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MIDDLE SOUTH UTILITIES SYSTEM

February 16, 1984

W3P84-0405
3-A1.01.04
Q-3-B41

Director of Nuclear Reactor Regulation
Attention: Mr. G.W. Knighton, Chief,
Licensing Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford SES Unit 3
Docket No. 50-382
Changes To Component Cooling Water System
To Enhance Availability Of Cooling To
Reactor Coolant Pump Seals

REFERENCE: W3P83-4150 dated December 29, 1983

ENCLOSURES: (1) Description of Change and Safety Evaluation
(2) FUSAR Change Request
(3) Revised Control Wiring Diagrams

Dear Sir:

In the referenced letter, we informed you that LP&L was making certain changes to the Waterford 3 Component Cooling Water (CCW) System. The objective of these changes is to ensure the availability of CCW to the Reactor Coolant Pump seal coolers in the event of an inadvertent Safety Injection Actuation Signal (SIAS), as well as for certain non-LOCA depressurization events addressed in Generic Letter 83-10a.

On January 26, a meeting was held in Bethesda, Maryland among members of the NRC, LP&L and Ebasco staffs at which the design details of the change were presented. These changes do not pose an unreviewed safety issue and, in fact, increase the overall safety of the plant.

The purpose of this letter is to inform you that we are proceeding to implement these changes prior to fuel load. Enclosed please find appropriate documentation in the form of a summary description of the change and a safety evaluation, a FUSAR change package, and design drawings.

B001
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Should you have any questions or comments on this matter, please feel free to contact Mike Meisner at (504) 363-8938.

Very truly yours,

K. W. Cook
Nuclear Support & Licensing Manager

KWC/MJM/ch
Attachments

cc: W.M. Stevenson, E.L. Blake, J. Wilson, R. Stevens (NRC/ICSB), J.S. Wermier (NRC/ASB), Y. Leung (NRC/RSB), Y.S. Huang (NRC/CSB), G.L. Constable

ENCLOSURE (1)

DESCRIPTION OF CHANGE AND SAFETY EVALUATION

(See Simplified CCW Flow Diagram Attached)

I. PRESENT DESIGN

The Waterford-3 CCW System is described in FSAR Sections 9.2.2 and is shown in FSAR Figure 9.2-1. The Reactor Coolant Pumps are described in FSAR Section 5.4.

II. PROBLEM

Both SIAS and CIAS are actuated via either a low pressurizer pressure or a high containment pressure signal. Under the present design, CCW to the RCP seal coolers will be isolated by either of these signals. Automatic closure of the CCW header isolation valves (3CC-F120A, 122A, 121B, 123B) on SIAS or automatic closure of the CCW supply and return containment isolation valves (CIV's) (2CC-F146A/B, F243A/B and F147A/B) on CIAS will therefore isolate CCW from the RCP's.

Once this isolation takes place via a valid or inadvertent SIAS or CIAS, the operator would have to manually re-open the header isolation valves and the CIV's. Though the RCP's have been tested to demonstrate that they can operate acceptably without CCW for 30 minutes (see response to FSAR Question 010.15), such manual intervention would have to take place within 10 minutes in order to maintain a high degree of confidence that the seals will not suffer degradation. During this critical initial period after an ESFAS, the operator's attention should be totally dedicated to diagnosing the problem and taking essential steps to bring the plant to a safe condition.

III. OJBECTIVE OF CHANGE

The objective is to ensure that CCW will continue to provide cooling to the RCP seal coolers after an SIAS or CIAS is generated by low pressurizer pressure without relying on operator action. This goal is in keeping with the "trip two/run two" strategy of the CE Owner's Group that will be adopted by LP&L at Waterford-3. It is also in

keeping with the intent of the guidance contained in Generic Letter 83-10a (Resolution of TMI Action Item II,K.3.5 "Automatic Trip of Reactor Coolant Pumps"). At the same time, this change will ensure that Waterford-3's design philosophy of physical separation and isolation of redundant trains for safety related systems, such as CCW, after any ESFAS is maintained, and that the CCW piping to and from the RCP's is isolated automatically on a large LOCA or MSLB, or any accident yielding elevated containment pressure.

It may be said that since the Containment Isolation Valves providing CCW to the RCP's are now dependent on a high containment pressure actuation signal, they therefore do not meet diverse isolation criteria. We feel, however, that since the concept of providing CCW to the RCP's for certain accidents is endorsed by NRC, the actual intent is met. CSAS is a fully qualified and NRC approved part of the Waterford-3 Plant Protection System (PPS). Such isolation, referred to as "Phase B" isolation in the terminology of ANS 56.2, which is endorsed by RG1.141, has industry precedent.

IV. DESCRIPTION OF CHANGE

A. SUMMARY

Upon SIAS or CIAS, the nonseismic, nonessential loop will continue to be isolated and the two redundant essential divisions of CCW will continue to be separated from each other. However, a flow path will be provided for CCW from the A train only to the RCP's and CEDM coolers. This will be accomplished by deferring closure of the header isolation valves on the A side (3CC-F120A, F122A) and the three CIV's from SIAS and CIAS, respectively to CSAS. Upon CSAS, the flow pattern of CCW and separation configuration will be exactly as it is now after SIAS or CIAS.

B. DETAILS

As noted above, in order to resolve the problem of providing adequate containment isolation and still provide continued availability of the RCP's, the containment isolation valves to

and from the RCP's will close on CSAS rather than CIAS. The two header isolation valves will also now close on CSAS rather than SIAS. The advantage of CSAS is that it is actuated on high containment pressure with an interlock with SIAS, so that SIAS must be actuated as a prerequisite for containment spray actuation. Actuation of CSAS, therefore, is a positive indication that there is either a LOCA event or a main steam line break in progress in the containment. In either event, the closure of the containment isolation valves in the CCW lines to the RCP's is in order.

The CSAS being used, as discussed above, is a four channel system as described in Section 7.3 of the FSAR and SER. It should also be noted that the instrumentation used in monitoring containment pressure for the purpose of actuation of SIAS and CSAS consists of independent loops that are not subject to a common fault.

In addition to the signal changes discussed above, the following other changes will be made:

Shutdown Heat Exchanger "A" Outlet Valve (3CC-F130A) - This valve will remain as is on SIAS and will open fully on CSAS. This is being done to reduce the demand on the "A" CCW pump which will be servicing the RCP's. The "B" SDHX outlet valve will continue to go full open on SIAS.

Fuel Pool Heat Exchanger TCV (3CC-TM138AB) - As before, CCW to the FPHX is isolated on SIAS. Now, however, SIAS will directly close this valve since the header valves on the "A" side will remain open on SIAS.

Letdown Heat Exchanger TCV (3CC-TM169AB) - The CCW to LDHX will be isolated but now it will close automatically when either letdown isolation valve, 2CH-F1518AB or 1CH-F2S01AB, on the CVCS side closes.

V. SAFETY EVALUATION

The following safety evaluation is based on the requirements and recommendations for integrated Component Cooling Water System design as expressed in Standard Review Plan 9.2.2.

1. General Design Criteria (GDC) 2:
   The above described change has no effect on the CCW System capability to meet GDC 2.
2. GDC 5: Not Applicable
3. GDC 44: As it relates to:
   a. The capability to transfer heat loads from safety-related structures, systems, and components to a heat sink under both normal operating and accident conditions.

      This change has no effect on the ability of CCW to transfer heat loads to a heat sink under both normal and accident conditions. Under both SIAS and CSAS configurations, there are two separate divisions of CCW, each capable of removing 100% of the essential heat loads.

   b. Component redundancy so that safety functions can be performed assuming a single active component failure coincident with loss of offsite power.

      Component redundancy and the ability to meet a single active failure is not affected by this change (See FSAR FMEA T9.2-4).

   c. The capability to isolate components, systems or piping, if required, so that the system safety function will not be compromised.

      This change has no affect on this capability.

   d. NUREG-0737 II.K.2.10 and II.K.3.25
      This change has no affect on compliance with these two items.

   e. (i) A single failure in CCW does not result in fuel damage or reactor coolant leakage in excess of normal coolant makeup capability. Single failure includes but is not limited to operator error, spurious activation of a valve operator, and loss of a cooling water pump.
      This change has no effect.

(ii) Moderate energy leakage crack analysis (per BTP ASB 3-1). This change has no effect on the moderate energy analysis of FSAR Sec. 3.6.

(iii) Demonstration by test that the RCP's can withstand loss of cooling water for 20 minutes, and instrumentation to detect same is provided in control room.
This change has no effect on this requirement. As stated in FSAR Section 5.4.1.3 and response to FSAR Q010.15, a 30 minute test has been conducted successfully.

4. GDC 45: No Effect

5. GDC 46: No Effect

6. FSAR Chapter 15 Safety Analyses

The safety analyses are not affected by this change. The actual setpoints are determined to ensure that the specified protective action is initiated at or before the analysis high pressure setpoint is reached. The analysis high pressure setpoint of CSAS is the same as that of SIAS or CIAS, i.e. 5 psig. The actual instrument setting will be slightly different only due to the fact that independent instrument loops are involved.

EBASCO SERVICES INCORPORATED

SHEET ____ OF ____

CLIENT LOUISIANA POWER & LIGHT

PROJECT WATERFORD 3 STEAM ELECTRIC STATION

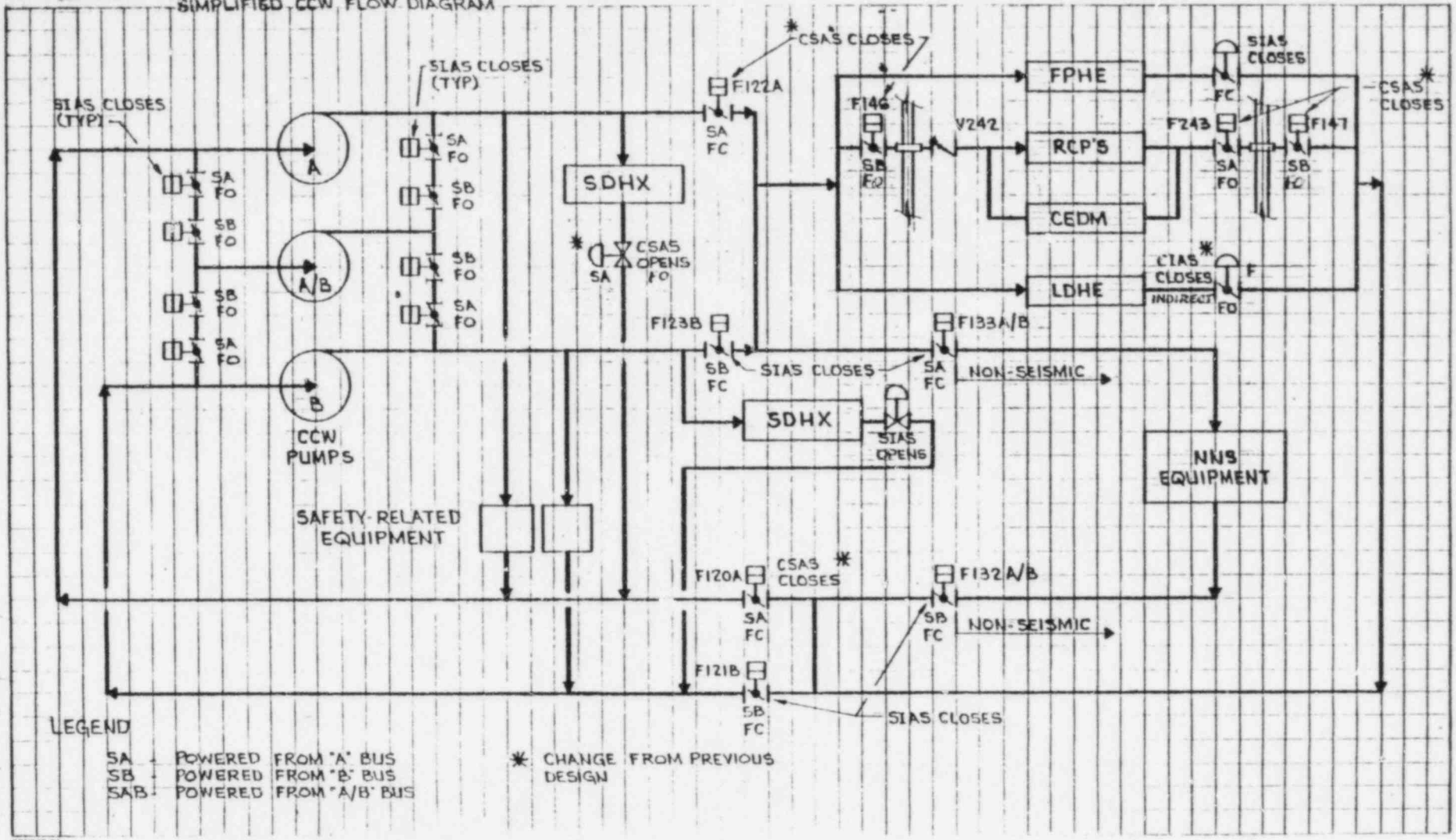
SUBJECT PROPOSED CHANGES TO CCWS TO SUPPLY CCW TO THE RCP'S.

SIMPLIFIED CCW FLOW DIAGRAM

OFS NO. ____ DEPT. NO. ____

BY ____ DATE ____

CHECKED BY ____ DATE ____



M10/5-74

ENCLOSURE (2)

FUSAR CHANGE PACKAGE

WSES-FSAR

TABLE 6.2-

Penetration No.	System Name	Fluid[a]	Penetration Type[j]	Penetration Class	Flow Direction[b]	Location Reference to Containment[c]	Valve Type	Valve Operator	Vented/Drained For Type "A" Test[k]	Valve Tag No.	Line Size (Inch)
16	Component Cooling Water Outlet from Containment Fan Cooler Units	Demineralized Water	III	C	E	O	Butterfly	P	No[n]	2CC-F161B2	8
17	Component Cooling Water Outlet from Containment Fan Cooler Units	Demineralized Water	III	C	E	O	Butterfly	P	No[n]	2CC-F158A1	8
18	Component Cooling Water Inlet to Containment Fan Cooler Units	Demineralized Water	III	C	I	O	Butterfly	P	No[n]	2CC-F154A1	8
19	Component Cooling Water Outlet from Containment Fan Cooler Units	Demineralized Water	III	C	E	O	Butterfly	P	No[n]	2CC-F159A2	8
20	Component Cooling Water Inlet to Containment Fan Cooler Units	Demineralized Water	III	C	I	O	Butterfly	P	No[n]	2CC-F155A2	8
21	Component Cooling Water Inlet to Containment Fan Cooler Units	Demineralized Water	III	C	I	O	Butterfly	P	No[n]	2CC-F156B1	8
22	Component Cooling Water Outlet from Containment Fan Cooler Units	Demineralized Water	III	C	E	O	Butterfly	P	No[n]	2CC-F160B1	8
23	Component Cooling Water Inlet to Reactor Coolant Pumps and CRDH Cooler	Demineralized Water	III	C	I	O I	Butterfly Check	P Self	No[n]	2CC-F146A/B 2CC-V242A/B	10 10

UNIT-3

(Cont'd)

Essential (d)	Actuation Signal (e)	Maximum Closure Time (sec)	Valve Position (f) Normal	Shutdown	Post-Accident	Loss of Power to Operator	Actuation Mode (g) Primary	Secondary	Approx. Length of Pipe (ft-in) (h)	Power Source AC/DC	Type "C" Tests (i)	Test Arrangement (o)	Remarks
Yes	SIAS (Opens)	NA	O	O	O	O	P	M	29-9	AC-SB	No	N/A	
Yes	SIAS (Opens)	NA	O	O	O	O	P	M	19-6	AC-SA	No	N/A	
Yes	SIAS (Opens)	NA	O	O	O	O	P	M	19-6	AC-SA	No	N/A	
Yes	SIAS (Opens)	NA	O	O	O	O	P	M	19-8	AC-SA	No	N/A	
Yes	SIAS (Opens)	NA	O	O	O	O	P	M	19-9	AC-SA	No	N/A	
Yes	SIAS (Opens)	NA	O	O	O	O	P	M	19-6	AC-SB	No	N/A	
Yes	SIAS (Opens)	NA	O	O	O	O	P	M	19-6	AC-SB	No	N/A	
No	CIAS (q) / None — CSAS	5	O	O	C/O	O (s)	P	M	25-0	DC-SB / None	No / No	N/A	

1A

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Penetration No.	System Name	Fluid[a]	Penetration Type[j]	Penetration Class	D
24	Component Cooling Water Outlet from Reactor Coolant Pumps and CEDM Cooler	Demineralized Water	III	C	
25	Fuel Transfer Containment and Fuel Handling Building	Fuel Transfer Tube	VI	**	
26	Chemical & Volume Control Letdown Line	Borated Water	III	B1	
27	Chemical & Volume Control Charging Line	Borated Water	III	D	
28	Sampling Line from Reactor Coolant Line	Primary Coolant	III	B1	
29	Sampling Line from Pressurizer Surge Line	Primary Coolant	III	B1	
30	Sampling Line from Pressurizer Steam Space	Primary Coolant	III	B1	
31	Waste Management from Containment Vent Header	Waste Gas	III	A1	
32	Safety Injection from SIS Sump	Borated Water	IV	D	
33	Safety Injection from SIS Sump	Borated Water	IV	D	
	Sampling Line from SIS Recirc. Sump	Borated Water	IV IV	D D	

** The double sealed blind flange when installed is considered part of the

p. 6.2-206 (cont'd)

TABLE 6.2-32 (Cont'd)

ion[b]	Location Reference to Containment[c]	Valve Type	Operator	Vented/Drained For Type "A" Test[k]	Valve Tag No.	Line Size (Inch)	Essential
	O	Butterfly	P	No[n]	2CC-F147A/B	10	No
	I	Butterfly	P		2CC-F243A/B	10	
	I	Double Sealed Flange	-	-	-	36	No
	O	Gate	P	Yes	2CH-F1518A/B	2	No
	I	Gate	P		1CH-F2501A/B	2	
	O	Gate	P	No[1]	2CH-F1529A/B	2	Yes[t
	I	Globe	S		1CH-E2505A	2	
		Globe	S		1CH-E2505B	2	
		Globe	S		1CH-E2504B	2	
		Globe	S		1CH-E2503A	2	
		Check	Self		1CH-V2506	2	
	O	Globe	P	Yes	2SL-F1504A/B	1/2	No
	I	Globe	P		2SL-F1501A/B	1/2	
	O	Globe	P	Yes	2SL-F1505A/B	1/2	No
	I	Globe	P		2SL-F1502A/B	1/2	
	O	Globe	P	Yes	2SL-F1506A/B	1/2	No
	I	Globe	P		2SL-F1503A/B	1/2	
	O	Diaphragm	P	Yes	2WM-F158A/B	1	No
	I	Diaphragm	P		2WM-F157A/B	1	
	O	Butterfly	P	No[m]	2SI-L101A	24	Yes
	O	Butterfly	P	No[m]	2SI-L102B	24	Yes
	O	Globe	S	-	2SI-E654	1-1/2	Yes
	O	Globe	S	-	2SI-E655	1-1/2	Yes

ainment pressure boundary.

P.6.2-206 (CONT'D)

tial[d]	Actuation Signal[e]	Maximum Closure Time (sec)	Valve Position[f] Normal	Shutdown	Post-Accident	Loss of Power to Operator	Actuation Mode[g] Primary	Secondary	Approx. Length of Pipe (ft-in)[h]	
	~~CSAS CIAS~~[q]	5	O	O	C/O	O[(S)]	P	M	28-3	
	~~CSAS CIAS~~[q]	5	O	O	C/O	O[(S)]	P	M		
	None	-	-	-	-	-	-	-	NA	
	CIAS[q]	10	O	O	C/O	C	P	M	17-9	
	CIAS[q]/SIAS[q]	10	O	O	C/O	C	P	M	-	
s[t]	Remote Manual	-	LO	O	O	O	P	M	13-0	
	Remote Manual	-	LC	C	C/O	C	S	-		
	Remote Manual	-	LC	C	C/O	C	S	-		
	Remote Manual	-	O	O	O	C	S	-		
	Remote Manual	-	O	O	O	C	S	-		
	None	-	-	-	-	-	-	-		
	CIAS[q]	10	O	O	C/O	C	P	M	26-6	
	CIAS[q]	10	O	O	C/O	C	P	M	-	
	CIAS[q]	10	O	O	C	C	P	M	26-6	
	CIAS[q]	10	O	O	C	C	P	M	-	
	CIAS[q]	10	O	O	C	C	P	M	24-9	
	CIAS[q]	10	O	O	C	C	P	M	-	
	CIAS	7	O	O	C	C	P	None	24-9	
	CIAS	7	O	O	C	C	P	None	-	
	SIAS (Close)/ RAS (Open)	5	C	C	O	AI	P	M	6-0	
	SIAS (Close)/ RAS (Open)	5	C	C	O	AI	P	M	6-0	
	None	5	C	C	C/O	O	S	-	11-0	
	None	5	C	C	C/O	O	S	-	10-0	

p. 6.2-206 (CONT'D)

Type "C" Tests (i)	Test Arrangement (o)	Remarks
No	N/A	19
No		
		25
No	N/A	33
-		25
Yes	3	33
Yes		
No	N/A	19
No		23
No		
No		
No		14
		8
Yes	3	33
Yes		
		14
Yes	3	33
Yes		
		14
Yes	3	33
Yes		
		14
Yes	3	
Yes		33
No	N/A	8
	N/A	
No	N/A	33
No	N/A	

except for the Component Cooling Water penetrations servicing the Reactor Coolant Pump seal coolers and CEDM coolers which automatically close on Containment Spray Actuation Signal (CSAS)

6.2.4 CONTAINMENT ISOLATION SYSTEM

The Containment Isolation System (CIS) provides the means for isolating fluid systems that pass through the containment in order to confine any radioactivity that may be released following a LOCA or main steam line break (MSLB) inside containment. The containment purge isolation signal (CPIS) also isolates the containment purge upon high radiation inside the containment (see Section 7.6).

6.2.4.1 Design Bases

6.2.4.1.1 Conditions Requiring Isolation

a) Automatic initiation of a containment isolation actuation signal (CIAS) occurs when containment high pressure or low pressure in pressurizer is detected. The CIAS closes all automatic isolation valves in the lines penetrating the containment not required for the operation of the engineered safety features systems. | 17 | 33 | 22 | 33

b) Main steam line and main feedwater isolation valves are closed automatically following a secondary system line break or detection of high pressure inside the containment. MSIS is generated by low steam generator pressure or high containment pressure. | 17

c) The containment purge is automatically isolated upon receipt of a high radiation inside containment signal and high activity in the plant stack, and the ESF signal CIAS. | 33

6.2.4.1.2 Criteria for Isolation of Fluid Systems Penetrating the Containment

a) Valves isolating penetrating lines serving engineered safety feature systems are not closed automatically by the CIAS, but have the ability to be closed by remote manual operation from the main control room, thereby isolating any engineered safety feature system which malfunctions.

b) All penetration assemblies and containment isolation valves are seismic Category I, Safety Class 2 (except for valves, inside containment, connected to the RCPB which are Safety Class 1) and are protected from the effects of missiles and pipe break. | 22

c) All piping penetrating the containment vessel shell is designed to withstand at least a pressure and temperature equal to the containment vessel design internal pressure and temperature and to withstand the post-accident transient environment. In each of the four classes of penetrations listed below, at least two barriers are provided between the containment atmosphere and the outside atmosphere, so that failure of one valve to close does not prevent isolation.

TABLE 7.3-5 (Cont'd)

(COMPONENTS ACTUATED ON SIAS)

Action	Component	Tag Number	Actuation Channel A	Actuation Channel B	
Start	Component Cooling Water Pump	A	X		
Start	Component Cooling Water Pump	B		X	
Start(9)	Component Cooling Water Pump	A/B	X	X	33
~~Open~~	~~CCW Outlet Valve from Shutdown HX A~~	~~3CC-F130A~~	~~X~~		
Open	CCW Outlet Valve from Shutdown HX B	3CC-F131B		X	
Start	Aux Component Cooling Water Pump	A	X		30
Start	Aux Component Cooling Water Pump	B		X	33
Close	CCW Pump A Discharge Header Isolation Valve	3CC-F109A/B	X		27
Close	CCW Pump A Discharge Header Isolation Valve	3CC-F110A/B		X	
Close	CCW Pump B Discharge Header Isolation Valve	3CC-F112A/B	X		30
Close	CCW Pump B Discharge Header Isolation Valve	3CC-F111A/B		X	
Close	CCW Pump A Suction Header Isolation Valve	3CC-F113A/B	X		
Block Auto Operation	Instrument Air Compressor	A	X		
Block Auto Operation	Instrument Air Compressor	B		X	
Close	CCW Pump A Suction Header Isolation Valve	3CC-F114A/B		X	
Close	CCW Pump B Suction Header Isolation Valve	3CC-F116A/B	X		30
Close	CCW Pump B Suction Header Isolation Valve	3CC-F115A/B		X	
Close	CCW Train A Supply to NNS ~~Isolation Valve~~	3CC-F122A	X		

TABLE 7.3-5 (Cont'd)

Action	Component	Tag Number	Actuation Channel A	Actuation Channel B
Close	CCW Train B Supply to ~~NSS~~ NNS Isolation Valve	3CC-F123B		X
Close	CCW Supply to NNS Isolation Valve	3CC-F133A/B	X	
~~Close~~	~~CCW Train A Return to CCW Pumps Common Suction Hdr Isolation Valve~~	~~3CC-F120A~~	~~X~~	
Close	CCW Train B Return to CCW Pumps Common Suction Hdr Isolation Valve	3CC-F121B		X
Close	CCW Return from NNS to CCW Pumps Common Suction Hdr Isolation Valve	3CC-F132A/B		X
Reset to SIAS operational mode	CCW Heat Exchanger A Temperature Control Valve	3CC-TM290A	X	
Reset to SIAS operational mode	CCW Heat Exchanger B Temperature Control Valve	3CC-TM291B		X
Close	Temperature Control Valve from Spent Fuel Pool Heat Exchanger	3CC-TM138AB	X	

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TABLE 7.3-7

COMPONENTS ACTUATED ON CSAS

Action	Component	Tag Number	Actuation Channel A	Actuation Channel B
Start	Containment Spray Pump	A	X	
Start	Containment Spray Pump	B		X
Open	Containment Spray Isol Valve	2CS-F305A	X	
Open	Containment Spray Isol Valve	2CS-F306B		X
Fail to start	Cont. Spray Pump A Alarm		X	
Fail to start	Cont. Spray Pump B Alarm			X
Close	Containment Isolation Valve - CCW to RCP's and CEDM's.	2CC-F146AB		X
Close	Containment Isolation Valve - CCW from RCP's and CEDM's.	2CC-F243AB	X	
Close	Containment Isolation Valve - CCW from RCP's and CEDM's.	2CC-F147AB		X
Open	CCW Outlet Valve from Shutdown HX A	3CC-F130A	X	
Close	CCW Train A Supply to NNS Isolation Valve	3CC-F122A	X	
Close	CCW Train A Supply to NNS Isolation Valve	3CC-F120A	X	

TABLE 7.3-8 (Cont'd)

(Components Actuated on CIAS)

Action	Component	Tag Number	Actuation Channel A	Actuation Channel B	
Close	Containment Purge Air Make-Up Isol Valve	2HV-B151A	X		
Close	Containment Purge Air Make-Up Isol Valve	2HV-B150B		X	27
Close	Containment Purge Air Make-Up Isol Valve	2HV-B152A	X		
Close	Containment Purge Exhaust Isol Valve	2HV-B155A	X		
Close	Containment Purge Exhaust Isol Valve	2HV-B154B		X	
Close	Containment Purge Exhaust Isol Valve	2HV-B153B		X	30 27
Close	SI Tank Drain to RWP Cont Isol Valve	2SI-F156A/B (SI-682)	X		30
~~Close~~	~~RCP Cooling Water Supply Cont Isol Valve~~	~~2CC-F146A/B~~		~~X~~	
~~Close~~	~~RCP Cooling Water Return Isol Valve~~	~~2CC-F243A/B~~	~~X~~		27
~~Close~~	~~RCP Cooling Water Return Cont Isol Valve~~	~~2CC-F147A/B~~		~~X~~	
Close	Containment Atmosphere RAD Monitoring Cont Isol Valves	2CA-E604B 2CA-E605A 2CA-E606A	 X X	X	
Close	Containment Pressure Instrumentation Isolation Valve	2HV-E633B		X	
Close	Containment Pressure Instrumentation Isolation Valve	2HV-E634A	X		33

Two CCW pumps normally operate. A third pump is provided as a standby. The motors of the two normally operating pumps are connected to buses in separate electrical divisions, A and B. The third pump is available to replace an on-line pump that is unable to perform its function. The standby pump is connected to the A/B bus and may be manually aligned to either A or B division (see Subsection 8.3.1.2.3).

INSERT A

During normal, shutdown or refueling operating conditions, the two operating CCW pumps are connected on the pump suction and discharge, and supply cooling water into common headers serving safety and nonsafety equipment. During the accident mode, a SIAS isolates the redundant safety-related CCW loops from each other and both from the nonessential equipment. The isolation of the redundant safety-related CCW loops is achieved by two valves in series. Following isolation, separate CCWS channels are formed, and each supplies cooling water in sufficient quantity and at the required temperature to remove 100 percent of the heat necessary to shutdown the reactor.

INSERT B

DELETE

The required NPSH for the CCW pumps is provided by a surge tank located approximately 70 ft. above the pumps. The surge tank is provided with a baffle plate and redundant level indication and controls to ensure that water loss in one CCWS channel will not affect the redundant channel operation. Overflow from the surge tank is piped to the waste drains leading to the Waste Management System.

LOW SURGE TANK LEVEL WILL ISOLATE THE RESPECTIVE CCW TRAIN.

The chemical feed tank in the system permits manual on-line addition of proper corrosion inhibitor. A commercial nitrite based corrosion inhibitor is used to maintain proper corrosion protection for the Component Cooling Water System. | 26

A continuously operating radiation monitor is provided in each of the redundant headers on the discharge loop of the CCW pumps. Additional radiation monitoring is provided to monitor radioactivity of the cooling water from the components inside the containment; i.e., reactor coolant pump, motor and seal coolers, and control element drive mechanism. Should activity in the system rise above the set limit, a high radiation alarm is actuated in the main control room. A more complete discussion of the CCWS radiation monitors is provided in Section 11.5.

9.2.2.2.2 Auxiliary Component Cooling Water System

The ACCWS removes heat, when required from the CCWS via the CCW heat exchanger during normal operation, normal shutdown, and accident conditions, and transfers it to the wet cooling towers for dissipation to the atmosphere. The ACCWS is required to operate whenever the heat rejection capacity of the CCWS is exceeded (LOCA conditions), or whenever the ambient conditions prevent the CCWS from rejecting its required heat load.

The temperature controls for the ACCWS components are described in Table 9.2-2 and in Subsection 9.2.5. The ACCWS consists of two 100 percent capacity, independent loops. Each loop includes a pump, and an evaporative wet type mechanical draft cooling tower. Each tower has a basin which is capable of storing sufficient water to bring the plant to safe shutdown under all

INSERT A

The CCWS supplies cooling water to two redundant safety related essential loops, a nonessential seismically qualified loop, and a non-essential nonseismic loop.

Each essential loop services the following equipment:

A. one emergency diesel generator
B. one essential services water chiller
C. two containment fan coolers
D. one high pressure safety injection pump and the standby high pressure injection pump (valved into one train only)
E. one low pressure safety injection pump
F. one containment spray pump
G. one shutdown cooling heat exchanger

The non-essential seismically qualified loop services the following equipment:

A. one letdown heat exchanger
B. one fuel pool heat exchanger
C. four reactor coolant pump seals and motor coolers (seismically supported)
D. control element drive mechanism (CEDM) coolers (seismically supported)

The nonessential, nonseismic loop services the following equipment:

A. waste gas compressors
B. sample coolers
C. chemical feed tank
D. basic acid and waste concentrators

INSERT B

Upon SIAS, the two redundant safety loops will be automatically isolated from each other by closure of two fail close pneumatic header isolation valves (3CC-F121B, 3CC-F123B) and the nonessential, nonseismically qualified loop will be automatically isolated from both by closure of two fail closed pneumatic valves (3CC-F133A/B, 3CC-F132A/B). The CCW pump suction and discharge header isolation valves will also close on SIAS. The outlet valve on the "A" shutdown heat exchanger (3CC-F130A) remains closed but may be opened manually from the control room, the outlet valve (3CC-F131B) on the "B" shutdown heat exchanger goes full open automatically. The A loop also continues to provide cooling to the Reactor Coolant Pumps via the nonessential seismically qualified loop.

Upon CSAS, the containment isolation valves (2CC-F146A/B, 2CC-243A/B, 2CC-F147A/B) on the supply and return lines of CCW to the Reactor Coolant Pumps and CEDM coolers are automatically isolated, and the outlet valve (3CC-F130A) on the A shutdown heat exchanger goes full open automatically.

Following isolation, on SIAS, separate CCWS channels are formed, and each supplies cooling water in sufficient quantity and at the required temperature to remove 100 percent of the heat necessary to shutdown the reactor.

TABLE 9.2-2

CCWS AND ACCWS TEMPERATURE AND FLOW CONTROL DESCRIPTION

temperature control valve 3CC-FM138A/B

	NORMAL	NORMAL SHUTDOWN	REFUELING	ACCIDENT	
Fuel Pool Heat Exchanger	The temperature control valve 3CC-FM138A/B maintains the fuel pool cooling water temperature leaving the heat exchanger at approximately 108 F.	Same as normal	Same as normal	The SIAS automatically closes ~~the isolating valves 3CC-F122A and 3CC-F123B~~, thereby shutting the CCWS flow to the fuel pool heat exchanger. The isolation valve will be manually re-opened ~~(see Section 9.1)~~.	
Reactor Coolant Pump (RCP)	Flow through the RCP coolers and the CEDM air cooler is set by manually operated outlet valves; the CCWS flow to each pump is shut-off automatically by inlet valves 3CC-B188A1, -189B1, - 190A2, and -191B2, whenever the pump is not operating; CCWS flow to the CEDM air cooler can also be shutdown from the main control room by closing the inlet valve 3CC-B187A/B.	Same as normal	Same as normal	~~The SIAS automatically closes~~ the isolating valves 3CC-F122A, 3CC-F123B, 3CC-F120A and 3CC-F121B, ~~thereby shutting in~~ CCWS flow to the reactor coolant pump coolers and CEDM air cooler.	33
Letdown Heat Exchanger	The temperature control valve 3CC-TM169A/B maintains the letdown water temperature below 140 F.	Same as normal	Same as normal	~~The SIAS automatically closes the isolating valves 3CC-F122A, 3CC-F123B, 3CC-F120A, and 3CC-F121B, thereby shutting the CCWS flow to the letdown heat exchanger~~.	33
HPSI, LPSI and Containment Spray Pumps	The required flow is set by manually adjusting the respective outlet valves.	Same as normal	Same as normal	Same as normal	
Waste Gas Compressors, Sample Coolers, Boric Acid/Waste and Waste Concentrators	The required flow is set by manually adjusting the respective outlet valves.	Same as normal	Same as normal	The SIAS automatically closes the isolating valves 3CC-F133A/B and 3CC-F132A/B, thereby shutting the CCWS flow to the waste gas compressors sample coolers, and concentrators.	33 33
Diesel Generator	Outlet valves 3CC-F268A and 3CC-F269B are closed. Bypass valves are set to maintain approximately 100 gpm through each diesel generator.	Same as normal	Same as normal	On loss of offsite power, the diesel generators start automatically. The starting of diesel generators will automatically open the outlet valves 3CC-F268A and 3CC-F269B, to pass 800 gpm through each diesel generator. The flow is set by manual valves 3CC-B27A, -B28A, -B31B, and -B32B.	3 3
Containment Fan Coolers	Only three containment fan coolers are operating. One fan cooler is isolated by closing the containment isolation valves to and from that particular	Same as normal	Same as normal	Post LOCA, the control valves 3CC-TM148A and 3CC-TM149B open fully to permit 2700 gpm through two fan coolers of each channel.	3

Upon SIAS, the A division and B division CCW essential loops will be isolated from each other and the non-essential non-seismic loop. The A division CCW will continue to provide CCW to the RCP seal coolers.

Upon CSAS, containment isolation valves 2CC-F146A/B, 2CC-F243A/B and 2CC-F147A/B will be automatically closed, thereby shutting

Temperature control valve 3CC-TM169A/B closes automatically when either containment isolation valve 2CH-FIS15A/B or 1CH-F250 A/B in the letdown line closes. The TCV will return to its normal temperature control mode when both of these containment isolation valves open. These latter valves are closed on SIAS or CIAS.

TABLE 9.2-2 (Cont'd)

	NORMAL	NORMAL SHUTDOWN	REFUELING	ACCIDENT
Containment Fan Coolers (Cont'd)	cooler. The control valves 3CC-TM148A and 3CC-TM149B control the CCWS flow through the coolers, at 670 gpm for for the channel in which the isolated cooler is located, and at 1340 gpm for the other channel.			Upon SIAS, SDHX B outlet valve will automatically open to pass 3000 gpm; the SDHX A outlet valve will remain as is. Upon CSAS, the SDHX A outlet valve will open automatically to pass 3000 gpm. The operator has the capability to manipulate these valves from the control room to adjust either valve to a pre-set flow.
Shutdown Heat Exchanger (SDHX)	Outlet valves 3CC-F130A and 3CC-F131B are closed. Bypass valves are set to maintain approximately 100 gpm flow through the SDHX.	Outlet valves 3CC-F130A and 3CC-F131B are opened fully by operator. Opening of the valves will provide each SDHX with 3000 gpm, controlled by the flow restricting orifices 3CC-K296A and 3CC-K297B. The operator has the capability from the main control room to partially close the discharge valves to a predetermined position, to reduce the CCWS flow through each SDHX to 2000 gpm.	Same as normal shutdown	~~Outlet valves 3CC-F130A and 3CC-F131B open automatically, to pass 3000 gpm through each SDHX; the flow is controlled by restricting orifices 3CC-K296A, and 3CC-K297B. The operator has the capability from the main control room to partially close the discharge valves to a predetermined position to reduce the CCWS flow through each SDHX to 2000 gpm.~~
Chillers	CCWS flow through each chiller is set at 850 gpm, by manually adjusting valves 3CC-V34A, 3CC-V35A/B, and 3CC-V36B. One chiller is normally isolated.	Same as normal	Same as normal	The chiller water supply valves (3CC-F272A, -F273B, -F274A, -F275B, -F276A, -F277B, -F278A, & -F279B) align automatically when temperature exceeds 105 F to supply cooling water to the chillers from the ACCWS. The operator has the capability to realign the valves to supply cooling water to the chillers from CCWS when the cold CCWS temperature decreases below 105 F. In this case the CCWS flow to each SDHX must be reduced to 2000 gpm to avoid runout of the CCW pump.
CCW Heat Exchanger	In the event that dry cooling towers cannot maintain 95 F outlet temperature in the CCWS, the ACCW pumps will start and pump cooling water through the CCW heat exchanger; control valves 3CC-TM290A and 3CC-TM291B maintain the CCWS cold temperature at 93 F.	The set point for the control valves 3CC-TM290A and 3CC-TM291B can be adjusted by the operator from the main control room to maintain the CCWS cold temperature at 80 F to permit faster shutd[illegible].	Same as normal shutdown	The set point for the control valves 3CC-TM290A and 3CC-TM291B automatically readjust on receipt of SIAS to maintain the CCWS cold temperature at 115 F. This feature is required to reduce water makeup requirements to the wet cooling tower post LOCA.

System Parameter & Location	Indication		Alarm*		Control Function	Instrument Range
	Local	Control Room	High	Low		
LPSI Pump						
1. Outlet Flow				X(CP-8)		-
Containment Spray Pump						
1. Outlet Flow				X(CP-8)		-
Boric Acid Concentrator						
1. Outlet Flow				X(CP-4)		-
Waste Management Concentrator						
1. Outlet Flow				X(CP-4)		-
Waste Gas Compressors						
1. Outlet Flow				X(CP-4)		-
Letdown Heat Exchanger						
1. Outlet Pressure	X					0-150 psig
2. Outlet Flow		CP-8		X(CP-8)		0-1400 gpm
Chemical Feed Tank						
1. Outlet Pressure	X					0-150 psig
CCW Pump						
1. Discharge Pressure	X					0-150 psig
CCW Surge Tank						
1. Level	X	CP-8	X(CP-8)	X(CP-8)	1. Control makeup flow into tank	0-48"
2. Level					2. Automatic bypass of dry towers on low level	

3. ISOLATE CCW TRAIN

*All alarms indicated are in the main control room

TABLE 9.3-1a

SAFETY CLASS VALVES WITH AIR ACCUMULATORS

Valve Tag	Figure	Valve Tag	Figure
2SI-L101A	6.3-1	2CC-F243A/B	9.2-1
2SI-L102B	6.3-1	2CC-F146A/B	9.2-1
3CC-B201A	9.2-1	2CC-F147A/B	9.2-1
3CC-B203B	9.2-1	2CC-F154A1	9.2-1
3CC-B262B	9.2-1	2CC-F155A2	9.2-1
3CC-B265A	9.2-1	2CC-F156B1	9.2-1
2HV-B156A	9.2-1	2CC-F157B2	9.2-1
2HV-B157B	9.2-1	2CC-F158A1	9.2-1
2CS-F305A	6.2-35	2CC-F159A2	9.2-1
2CS-F306B	6.3-35	2CC-F160B1	9.2-1
		2CC-F161B2	9.2-1
		3CC-F130A	9.2-1
		3CC-TM169 A/B	9.2-1
		3CC-FM138A/B	9.2-1

9

12

EBASCO SERVICES INCORPORATED

SHEET ____ OF ____

FSAR
FIGURE 010.17-1

CLIENT LOUISIANA POWER & LIGHT

PROJECT WATERFORD 3 STEAM ELECTRIC STATION

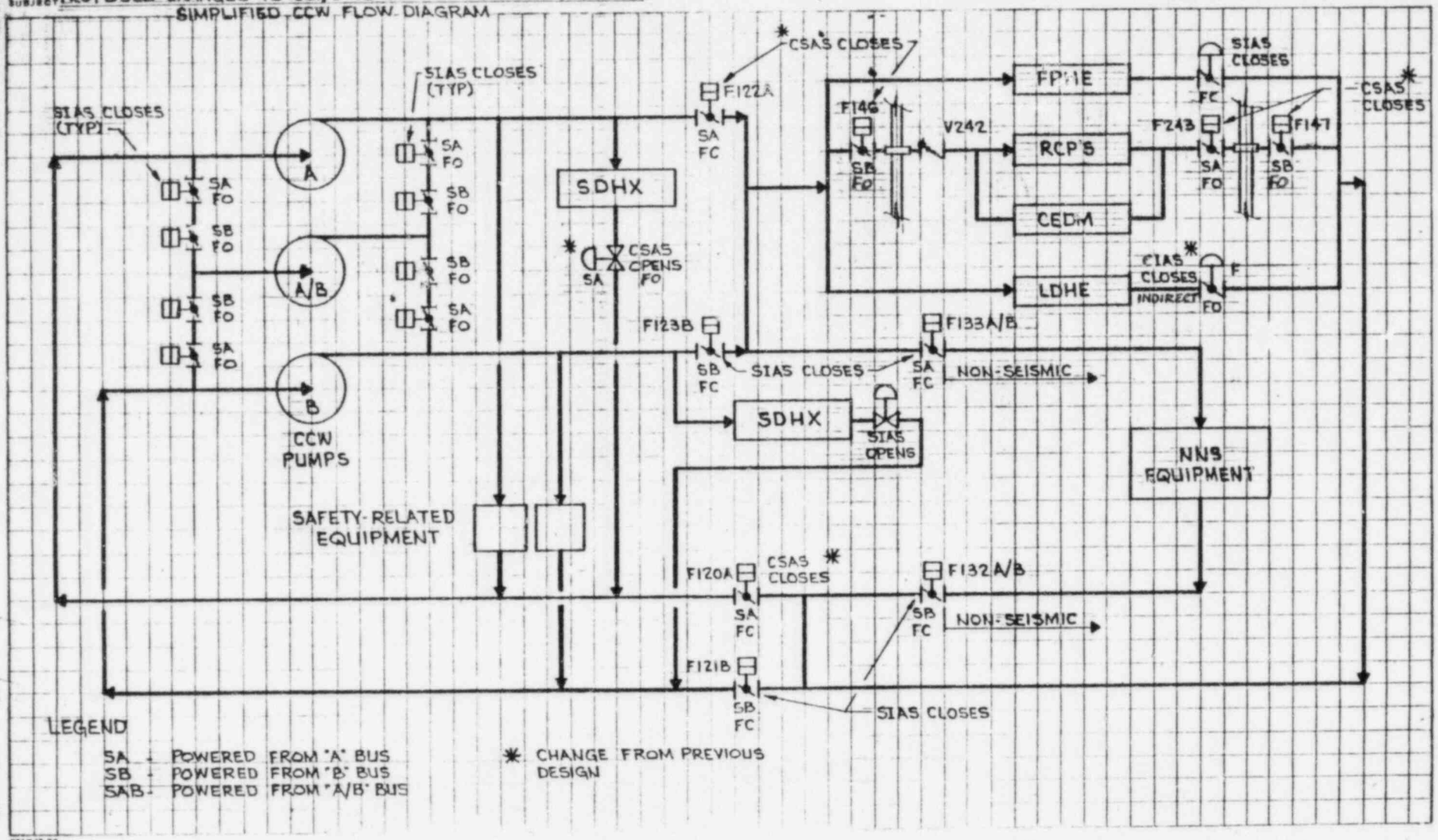
SUBJECT PROPOSED CHANGES TO CCWS TO SUPPLY CCW TO THE RCP'S.

SIMPLIFIED CCW FLOW DIAGRAM

OES NO. _____ DEPT. NO. _____

BY _____ DATE _____

CHECKED BY _____ DATE _____



M10/5-74

Question No.

480.44 Table 6.2-32 states that the component cooling water inlet valve (2CC-F146A/B) and outlet valves (2CC-F147A/B and 2CC-F263A/B) for the reactor coolant pumps and CEDM cooler fail open. Provide the necessary justification this is the "safe" position as opposed to failing closed.

Response

These valves are closed automatically on an ~~SIAS~~ CSAS to ensure that there is sufficient water supply to the essential cooling water systems post-LOCA. However, if offsite power is available, the operator may manually override the ~~SIAS~~ CSAS in order to open these valves and provide cooling water to the Reactor Coolant Pumps (RCP). The valves fail open to ensure that a single active failure will not preclude availability of the RCP's. The fail open position is the safe position for the following reasons:

Inlet Valves

For the post accident period, the valve is positioned by the operator in the safe position. If that position is open, then a failure to the open position is a trivial case. It should also be noted that the RCP's have been tested to demonstrate that they can operate acceptably without component cooling water for thirty minutes (see response to Question 010.15). If the safe position is closed, a failure to the open position does not compromise containment isolation because of the check valve inside containment. It is therefore, neither necessary nor desirable for the isolation valve outside containment to fail closed or "as is." 1

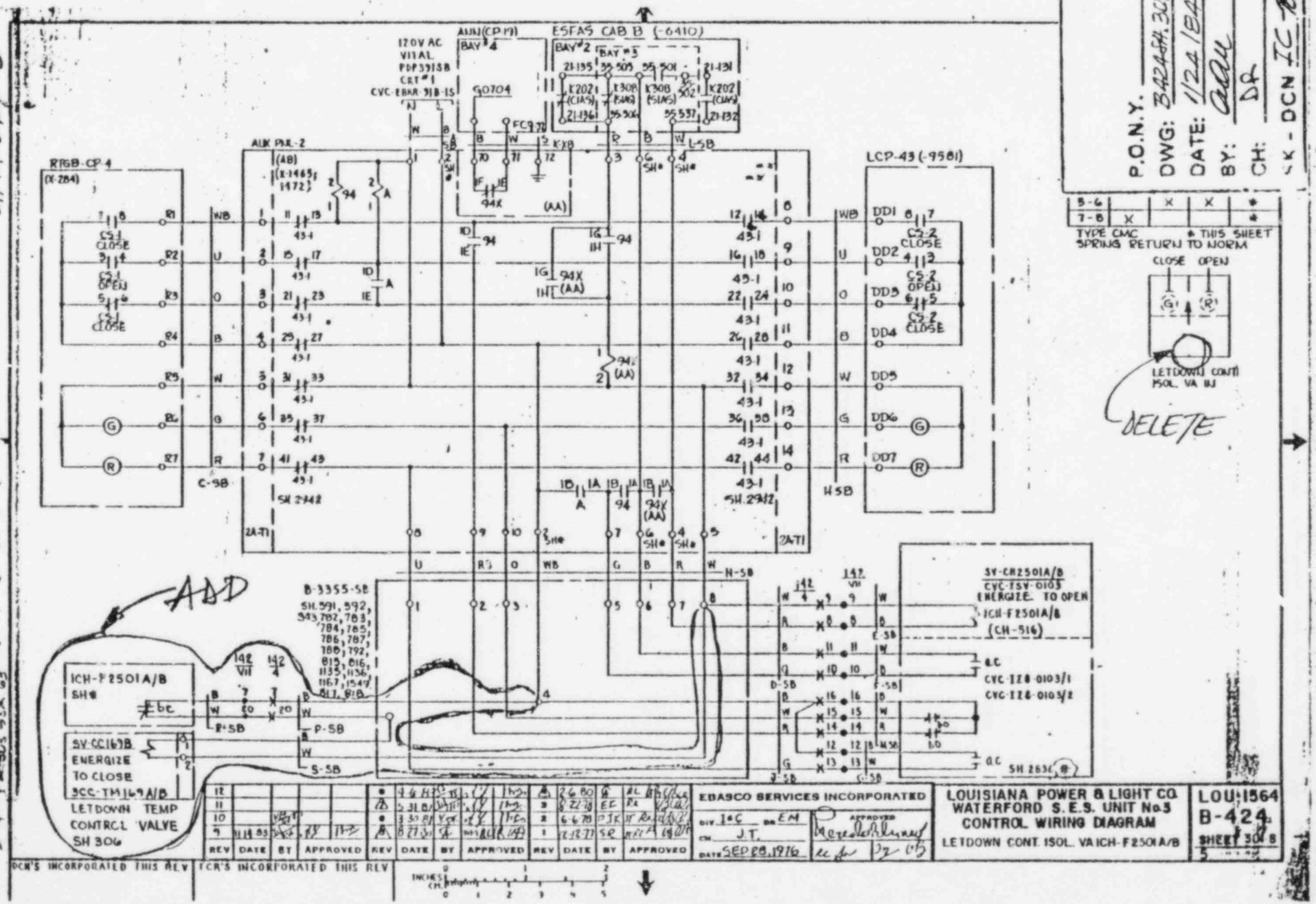
Return Valves

There are two power operated valves, one inside containment and one outside. The inside valve is powered by the SA channel plus a DC redundant source. The outside valve is powered by the SB channel plus a DC redundant source. If the safe position is closed, and a valve should fail open, the other independent valve would remain closed.

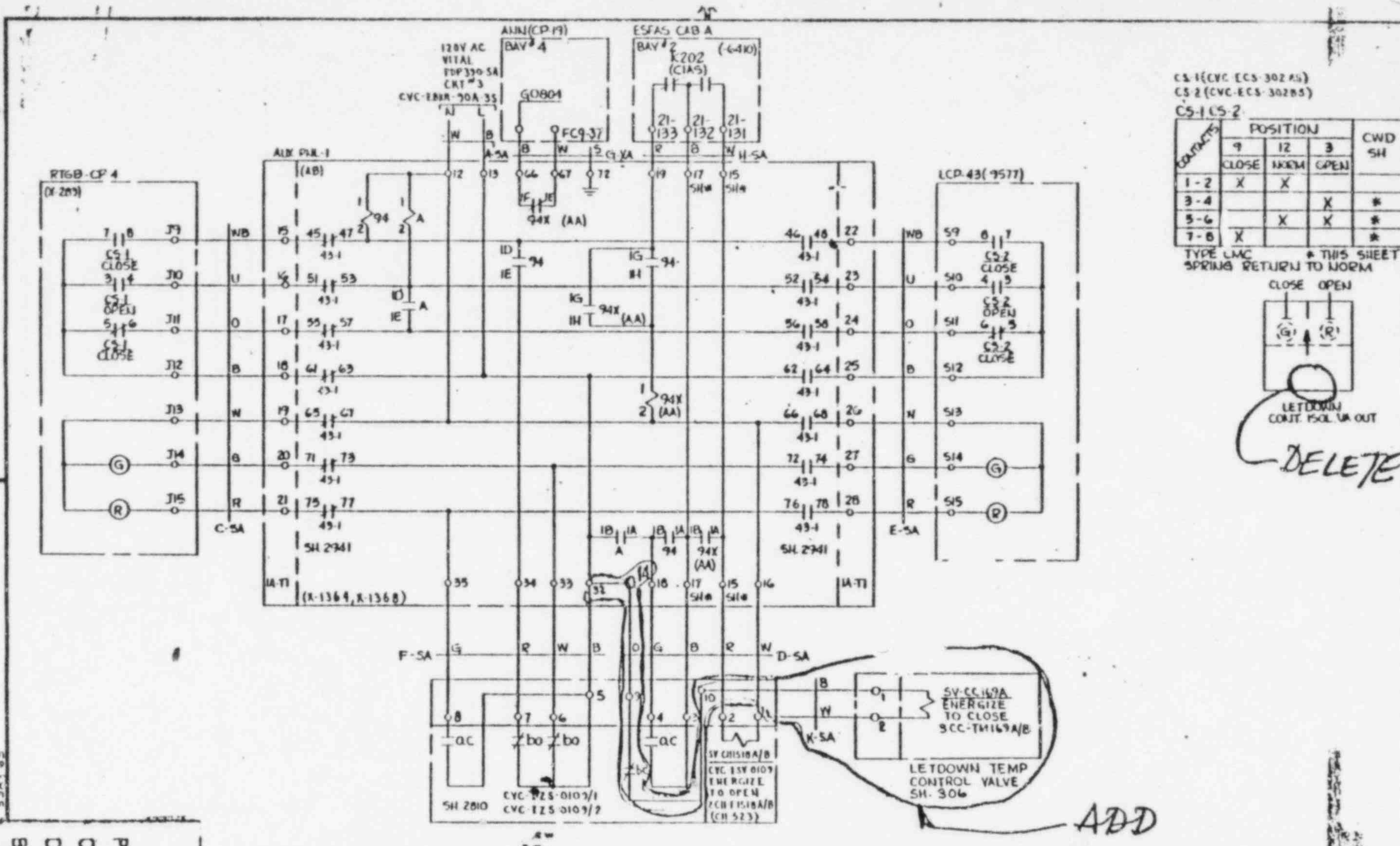
The inlet isolation valve and both return isolation valves are each provided with seismically qualified air accumulators to preclude a common mode failure from moving these valves into an undesired position.

Reference

See revised Table 6.2-32 (Penetrations 23 and 24).


P.O.N.Y.
DWG: B424#, 301 SRQ
DATE: 1/24 184
BY: CAQUE
CH: DR
DCN IC 1840
5-6 X X *
7-8 X *
TYPE CMC * THIS SHEET
SPRING RETURN TO NORM
CLOSE OPEN
LETDOWN CONTL ISOL VA 8J
DELETE
ADD
ENCLOSURE (13)
SH. 4 OF 13
FOR INFORMATION ONLY
120V AC VITAL PDP39158 CRT#1
CVC-EBAR-918-15
AUX(CP#3)
ESFAS CAB B (-6410)
RTGB-CP-4 (X-284)
AUX PNL-2 (48) (X-1465, 1472)
LCP-43 (-9581)
C-SB
H-SB
N-SB
B-3355-SB
SH. 591, 592, 593, 782, 783, 784, 785, 786, 787, 788, 792, 815, 816, 1135, 1136, 1167, 1549, 8L1, 8L8
ICH-F2501A/B SH 8
SV-CC1678 ENERGIZE TO CLOSE
SCC-TM149A/B LETDOWN TEMP CONTROL VALVE SH 306
SV-CR2501A/B
CVC-ISV-0103 ENERGIZE TO OPEN
ICH-F2501A/B (CH-516)
CVC-IZ8-0103/1
CVC-IZ6-0103/2
SH 2836
EBASCO SERVICES INCORPORATED
LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No.3
CONTROL WIRING DIAGRAM
LETDOWN CONT. ISOL. VA ICH-F2501A/B
LOU-1564
B-424
SHEET 30 B
DCN'S INCORPORATED THIS REV
TCR'S INCORPORATED THIS REV
REV DATE BY APPROVED
SEP 29, 1976

FOR INFORMATION ONLY



REV	DATE	BY	APPROVED

FCR'S INCORPORATED THIS REV

EBASCO SERVICES INCORPORATED

DES I+C DR EM CH JT DATE SEP 28, 1976 APPROVED

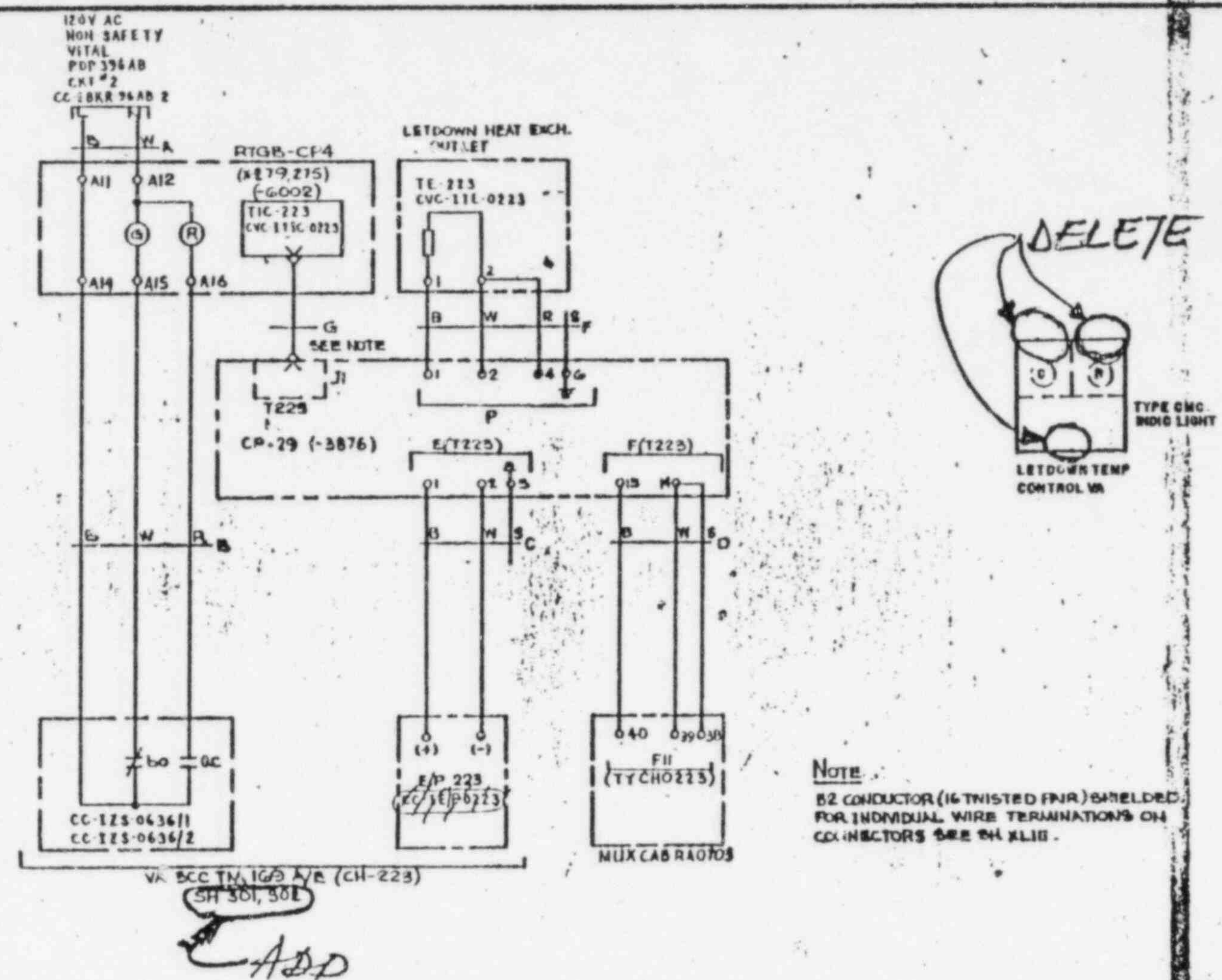
LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No.3
CONTROL WIRING DIAGRAM
LETDOWN CONT ISOL VA ICH-FI518A/B

LOU-1564
B-424
SHEET 8028
6

4.5 of 13

P.O.N.Y.
DWG: B424A.302SR8
DATE: 1/24/84
BY: [signature]
CH: DR
SK-DCN IC-1848

FOR INFORMATION ONLY



Note:
B2 CONDUCTOR (16 TWISTED PAIR) SHIELDED. FOR INDIVIDUAL WIRE TERMINATIONS ON CONNECTORS SEE SH XLIII.

EBASCO SERVICES INCORPORATED
NEW YORK

DRN IAC CH JB
SCALE NONE CH RC
DATE AUG 30, 1974

LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No.3
CONTROL WIRING DIAGRAM
LETDOWN TEMP CONTROL
VALVE 3CC-TM169 A/B

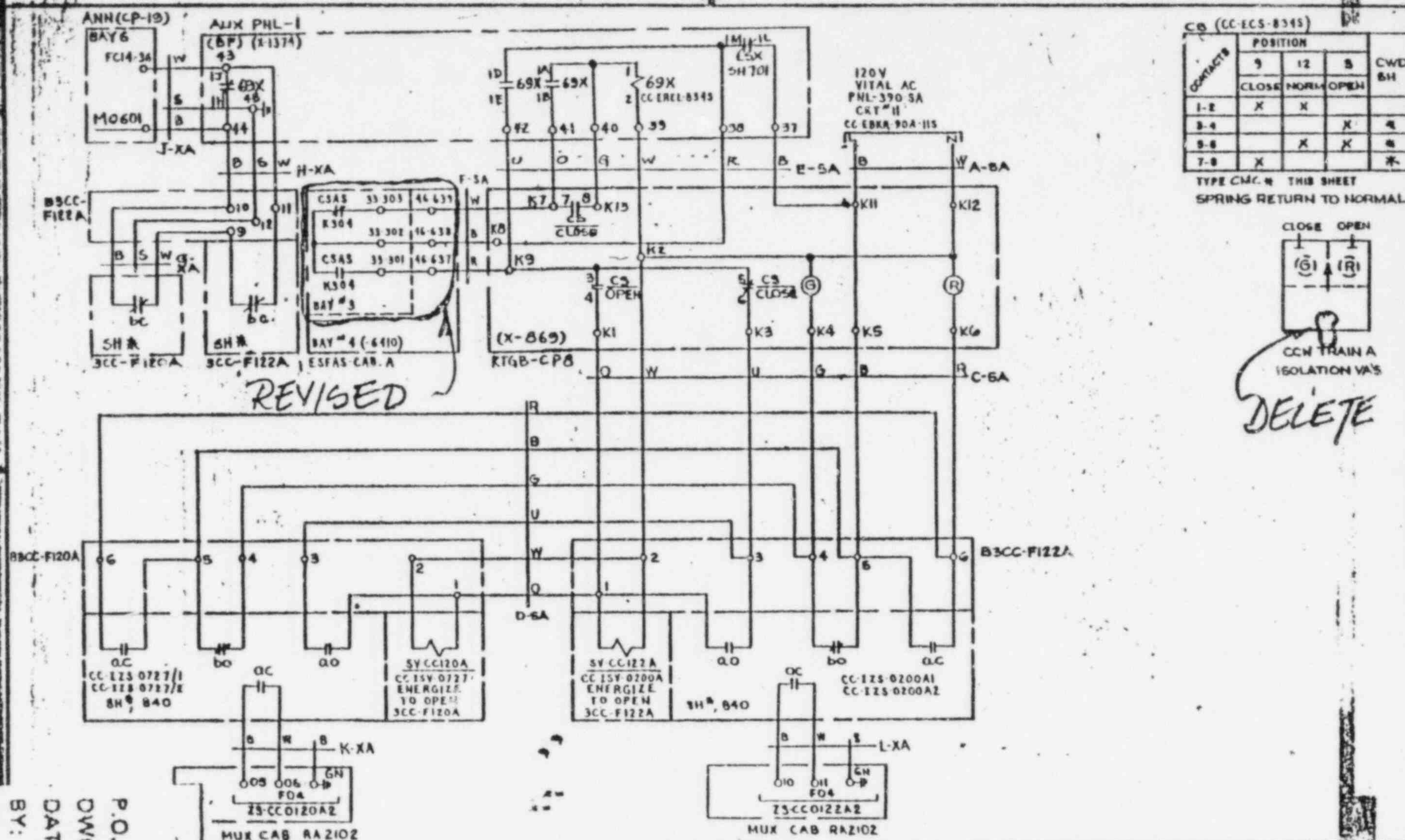
LOU-1564
B-424
SHEET 306

HATCHED PORTION
NOT PART OF THIS DCN -

P.O.N.Y.
DWG: B424H.306R7
DATE: 1/24/84
BY:
CH:
DCN IC-1848

Sh. 6 of 13

FOR INFORMATION ONLY



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7	10-5-83			3	3-27-79	RC	
6	3-11-83			2	2-26-78	SR	
5	1-17-80	ZR		1	1-7-78	FM	

EBASCO SERVICES INCORPORATED

DIV I&C DR REL
CH MAZIEMSKI
DATE JUN 21, 1977

LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No. 3
CONTROL WIRING DIAGRAM
COMPONENT COOLANT TRAIN A ISOL VA'S
3CC-F120A & 3CC-F122A

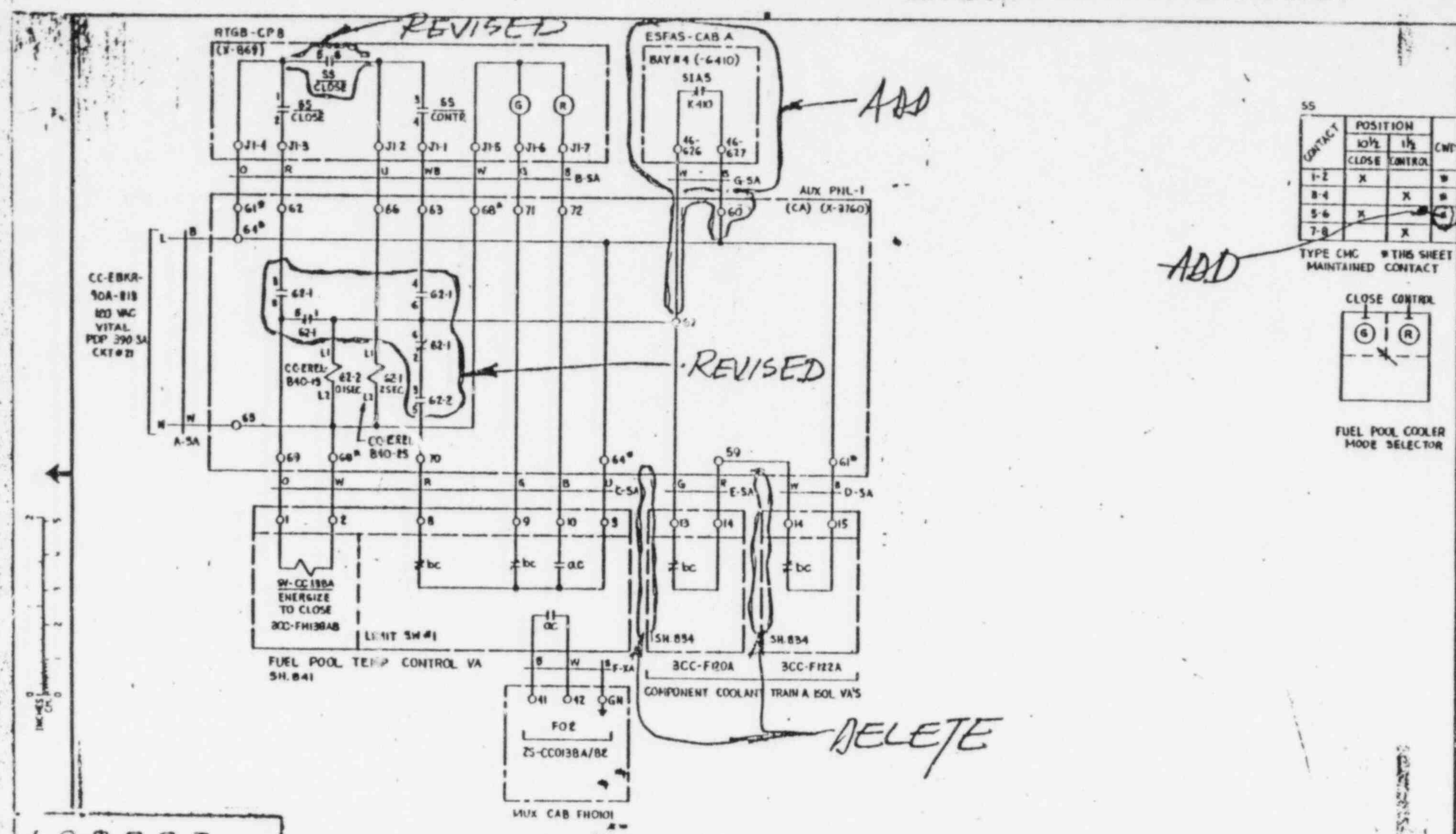
LOU-1564
B-424
SHEET 834 S
4

FCR'S INCORPORATED THIS REV

P.O.N.Y.
DWG: B424-834SR7
DATE: 1/24/84
BY:
CH:
SK-DCN IC-1848

7 of 13

FOR INFORMATION ONLY



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5	6-4-81			2	1-9-81	GA	
				1	9-11-80	GA	

V FCR'S INCORPORATED THIS REV

EBASCO SERVICES INCORPORATED

DIV I&C DR ST
CH W. MAJEROVSKY
DATE JUL 30, 1980

LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No.3
CONTROL WIRING DIAGRAM
FUEL POOL TEMP CONTROL VA 3CC-FM138AB CHANNEL A

LOU-1564
B-424
SHEET 840S

P.O.N.Y.
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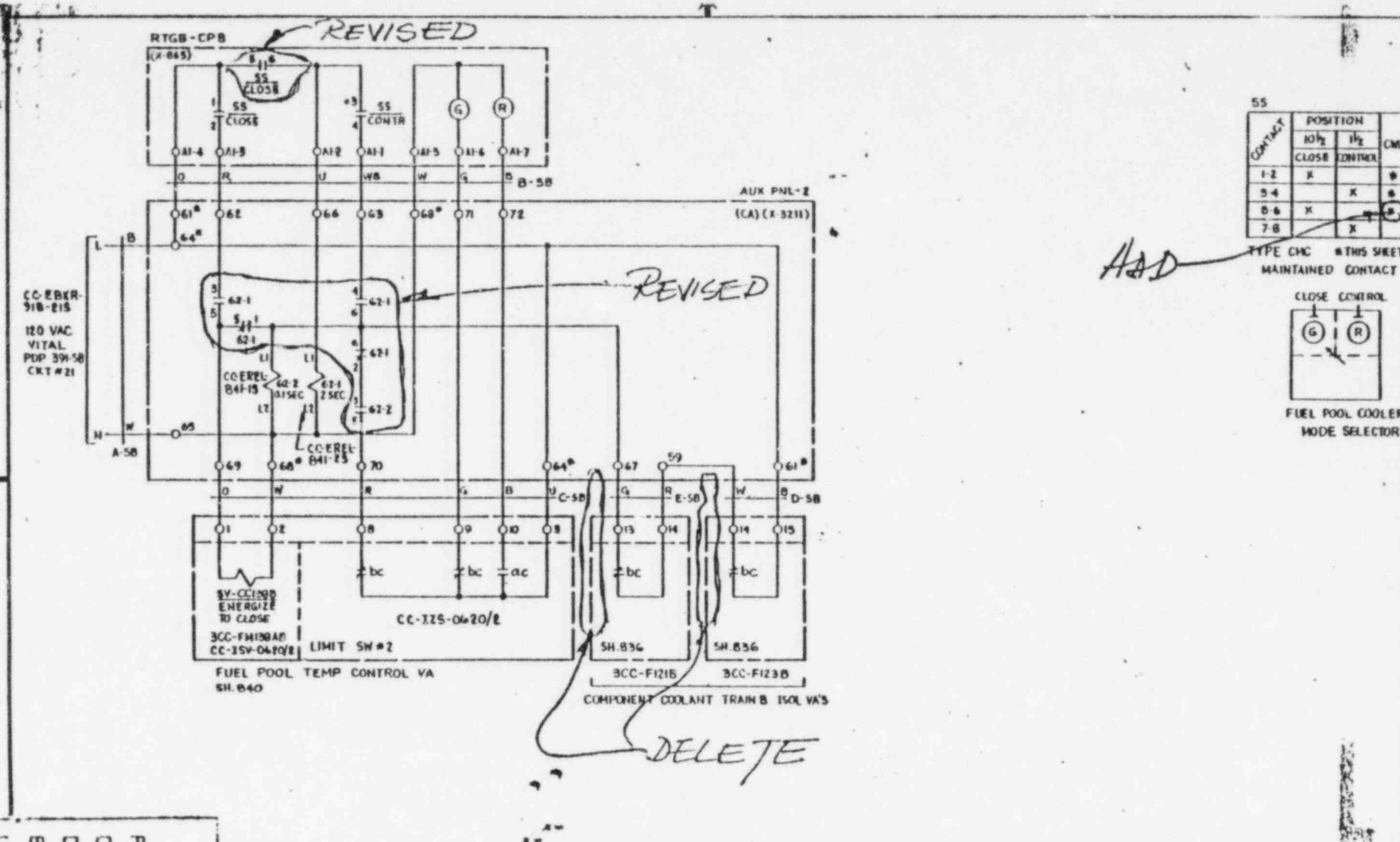
DATE: 1/24/86
BY: [illegible]
CH: DR
K-DCN IC-1848

Sh. 8 of 13

FOR INFORMATION ONLY



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5	4-6-83			1	9-11-80	CA	

V FCR'S INCORPORATED THIS REV

EBASCO SERVICES INCORPORATED
DIV I&C DR ST
CH N. MAJEROVSKY
DATE JUL 30, 1980

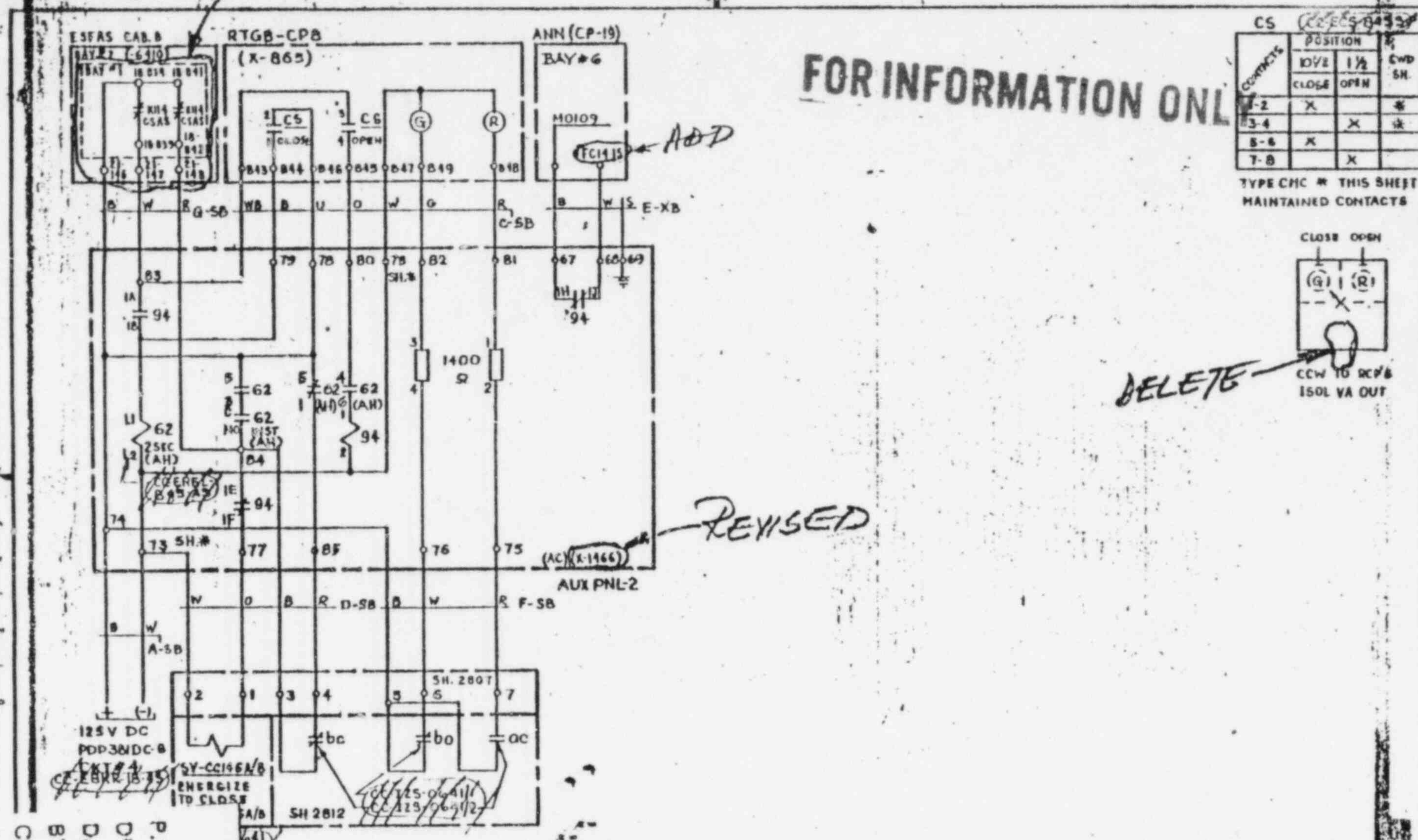
LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No. 3
CONTROL WIRING DIAGRAM
FUEL POOL TEMP CONTROL VA
3CC-FM138A/B CHANNEL B

LOU-1564
B-424
SHEET 84/5

P.O.N.Y.
DWG: B424SH 841S R
DATE: 1/24/84
BY:
CH:
K - DCN JC-1848

9 of 13

FOR INFORMATION ONLY



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11				7	12-15-80	PJK		3	2.1.79	AC	
10				6				2	10.9.78	EM	
9	1.11.83			5	2.6.80	MK		1	5.24.78	RK	

EBASCO SERVICES INCORPORATED

DES. E.L.C. DR. PJK

CH. K. D. KAIR AB

DATE DEC. 2, 1977

LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No. 3
CONTROL WIRING DIAGRAM
COMPONENT COOLING WATER TO RC PUMP'S COOLANT VA 2CC-F146A/B

LOU-1564
B-424
SHEET 845

HATCHED PORTIONS NOT PART OF THIS DCN

SH. 10 OF 13

P.O.N.Y.
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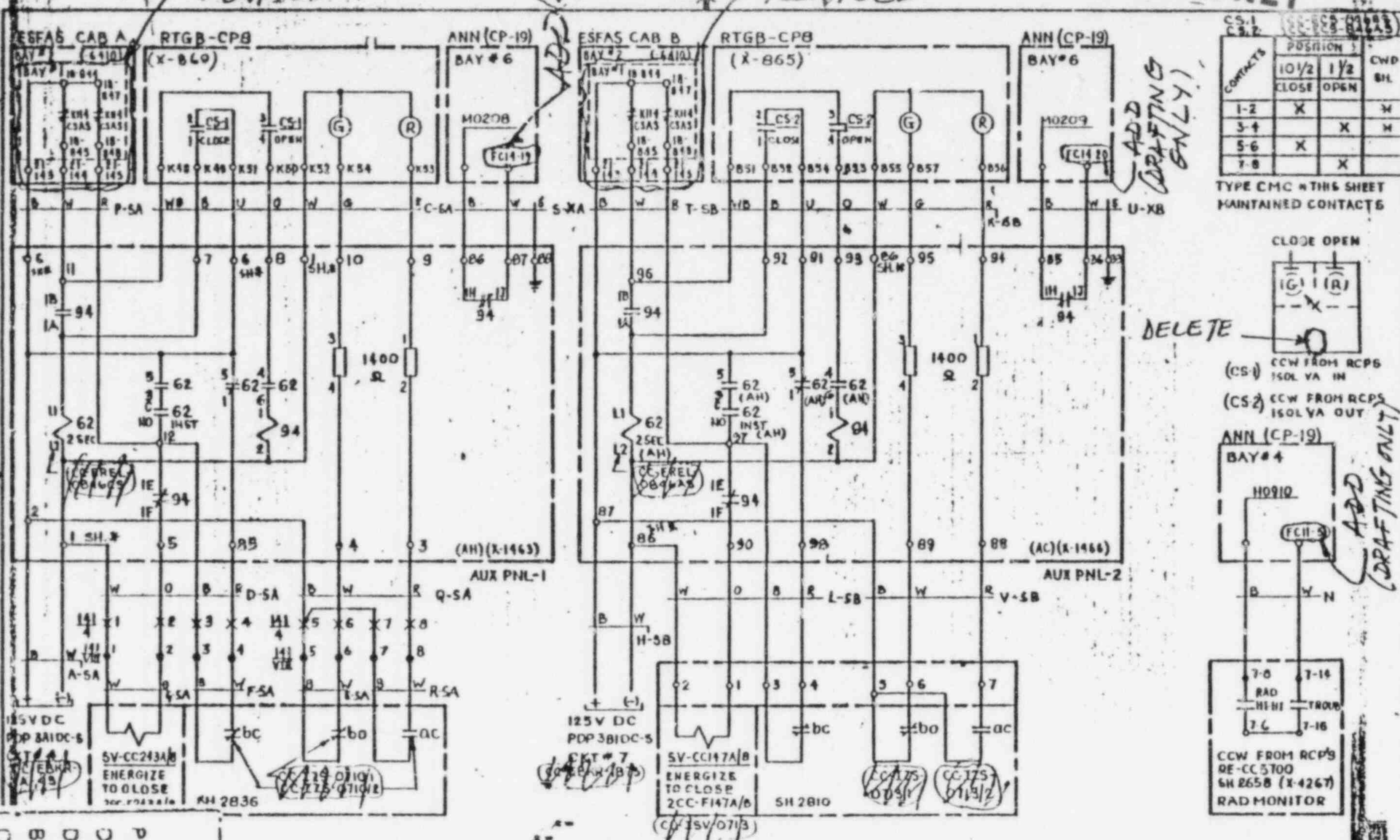
DATE: 1/24/84
BY:
CH: DR
SK-DCN IC-868

FOR INFORMATION ONLY



CONTACTS	101/2 CLOSE	11/2 OPEN	CWD SH.
1-2	X		H
3-4		X	H
5-6	X		
7-8		X	

P.O.N.Y
DWG: B424 B463
DATE: 1/24/84
BY: [illegible]
CH: [illegible]
K - DCN IC-1848

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11				7	8-21-81	[illegible]	[illegible]	3	7-24-79	[illegible]	[illegible]
10				6	5-5-80	[illegible]	[illegible]	2	2-1-79	[illegible]	[illegible]
9	3-21-83	[illegible]	[illegible]	5	2-6-80	[illegible]	[illegible]	1	7-25-78	[illegible]	[illegible]

ER'S INCORPORATED THIS REV

EBASCO SERVICES INCORPORATED
DIV I&C DR PJK
CH NONE KDK
DATE DEC 2, 1977
APPROVED

LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No.3
CONTROL WIRING DIAGRAM
COMPONENT COOLING WATER FROM RCP'S ISOL VALVES 2CC F243A/B & 2CC F147A/B

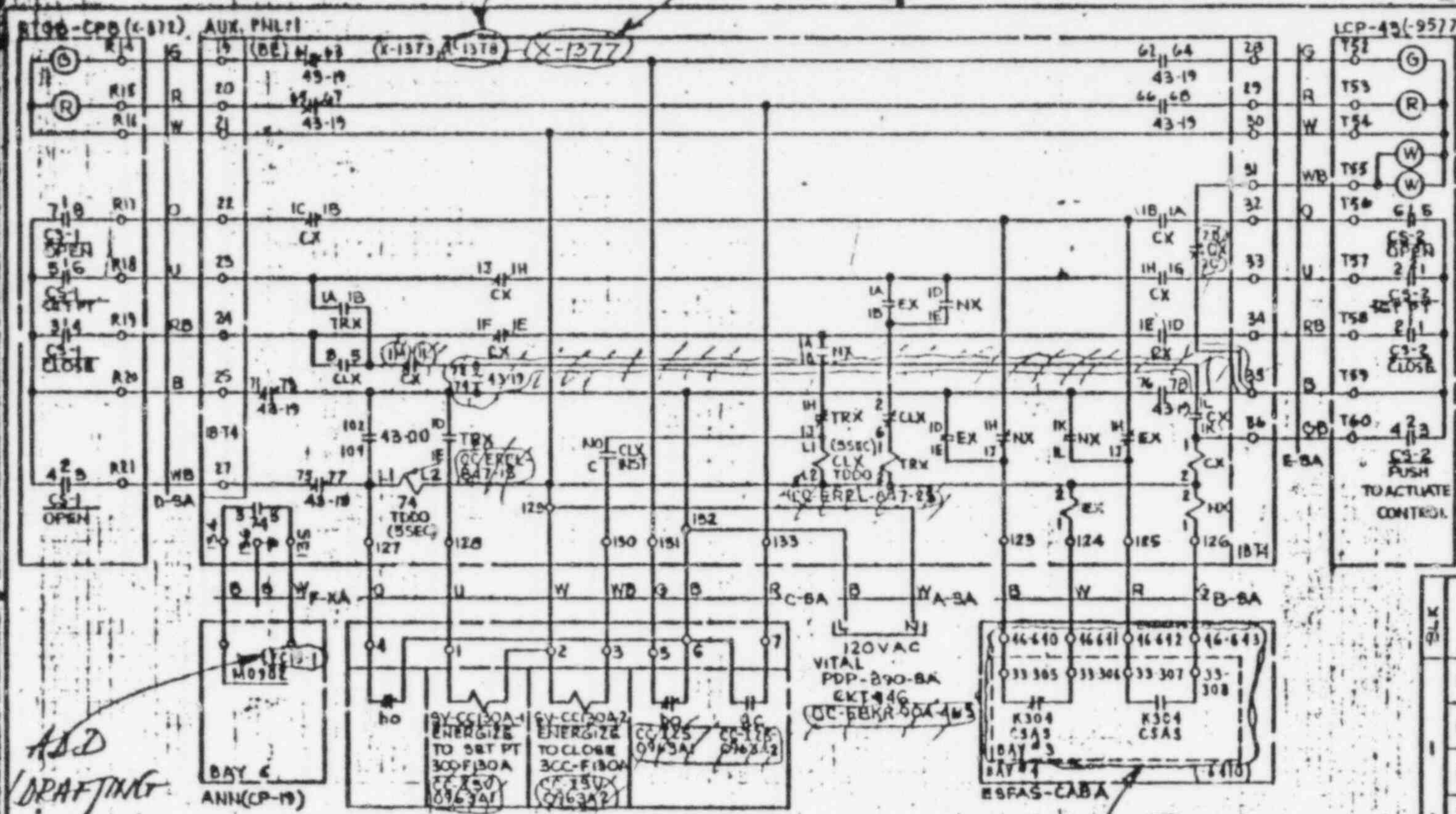
LOU-1564
B-424
SHEET 8463

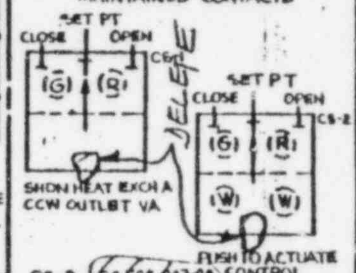
HATCHED PORTIONS NOT PART OF THIS DCN

SH. 11 OF 13

FOR INFORMATION ONLY

DELETE ADD





CS-1 (CC-ECS-847-15)

BLK	CONTACTS	9 CLOSE	12 SET PT	3 OPEN	CWD SH.
1	1-2		X		
	3-4	X			*
	5-6		X		*
	7-8			X	*
2	1-2		X		
	3-4			X	*

TYPE CMC * THIS SHEET
MAINTAINED CONTACTS

CS-2 (CC-ECS-847-25)

BLK	CONTACTS		9 CLOSE	12 SET PT	3 OPEN	CWD SH.
1	1-2	FREE	X			*
		DEPRESS				
	3-4	FREE			X	
		DEPRESS	X	X	X	
	5-6	FREE			X	*
		DEPRESS				
	7-8	FREE	X			
		DEPRESS	X	X	X	
2	1-2	FREE		X		*
		DEPRESS				
	3-4	FREE				*
		DEPRESS	X	X	X	
	5-6	FREE		—		
		DEPRESS		—		
	7-8	FREE		X		
		DEPRESS	X	X		

1. TYPE CMC * THIS SHEET
MAINTAINED CONTACTS

ADD (DRAFTING ONLY)

REVISED

REV	DATE	BY	APPROVED	REV	DATE	BY	APPROVED
8				4	3-21-83		
7				3	5-11-79	SM	RL
6				2	2-21-79	EM	RL
5				1	8-15-78	AY	RL

EBASCO SERVICES INCORPORATED
DIV I&C DR REL
CH MA ZIEMSKI
DATE APRIL 27, 1978
APPROVED

LOUISIANA POWER & LIGHT CO.
WATERFORD S.E.S. UNIT No 3
CONTROL WIRING DIAGRAM
SHUTDOWN HEAT EXCHANGER A
OUTLET VA 3CC-F130A

LOU-1564
B-424
SHEET 47

FCR'S INCORPORATED THIS REV

INCHES 0 1 2
CM 0 1 2 3 4 5

HATCHED PORTIONS NOT PART OF THIS DCN —

P.O.N.Y.
DWG: B424SH47
DATE: 1/24/84
BY: [illegible]
CH: [illegible]
SK. - DCN IC-1848

SH. 12 OF 13