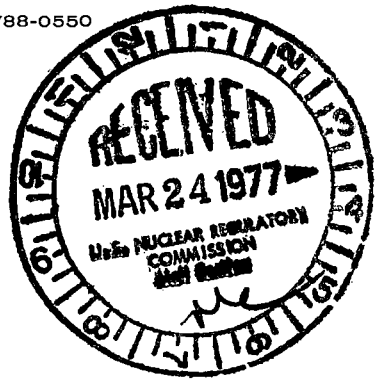
Consumers
Power
Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

March 23, 1977



Director of Nuclear Reactor Regulation
Att: Mr Albert Schwencer, Chief
Operating Reactor Branch No 1
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-255, LICENSE DPR-20 -
PALISADES PLANT - SUBMERGED
ELECTRICAL SYSTEMS STUDY

By letter dated May 26, 1976, you requested additional information concerning environmental qualification of electrical equipment and the effects of its submergence. That attached letter and report provide answers to questions attached to the reference letter with the exception of 1b. The environmental qualifications of other related equipment are provided in Sections 6 and 8 of the Palisades Plant FSAR and will provide the answer to question 1b.

On March 16, 1977, this subject was reviewed with members of your staff and we have concluded that implementation of the concepts provided in the Bechtel report will complete this issue. Consumers Power is making every effort to complete the required plant modifications during our next refueling outage.

David P. Hoffman

David P Hoffman
Assistant Nuclear Licensing Administrator

CC: JGKeppler, USNRC

7708040377

Bechtel Associates Professional Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

December 8, 1976

Mr. J. R. Yope
Operating Services Department
Consumers Power Company
1945 West Parnall Road
Jackson, Michigan 49201

Consumers Power Company
Palisades Plant
CPCO-GWO-8428
Bechtel Job No. 10512-040
Submerged Electrical Systems Study
File No. 0275
76-040-4

Reference: a) CPCo letter HFMN 07-76
Hoffman to Bixel dated 1/22/76

Dear Mr. Yope:

Please find enclosed six (6) copies of the report on the investigation of submerged electrical equipment inside containment for Palisades Plant.

The following salient factors are put forth for your consideration during the review of the report:

1. Determination of submerged equipment inside containment is based on a maximum water elevation of 596'-0" following LOCA. This was determined by our containment flooding calculations based on the following worst case flooding conditions, resulting from water volumes from the following:

   a) 1 - SIRW Tank
   b) 4 - Safety Injection Tanks
   c) 2 - Clean Waste Receiver Tanks, each ½ full (rupture)
   d) Primary Coolant System (LOCA)

   Please note that this figure of 596'-0" is in agreement with CPCO's calculations, ref. (a).

2. The exact mounting elevation of certain solenoid valves could not be determined from the layout drawings. It has, therefore, been conservatively assumed that all solenoid valves mounted on racks at elevation 590'-0" are liable to become submerged.

   In case a CPCo field check indicates that some of these valves are located above 596'-0", they should be deleted from Appendices A and E of the enclosed report.

3. In the case of size 2 MCC starters listed under Appendix C of the report, the schematic diagrams do not indicate the size of the existing control circuit fuse. It is recommended that this information be obtained from the field and entered under "Existing Primary Fuse" column in Appendix C. The next higher standard size of fuse should be selected for backup protection and its rating is to be entered under "Additional Backup Fuse Requirements" column.

4. Certain submerged instruments listed under Appendix F have been identified as being located outside containment and certain others as being above flood level. This is based on our review of Palisades physical layout drawings.

   These instruments have been included in Appendix F because of the reason that CPCo had already included these in the submerged electrical equipment list conveyed to NRC by CPCo by letter dated 4/7/76 by R. B. Sewell. It is recommended that CPCo review the location of these instruments again and delete these from Appendix F if it is determined that these are located outside containment or above flood level as the case may be.

   It is also to be noted that in a few cases, Appendix F does not indicate primary and backup protection fuse ratings. This is because of the reason that this information is not shown on the schematics. It is recommended that CPCo obtain this information from the field and include it under Appendix F.

5. As regards the environmental qualification of safety related components of the ECCS required to mitigate the consequences of a LOCA, it is to be noted that "safety related" or "non-safety related" status of equipment has not been altered as a result of this study and its findings. Since the safety related components of the ECCS had been originally procured with suitable environmental

qualifications, it is our opinion that no further verification is required since the design changes recommended by the submerged elect systems study do not alter the safety related status of equipment.

6. The subject of MCC 9, which is located inside containment, has been investigated. Even though MCC 9 is located well above flood level, since it is not disconnected following a safety injection signal but left exposed to the severe environmental conditions following a LOCA, it was assumed that electrical faults can develop in MCC 9 as though it were submerged.

   Our review indicates that in the case of MCC 9 feeder, under certain conditions, the fault current is too low to operate the backup protection ACB 52-1302 which is the incoming ACB to the 480V load center. It is, therefore, recommended that a breaker failure type of protection be employed on the MCC 9 feeder ACB. This will comprise of IDMT overcurrent relays and a timer connected to CTs on the feeder ACB. In case a feeder fault is not cleared by the tripping of the feeder ACB within a preset time, it will be assumed that the feeder ACB has failed and the load center incomer ACB will be tripped through the timer contacts. This will ensure that the penetration integrity is maintained in case of failure of primary protection and operation of backup protection.

In conclusion, we believe that the presentation of the enclosed report concludes the Bechtel activities covered by the scope of the CPCo Purchase Order No. 82320-Q dated 8/12/76.

In case of any questions, please do not hesitate to contact us.

Very truly yours,

C. A. St. Onge

C. A. St. Onge
Project Engineer

TM/CASO/pjh

(In Quintuplicate)

Enclosures (6)

Bechtel Associates Professional Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

December 8, 1976

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Very truly yours,

C. A. St. Onge

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Project Engineer

TM/CASO/pjh

(In Quintuplicate)

Enclosures (6)

INVESTIGATION OF SUBMERGED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT FOR PALISADES PLANT CONSUMERS POWER COMPANY BECHTEL JOB 10512-040

PREPARED BY
BECHTEL ASSOCIATES PROFESSIONAL CORPORATION
ANN ARBOR, MICHIGAN

DECEMBER, 1976

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III	ASSUMPTIONS AND BACKGROUND INFORMATION	2
IV	CONCLUSIONS	4
V	RECOMMENDATIONS	7

ATTACHMENTS

Appendix A, Sheets 1 thru 3	Submerged Equipment
Appendix B, Sheet 1	Submerged Motor Operated Valves not Disconnected following a Safety Injection Signal - Power Circuit Backup Protection
Appendix C, Sheet 1	Submerged Motor Operated Valves not Disconnected following a Safety Injection Signal - Control Circuit Backup Protection
Appendix D, Sheet 1	Submerged Pumps not Disconnected following a Safety Injection Signal - Power Circuit Backup Protection
Appendix E, Sheets 1 and 2	Submerged Solenoid Valves not Disconnected following a Safety Injection Signal
Appendix F, Sheets 1 thru 5	Submerged Instruments

I. PREFACE

Consumers Power Company issued a Purchase Order No. 82320-Q dated August 12, 1976, requesting Bechtel to conduct an investigation of electrical systems inside containment that will become submerged during a Loss of Coolant accident. Bechtel was requested to provide a report that explicitly defines methods of corrective action that can be taken to prevent any safety related system from being disabled as a result of submergence of any electrical system in containment. The Bechtel report was to be utilized by Consumers Power Company for providing answers to the questions presented by NRC to CPCo in the NRC letter dated May 25, 1976, Docket No. 50-255.

Bechtel provides this report in fulfillment of the above requirements for Consumers Power Company's information only and makes no representation, warranty, or guarantee, regarding any of the assumptions made in this report or the data contained herein. Further, Bechtel makes no representation, warranty, or guarantee as to the accuracy of the statements contained in the report regarding the methods of plant operation, plant operating history, or thermal withstand capability of penetration and accepts no liability whatsoever for such matters.

Further, the recommendations presented herein are based on attached and/or referenced documents which may or may not accurately depict the existing conditions of the Palisades Plant.

II. INTRODUCTION

The purpose of this study is twofold: first, to verify and document penetration integrity at calculated fault levels due to electrical faults inside the containment caused by submergence of electrical equipment following a LOCA; and second, to verify by analysis that operation of the backup protection for faults caused by submergence does not interrupt the supply to safety related equipment.

The enclosed tables, Appendices A and F, provide a complete listing of all submerged equipment in the containment.

III. ASSUMPTIONS AND BACKGROUND INFORMATION

1. It is assumed that primary protection does not operate and the fault is cleared by the operation of backup protection.

2. The penetration manufacturer, Viking, no longer manufacturers containment electrical penetrations and the business interests have been acquired by Pyle National.

The latter was contacted for the purpose of obtaining information concerning the thermal withstand capability of penetrations, but were unable to provide any information. The thermal withstand capability has, therefore, been determined on the basis of fault current withstand ratings specified under Section 3.1.4 of Specification No. 5935-E-20, Specification for Electrical Penetration Assemblies, which states the following:

"The penetration assemblies shall be designed and built to withstand fault currents as follows:

P1 - 80,000 amperes

P2 - 60,000 amperes

P3 through P5 - 15,000 amperes except for #9 and #12 conductors which shall be 1500 amperes.

The currents are momentary asymmetrical with an offset factor of 1.6 which decays exponentially for 3 cycles, then is interrupted by a circuit breaker."

Based on the above, the thermal withstand capability was calculated and found to be as follows:

Penetration type P1 - 3.2×10^8 Amp^2 Sec.

P2 - 1.8×10^8 Amp^2 Sec.

P3, P4, P5 - 1.125×10^7 Amp^2 Sec.

#9, #12 - 1.125×10^5 Amp^2 Sec.

IV. CONCLUSIONS

1. PENETRATION INTEGRITY

As a result of calculations and analyses, it has been determined that additional backup protection fuses are required to ensure that the integrity of penetrations can be maintained by the operation of the backup protection to clear the faults due to submergence in the following cases:

a. 480 volt feeders fed through Motor Control Center starters listed in the enclosed tables, Appendices B and D.

b. 120 volt AC control circuits associated with size 2 starters in the 480 volt Motor Control Centers listed in the enclosed table, Appendix C.

The enclosed tables, Appendices B, C, and D provide a complete listing of circuits under category (a) and (b) above and also indicate the size and type of the recommended backup protection fuses for each case. Further details have been shown under Section IV, Recommendations.

In the case of 120 volt AC control circuits associated with size 1 starters in the 480 volt Motor Control Centers, it has been determined by analysis and calculations that the worst case fault currents cannot exceed the continuous maximum current withstand capability of the associated penetrations. It is, therefore, concluded that no additional protection is required for these circuits.

In the case of instrumentation loop circuits, it has been concluded that even though submergence can lead to electrical faults, penetration integrity will not be compromised because of the current limiting feature inherent in the low energy instrumentation circuits.

The enclosed table, Appendix F, provides a listing and identifies all such submerged instrumentation devices.

2. INTERRUPTION OF POWER SUPPLY TO SAFETY RELATED EQUIPMENT ON OPERATION OF BACKUP PROTECTION

a. Provision of additional backup protection fuses for 480 volt feeders from Motor Control Centers shown under item IV-1(a) above will, in addition to ensuring penetration integrity, also serve to prevent the interruption of power supply to safety related equipment on operation of backup protection to clear faults on submerged equipment.

Enclosed tables, Appendices B and D, provide a complete listing of the above circuits.

b. In the following cases, it has been determined that the operation of existing backup protection is likely to lead to the interruption of the power supply to safety related equipment:

1. Certain 120 volt AC solenoid valves supplied from instrument AC distribution panel Y01.

2. Certain 125 volt DC solenoid valves and the Containment Building Gas Analyzing Panel C102 supplied from distribution panels D11 and D21.

3. 2400 volt feeders to Pressurizer Heater Transformer X16.

The enclosed table, Appendix E, provides a complete listing of the circuits covered by items 1 and 2 above.

Suggested design modifications for the above cases are outlined under Section V, Recommendations.

V. RECOMMENDATIONS

1. 480 volt feeders fed through MCC starters feeding submerged equipment not de-energized following a LOCA

As discussed under Conclusions, IV, 1(a) and IV, 2(a) above, it is recommended that additional fuses be installed in the MCC starters to provide backup protection for the existing circuit breakers in the MCC starters and also to ensure that the operation of backup protection does not lead to interruption of the power supply to other safety related equipment, namely, the remaining loads on the Motor Control Center.

It is recommended that a warning label be affixed to each of the above starters to caution the operator that both the starter circuit breaker and the backup fuses should be checked in case of interruption of power supply.

The enclosed tables, Appendices B and D, provide a complete listing of the above circuits and also the size and type of the recommended backup protection fuses.

2. <u>120 volt AC control circuits for size 2 starters feeding submerged equipment not de-energized following a LOCA</u>

For the above circuits, it is recommended that in addition to the existing control fuse, an additional fuse be installed to provide backup protection. The second fuse shall be installed in close proximity to the existing fuse to facilitate easy identification in the event of fuse blowing.

It is also recommended that a warning label be affixed to each of the above starters to caution the

operator that both the main and backup protection fuses should be checked in case of control circuit problems.

The enclosed table, Appendix C, provides a listing of the above circuits and indicates the requirement of backup protection fuses.

3. 120 volt AC control circuits for size 1 starters feeding submerged equipment not de-energized following a LOCA

For reasons outlined under item IV, (1) above, it is recommended that no design changes or modifications be instituted in these circuits since the penetration integrity is not compromised even under worst case fault conditions.

The enclosed table, Appendix D, provides a listing of the above circuits and indicates that control circuit backup protection is not required.

4. 2400 volt feeders to Pressurizer Heater Transformers X15 and X16

Pressure Heater Transformers X15 and X16 are fed from

2400 volt buses 1E and 1D through ACBs 152-305 and 152-211 respectively.

It is recommended that Combustion Engineering be consulted to confirm Bechtel's conclusion, discussed below, that the above ACBs be tripped in case of Safety Injection Signal through SIS relay contacts. It is our opinion that de-energizing of Pressurizer Heater Transformers following a Safety Injection Signal will not lead to a safety violation or compromise of Plant safety under any circumstances.

This conclusion is supported by the fact that according to the present circuit configuration, even though the Pressurizer Heater Transformer feeders are not tripped directly by SIS signal, in the event of SIS combined with a loss of offsite power, both these feeders are tripped. It is also to be noted that subsequently, transformer X16 which is fed from safety bus 1D is not sequenced back even after the diesel generator restores voltage on bus 1D.

5. a. <u>Solenoid Valves supplied from 120 volt instrument AC Distribution Panel Y01, listed in the enclosed table, Appendices A and E</u>

b. Solenoid Valves and the Containment Building Gas Analyzing Panel C102 supplied from 125 volt DC Distribution Panels D11 and D21, listed in the enclosed table, Appendices A and E

In all above cases, depending on the circuit configuration, it is recommended that either additional backup protection fuses only or both additional primary and backup protection fuses be included for reasons discussed under item IV, 2(b) above.

The reason for the addition of both primary and backup protection fuses in some cases is to ensure that the operation of backup protection does not interrupt the supply to other safety related equipment. In these cases, such an interruption will occur if the existing fuse is used as backup protection fuse.

Complete details including fuse sizes are shown in the enclosed table, Appendix E.

6. INSTRUMENTATION CIRCUITS

As discussed under item IV, (1) above, it has been concluded that even though the submergence of instruments and devices can lead to electrical faults, penetration integrity will not be compromised since the fault currents in the loops will be maintained at very low values because of the current limiting feature inherent in the low energy instrumentation circuits.

In view of the above, no design changes or modifications have been recommended for the instrumentation circuits.

The enclosed table, Appendix F, provides a listing and identifies all submerged instrumentation devices for information only.

SUBMERGED EQPT.	POWER SOURCE		
	D. C. PANEL	M.C.C./L.C.	BRK. NO.
SV 0101	D21		72-219
SV 0142 B		MCC B01	52-195
SV 0143 B		MCC B09	52-926
SV 0148	D21		72-209
SV 0150	D21		72-209
SV 0152	D21		72-209
SV 0160	D21		72-219
SV 0861 *	D21	LC B12	72-205
SV 0862	D21	LC B12	72-205
SV 0864 *	D21	LC B12	72-205
SV 0865	D21	LC B12	72-205
SV 0867 *	D11	LC B11	72-105
SV 0869	D11	LC B11	72-105
SV 0870	D21	LC B12	72-205
SV 0873 *	D21	LC B12	72-205

L.C. - LOAD CENTER

* - THESE SOLENOID VALVES ARE DISCONNECTED FOLLOWING A SAFETY INJECTION SIGNAL.

SUBMERGED EQUIPMENT

Appendix A

SUBMERGED EQPT.	POWER SOURCE		
	D. C. PANEL	M.C.C./L.C.	BRK. NO.
M 3008		MCC #1	52-141
M 3010		MCC #1	52-147
M 3012		MCC #2	52-247
M-3014		MCC #2	52-251
P 77 A		MCC #2	52-291
P 77 B		MCC #1	52-171
Transformer X15		Load Center 1E	152-305
Transformer X16		Load Center 1D	152-211

SUBMERGED EQUIPMENT

Appendix A

SUBMERGED EQPT.	POWER SOURCE		
	D. C. PANEL	M.C.C,/L.C.	BRK. NO.
SV 0932	D21		72-229
SV 0934	D11		72-129
SV 1819	D21	LC B12	72-205
SV 1820	D21	LC B12	72-205
SV 1821	D21	LC B12	72-205
SV 1822	D21	LC B12	72-205
SV 1823	D11	LC B11	72-105
SV 1868	D11	LC B11	72-105
SV 1890	D11	LC B11	72-105
SV 2191	D21		72-209
SV 2321		Y01	#34
SV 2322		Y01	#34
SV 2323		Y01	#34
Panel C-102	D21		72-214

L.C. - LOAD CENTER

SUBMERGED EQUIPMENT

Appendix A

EQPT.	POWER SOURCE		RECOM.+ FUSE RTNG(A)	FAULT CURRENT (AMPS)		FUSE MELTING TIME SEC		FAULT I^2t		SPEC I^2t WITHSTAND
	MCC	BRK NO.		PENETRATION*	EQPT**	PENETRATION	EQPT	PENETRATION	EQPT	
M 3008	B01	52-141	80	695	474	0.03	0.2	1.45×10^4	4.5×10^4	1.125×10^5
M 3010	B01	52-147	80	695	472	0.03	0.2	1.5×10^4	4.5×10^4	1.125×10^5
M 3012	B02	52-247	100	844	504	0.03	0.35	2.13×10^4	8.9×10^4	1.125×10^5
M 3014	B02	52-251	100	868	500	0.03	0.35	2.2×10^4	8.75×10^4	1.125×10^5

* The fault occurs at the penetration
** The fault occurs at the equipment
\+ Fuses recommended are type KTS-600V Limitron Fuse

SUBMERGED MOTOR OPERATED VALVES
NOT DISCONNECTED FOLLOWING A SAFETY
INJECTION SIGNAL

POWER CIRCUIT BACKUP PROTECTION

Appendix B

EQPT.	POWER SOURCE	STARTER NO.	EXISTING PRIMARY FUSE	ADDITIONAL BACKUP FUSE REQUIREMENTS
M 3008	B01	42-141		
M 3010	B01	42-147		
M 3012	B02	42-247		
M 3014	B02	42-251		

SUBMERGED MOTOR OPERATED VALVES
NOT DISCONNECTED FOLLOWING
A SAFETY INJECTION SIGNAL

CONTROL CIRCUIT BACKUP PROTECTION

(SIZE 2 STARTERS)

Appendix C

EQPT.	POWER SOURCE		RECOM.+ FUSE RATING(A)	FAULT CURRENT (AMPS)		FUSE MELTING TIME SEC		FAULT I^2t		SPEC I^2t WITHSTAND
	MCC	BRK. NO		PENETRATION	EQPT.	PENETRATION	EQPT.	PENETRATION	EQPT.	
P77A	B02	52-291	80	830	370	0.016	0.7	1.1×10^4	9.6×10^4	1.125×10^5
P77B	B01	52-171	80	915	389	0.01	0.5	1.33×10^4	7.6×10^4	1.125×10^5

+ Fuses recommended are type KTS-600V Limitron Fuse

SUBMERGED PUMPS NOT DISCONNECTED FOLLOWING A SAFETY INJECTION SIGNAL

POWER CIRCUIT BACKUP PROTECTION

(THESE ARE SIZE 1 STARTERS FOR WHICH CONTROL CIRCUIT BACKUP PROTECTION IS NOT REQUIRED.)

Appendix D

EQPT.	POWER SOURCE			EXISTING PROTECTION		ADDITIONAL PROTECTION REQ'D	
	D.C.PANEL	LOAD CTR.	LOC.	PRIMARY FUSE	BACKUP CB	PRIMARY FUSE	BACKUP FUSE
SV0101	D21	-	C13	10A	72-219	5A	Existing 10A Primary Fuse
SV0160	D21	-	C13	10A	72-219	5A	Existing 10A Primary Fuse
SV0148	D21	-	CO-2R	10A	72-209	5A	Existing 10A Primary Fuse
SV0150	D21		CO-2R	10A	72-209	5A	Existing 10A Primary Fuse
SV0152	D21		CO-2R	10A	72-209	5A	Existing 10A Primary Fuse
SV2191	D21		CO-2	10A	72-209	2A	5A
SV0862	D21	B12		10A	72-205	2A	5A
SV0865	D21	B12		10A	72-205	2A	5A
SV0870	D21	B12		10A	72-205	2A	5A
SV1819	D21	B12		10A	72-205	2A	5A
SV1820	D21	B12		10A	72-205	2A	5A
SV1821	D21	B12		10A	72-205	2A	5A
SV1822	D21	B11		10A	72-205	2A	5A
SV0932	D21		CO-8	10A	72-229	2A	5A

SUBMERGED SOLENOID VALVES NOT
DISCONNECTED FOLLOWING A SAFETY INJECTION SIGNAL
PRIMARY AND BACKUP PROTECTION

Appendix E

EQPT.	POWER SOURCE			EXISTING PROTECTION		ADDITIONAL PROTECTION REQ'D	
	D.C.PANEL	LOAD CTR.	LOC.	PRIMARY	BACKUP CB	PRIMARY FUSE	BACKUP FUSE
SV0869	D11	B11		10A Fuse	72-105	2A	5A
SV0934	D11		CO-8	10A Fuse	72-129	2A	5A
SV1823	D11	B11		10A Fuse	72-105	2A	5A
SV1868	D11	B11		10A Fuse	72-105	2A	5A
SV1890	D11	B07+			None	2A	5A
SV2321		Y01*	Y01	10A Fuse	Brk No. #34	2A	5A
SV2322		Y01*	Y01	10A Fuse	Brk No. #34	2A	5A
SV2323		Y01*	Y01	10A Fuse	Brk No. #34	2A	5A
SV0142B		B01+		Brk. No. 52-195		MCC Breaker	20A
SV0143B		B09+		Brk. No. 52-926		MCC Breaker	20A
Panel C-102	D21			72-214	-	10A	Existing CB - 72-214

\+ 480 VOLT MCC

* 120 VOLT INST. AC DIST. PANEL

SUBMERGED SOLENOID VALVES NOT
DISCONNECTED FOLLOWING A SAFETY INJECTION SIGNAL

DEVICE NO.	POWER SOURCE		PROTECTION		REMARKS
	DISTRIBUTION PANEL	BREAKER NO.	PRIMARY	BACKUP	
PDT 0112 AA	Y10	#5	½A Fuse	1A Fuse	RPS & Trip & Primary Loop Flow Indication would be lost from these transmitters
PDT 0112 BA	Y10	#5	½A Fuse	1A Fuse	
PDT 0122 CA	Y10	#5	½A Fuse	1A Fuse	
PDT 0122 DA	Y10	#5	½A Fuse	1A Fuse	
PDT 0112 AB	Y20	#5	½A Fuse	1A Fuse	
PDT 0112 BB	Y20	#5	½A Fuse	1A Fuse	
PDT 0122 CB	Y20	#5	½A Fuse	1A Fuse	
PDT 0122 DB	Y20	#5	½A Fuse	1A Fuse	
PDT 0112 AC	Y30	#5	½A Fuse	1A Fuse	
PDT 0112 BC	Y30	#5	½A Fuse	1A Fuse	
PDT 0122 CC	Y30	#5	½A Fuse	1A Fuse	
PDT 0122 DC	Y30	#5	½A Fuse	1A Fuse	
PDT 0112 AD	Y40	#5	½A Fuse	1A Fuse	
PDT 0112 BD	Y40	#5	½A Fuse	1A Fuse	
PDT 0122 CD	Y40	#5	½A Fuse	1A Fuse	
PDT 0122 DD	Y40	#5	½A Fuse	1A Fuse	
PDT 0104	Y01	#8			None
POS 1024	D11	72-125	Fuse	72-125	None

SUBMERGED INSTRUMENTS

* Located above flood level.

DEVICE NO.	POWER SOURCE		PROTECTION		REMARKS
	DISTRIBUTION PANEL	BREAKER NO.	PRIMARY	BACKUP	
POS 1027	D11	72-125	Fuse	72-125	None
POS 1030	D11	72-125	Fuse	72-125	None
POS 1033	D11	72-125	Fuse	72-125	None
POS 1023	D11	72-126	Fuse	72-126	None
POS 1025	D11	72-126	Fuse	72-126	None
POS 1028	D11	72-126	Fuse	72-126	None
POS 1031	D11	72-126	Fuse	72-126	None
PT 0101 A	Y10	#6	1/8A Fuse	3/8A Fuse	None
PT 0101 B	Y20	#6	1/8A Fuse	3/8A Fuse	None
PT 0102 A	Y10	#5	1/8A Fuse	3/8A Fuse	RPS Trip SI and PRI Loop Press. Ind. would be lost from these transmitters
PT 0102 B	Y20	#5	1/8A Fuse	3/8A Fuse	
PT 0102 C	Y30	#5	1/8A Fuse	3/8A Fuse	
PT 0102 D	Y40	#5	1/8A Fuse	3/8A Fuse	
PT 0103	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0131 A	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0131 B	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0132 A	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0132 B	Y01	#26	1/10A Fuse	5A Fuse	None

SUBMERGED INSTRUMENTS

+ Located outside containment.
* Located above flood level.

DEVICE NO.	POWER SOURCE		PROTECTION		REMARKS
	DISTRIBUTION PANEL	BREAKER NO.	PRIMARY	BACKUP	
*PT 0133 A	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0133 B	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0141 A	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0141 B	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0142 A	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0142 B	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0143 A	Y01	#26	1/10A Fuse	5A Fuse	None
*PT 0143 B	Y01	#26	1/10A Fuse	5A Fuse	None
PT 0702	Y10, 30	#4	Fuse	10A CB	None
PT 0704	Y20, 40	#4	Fuse	10A CB	None
PT 0751 A	Y10	#5	1/8A Fuse	3/8A Fuse	RPS Trip and Loss of Press. Ind. on E 50 A S.G.
PT 0751 B	Y20	#5	1/8A Fuse	3/8A Fuse	
PT 0751 C	Y30	#5	1/8A Fuse	3/8A Fuse	
PT 0751 D	Y40	#5	1/8A Fuse	3/8A Fuse	
PT 1001	Y01	#27	1/16A Fuse	Y01-27	None
PS 0101					None
+PS 0103	MCC #1	Starter 42-167			
*PS 0935	MCC #1	Starter 42-171			None
FS 0927		252-103!			None

! INSTRUMENT CONNECTED TO 125 V DC CONTROL CIRCUIT OF ACB.

SUBMERGED INSTRUMENTS

DEVICE NO.	POWER SOURCE		PROTECTION		REMARKS
	DISTRIBUTION PANEL	BREAKER NO.	PRIMARY	BACKUP	
FS 0928		252-203!			
FS 0929		252-104!			
FS 0930		252-204!			
FT 0701	Y10, 30	#4	Fuse	10A CB	None
FT 0702			Fuse	10A CB	
FT 0703	Y20, 40	#4	Fuse	10A CB	
FT 0704			Fuse	10A CB	
RE 1808	Y40	#14	¼A Fuse	1A Fuse	Possible one channel isolation
RE 1817	Y01	#34	¼A Fuse	1A Fuse	None
RE 1817 Pump			¼A Fuse	1A Fuse	None
LT 0101 A	Y10	#6	1/8A Fuse	3/8A Fuse	None
LT 0101 B	Y20	#6	1/8A Fuse	3/8A Fuse	None
LT 0102 A	Y10	#5	1/8A Fuse	3/8A Fuse	None
LT 0102 B	Y20	#5	1/8A Fuse	3/8A Fuse	None
LT 0102 C	Y30	#5	1/8A Fuse	3/8A Fuse	None
LT 0102 D	Y40	#5	1/8A Fuse	3/8A Fuse	None
LT 0103	Y01	#26	1/10A Fuse	5A Fuse	None
LT 0116	Y01	#26	1/10A Fuse	5A Fuse	None

! INSTRUMENT CONNECTED TO 125 V DC CONTROL CIRCUIT OF ACB

SUBMERGED INSTRUMENTS

* THESE L.T.'S ARE ABOVE FLOOD LEVEL.

DEVICE NO.	POWER SOURCE		PROTECTION		REMARKS
	DISTRIBUTION PANEL	BREAKER NO.	PRIMARY	BACKUP	
LT 0701	Y10, 30	#4	Fuse	10A CB	None
LT 0702	Y10, 30	#4	Fuse	10A CB	None
LT 0703	Y20, 40	#4	Fuse	10A CB	None
LT 0704	Y20, 40	#4	Fuse	10A CB	None
LT 0751 A	Y10	#5	1/8A Fuse	3/8A Fuse	RPS Trip and SG Level Ind, would be lost
LT 0751 B	Y20	#5	1/8A Fuse	3/8A Fuse	
LT 0751 C	Y30	#5	1/8A Fuse	3/8A Fuse	
LT 0751 D	Y40	#5	1/8A Fuse	3/8A Fuse	
LT 1001	Y01	#27		1/16A Fuse	None
*LT 1012	Y01	#27		1/16A Fuse	None
*LT 1014	Y01	#27		1/16A Fuse	None
*LT 1016	Y01	#27		1/16A Fuse	None
*LT 1018	Y01	#27		1/16A Fuse	None
LS 0358	Y01	#13			None
LS 0360	Y01	#13			None
LS 0817		72-219	5A Fuse		None
LS 0865		72-219	5A Fuse		None
LS 0868		72-219	5A Fuse		None
LS 0870		72-219	5A Fuse		None