, 1988, during telecon meetings with Region III personnel, the licensee committed to implement a temporary change standing order to Procedure No. ONP 25.2 to monitor the temperature of the 590' elevation corridor in the West Safeguards Room area. Region III personnel determined that the licensee's actions are adequate interim compensatory measures until the licensee performs a re-review of the HVAC analysis for both hot and cold shutdown functions and determines whether the above recommendation is appropriate.

- The DG 1-1 Room was not analyzed by test verification. The licensee proposes opening the DG doors to provide cooling. The inspectors determined that this method was not acceptable without verification by test or further analysis.

The analyses for the other rooms were reviewed and determined to be acceptable.

The above concerns regarding the West Safeguards Room and the DG 1-1 Room must be satisfactorily addressed for this portion of the open item to be closed.

- b. (Closed) Unresolved Item (255/86022-02): The licensee's breaker coordination study was determined to be incomplete in that time current curves were not available for inspector review. The following circuits were reviewed:

<u>Circuit</u>	<u>Status</u>
Switchgear 1C	Coordination Satisfactory
Switchgear 1D	Coordination Satisfactory

MCC 1	Coordination Satisfactory
MCC 7	Coordination Satisfactory
MCC 8	Curves Not Available For Review
BUS B11	Curves Not Available For Review
BUS B12	Curves Not Available For Review
Panel D11a	Curves Not Available For Review
Panel D21	Curves Not Available For Review

For Crane L3, Breaker 52-725, the largest load on MCC 7, the short time trip curve was found to overlap with the short time trip for MCC 7, supply breaker 52-1103. Breaker maintenance record review verified that the actual existing short time trip setpoints for breakers 52-725 and 52-1103 were coordinated. This circuit (MCC 7) was reviewed during the May/June 1988 inspection only.

During the previous Appendix R inspection, the licensee indicated that a completed bus coordination study had not been performed as part of the plant associated circuit analysis. The explanation given was as follows:

- Breaker coordination studies had been performed during design of plant modifications; however, the studies pertained only to the specific modifications under design.
- Breaker coordination studies were assumed to have been completed during plant construction.
- Time current curves were assumed to be retained in Bechtel construction records.

By letter dated October 14, 1986, the licensee indicated that a completed associated circuit/breaker coordination analysis was scheduled for completion by December 1, 1987.

During this inspection, the above circuits were again selected for review to verify that breaker coordination was provided as required. The inspectors determined that breaker coordination was now satisfactory. However, the inspectors determined that this coordination had not been completed, as required, at the time of the previous inspection. Failure to not have had a completed coordination study as discussed above is considered an example of an apparent violation (255/88012-01(DRS)) of Sections III.G and L of 10 CFR Part 50, Appendix R.

Further, during the previous Appendix R inspection, the licensee had not analyzed for the high impedance fault concern which is found in cases where potential multiple high impedance faults exist as loads on a safe shutdown power supply and cause the loss of the safe shutdown power supply prior to clearing the high impedance faults.

In discussions with NRR, it was determined that the high impedance fault concern is considered a newer issue and has been incorporated in Generic Letter 86-10. Originally, the associated circuit reviews did not involve this issue.

During this inspection, the inspectors determined that the licensee had analyzed for multiple high impedance faults. The licensee provided the inspectors with the "Palisades Alternate Safe Shutdown Equipment Multiple High Impedance Fault Analysis," (RJP12-87) dated November 30, 1987. This analysis concluded that high impedance faults will not effect the designated alternate safe shutdown equipment at the plant. The protection for high impedance faults is achieved by Procedure No. ONP 25.2, Revision 2, dated March 9, 1988. Procedure No. ONP 25.2 specifies tripping breakers and pulling control power fuses for those circuits which are supplied by safe shutdown power supplies but which are not required for safe shutdown.

The inspectors determined that the licensee's protection for high impedance faults was satisfactory.

- c. (Closed) Unresolved Item (255/86022-03): The inspectors reviewed the spurious signal and common enclosure areas of associated circuits. The licensee's high/low pressure interface analysis was determined to be incomplete in that (1) letdown, (2) pressurizer power operated relief valves (PORV), (3) reactor vessel head vent and (4) pressurizer head vent high/low pressure interfaces had not been analyzed for Appendix R purposes to determine if protection had been provided to prevent fire induced spurious signals from producing a fire induced LOCA. Items (2), (3), and (4) were determined by the inspectors to have been administratively controlled.

However, subsequent to this site visit, the licensee expressed disagreement that the above interfaces, except for the letdown high/low pressure interface, had not been previously analyzed for Appendix R purposes.

According to the licensee's October 14, 1986 submittal, if valves in the letdown flowpath are opened by fire-caused hot shorts, they can be closed by removing the air supply.

A second concern mentioned during the previous Appendix R inspection was that the licensee had not adequately addressed the issue of burned out current transformer secondaries inducing fires due to current transformer open circuits.

A third concern previously raised regarded the lack of a spurious signal analysis for the VCT outlet valve, MO-2087. This valve was selected because spurious operation of this valve could cause loss of charging flow.

Regarding the high/low pressure interface concerns, during this inspection the licensee provided an analysis designated EA-PAL-R-HI-LO, dated April 25, 1988, documenting the licensee's review of the following high/low pressure interfaces:

- Letdown System
- Pressurizer PORV System
- Reactor Head Vent System
- Pressurizer Vent System
- Shutdown Cooling System
- Primary Coolant System (PCS) Sample System

The inspectors review of each of the interfaces is discussed in detail as follows:

- (1) The Letdown System Interface includes the following components that form a high/low pressure boundary:
- CV-2001, 125 VDC electrically controlled air operated Letdown Isolation Valve,
 - CV-2003, 125 VDC electrically controlled air operated Letdown Orifice Isolation Valve,
 - CV-2004, 125 VDC electrically controlled air operated Letdown Orifice Isolation Valve,
 - CV-2005, 125 VDC electrically controlled air operated Letdown Orifice Isolation Valve,
 - CV-2002, 125 VDC electrically controlled air operated Letdown By-pass Isolation Valve, and
 - CV-2202, Letdown By-pass Flow Control Valve controlled by electric-pneumatic converter E/P2202.

The above components form two letdown flow paths, normal letdown and by-pass letdown. The normal letdown flow path consists of CV-2001 in series with the parallel arrangement of CV-2003, CV-2004 and CV-2005. The by-pass letdown flow path consists of CV-2001 in series with CV-2002 and CV-2202.

- (a) The by-pass letdown interface consists of the following valves in series:
- CV-2001, Letdown Isolation Valve,
 - CV-2002, By-pass Letdown Isolation Valve, and
 - CV-2202, By-pass Letdown Flow Control Valve.

CV-2001 is an electrically controlled, 125 VDC, air operated valve. The valve is a normally open valve which must be energized to close. 125 VDC electrical power is supplied to CV-2001, solenoid SV-2001, by conductors P51 and N1 of cable S55/C02-Z221/9. CV-2001 will spuriously open by fire induced opening of either conductor P51 or N1 of cable S55/C02-Z221/9.

CV-2002 is an electrically controlled, 125 VDC, air operated valve. The valve is a normally closed valve which must be energized to open. 125 VDC electrical

power is supplied to CV-2002 solenoids, SV-2002A and SV-2002B, by conductors 12 and 22 of cable S20/C02-Z221/6. Conductor P1 in cable S20/C02-Z221/6 has 125 VDC applied with the correct polarity to cause spurious opening of CV-2002 in the event of fire induced shorting to conductors 12 and 22.

CV-2202 is a normally closed pneumatically operated valve controlled by electric/pneumatic converter E/P-2202. E/P-2202 is controlled by a 4-20 ma (21-40 V) signal on conductors EP1 and EP2 of cable IM14/C02-3-Z243/1. CV-2202 would fully open if a fire induced 40 V signal was spuriously applied to conductors EP1 and EP2 of cable IM14/C02-3-Z243/1.

Since a 40 V signal was not found to be readily available to cause the fire induced spurious operation of CV-2202, the bypass letdown high/low pressure interface was found to be protected from fire induced spurious opening.

- (b) The normal letdown high/low pressure interface consists of CV-2001, in series with the parallel arrangement of the letdown orifice valves, CV-2003, CV-2004 and CV-2005.

By analysis, the licensee demonstrated protection for the simultaneous spurious opening of CV-2001 and any of the orifice isolation valves, CV-2003, CV-2004 or CV-2005 individually, but not in the event that more than one orifice valve spuriously open.

During the inspection it was determined that:

- CV-2003 opens when positive 125 VDC is applied to SV-2003 via conductor 32 of cable S17/C02/Z221/5,
- CV-2004 opens when positive 125 VDC is applied to SV-2004 via conductor 42 of cable S17/C02-Z221/5,
- CV-2005 opens when positive 125 VDC is applied to SV-2005 via conductor 52 of cable S17/C02-Z221/5,
- Conductor P1 of cable S17/C02-Z221/5 has positive 125 VDC applied,
- Cable S17/C02-Z221/5 is subject to various modes of fire induced failure including the shorting of conductors 32, 42 and 52 to conductor P1,
- CV-2001 opens if either conductor P51 or N1 of cable S55/C02-Z221/9 is opened,

- Cables S55/C02-Z221/9 and S17/C02-Z221/5 are routed in common enclosure in raceways H021, XP123, XK460, XK452, XK450, XK438, XK434 and XK430.

Since cables S55/C02-Z221/9 and S17/C02-Z221/5 are routed in common enclosure, the cables are susceptible to fire damage that could cause the simultaneous spurious opening of CV-2001, CV-2003, CV-2004 and CV-2005. And, since the licensee's analysis did not demonstrate protection for the simultaneous spurious opening of CV-2001, CV-2003, CV-2004 and CV-2005, the licensee had not demonstrated protection for the normal letdown high/low pressure interface.

The licensee's analysis concluded that the probability of any of the high/low pressure interfaces opening due to fire caused spurious actuation is significantly lower than the probabilities accepted for non high/low pressure interface spurious action and no modifications are necessary for compliance with 10 CFR Part 50, Appendix R. However, during this inspection, the inspectors took issue with the licensee's conclusion for the letdown interface following a review of NRC issued guidance materials (e.g., Generic Letter 86-10). This resulted in a meeting between the inspectors and NRR at NRC Headquarters on May 18, 1988. As a result of the meeting, it was determined that the safety significance of this issue warranted interim compensatory measures be implemented by the licensee until further licensee analysis was performed.

On May 18, 1988, following the above meeting, a conference call was held between the licensee and NRR/Region III. As a result of this conference call, the licensee committed to initially implement fire watch patrols and subsequently implemented a permanent procedural change in lieu of the fire watch patrols.

In summation:

In raceways H021, XP123, XK460, XK452, XK450, XK438, XK434 and XK430 redundant safe shutdown cables S55/C02-Z221/9 and S17/C02-Z221/5 were not separated in accordance with Appendix R, Section III.G.2 separation requirements. These cables are required for safe shutdown to prevent the simultaneous spurious operation (opening of CV-2001, CV-2003, CV-2004 and CV-2005) of the normal letdown flow path. Since the licensee's analysis demonstrated protection only for the simultaneous spurious opening of CV-2001 and either CV-2003, CV-2004 or CV-2005, the licensee failed to demonstrate a reactor coolant makeup capability for adequately maintaining reactor coolant level. Failure to have protected the letdown high/low pressure interface as discussed above is considered an example of an apparent violation (255/88012-01(DRS)) of Sections III.G and L of 10 CFR Part 50, Appendix R.

(2) The pressurizer relief high/low pressure interface consists of two parallel paths, each containing a PORV, PORV-1042B or PORV-1043B, and their associated block valves, MO-1042A or MO-1043A. The pressurizer relief high/low pressure interface is protected when at least one valve in each parallel path is shut. Specifically:

- Either MO-1042A is shut or PORV-1042B is shut, and
- Either MO-1043A is shut or PORV-1043B is shut.

During normal operations all four valves are shut and the breakers supplying power to the PORV solenoids are open. The plant Standard Operating Procedure (SOP 1) requires that the PORV power breakers be open during normal operations.

The PORV block valves, MO-1042A and MO-1042B, are motor operated valves requiring 480 VAC three phase power. 125 VDC control power is used to control these valves.

The two PORVs, PORV-1042B and PORV-1043B, are solenoid operated valves requiring 480 VAC single phase power. 125 VAC control power is used to control these valves.

While onsite, protection for the pressurizer relief valve high/low pressure interface was found to be satisfactory; however, additional in-office review of available information indicated that a potential pressurizer PORV high/low pressure interface concern existed. This concern was discussed with the licensee on June 14, 1988. As a result, the licensee provided the electrical inspector with additional technical materials to support a systematic analysis of the pressurizer relief valve high/low pressure interface.

This information was discussed with NRR representatives who advised that the pressurizer relief path was not considered to be an Appendix R high/low pressure interface concern and not subject to multiple spurious signal protection. Based upon the NRR guidance, the pressurizer relief high/low pressure interface concern is considered resolved.

- (3) The reactor head vent and pressurizer head vent flowpaths are small enough to limit flow to less than the capacity of one charging pump. In addition, the PCS sample line can be isolated by manual valves. The inspectors review determined that these high/low pressure interfaces are adequately protected.
- (4) The shutdown cooling suction valve motor operators, MO-3015 and MO-3016, were the only (powered by 480 V, 3 phase AC, installed in series) high/low pressure interfaces identified by the licensee and were controlled administratively by procedure.

The licensee controls the shutdown cooling high/low pressure interface by opening MO-3015 and MO-3016 motor operator circuit breakers, (breakers 52-167 and 52-271) in accordance with SOP 3, Section 7.3.4.h. This method of control provides protection from spurious opening of the valves in the event of fire induced control circuit failures, but does not prevent spurious operation in the event of fire induced hot shorts on the MO-3015 power cable, B167/B01-Z112/4, and the MO-3016 power cable, B271/B02-Z211/10. These power cables are susceptible to hot shorting to other 480 VAC, 3 phase cables; however, since all three phases are contained in a single cable instead of individual cables for each phase, the licensee's analysis concluded that the simultaneous spurious opening of MO-3015 and MO-3016 by fire induced hot shorts on cables B167/B01-Z112/4 and B271/B02-Z211/10 would not occur. The inspectors determined that this analysis demonstrated adequate protection for the shutdown cooling high/low pressure interface.

The second concern raised during the previous Appendix R inspection addressed the issue of burned out current transformer secondaries inducing fires due to current transformer open circuits. During the previous inspection, the inspectors determined that the licensee's analysis was generic in nature and not substantiated by technical data for the type transformers located at Palisades.

This concern was also discussed during the meeting held at NRC Headquarters on May 18, 1988, and was subsequently determined by NRR Power Systems Branch to not be an NRC concern. This issue is considered resolved.

The third concern raised during the previous Appendix R inspection regarded the lack of a spurious signal analysis for the VCT outlet valve, MO-2087.

During this inspection, the licensee's staff indicated that their review of VCT outlet valve, MO-2087, had determined that if this valve spuriously opened, the valve could be manually closed. During further inspector review, it was learned that manually closing the valve did not prevent valve MO-2087 from spuriously reopening when the manual operation was completed. Consequently, the licensee's protection for fire induced spurious opening of MO-2087 was determined by the inspectors to be ineffective in preventing fire induced spurious operation of the valve.

The inspectors review of plant schematic diagrams identified 125 VAC control power cables B161/C02-C33/2 and B161/B01-C02/1 as capable of causing spurious opening of valve MO-2087 if either of the cables were hot shorted to 125 VAC. Since valve MO-2087 was not protected from fire induced spurious opening, hot shutdown makeup capability using the charging pumps could not be demonstrated.

Consequently, following discussions with the inspectors, the licensee implemented a temporary change to Procedure ONP 25.1 to open MO-2087 valve breaker 52-16 prior to manually closing valve MO-2087. The inspectors determined that the licensee's change to Procedure ONP 25.1 will isolate spurious signals that could cause spurious opening of valve MO-2087.

In summation:

Protection to prevent 125 VAC hot shorts on control cables B161/C02-C33/2 and B161/B01-C02/1 for VCT outlet valve, MO-2087 was not provided in accordance with Appendix R, Section III.G.2 separation requirements. These cables require protection from 125 VAC hot shorts to prevent spurious operation (opening) of MO-2087 or measures must be implemented to isolate the hot shorts to prevent spurious opening. The VCT outlet valve (MO-2087) must be maintained shut to prevent loss of the charging pump(s). The charging pump(s) is/are required to provide the hot shutdown reactor coolant makeup function. The failure to protect the VCT outlet valve cabling or prevent spurious opening of MO-2087 could cause a loss of reactor coolant makeup capability which is required to ensure safe shutdown.

Failure to have protected the VCT outlet valve, MO-2087, from spurious signals could have caused a loss of the reactor coolant function as described above. This concern is considered an example of an apparent violation (255/88012-01(DRS)) of Sections III.G and L of 10 CFR Part 50, Appendix R.

Based on the above two examples of an apparent violation and the previous failure to have had adequately separated redundant cabling for certain Auxiliary Feedwater Pump pressure transmitters as discussed in Paragraph 4, the licensee was requested to address the potential for other plant components (e.g., valves, cabling) to be susceptible to the spurious signal and/or common enclosure concerns relative to the associated circuit area of 10 CFR Part 50, Appendix R.

- d. (Open) Unresolved Item (255/86022-04): The inspectors observed certain areas, such as: (1) the 590' elevation corridor of the Auxiliary Building, (2) the second level of the CCW Pump Room and (3) the Intake Structure, as being locations where additional fire detection appeared to be necessary.

In addition, the inspectors noted that the analysis for the metal panel in the floor of the 1-D Switchgear Room cableway did not take into account all of the combustible materials in the fire area located beneath this area, the absence of sprinkler protection immediately above the metal panel, and the possible loss of redundant shutdown systems on either side of the metal panel due to a fire below it.

During preparation for this inspection, an inspector discussed this matter with the NRR fire protection reviewer who raised the first three concerns. As a result of this discussion, the licensee's analyses are considered to need additional licensee re-review at this time. At the exit interview on May 13, 1988, the licensee was requested to contact the NRR fire protection reviewer to resolve these concerns.

With regard to the licensee's analysis for the metal panel in the floor of the 1-D Switchgear Room cableway, according to the NRR fire protection reviewer who initially raised this concern, a determination was made that this analysis is considered adequate and therefore this portion of the unresolved item is considered resolved.

- e. (Closed) Violation (255/86022-05): The inspectors observed that conduits were not internally sealed where they penetrate a three hour fire barrier required by Appendix R and enter a junction box, panel or other similar enclosure. The inspectors did not consider the fire protection afforded by these components equivalent to a three hour fire barrier. By letter dated December 12, 1986, the licensee committed to modify their criteria for sealing conduit penetrations to include the requirement to seal cables to conduit at the entrance to junction boxes and pull boxes when those junction boxes and pull boxes are in conduit four inches and smaller and are located within five feet of a fire barrier.

During this inspection, it was learned from the licensee that a plant walkthrough was conducted to determine which conduits needed to be sealed. As a result, an inspector visually inspected eight conduits (four inches or smaller) which entered junction boxes or related panels within five feet of a fire barrier. The inspector verified that these conduits were sealed with Dow Corning Product No. 3-6548 which is a silicone foam material. The conduits were identified as follows:

<u>Junction Box/Panel</u>	<u>Conduit</u>
JL 259	X 2422
JL 258	X 1297
JL 258	X 2423
J 9372	X 1466
JB AC-27	X 7214
J 9350	X 1462
J 9350	X 1471
JB AC-23	X 7263

The sealing project was performed under Work Orders No. 24700368 and No. 24700581 which were completed on February 15, 1987. Consequently, this item is considered closed.

- f. (Closed) Open Item (255/86022-06): The inspectors observed that cables penetrating the "Nelson" fire stop in the wall between the Cable Spreading Room and the Turbine Building appeared to exceed the maximum fill allowance (number of cables permitted to penetrate the seal) identified in the listing criteria of Underwriters Laboratories. This condition could result in a loss of seal integrity in the event of a fire. The licensee responded that the fill allowance was not exceeded. However, manufacturer's literature to support the licensee's contention could not be provided during the audit.

Attachment 6 of the licensee's October 14, 1986 submittal provided information to support the licensee's position that the as-installed configuration met the applicable installation instructions and the Underwriter Laboratories listing requirement.

As part of this inspection, a review of the licensee's submittal was conducted by the NRR fire protection reviewer who had initially raised this concern. A determination was made that the licensee's response to resolve this item was adequate. No further concern in this area was identified during this inspection. Therefore, this item is considered closed.

- g. (Closed) Open Item (255/86022-07): The inspectors observed that in the Intake Structure, the diesel powered fire pump was not sufficiently protected from the service water pumps to provide reasonable assurance that a single fire would not damage both normal and alternate shutdown capability. However, the licensee had previously identified this condition and requested a staff evaluation of the adequacy of the in-place protection.

By letter dated October 14, 1986, the licensee committed to the following:

- (1) To install a fire detection system in the Intake Structure before startup from the present outage,
- (2) To cover the control and annunciator cables for the diesel fire pump with one hour rated fire resistant material before March 1, 1987,
- (3) To install a fire suppression system directly over the fuel transfer pumps before March 1, 1987,
- (4) An analysis showing that extending the radiant shield to the west was not necessary would be completed by October 16, 1986, and
- (5) An analysis showing an additional drain at the fuel oil transfer pumps was not required would be completed by October 16, 1986.

During this inspection the inspector visually inspected and verified that Items (1), (2), and (3) mentioned above have been completed. In addition, a review of the licensee's analysis to satisfy Items (4) and (5) mentioned above were also reviewed and determined to be satisfactory. Further with regard to Item (2), the inspectors confirmed through review of Drawing Nos. E-375, Revision 38, dated March 9, 1987; E-739, Revision 6, dated March 13, 1987; and E-797, Revision 9, dated September 20, 1974 that the proper diesel fire pump cables were wrapped as stated.

- h. (Closed) Unresolved Item (255/86022-08): The inspectors observed that significant quantities of foam plastic insulation was installed above the suspended ceiling in the Technical Support Center (TSC) adjacent to the Control Room. This condition is contrary to NRC guidelines due to the combustibility of the material.

By letter dated October 14, 1986, the licensee committed to replace the foam with fiberglass during the first quarter of 1987.

During this inspection the inspectors requested and were provided Purchase Requisition No. 1226928 that implemented through contractor services the licensee's corrective actions to replace the thermal insulation (foam) above the TSC suspended ceiling with a insulated rigid fiberglass board. According to the licensee's corporate fire protection engineer this material is noncombustible. In addition, the inspector toured the TSC and visually inspected the licensee specified affected area above the suspended ceiling and determined that the foam material has been replaced. Therefore, this item is considered closed.

- i. (Open) Violation (255/86022-09): The inspectors observed that emergency lighting was not available in the VCT Room, Boric Acid Storage Tank (BAST) Room, 590' elevation near the air ejector and inside Containment near valve No. CV-2001, the letdown system isolation valve.

According to the licensee's response to this identified violation dated December 12, 1986, all areas containing safe shutdown equipment and the access and egress routes thereto are being re-evaluated regarding the requirement to provide ELUs. Further specifying that if locations in addition to those which already have ELUs installed are determined, ELUs will be installed at those additional locations. The date when full compliance was scheduled to be achieved was prior to the startup from the 1987 Maintenance Outage.

Further, by letter dated October 14, 1986, the licensee committed to install emergency lighting units (ELU's) at the VCT Room, BAST Room and fast makeup valve before startup from the fall 1986 maintenance outage. With regard to the containment letdown system isolation valve, the licensee's letter of February 10, 1988, revised the previous commitment describing compensatory action. The licensee requires operators to carry portable lights while performing ONP 25.2 (formerly EOP 10.2). This is to remain in effect until the problem of installing an ELU is resolved.

During this inspection, the inspectors verified, by review of Specification Change 86-241, that three of the locations missing ELU's now have units installed and that ONP 25.2 requires operators to carry portable lights as noted above. However, during an ELU walkdown performed on May 11, 1988, the inspectors learned that the licensee, during a previous internal ELU walkdown, identified 14 additional ELU's that were needed to be installed and also that the licensee incorrectly took credit for having the DC lighting system in-place for Appendix R emergency lighting purposes. Therefore, the inspectors requested the licensee to re-perform the ELU walkdown but this time only taking credit for the eight hour portable ELU's and performing a more thorough review. Consideration should be given as plant conditions permit to having selected plant areas AC and DC lighting shutoff to determine the adequacy of the installed eight hour emergency lighting. During telecon discussions between the licensee and inspectors on May 31, 1988, the licensee indicated that potentially not all 14 additional ELU's were required to be installed to meet the Rule. It was also observed during the inspectors walkthrough that several ELU lamps appeared to be misdirected so as not to optimize the illumination levels of the ELU's (addressed further below).

Based on the apparent discrepancies encountered during the ELU review, it appeared that communication between operations personnel performing the ELU walkdowns and guidance provided by appropriate technical staff could be improved. Therefore, it appears that additional management attention needs to be devoted to the Appendix R area. This is an item to be discussed during the upcoming Enforcement Conference. This item will remain open pending those discussions and further determination. However, based upon the licensee's previous inspection report response to the identified violation and the information learned during this inspection, additional enforcement action is being considered.

According to the licensee's staff, installation of the additional ELU's is scheduled to be completed prior to startup from the planned fall 1988 refueling outage. Licensee management acknowledged this schedule of installing the additional ELU's.

- j. (Closed) Unresolved Item (255/86022-13): During eight hour emergency lighting discharge testing conducted on July 31, 1986, an ELU bulb filament problem was identified. Consequently, the licensee was requested to provide a tentative completion date for resolution of the filament failure and for the finalized procedures for preventive maintenance of the ELUs.

By letter dated October 14, 1986, the licensee committed to activate the ELUs and maintain a record to determine the frequency of the ELU bulb burnout problem. The licensee further indicated that corrective action would be implemented if it is determined that bulb failure was a generic problem.

During this inspection, the licensee's staff provided the last two preventative surveillance Work Order Packages Numbered 24701585 and 24705811 for review. After a review of these work order packages and discussions with the electrical system engineer assigned ELU responsibility, the inspector was informed that all Appendix R required ELUs will have the bulbs replaced annually. Plant management acknowledged this at the status meeting on May 12, 1988. The replacement of the bulbs on an annual frequency is considered satisfactory corrective action based on the licensee's review. With regard to the finalized procedures for preventative maintenance of the ELUs, the licensee provided Procedure Nos. AE-5, Revision 1, dated July 7, 1986 and AE-5A, Revision 0, dated December 2, 1986 for review. The purpose of these procedures is to demonstrate a minimum lighting duration of eight hours for the battery operated ELUs and to verify that the ELUs are correctly aimed. The inspector determined that the procedures were adequately written although during the ONP 25.2 walkdown several ELU lamps appeared to be misdirected so as not to optimize the ELU illumination. Further guidance should be given to those individuals who routinely perform the ELU surveillance maintenance procedure regarding paying particular attention to proper lamp placement.

4. 1-D Switchgear Room

As discussed in Inspection Report 255/86022, the licensee's fire hazards analysis, Revision 5, states that, "No cables or equipment of the other train is allowed in this room." However, inspector review of the 1-D Switchgear Room, Fire Area 3, identified that cabling for the AFW P-8A and B low suction pressure trip transmitters (Numbered PT-0741A, B and DD) were not separated from the redundant cabling for the AFW pump P-8C low suction pressure trip transmitters (PT-0726A, B and C) in accordance with Section III.G.2 of Appendix R.

These cables are needed for safe shutdown in that the low suction pressure transmitters could trip the AFW flow to the steam generators. The AFW flow is required to provide the hot shutdown decay removal capability.

According to the licensee's October 14, 1986 submittal, a change to the Palisades Emergency Operating Procedures which recognizes that safe shutdown after a fire in the 1-D Switchgear Room may require use of the Auxiliary Shutdown Panel has been drafted. The submittal indicated that this procedure will be implemented before startup from the present outage. Further, according to the previous inspection report, this concern had been considered adequately addressed.

During this inspection, it was further determined that adequate procedural steps have been added to ONP 25.2 (formerly 10.2) so that a fire in the 1-D Switchgear Room will not prevent a safe shutdown.

5. Charging Pump Room/Corridor

By letters dated April 23 and July 16, 1984, the licensee requested an exemption from the requirements of Section III.G of Appendix R to 10 CFR Part 50 due to a concern that one potential fire in the Charging Pump Room or 590' elevation corridor at Palisades could result in the loss of all three charging pumps.

By letter dated June 19, 1985, the licensee requested the NRC to defer the evaluation of the exemption request in the Charging Pump Room pending completion of a licensee analysis which was evaluating the ability to use the high pressure safety injection (HPSI) pumps as a backup for the charging pumps. Subsequently, by letter dated December 23, 1986, the licensee provided analyses to demonstrate safe shutdown capability in the event of a fire in the Charging Pump Room on the 590' elevation corridor of the Auxiliary Building.

Consequently, by letter dated December 3, 1987, the NRC determined that the licensee's December 23, 1986 analyses was acceptable with the implementation of the licensee commitments. As a result, the inspectors reviewed ONP 25.2 and found this procedure contained the steps necessary to implement makeup injection by HPSI in the appropriate configuration. Yet, an NRC concern still remains for the Charging Pump Room/Corridor area as is described in Paragraph 3.d of this report.

However, during the review of Facility Change Request FC 722 (installation of N₂ backup to selected control valves (CV)) adding two valves for a backup nitrogen supply to the existing air supply for valve CV 3070 (HPSI pump subcooling) the inspectors found that the documentation contained quality assurance concerns. These concerns included a concern that the as-built configuration did not conform to the construction drawing, and that plant administrative procedures did not require checks be performed between construction completion and testing as required by ANSI N45.2.8, Paragraph 4.5 to assure that the installation was correct. Additional inspector concerns included a concern that contractor personnel performing the work were not familiar with the administrative procedures at the plant and at the start of the job did not have the work order and working level procedures at the job site. A similar issue was identified by the NRC during a previous inspection (255/87027-01) which already addressed this concern. The concerns between the as-built configuration and the drawings were reviewed with the licensee and were found not to affect the function of the modification.

6. Post-Fire Safe Shutdown Procedures

The licensee has developed two procedures for post fire safe shutdown. Procedure ONP 25.1 entitled, "Fire Which Threatens Safety Related Equipment," is a voluminous procedure because of the licensee's heavy reliance on manual actions. The procedure lists all of the equipment and cabling required for safe shutdown by fire area with the consequences of fire induced failure and suggested alternative actions; many of which are manual operations.

Errors in the procedure found during the previous Appendix R inspection have been corrected, however, during this inspection, the inspectors identified additional areas of concern as follows:

- In searching for specific areas within ONP 25.1, a 133 page document, it was found that the page numbers of specific areas in the Table of Contents were incorrect in many places.
- In general, the procedure is not user friendly in its present state. Specifically, many headings were not underlined or high lighted.

In discussing this concern with the licensee, it was pointed out that the basic concern regarded the ability of the operators to use the document under emergency conditions. The procedural Table of Content discrepancies encountered during the procedural review gave the appearance that insufficient supervisory reviews were performed to assure the completeness of this procedure. Based on this it appears that additional management attention needs to be devoted to the Appendix R area. The above two concerns are considered an open item (255/88012-03(DRS)) pending a complete review of Procedure ONP 25.1 by the licensee and a review by the NRC of the finished document.

Procedure No. ONP 25.2 entitled, "Alternate Safe Shutdown Procedure," was also reviewed during this inspection. This procedure is written in step by step format for fires which require control room evacuation. The inspectors did not identify any unacceptable items and, therefore, this procedure was determined by the inspectors to be satisfactory.

7. Communications

As part of the procedural review, the adequacy of communications during the use of those procedures was also reviewed.

During the previous Appendix R inspection, the inspectors determined that the hand-held radio system used for the procedure walkdown was inadequate due to poor communication between certain radio sets in some areas.

The licensee had in the interim mapped out the locations where communication is impaired and instructed the operators to move to the nearest location where communication can be maintained adequately. This was determined to be a satisfactory resolution of the concern by the inspectors.

8. Fire Protection Organization

The inspector examined a selected number of fire brigade training records, witnessed a halon system training class and witnessed an unannounced fire brigade drill.

As requested by the inspector, the licensee provided fire brigade training records and other records demonstrating the following: (1) that shift three had performed the required quarterly drills during the past one calendar year; and (2) that the shift supervisor is not a member of the

fire brigade. The inspector also witnessed a training session on an installed halon fire suppression system. The inspectors commented that this was a useful training session for all participants involved. However, during the review of the shift three fire brigade records, an inspector identified that one fire brigade member of shift three only attended one shift drill during calendar year 1987 and missed the first quarterly drill during calendar year 1988. In addition, three other fire brigade members missed one of the quarterly fire drills during the 1987 calendar year. Using the licensee's known license requirements as described in licensee submittals dated June 19, 1978, September 29, 1978, March 1, 1979, and March 5, 1979, the inspectors made a determination that this license requirement had not been violated based on the above approved submitted information. These licensee submittals were incorporated as license requirements in Amendment No. 64 to the Provisional Operating License dated February 10, 1981.

Following this inspection, it was learned during further in-office review that Section 12.2.1.12 of the FSAR Update, Revision 3, dated October 30, 1987, specifies that each fire brigade member should participate in each quarterly drill, but must participate in at least two drills per year. Based on the above licensee written commitment, the known information that one fire brigade member of shift three only attended one shift drill during calendar year 1987 is considered a deviation (255/88012-04(DRS)) from a FSAR commitment. During a telecon meeting held on June 14, 1988, the licensee was informed of the inspector's in-office determination of this issue.

As part of the fire protection organization review, the inspector requested an unannounced fire drill be conducted utilizing the on-duty fire brigade and support personnel as necessary.

An NRC document entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance," dated August 19, 1977, indicated that fire brigade drills should be performed in the plant so that the fire brigade can practice as a team. The licensee committed to this document as described in specific licensee submittals and as approved by the NRC. The NRC fire protection document further entailed other drill parameters.

The inspector requested a fire scenario which would involve the fire brigade demonstrating firefighting techniques (including fire hose handling) and which also would demonstrate the adequacy of communication interface between the fire brigade and Health Physics technician personnel during fire emergency conditions having radiation hazard involvement.

The fire drill postulated an ordinary combustible type fire in the Track Alley area on the 625' elevation level. This room has the potential to have radiological contaminated material involved in a fire. The inspector reviewed the fire drill scenario and pre-fire plan which included a walkthrough of the "fire" area prior to the drill.

In preparing to witness the fire drill, the inspector also reviewed appropriate portions of licensee procedures which relate to fire discovery and subsequent fire extinguishment.

This unannounced fire drill was initiated on May 11, 1988, at approximately 1825 hours. The inspector was stationed initially in the control room to observe the actions taken by the control room operators upon receipt of the fire alarm. The inspector then proceeded to the fire brigade station and followed the fire brigade to the "fire" area observing the brigade including certain support personnel actions until the fire drill was terminated.

The inspector observed fire brigade members assemble and don protective clothing including self-contained breathing apparatus at a fire brigade station (fire equipment room). The inspector evaluated the fire brigade and support personnel actions in determining and observing the following: (1) fire brigade members' conformance with established plant firefighting procedures; (2) an assessment of the fire brigade leader's direction of the firefighting efforts; (3) actual donning and use of the self-contained breathing apparatus (SCBA); (4) actual donning of protective clothing; (5) simulated use of an 1½" fire hose station; (6) use of portable radio communication equipment; (7) brigade timeliness in response and numbers of personnel responding with proper firefighting equipment; and (8) brigade leader interaction with the Radiation Control Technician (RCT) and other support personnel.

The inspector participated in the post-drill critique and provided the following comments regarding his observations:

a. Positive Observations

- The fire brigade leader provided overall satisfactory direction to the brigade members.
- The number of fire brigade members responding exceeded NRC minimum requirements.
- The fire brigade personnel properly utilized the wearing of the protective clothing and self-contained breathing apparatus (SCBA) and the utilization of the portable radios.
- A simulated notification to the offsite fire department.
- Two representatives from Health Physics, accompanied the fire brigade during the fire drill exercise.

b. Deficiency

- The fire brigade leader did not perform an initial size-up of the "fire" area upon arrival outside of the "fire" area.

The inspectors overall assessment of the fire drill adequacy was that the drill was satisfactory.

9. Open Items

Open items are matters that have been discussed with the licensee, and which will be reviewed further by the inspector, and which involves some action on the part of the NRC or licensee or both. An open item disclosed during this inspection is discussed in Paragraph 6 of the report.

10. Exit Interview

The inspectors met with licensee representatives (denoted in Paragraph 1) on May 13, 1988 to discuss the scope and preliminary findings of the inspection. A followup meeting was held with licensee representatives (denoted in Paragraph 1) via telecon on May 18, 1988. In addition, on May 31, 1988, additional discussions regarding the overall inspection findings were discussed between the licensee and NRC Region III personnel (denoted in Paragraph 1). Further, on June 14, 29 and 30, 1988, discussions were held between the licensee and NRC Region III personnel (denoted in Paragraph 1) to discuss the in-office finding of the FSAR deviation, the NRC review determination on the pressurizer relief high/low pressure interface issue; and the NRC concerns regarding procedural revisions to alert plant operators to the need to achieving cold shutdown conditions.

The inspectors also discussed the likely informational content of the inspection report with regard to documents reviewed by the inspectors during the inspection. Subsequently, the licensee did not identify any such documents as proprietary.