Consumers Power Company

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October 12, 1982

Dennis M Crutchfield, Chief
Operating Reactors Branch No 5
Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT -
SEP TOPIC VIII-4, ELECTRICAL PENETRATIONS OF THE
REACTOR CONTAINMENT

The attached enclosure serves to apprise the NRC of the current status of the Consumers Power Company program to evaluate the adequacy of overload and short-circuit protection for Palisades and Big Rock Point Plant electrical circuits that pass through the reactor containment. As you are aware, the purpose of this evaluaton program is to determine if adequate protection exists to preclude damage to the reactor containment electrical penentrations which could conceivably result from circuit overload and short-circuit conditions. Utilizing the November 16, 1981 Consumers Power Company submittal as a reference, the enclosure describes in detail the evaluative work completed to date and that work which remains to be done to complete the evaluation program. The enclosure also includes an activity table which provides Consumers Power Company estimates for completion of outstanding work for both the Palisades and Big Rock Point Plants.

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Attachment

oc1082-0055b142

A035

Consumers Power Company
Palisades & Big Rock Point Plants
Dockets 50-255 & 50-155

SEP TOPIC VIII-4
ELECTRICAL PENETRATIONS OF THE REACTOR CONTAINMENT
STATUS REPORT

19 pages

ic1082-0055a142

ENCLOSURE
SEP TOPIC VIII-4
"ELECTRICAL PENETRATIONS OF
THE REACTOR CONTAINMENT"
STATUS REPORT

By letter dated November 16, 1981 (see Reference #1), Consumers Power Company (CPCo) submitted to the Nuclear Regulatory Commission (NRC) a description of its program to evaluate the adequacy of overload and short-circuit protection for circuits that pass through the reactor containment at both the Palisades and the Big Rock Point Plants. As part of that submittal was included a description of what action had been taken up to November 16, 1981 and what was believed to be a realistic schedule for completion of the remaining work. This report not only describes the present status of the evaluation program but also describes the work that remains to be completed and readjusts completion schedules accordingly.

The present status of the evaluation program is best described utilizing the activity table forwarded to the NRC as part of the CPCo November 16, 1981 submittal. Attachment #1 parts A and B of this enclosure reveal the program status as of November 16, 1981 and as of this writing, respectively. Attachment #1 serves as the basis for the program status discussion which follows.

PALISADES CONTROL CIRCUITS

The Palisades control circuits evaluation program is presently 80% complete. (Attachment 1 Part B represents the status as of this writing.) The work completed to date consists of categorizing the circuits into groups, determining on a preliminary basis what modifications may be required for non-environmentally qualified circuits and performing a preliminary technical review of the proposed modifications. As shown in Attachment #2, the Palisades control circuits have been categorized into a total of 78 groups. In general, the groups were formed by combining all of those in-containment circuit loads that are protected by a given (or similar) overload protection scheme(s). As shown in section A of Attachment #2, a number of the groups consist entirely of circuits whose in-containment components are or will be environmentally qualified and therefore will not require secondary overload protection. (Secondary overload protection is not required for environmentally qualified circuits per NRC position as stated in its March 26, 1981 letter; see Reference #2.) The balance of the control circuits have been categorized as either acceptable or unacceptable (refer to sections B and C of Attachment #2, respectively) based on an initial review of the existing coordination of time versus current characteristics associated with the circuit's breaker, fuse, conductor and penetration.

As indicated above, preliminary recommendations of necessary modifications have been made and preliminary technical review has been performed for the non-environmentally qualified control circuits that are shown in Attachment #2. The preliminary recommendations and reviews have been performed by our Systems Protection group. In all cases, the preliminary recommendations call for the installation of fuses to serve as adequate secondary overload protection.

The next objective of CPCo is to complete the remainder of the control circuit evaluation work. The remaining work yet to be completed by our Systems Protection group consists of preparing a final report which includes the overload scheme modification recommendations and schematic drawings which represent the recommended modifications to facilitate Nuclear Operations Department (NOD) review and disposition. Once the final report receives its final Systems Protection group review, it will be published and forwarded to our NOD. Plant and General Office NOD personnel will perform a review of this report and the report already issued for the power circuits (this report was transmitted to the NRC as part of the CPCo November 16, 1981 submittal; see Reference #1) to determine the appropriate means to ensure penetration protection ie, modification of existing administrative control systems to ensure that the circuit is deenergized (as permitted per NRC position as stated in its March 26, 1981 letter; see Reference #2) or modification of existing overload protection schemes to include effective secondary protectors as recommended by the System Protection group.

It should be noted that in a very limited number of circuits that have already been evaluated, the in-containment loads are automatically disconnected upon receipt of an accident signal and, therefore, will not require circuit modifications as permitted per NRC position (see Reference #2).

As is shown in Attachment #1, a very time consuming effort has been required to evaluate the Palisades control circuits. The primary reason that the control circuit evaluation has consumed more time than had been estimated in the CPCo November 16, 1981 submittal (see Reference #1), is that circuit data (ie, fuse and breaker manufacturer, trip rating and trip current/time characteristics) were not readily available either in plant schematics, wiring diagrams or in our System Protection files. The lack of such readily available information forced time consuming field verifications and manufacturer correspondence to be undertaken to obtain necessary inputs to evaluate the adequacy of existing protection schemes. The revised schedule (Attachment #1, part B) has been modified to reflect such effort that may be required to complete the remaining work on both the Palisades and Big Rock Point Plants.

PALISADES INSTRUMENTATION CIRCUITS

The evaluation of the instrumentation circuits is 98% complete as of this writing. (Attachment 1 Part B represents the present status of this evaluation program.) In the case of these circuits, very conservative analyses have been performed to show that in all of the instrumentation circuits, other than those listed in Attachment #3, maximum expected short-circuit current can flow indefinitely without damaging either the cable or the penetration to which the cable is attached.

As of this writing, approximately 420 instrumentation circuits have been evaluated which constitutes 98% of those existing at the plant. In brief, the methodology for evaluating the circuit in most cases consisted of: 1) grouping the circuits according to power supply type, 2) selecting for detailed anlaysis the circuit in the group which featured the least resistance to oppose short-circuit current and 3) calculating the maximum expected short-circuit current utilizing the circuit resistance as determined in item 2 above and the power supply output voltage which was assumed not to decrease when the short-circuit condition occurs. The calculated short-circuit current was then compared to the maximum continuous current-carrying capability of the penetration conductor. If the continuous current-carrying capability of the penetration conductor exceeded the magnitude of the maximum expected short-circuit current, it was determined that credit need not be taken for circuit protective devices and the circuit was acceptable. The above approach resulted in performing 35 detailed analyses to effectively evaluate approximately 420 circuits. In all cases but those listed in Attachment #3, it was determined that credit need not be taken for protective devices to ensure that the penetrations were not damaged.

As in the case of the power and control circuits, the instrumentation circuits for which the existing protection is not determined as adequate will be submitted to appropriate General Office and Plant NOD personnel for final review and determination of appropriate means for resolution. It is expected that the instrumentation circuit final reviews will be conducted at the same time the control and power circuits undergo final NOD review.

FINAL REVIEW OF PALISADES POWER, CONTROL & INSTRUMENTATION CIRCUITS

The previous two sections of this enclosure collectively stated that final CPCo NOD review and subsequent determination of appropriate means to provide adequate assurance that the penetrations would not be damaged by circuit overload or short-circuit conditions would be performed after completion of the evaluation of all the circuits; ie, the power circuits, the control circuits and the instrumentation circuits. As shown in Attachment 1 Part B, this review is expected to commence shortly after 01/01/83. It is the opinion of CPCo that this is a more desirable course of action than that of performing a final review and commencing with necessary modification as soon as the evaluation of each circuit category is completed for the following reasons:

1. The control and instrumentation circuit evaluations should be completed at approximately the same time.

2. The power circuits that require additional overload protection are only a small percentage (<20%) of the total number of circuits that require additional overload protection.

3. The impact on plant operations will be less in terms of review and implementation of additional protection if all of the circuits are grouped together.

Finally, it should be noted that plant modifications performed between the time that the initial power, control or instrumentation circuit evaluation was completed and the time that the NOD review is scheduled will also be added to the evaluation program and submitted for NOD review. Also, CPCo design standards will be updated as soon as possible to require adequate penetration protection for future modifications.

OVERLOAD PROTECTOR SURVEILLANCE PROGRAM

As indicated in its November 16, 1981 submittal, CPCo stated that it would evaluate the adequacy of its overload protector surveillance testing program. CPCo committed to such an evaluation in response to an NRC note in its March 26, 1981 letter (see Reference #2) in which the NRC states: "Circuit breakers should be tested periodically to verify their trip setting value and response time".

Regarding trip setpoints, a review of the Palisades testing program shows that all safety-related relays are tested at intervals not to exceed 48 months. The testing frequency was recently decreased as a result of test result repeatability. During these tests, the relay setting and time response is monitored and verified to be within acceptable limits.

Regarding time response verification, it should be noted that neither the medium voltage breakers (ie, the 4160VAC or the 2400VAC breakers), the 2400VAC/480VAC load center breakers nor the molded case circuit breakers on the 480VAC and 125VDC systems are periodically time response tested. Initial installation testing of similar molded case and load center breakers at other CPCo plants has revealed that the acceptance criteria of four cycles or less of operating time has been met for approximately 95% of 1000 or more magnetic breakers tested and 90% of 1000 or more thermal-magnetic breakers tested. Also, of the 10% or less of the breakers that did not meet the acceptance criteria, less than 1% were mechanical failures that resulted in the trip mechanism failing to operate. Therefore, it is the opinion of CPCo that periodic circuit breaker time response testing is not necessary.

INDEPENDENCE AND SEPARATION FOR PRIMARY AND SECONDARY PROTECTORS

The March 26, 1981 NRC letter (see Reference #2) states in its enclosure: "Where external power is used for actuating the protection systems the power for primary and backup breakers are derived from separate sources. Overcurrent signals for tripping primary and backup system devices are electrically independent and physically separated." At Palisades, the only circuits that pass through the reactor containment wall which utilize external control power for both the primary and secondary breakers are the primary coolant pump motor feeders. A review of the protection schemes for these feeders reveals that the control power for both the primary and secondary breaker is derived from the same source: namely, one of the two Class 1E 125VDC distribution systems (see the following attachments: Attachment #4 for the overall primary coolant pump feeder metering schemes, Attachments #5 and 6 for the secondary breaker, Attachments #7, 8 and 9 for the primary breaker and Attachment #10 for the Class 1E 125VDC distribution systems). Although each breaker is supplied by the same source, CPCo considers this source as very reliable since power can be supplied by an inservice station battery charger or, upon charger failure, by a station battery which is normally floating in parallel with the charger. In addition, reliability is further enhanced in that each breaker's individual control circuitry is fuse protected in each of its four legs at the input of the circuitry. This protection will serve to isolate a breaker's faulty control circuitry from the remainder of the 125VDC system should a short-circuit condition occur within the control circuitry which results in opening one or more of the control circuit fuses (refer to Attachment #6 and 9).

Regarding the overcurrent signals for tripping the primary and secondary breakers, it should be noted that each breaker utilizes its own separate and independent set of sensing relays. As shown in Attachment #4, secondary breaker #252-101 utilizes sensing relays #251 and 251N for phase and ground overcurrent sensing, respectively, whereas primary breaker #252-103 utilizes relays #250/251 and #250G for similar purposes. These overcurrent sensing relays and associated wiring are located in the associated breaker cubicle.

ADDITIONAL FUSING TESTS FOR BIG ROCK POINT CIRCUIT EVALUATIONS

As shown in Attachment #1 part A, more controlled "fusing" tests were scheduled to be completed in the spring of this year. These tests have been rescheduled as shown in Attachment #1 part B. The tests were rescheduled since it was determined by surveying the Big Rock Point through-containment circuits that only approximately 20% of the circuits employ cable conductor of smaller diameter than that of the penetration conductor. It was originally believed that a majority of the through-containment circuits utilized smaller conductor cables and that this smaller conductor cable would act as a fuse to protect the larger diameter penetration conductor in the event of short-circuit conditions. It was also originally believed that the additional fusing tests (as described in more detail in the CPCo November 16, 1981 submittal; see Reference #1) could conceivably eliminate most of the required circuit evaluations if the "fusing" effect was proven for test specimens and conditions that approximated those at the plant. However, since only 20% of the plant circuits fit into this category it was determined that the tests could be postponed to make available necessary resources for the Big Rock Point refueling outage (which was conducted during the spring of this year) without significantly affecting the upcoming work schedule of our Systems Protection group regarding the evaluation of the Big Rock Point power and control circuits.

SUMMARY

As the attachments reveal, certain adjustments have been made to our circuit evaluation program schedule which reflect difficulties encountered which were not originally perceived. It should be emphasized that the project at hand is an enormous one which essentially consists of verifying the original design of circuit overload and short-circuit protection systems or the environmental qualification status of thousands of circuits that pass through our reactor containment walls. Given the magnitude of such a project, forecasting the availability of necessary input data to complete the required evaluations has been very difficult and as a result has led to the inaccuracy of previously submitted schedules. Nevertheless, it should be noted that all of the schedules submitted to date were the result of an honest attempt to predict job completion and keep the NRC abreast of our activities and plans. It should be noted that work on this project has steadily progressed ever since the project began and will continue to do so until its completion.

ACTIVITIES RELATED TO SEP TOPIC VIII-4
"ELECTRICAL PENETRATIONS OF THE REACTOR CONTAINMENT"
COMPLETED AND PROPOSED COMPLETION DATES

Attachment #1
Part A

KAT-31-82

ITEM	ACTIVITY	PROPOSED COMPLETION DATE (COMPLETED DATE)					
		PALISADES PLANT			BIG ROCK POINT PLANT		
		PENETRATION TYPE			PENETRATION TYPE		
A.	Evaluation of Adequacy of Circuit Secondary Overload Protection	Power	Control	Instrtn	Power	Control	Instrtn
A1.	Penetration Circuit Lengths and Sizes Determined	(6/3/81)	(7/21/81)	(8/25/81)	9/13/81)	11/15/81	12/15/8
A2.	Circuits Categorized into Similar Groups and Referenced on One-Line Diagrams that Illustrate Each Circuit and its Relation to a Supply Feeder.	(7/29/81)	(9/28/81)	6/1/82	10/1/82	1/1/83	6/1/83
A3.	Circuit Conductor and Penetration Rated Time vs Current Characteristics Graphed, Circuit Primary and Secondary Protection Time vs Current Characteristics Graphed,	(7/29/81)	3/1/82	8/1/82	11/1/82	4/1/83	7/15/83
A4.	Circuits Requiring Adequate Secondary Overload Protection Itemized With Recommendations for Secondary Overload Protection Upgrades.	(9/30/81)	4/1/82	9/1/82	12/1/82	5/1/83	8/1/83
B.	Subordinate Activities Related to Item A						
B1.	Feasibility Tests to Determine Whether Smaller Diameter Field Cable will "Fuse" to Protect Larger Diameter Penetration Cable	N/A	N/A	N/A	(7/22/81)	(7/22/81)	(7/22/81)
B2.	More Controlled "Fusing" Tests (see B.1) Which More Closely Approximate Actual Big Rock Point Circuit Connections	N/A	N/A	N/A	4/1/82	4/1/82	4/1/82
B3.	Evaluation of Adequacy of Overload Protector Surveillance Testing Program	6/1/82	6/1/82	6/1/82	8/1/83	8/1/83	8/1/83
B4.	Evaluation of Independence and Separability for Primary and Secondary Overload Protectors	6/1/82	6/1/82	6/1/82	N/A	N/A	N/A

Attachment #1
Part B

ACTIVITIES RELATED TO SEP TOPIC VIII-4
"ELECTRICAL PENETRATIONS OF THE REACTOR CONTAINMENT"
COMPLETED AND PROPOSED COMPLETION DATES

KAT-31-82

ITEM	ACTIVITY	PROPOSED COMPLETION DATE (COMPLETED DATE)					
		PALISADES PLANT			BIG ROCK POINT PLANT		
		PENETRATION TYPE			PENETRATION TYPE		
A.	Evaluation of Adequacy of Circuit Secondary Overload Protection	Power	Control	Instrtn	Power	Control	Instrtn
A1.	Penetration Circuit Lengths and Sizes Determined	(6/3/81)	(7/21/81)	(8/25/81)	(9/13/81)	3/1/83	3/1/83
A2.	Circuits Categorized into Similar Groups and Referenced on One-Line Diagrams that Illustrate Each Circuit and its Relation to a Supply Feeder for Pwr and Control Type. For Instrumentation Type, Circuits Categorized into similar groups.	(7/29/81)	(9/28/81)	(9/15/82)	2/1/83	7/1/83	6/1/83
A3.	Circuit Conductor and Penetration Rated Time vs Current Characteristics Graphed, Circuit Primary and Secondary Protection Time vs Current Characteristics Graphed,	(7/29/81)	(8/1/82)	N/A	3/1/83	10/1/83	7/15/83
A4.	Circuits Requiring Adequate Secondary Overload Protection Itemized With Recommendations for Secondary Overload Protection Upgrade.	(9/30/81)	1/1/83	12/1/82	4/1/83	11/1/83	8/1/83
B.	Subordinate Activities Related to Item A						
B1.	Feasibility Tests to Determine Whether Smaller Diameter Field Cable will "Fuse" to Protect Larger Diameter Penetration Cable	N/A	N/A	N/A	(7/22/81)	(7/22/81)	(7/22/81)
B2.	More Controlled "Fusing" Tests (see B.1) Which More Closely Approximate Actual Big Rock Point Circuit Connections	N/A	N/A	N/A	2/1/83	2/1/83	2/1/83
B3.	Evaluation of Adequacy of Overload Protector Surveillance Testing Program	(6/1/82)	(6/1/82)	(6/1/82)	8/1/83	8/1/83	8/1/83
B4.	Evaluation of Independence and Separability for Primary and Secondary Overload Protectors	(6/1/82)	N/A	N/A	N/A	N/A	N/A

KAT-31-82
ENCLOSURE
SEP TOPIC VIII-4
STATUS REPORT

List of References

Reference No.	Reference Description
1.	Letter: RAVincent (CPCo) to DMCrutchfield (NRC), "Docket 50-255-License DPR-20-Palisades Plant Docket 50-155-License DPR-6-Big Rock Point Plant-SEP Topic VIII-4, Electrical Penetrations of the Reactor Containment", November 16, 1981
2.	Letter: DMCrutchfield (NRC) to DPHoffman (CPCo), "SEP Topic VIII-4, Electrical Penetrations of Reactor Containment (Palisades Plant)", March 26, 1981.

PALISADES CONTROL PENETRATIONS

A. ENVIRONMENTALLY QUALIFIED PENETRATIONS

	Equipment	Scheme No
1.	Charging and Letdown Valves SV2113, SV2115 and SV2117	S55
2.	Pressurizer Spray E/P 1057 and E/P 1059	S56
3.	Pressurizer Level Indicator LT103	IL34
4.	Containment Cooler Recirc Fan V-4A Service Water Valve SV0867 and SV0869	B1108
5.	Hydrogen Recombiner M69A and M69B	B176/B2005
6.	Primary Sample Valves SV1901 - SV1905	J057
7.	Pressurizer Spray Valve Indicating Circuit	S57
8.	Safety Injection High Pressure MOV 3007	B137
9.	Safety Injection Low Pressure MOV 3008	B141
10.	Safety Injection Low Pressure MOV 3010	B147
11.	Safety Injection High Pressure MOV 3062	B151
12.	Safety Injection High Pressure MOV 3064	B157
13.	Shutdown Cooling MOV 3015	B167
14.	Safety Injection High Pressure MOV 3009	B197
15.	Safety Injection High Pressure MOV 3011	B237
16.	Safety Injection High Pressure MOV 3013	B241
17.	Safety Injection Low Pressure MOV 3012	B247
18.	Safety Injection Low Pressure MOV 3014	B251
19.	Safety Injection High Pressure MOV 3066	B257
20.	Safety Injection High Pressure MOV 3068	B261
21.	Shutdown Cooling Valve MOV 3016	B271

B. ACCEPTABLE PENETRATIONS

	Equipment	Scheme No
1.	Primary Coolant Pumps P50A-D Instrumentation (Seal Leakage and Heat Exchanger Flow)	1F13 through 1F16
2.	Air Room Purge Fan V-46	B713
3.	Control Rod Drive Mechanism Seal	IR46

C. UNACCEPTABLE PENETRATIONS

	Equipment	Scheme No
1.	DC Oil Lift Pumps P81A-D	D013/D014 D023/D024
2.	Primary Coolant Pumps P50A-D	A2103/A2104 A2203/A2204
3.	Containment Cooler Recirc Fan V-4A Service Water Valve Position Switch	B1108
4.	Pressurizer Power Relief Valve 1042B	S60
5.	Safety Injection Tank T-82A&B Valves	S45/S47
6.	Event Recorder ER-0001 and 0002	IG01/IG02
7.	Receiver Tank Recirc Solenoid Valves	J039
8.	Receiver Tank Recirc Solenoid Valves	J040/J041

UNACCEPTABLE PENETRATIONS

Equipment	Scheme No
9. Miscellaneous Solenoid Valves	J042
10. Shield Cooling Water Valve SV0934	S15
11. Reactor Bldg Evacuation Siren	S63
12. Containment Cooler Recirc Fan V-1A through V-3A	B1208/B1209
Service Water Valve Position Switch	B1210
13. Containment Gas Radiation Sample Solenoid Valves	IR94
14. Quench Tank Solenoid Valves	S12
15. Shutdown Cooling and Letdown Valves	S17
16. Letdown Orifice By-Pass Stop Valve	S20
17. Charging and Letdown Line Valves	S55
18. Primary Coolant Pump Controlled Bleedoff Isolation Valve	S30
Pressurizer Power Relief Valve 1043B	S61
Primary Coolant Pump Vibration Alarm	IW03
19. Safety Injection Tank T82C&D Valves	S46/S48
20. Annunciators - Safeguards, Safety Injection and Isolation Systems	K13
Reactor Vessel Flange Leak Drain Valves	W007
21. Annunciators - Radwaste System (Position Indication for Primary System Drain Tank)	K15
22. Event Recorder ER-0003	IG03
23. Annunciators - Primary System - Volume, Level and Pressure	K07
Annunciator - Primary Coolant Pump, Steam Gen and Rod Drives	K09
24. Shield Cooling Water Valve SV0932	S16
Shield Cooling Surge Tank M/U Valve	S54
25. Steam Generator and Air Room Evacuation Siren	S63
26. Pressurizer Back-up Heater Bank 1 thru 4	B1500/B1600
27. Pressurizer Proportional Heater	B1501/B1601
28. Containment Bldg Atmosphere Gas Sampling System	J138
29. Containment Emergency Lights	B215
30. Control Rod Drive Control	IR01 Thru 1R45
31. Shield Cooling Pump P-77B	B171
32. Pressurizer Relief Isolation Valve 1042A	B177
33. Primary Coolant Pump, Backstop Pumps P83A-D	B265A/B265B B265C/B265D
34. Pressurizer Relief Isolation Valve 1043A	B281
35. Fuel Transfer Machine Consoles	J051
36. Primary Coolant Pump, Backstop Pumps P84A-D	B755A/B755B B755C/B755D
37. Safety Injection Tank T82A Discharge MOV 3041	B911
38. Containment Lights	B917
39. Safety Injection Tank T82B Discharge MOV 3045	B921
40. Safety Injection Tank T82C Discharge MOV 3049	B927
41. Safety Injection Tank T82D Discharge MOV 3052	B931
42. Reactor Vessel Differential Press Indication Leak-off Temperature Instrumentation	1P63
Letdown Flow Local Temperature Controller	IT76
Radiation Zone Door Alarm	S64

UNACCEPTABLE PENETRATIONS

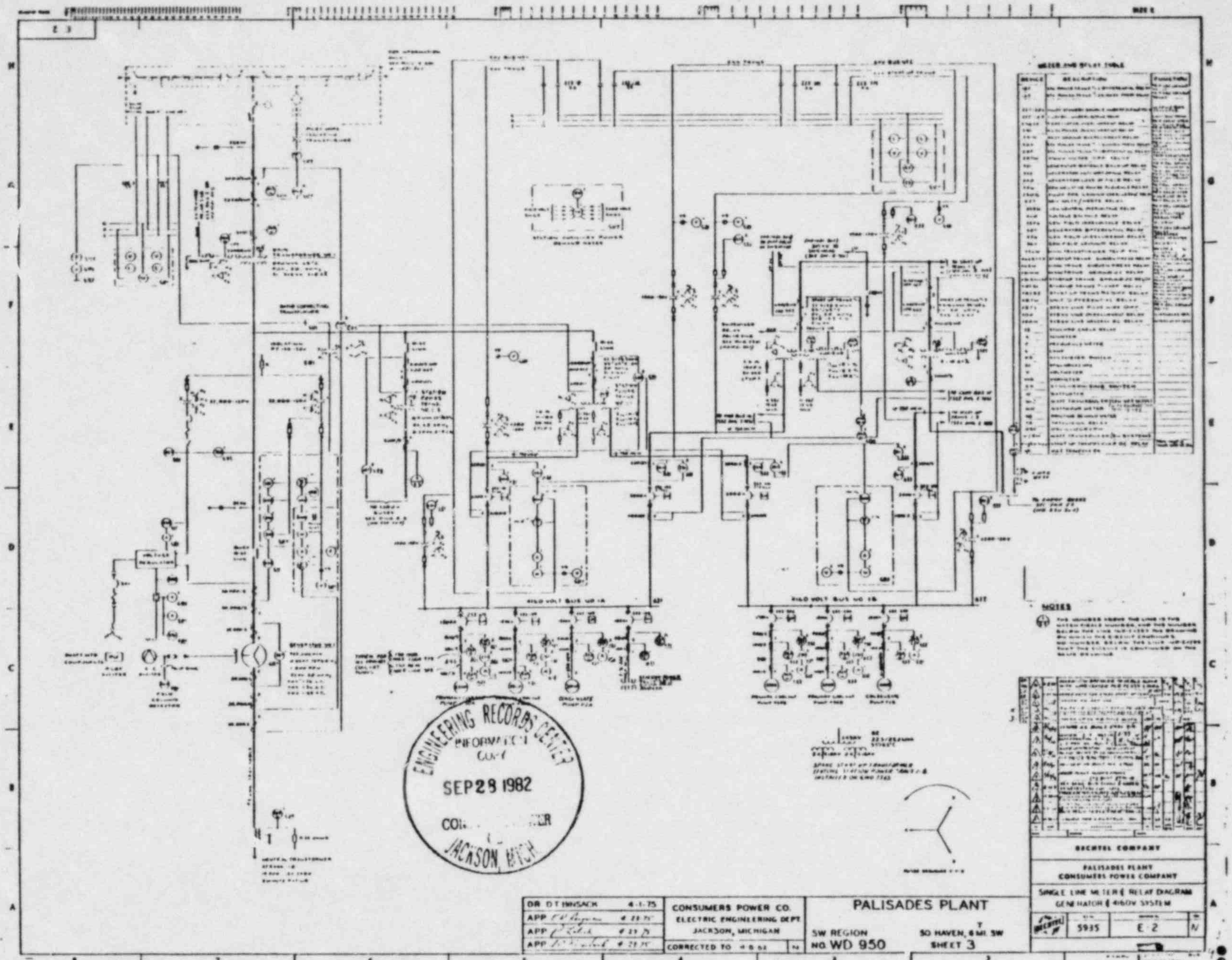
	Equipment	Scheme No
43.	Control Rod Drive Limit Switches	IR01 Thru IR45
44.	Containment Bldg Reactor Cavity Humidity	IH04
45.	Letdown Flow Temperature Control	IT43
46.	Primary Coolant Pump Speed	Y0133
47.	Containment Bldg Gas Monitoring	IR87 Via S70
	Containment Bldg Gas Monitoring	S70
48.	Fuel Hdlg Area Radiation Monitor #1	IR74
	Air Room Radiation Monitor	IR75
	Personnel Air Lock Radiation Monitor	IR76
	Fuel Hdlg Area Radiation Monitor #2	IR93
49.	Safety Injection Tank T82A Pressure Control Valve Position	IP37
50.	Safety Injection Tank T82C Pressure Control Valve Position	IP39
51.	Safety Injection Tank T82B Pressure Control Valve Position	IP38
52.	Containment Bldg Dome Humidity	IH01
	Safety Injection Tank T84D Pressure Control Valve Position	IP40
53.	Control Rod Drive Clutches	IR01 Thru IR45
54.	Control Rod Synchros Primary Position Indicating System (Synchros)	IR01 Thru IR45

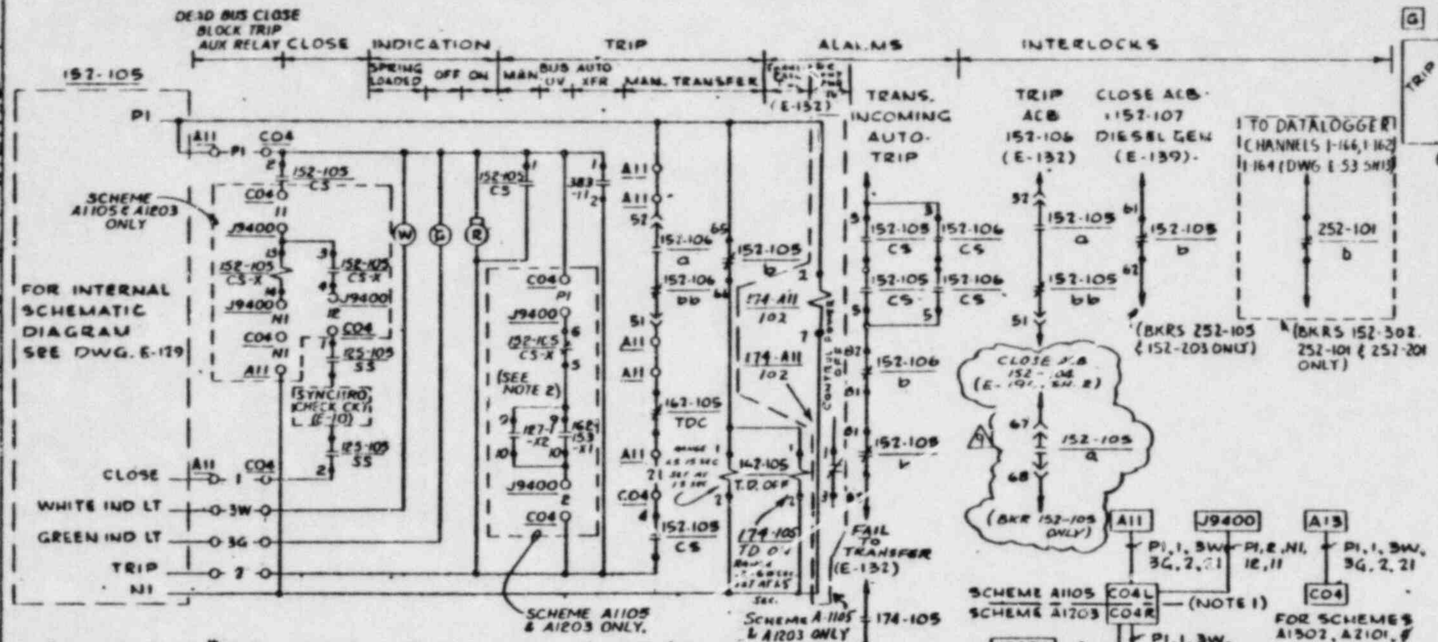
KAT-31-82
ENCLOSURE
SEP TOPIC VIII-4
ATTACHMENT #3

Instrumentation Circuits That Require Additional Overload Protection

Circuit Scheme No	Circuit Description
J052	Closed Circuit Television #2 Control Console for 120VAC Supply to the In-Containment Camera
IR74	Fuel Handling Area #1 Monitor +20VDC Supply
IR75	Air Room Area Monitor +20VDC Supply
IR76	Personnel Air Lock Area Monitor +20VDC Supply
IR77	Containment Isolation Monitor +20VDC Supply
IR78	Containment Isolation Monitor +20VDC Supply
IR79	Containment Isolation Monitor +20VDC Supply
IR80	Containment Isolation Monitor +20VDC Supply
IR93	Fuel Handling Area #2 Monitor +20VDC Supply

KAT 31-82 ATTACHMENT 4





2400V. BUS #1C INCOMING BREAKER 152-105 (1336)

SCHEME A1105

G W R

CONTACTS (HANDLE END)	CLOSE	NORM AFTER CLOSE	NORM AFTER TRIP	TRIP
1				X
2	X			
3		X	X	
4		X	X	
5	X	X		
6	X	X		

CONTROL SWITCH 152-105/CS

G.E. TYPE SBM, SPRING RETURN
LOCATION C04 ◆- NOT USED

NOTE

1. SEPERATE RACEWAY SYSTEM.
2. FIELD TO MODIFY N.O. CONTACT BETWEEN TERM 5 & 6 TO N.C. CONTACT.

CONTACTS (HANDLE END)	ON	OFF
1	X	
2	X	
3	X	
4	X	

SYNCHRONIZING SWITCH 125-105/SS

G.E. TYPE SBM, MAINTAINED CONTACT
LOCATION C04 ◆ SEE DWG. E-10 & E-11

DESCRIPTION	C.P. CO. BKR. NO.	ACB NO.	ACB LOC	SCHEME	CONTROL SW. NO.	CONTROL SW. LOC	SYNCHRONIZING SW. NO.	SYNCHRONIZING SW. LOC	TRANSFER REL. NO.	TRANSFER REL. LOC	START-UP TRANS. INC. BKR. NO.	START-UP TRANS. INC. BKR. LOC	TRANSFER RELAYS RELAY	T.D. OFF	RELAY	T.D. ON
2400V. BUS #1C INCOMING BKR	(1336)	152-105	A11	A1105	152-105/CS	C04L	125-105/SS	C04L	385-11/1	C04L	152-106	A11	162-105	1.5 Sec	174-105	1.5 Sec
2400V. BUS #1D INCOMING BKR	(1436)	152-203	A12	A1203	152-203/CS	C04R	125-203/SS	C04R	385-12/2	C04R	152-202	A12	162-203	1.5 Sec	174-203	1.5 Sec
2400V. BUS #1E INCOMING BKR	(1536)	152-302	A13	A1302	152-302/CS	C04	125-302/SS	C04	385-12/1	C04	152-303	A13	162-302	1.5 Sec	174-302	1.5 Sec
4160V. BUS #1A INCOMING BKR	(1136)	252-101	A21	A2101	252-101/CS	C04L	225-101/SS	C04L	385-21/1	C04L	252-102	A21	262-101	.2 Sec	274-101	.2 Sec
4160V. BUS #1B INCOMING BKR	(1236)	252-201	A22	A2201	252-201/CS	C04R	225-201/SS	C04R	385-22/2	C04	252-202	A22	262-201	.2 Sec	274-201	.2 Sec

CONT. FROM ABOVE

CONTROL PWR UV No.	CONTROL PWR UV LOC.	BLOCK TRIP AUX. RELAYS RELAY	CONTACTS		LOC.	BUS UV AUX. RELAYS AUX. RELAYS		LOC.
174-A11/102	A11	152-105/CS-X	2	3	J9400	127-1-X2/5	162-153X1/5	J9400
174-A12/202	A12	152-203/CS-X	2	3	J9401	127-2-X2/5	162-154X1/5	J9401
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—

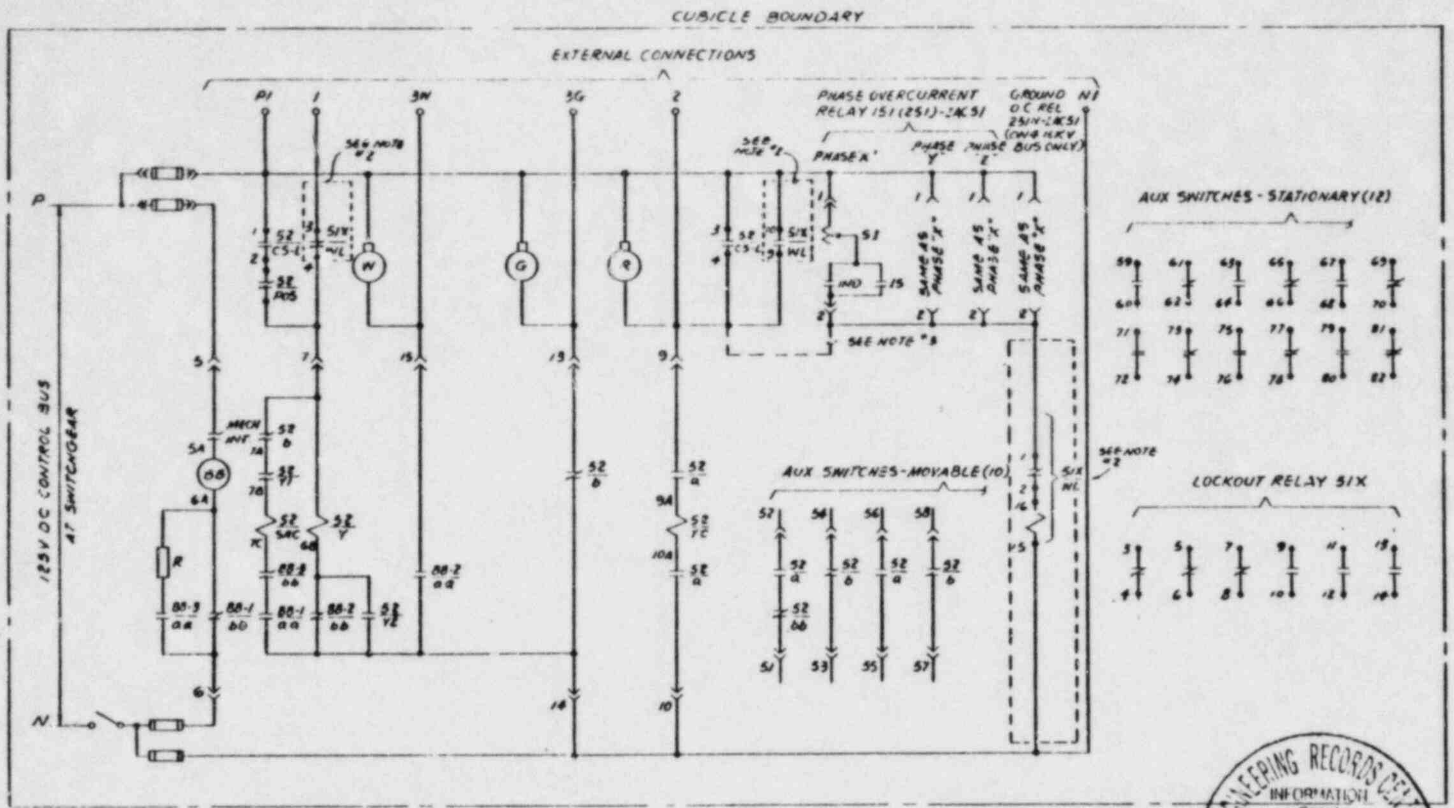
BECHTEL COMPANY

PALISADES PLANT
CONSUMERS POWER COMPANY

SCHEMATIC DIAGRAM
STATION POWER TRANSFORMER
1-1 & 1-2 INCOMING BREAKERS

JOB No.	DRAWING No.	REV.
5935	E-131	9

8 ISSUED FOR RECORD PER G.W.O. 8538
5 ISSUED FOR CONSTRUCTION



INTERNAL WIRING SCHEMATIC DIAGRAM

STORED ENERGY CIRCUIT BREAKER - 2400V & 4160V BUS INCOMING BKRS

NOTES

1. POSITION SWITCHES (52/A-S) SHOWN WITH BREAKER IN TEST POSITION
2. OVERCURRENT LOCKOUT RELAY 51X/WL IS TO BE USED ON CIRCUIT BREAKERS 152-105, 152-203, 152-302, 252-101 & 252-201 ONLY (INCOMING BKR'S FROM STATION POWER TRANS 1-1 & 1-2)
3. ON CIRCUIT BREAKERS 152-106, 152-202, 152-303, 252-102 & 252-202 CONNECT OVERCURRENT RELAYS TO TRIPPING CIRCUIT DIRECTLY AS SHOWN BY DOTTED LINE. (INCOMING BKR'S FROM START-UP TRANS. 1-1 & 1-2)
4. FOR SOLENOID OPERATED CIRCUIT BREAKERS, SEE DWG E-130

SCALE NONE | DESIGNED | DRAWN D. T.

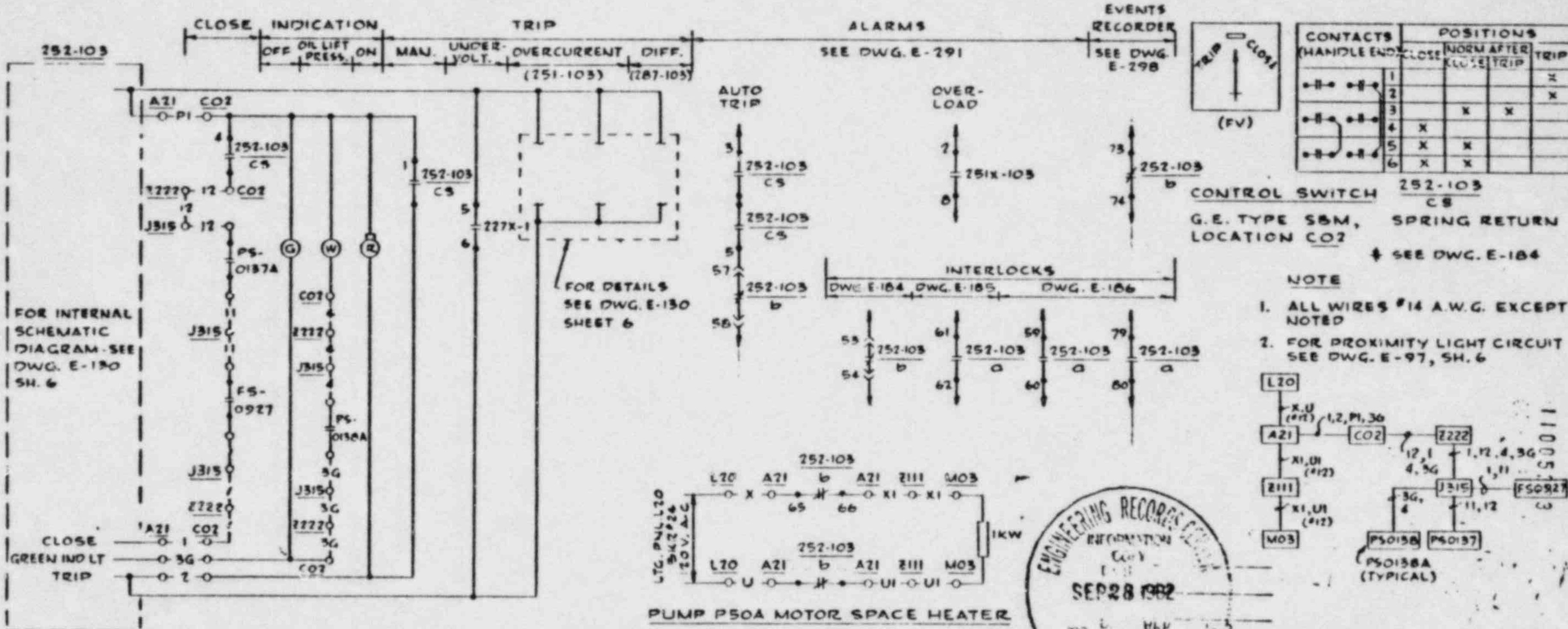
BECHTEL COMPANY

PALISADES PLANT
CONSUMERS POWER COMPANY

SCHEMATIC DIAGRAM
STORED ENERGY CIRCUIT BREAKER 2400V & 4160V

JOB No.	DRAWING No.	REV.
5935	E-129 SH.1	2

ATTACHMENT 7
KAT 31-82



PRIMARY COOLANT PUMP P50A

SCHEME A2103

CONTACTS (HANDLE END)		POSITIONS: CLOSE	NORM AFTER CLOSE	NORM AFTER TRIP	TRIP
	1				X
	2				X ♦
	3		X	X	
	4	X			
	5	X	X		
	6	X	X		♦

CONTROL SWITCH $\frac{252\text{-}103}{CS}$

G.E. TYPE SBM, SPRING RETURN
LOCATION CO2

♦ SEE DWG. E-184

NOTE

1. ALL WIRES #14 A.W.G. EXCEPT AS NOTED
2. FOR PROXIMITY LIGHT CIRCUIT SEE DWG. E-97, SH. 6

ADAPTER TABLE

PRIMARY COOLANT PUMP No.	ACB 252-	ACB LOC	SCHEME	CONTROL SW. 252-	CONTROL SW. LOC	UNDERVOLT. RELAY 227X-	UNDERVOLT. RELAY LOC	DIFF RELAY 287-	DIFF RELAY LOC	PRESS. SW. PS-	OVERCURRENT AUX. RELAY No.		OVERCURRENT AUX. RELAY LOC	DIFF. RELAY 287-	LIFT PP PRESS SW	COOL WTR FLOW SW.	LTG CKT	CANISTER		TERMINAL BLOCK LOCATION	MOTOR LOC
P50A	103	A21	A2103	103/CS	CO2	1/5E6	A21	103	A21	0138A	251-103	251X-103	A21	103	PS-0137A	FS-0927	24	2111	2222	J315	M03
P50B	203	A22	A2203	203/CS	CO2	2/5E6	A22	203	A22	0138B	251-203	251X-203	A22	203	PS-0137B	FS-0928	20	2111	2222	J316	M03
P50C	104	A21	A2104	104/CS	CO2	1/7E8	A21	104	A21	0146A	251-104	251X-104	A21	104	PS-0147A	FS-0929	24	2112	2222	J317	M04
P50D	204	A22	A2204	204/CS	CO2	2/7E8	A22	204	A22	0146B	251-204	251X-204	A22	204	PS-0147B	FS-0930	20	2112	2222	J318	M04

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PALISADES PLANT
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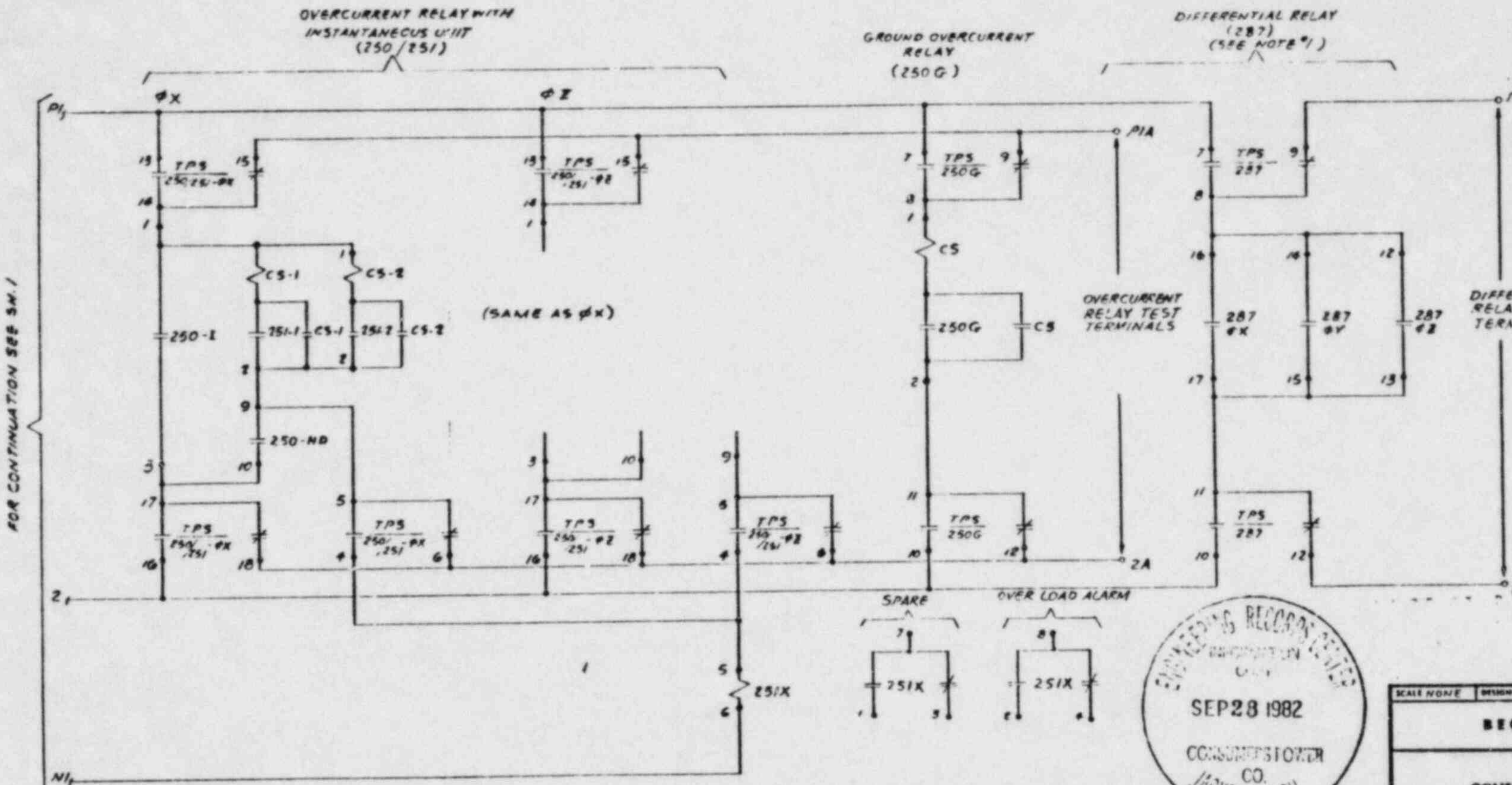
SCHEMATIC DIAGRAM
PRIMARY COOLANT PUMPS

JOB No.	DRAWING No.	REV.
5935	E-183	4

NO.	DESCRIPTION
4	ISSUED AS BUILT 5935-D
3	REL. AS MARKED

16

ATTACHMENT B
KAT 31-82



4160 V MOTOR FEEDER
OVERCURRENT & DIFFERENTIAL TRIP CIRCUIT

NOTE
1. DIFFERENTIAL RELAY (287-) USED ON PRIMARY COOLANT PUMP FEED BKR'S ONLY (252-103, -104, -203 & -204)

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JACKSON, MICH.

SCALE NONE | DESIGNED | DRAWN

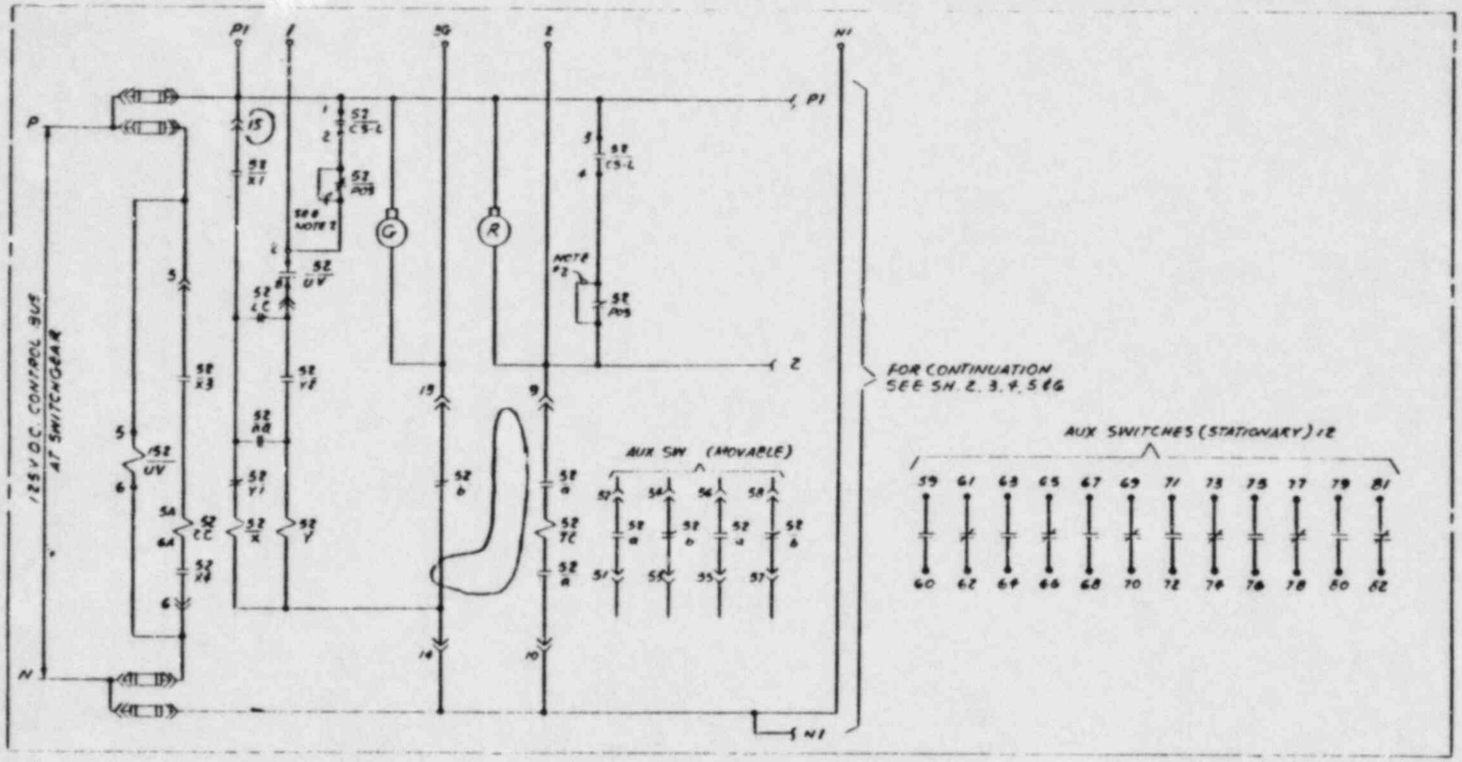
BECHTEL COMPANY

PALISADES PLANT
CONSUMERS POWER COMPANY

SCHEMATIC DIAGRAM
SOLENOID OPERATED
CIRCUIT BREAKER

JOB No.	DRAWING No.	REV.
5935	E-130 SH6 OF6	2

ATTACHMENT 9
KAT 31-82



INTERNAL WIRING SCHEMATIC DIAGRAM

SOLENOID OPERATED CIRCUIT BREAKER

NOTES:

1. POSITION SWITCHES (52/POS) SHOWN WITH BREAKER IN TEST POSITION.
2. JUMPERS PROVIDED ON ALL BREAKERS ON 2400V BUSES #1C AND #1D TO PERMIT OPERATION IN BOTH TEST AND OPERATING POSITIONS EITHER FROM CONTROL ROOM OR AT THE SWITCHGEAR
3. FOR STORED ENERGY CIRCUIT BREAKER, SEE DWG. E-129
4. REF. ALLIS-CHALMERS DWG N° 18-463-584-443 (5935-22)

REV.	DESCRIPTION	ENG	DR	CHK	SUPV	MATL	APPROVALS	DATE
2	REV PER VP(85-22) & ISSUED AS BUILT 59350							
1	Added O/C relay to 4160V Motor Feeder Ckt.		GYR					
0	ISSUED FOR CONSTRUCTION		DT	J.M.				

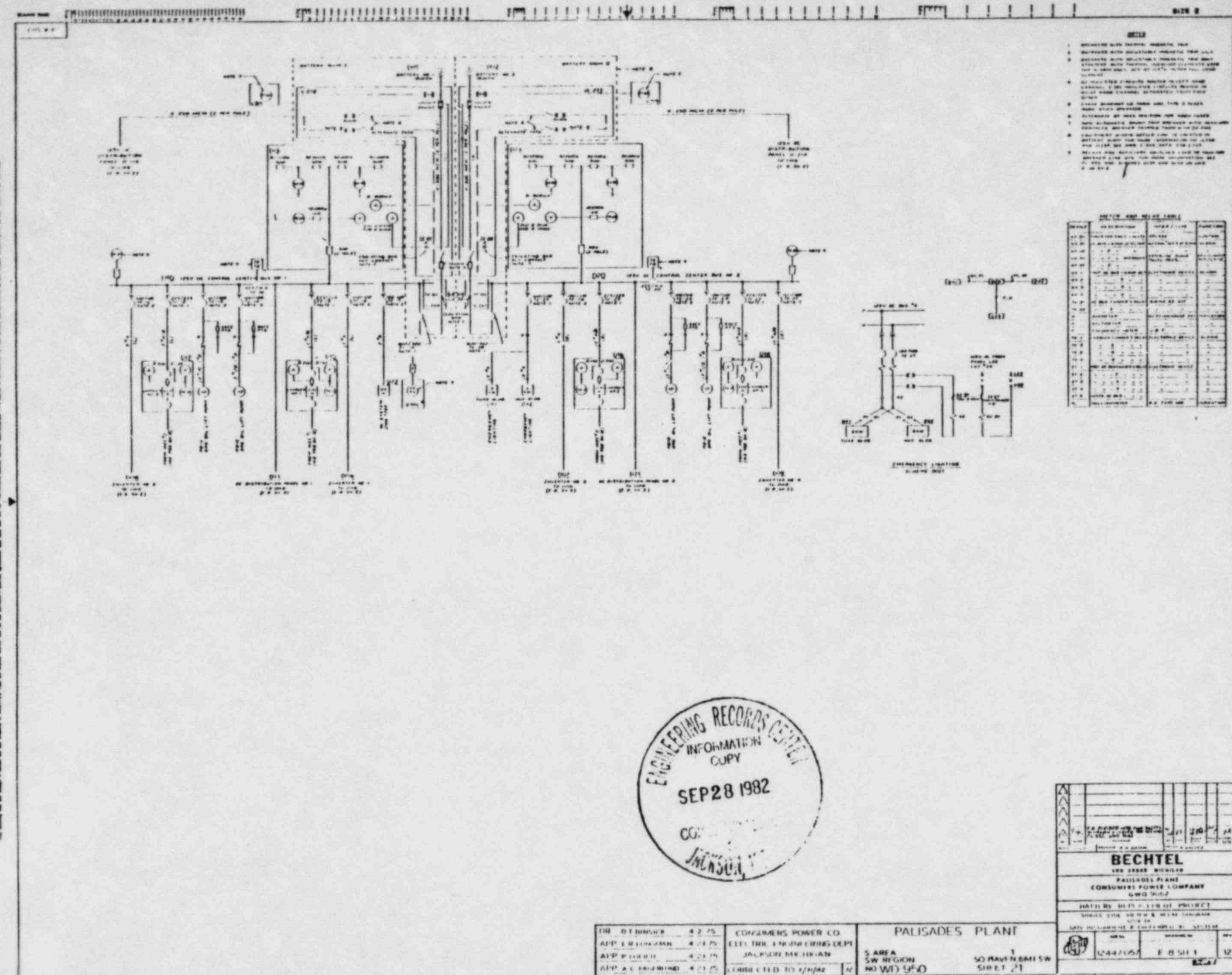
SCALE NONE	DESIGNED	DRAWN D.T.

BECHTEL COMPANY

PALISADES PLANT
CONSUMERS POWER COMPANY

SCHEMATIC DIAGRAM
SOLENOID OPERATED CIRCUIT BREAKER

JOB No.	DRAWING No.	REV
5935	E-130 SH 1 OF 6	2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NO WD 950
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12