CDM MODIFICATION PAGES

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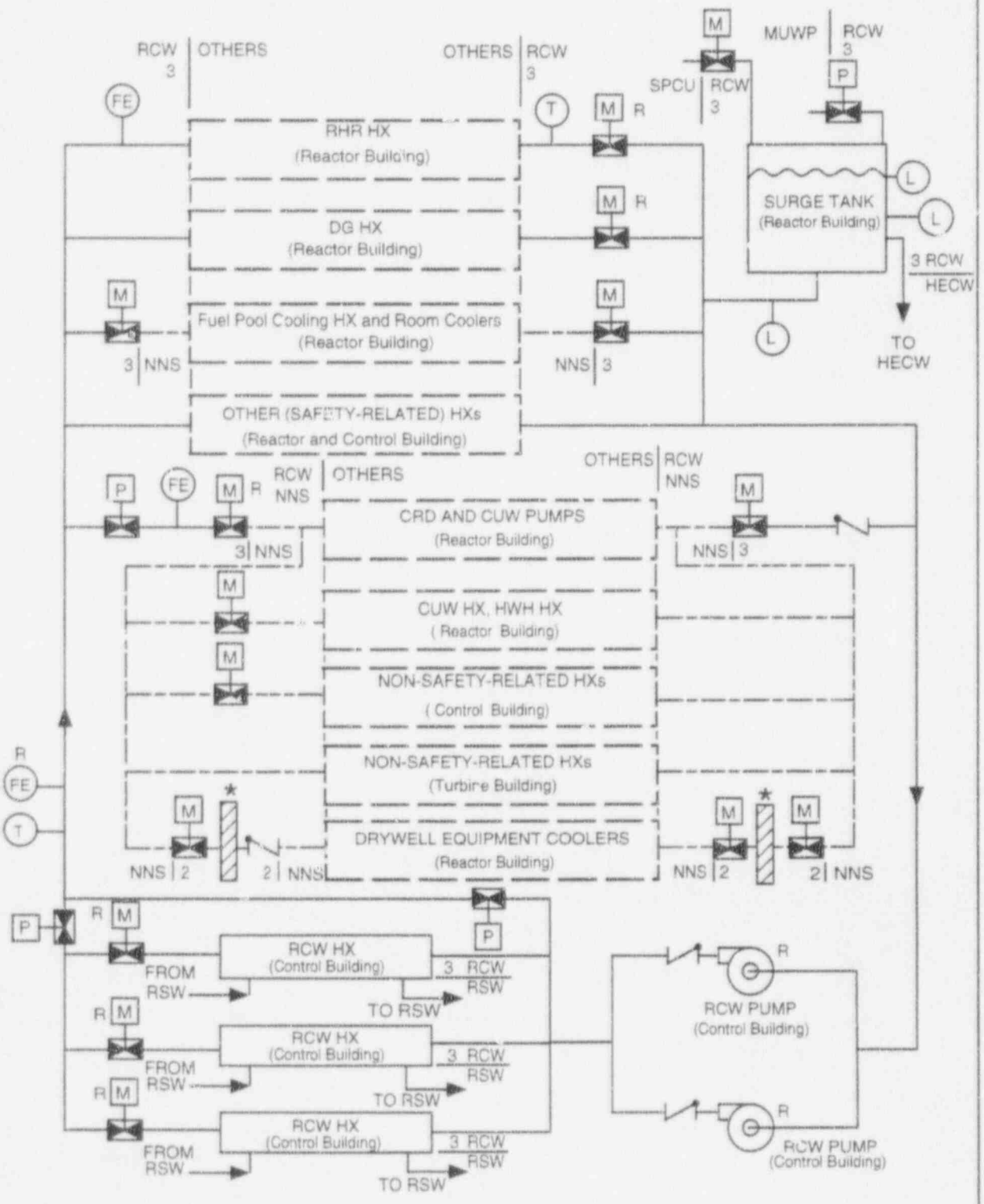
*** Underlined sections –Title only, no entry for design certification.**

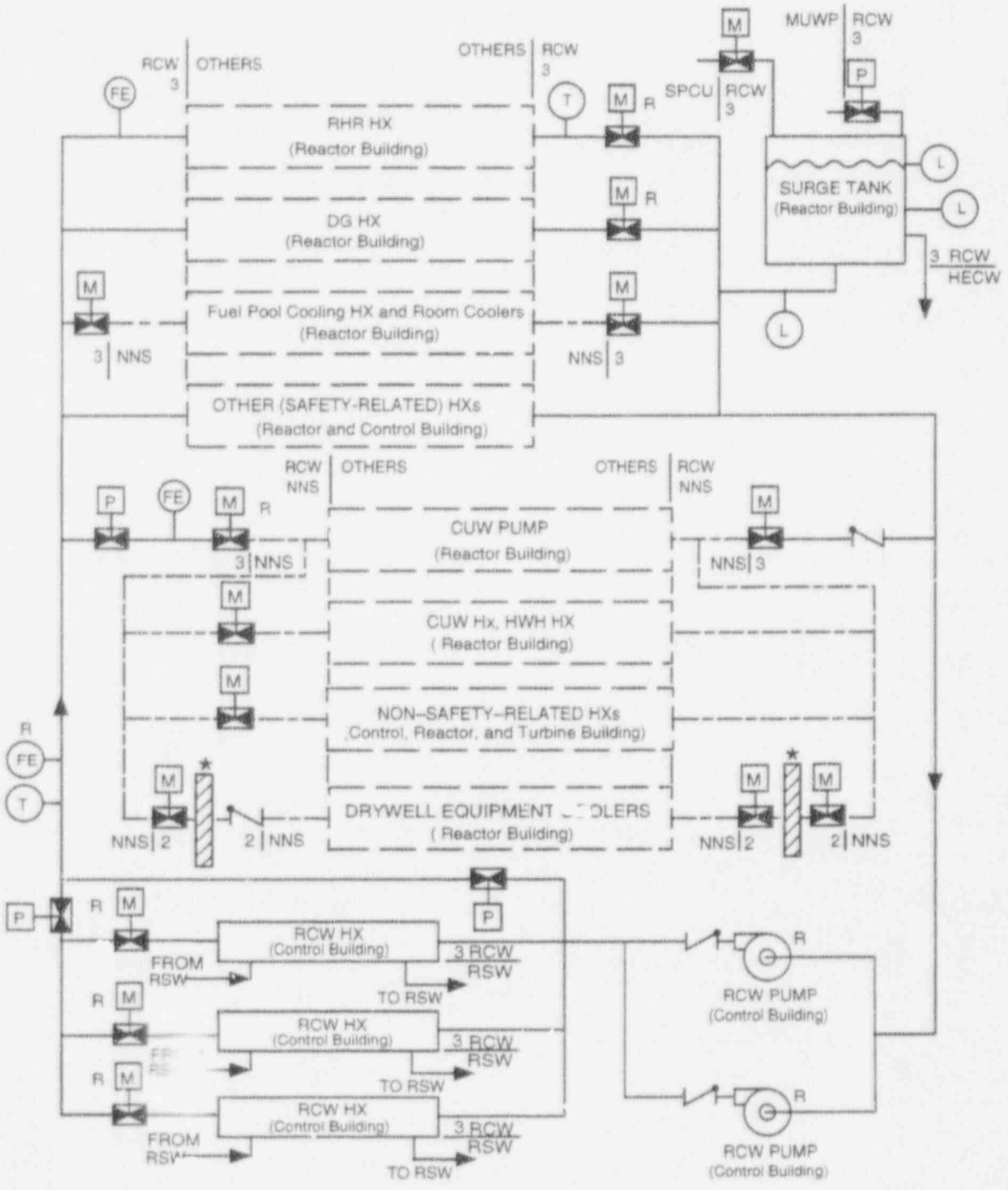


NOTES:

1. ALL ELECTRICAL POWER LOADS FROM THE CLASS 1E COMPONENTS SHOWN ON THIS FIGURE ARE POWERED FROM CLASS 1E DIVISION I EXCEPT FOR THE OUTBOARD CONTAINMENT ISOLATION VALVE, WHICH IS POWERED FROM DIVISION II.

★ = PRIMARY CONTAINMENT

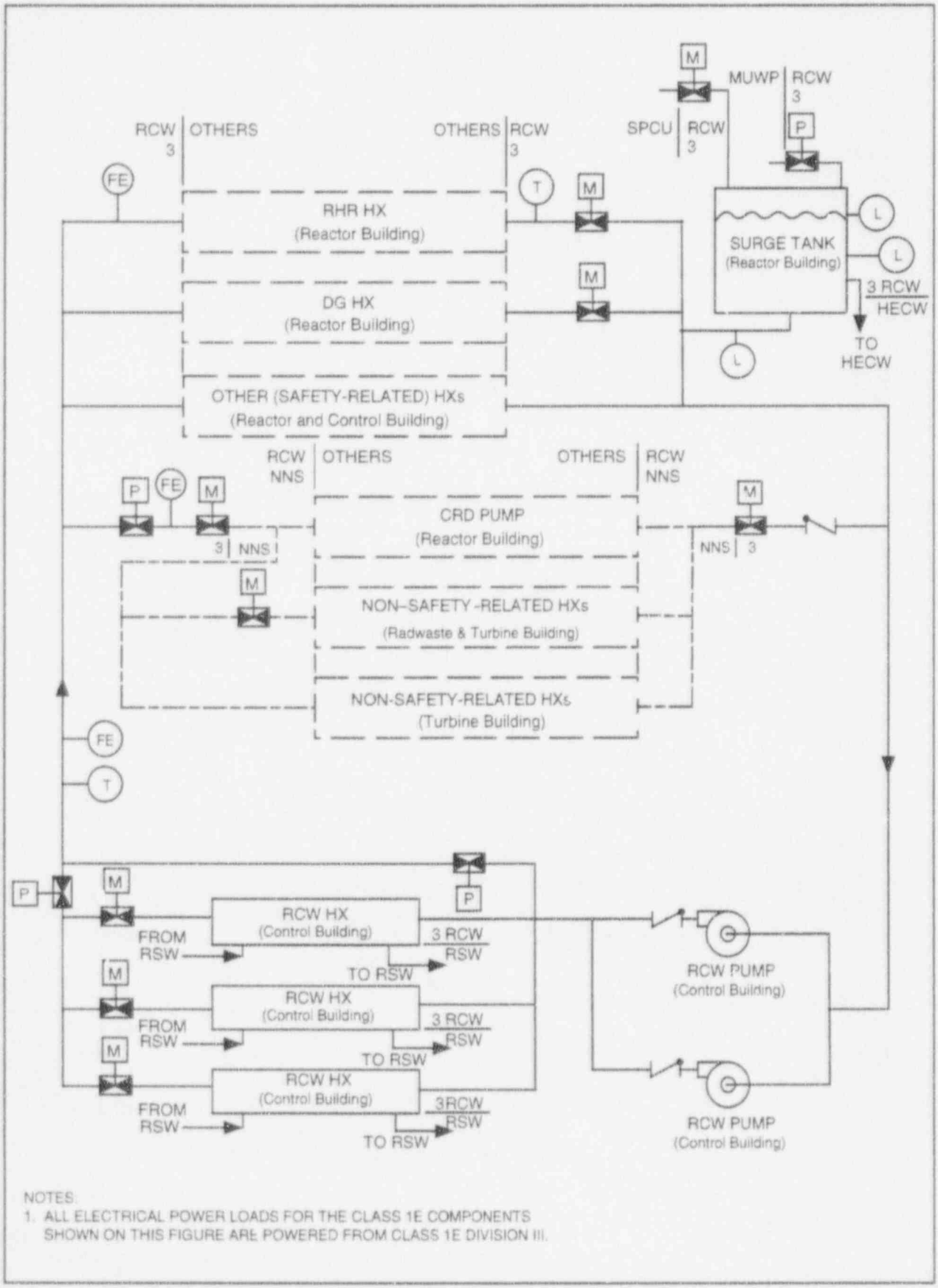
Figure 2.11.3a Reactor Building Cooling Water System (RCW-A)



NOTES:
1. THIS DIVISION IS POWERED FROM CLASS 1E DIVISION II, EXCEPT FOR THE CONTAINMENT OUTBOARD ISOLATION VALVE, WHICH IS POWERED FROM DIVISION III.

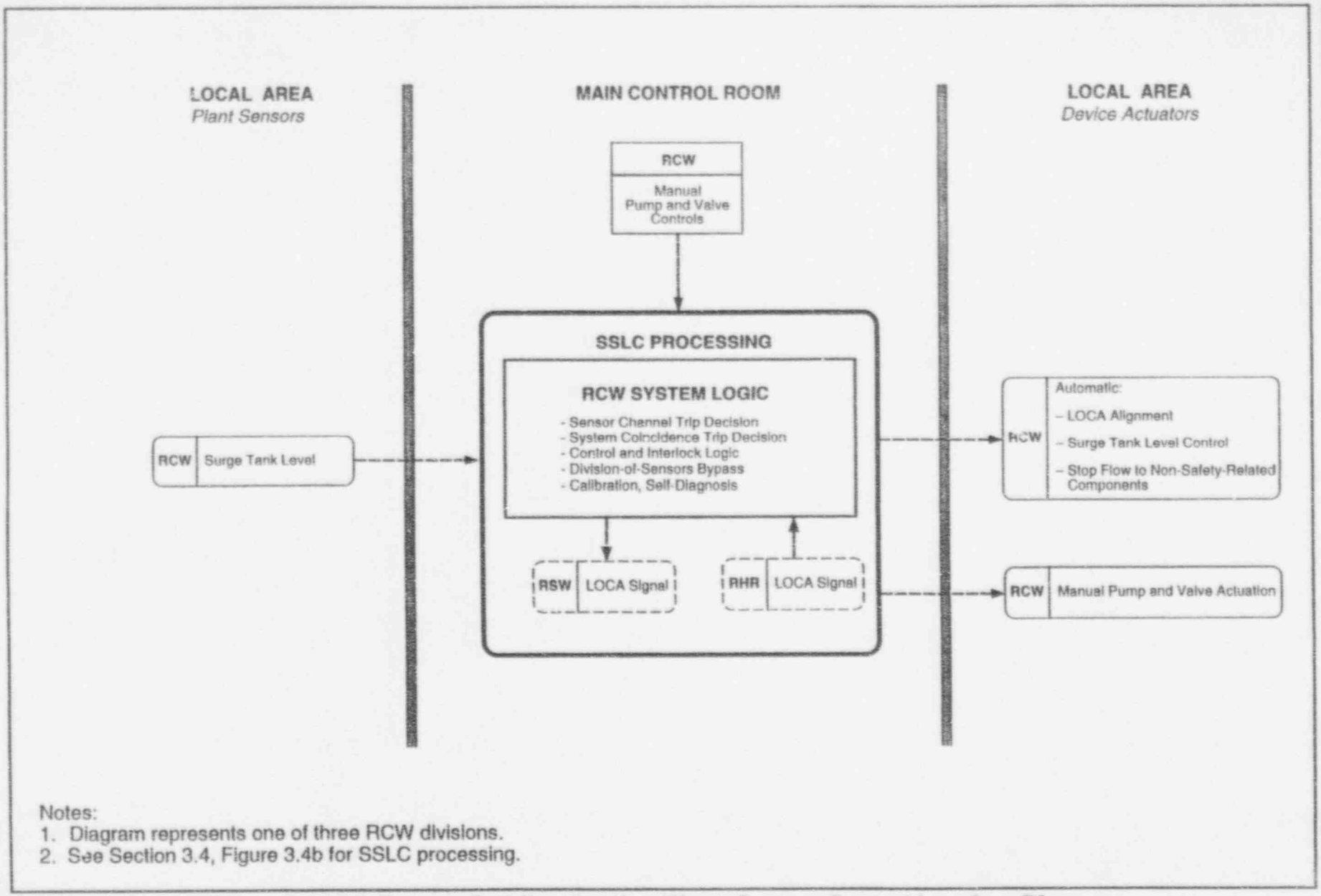
★ = PRIMARY CONTAINMENT

Figure 2.11.3b Reactor Building Cooling Water System (RCW-B)



NOTES:
1. ALL ELECTRICAL POWER LOADS FOR THE CLASS 1E COMPONENTS SHOWN ON THIS FIGURE ARE POWERED FROM CLASS 1E DIVISION III.

Figure 2.11.3c Reactor Building Cooling Water System (RCW-C)



Notes:
1. Diagram represents one of three RCW divisions.
2. See Section 3.4, Figure 3.4b for SSLC processing.

Figure 2.11.3d Reactor Building Cooling Water System Control Interface Diagram

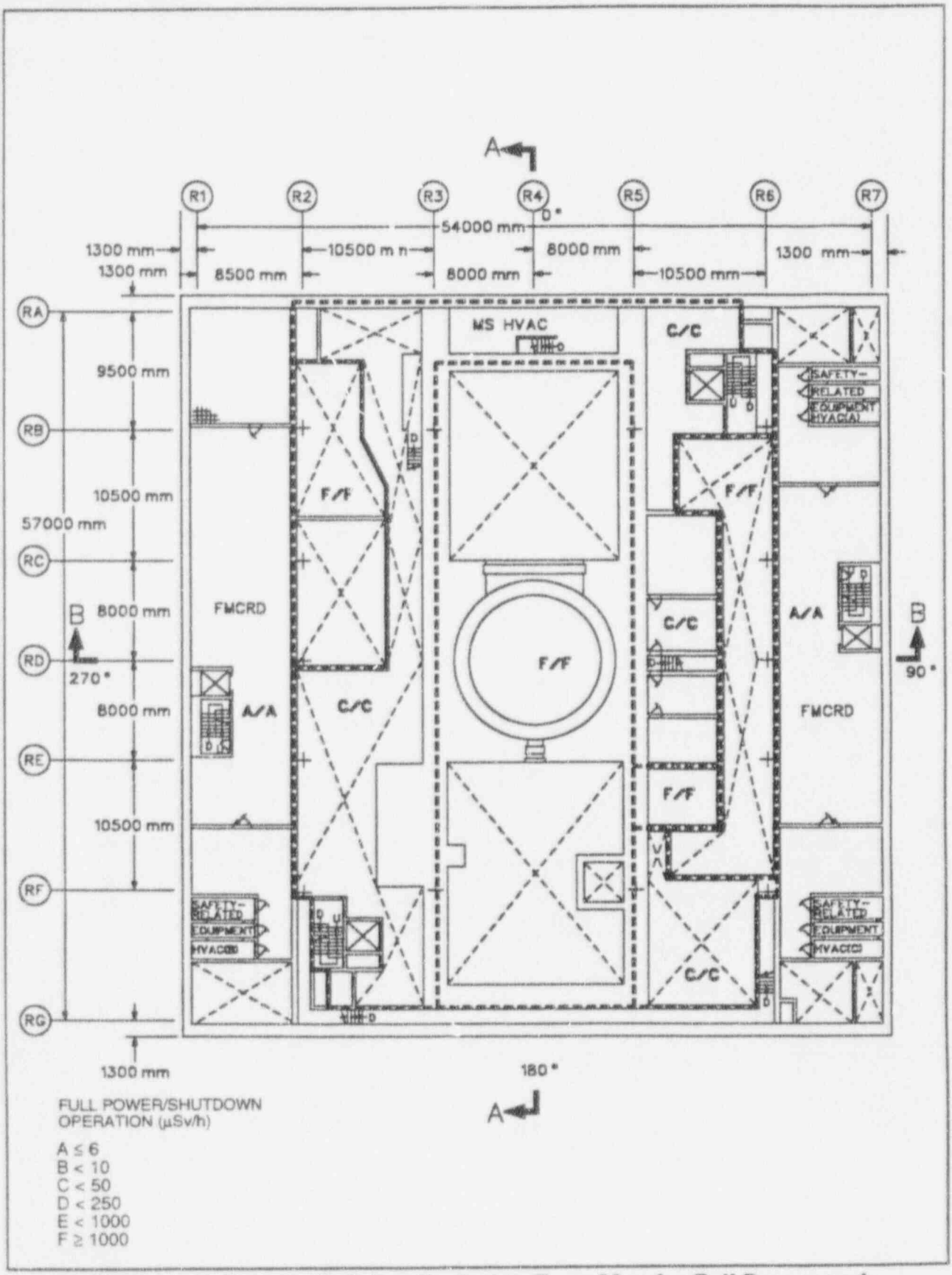
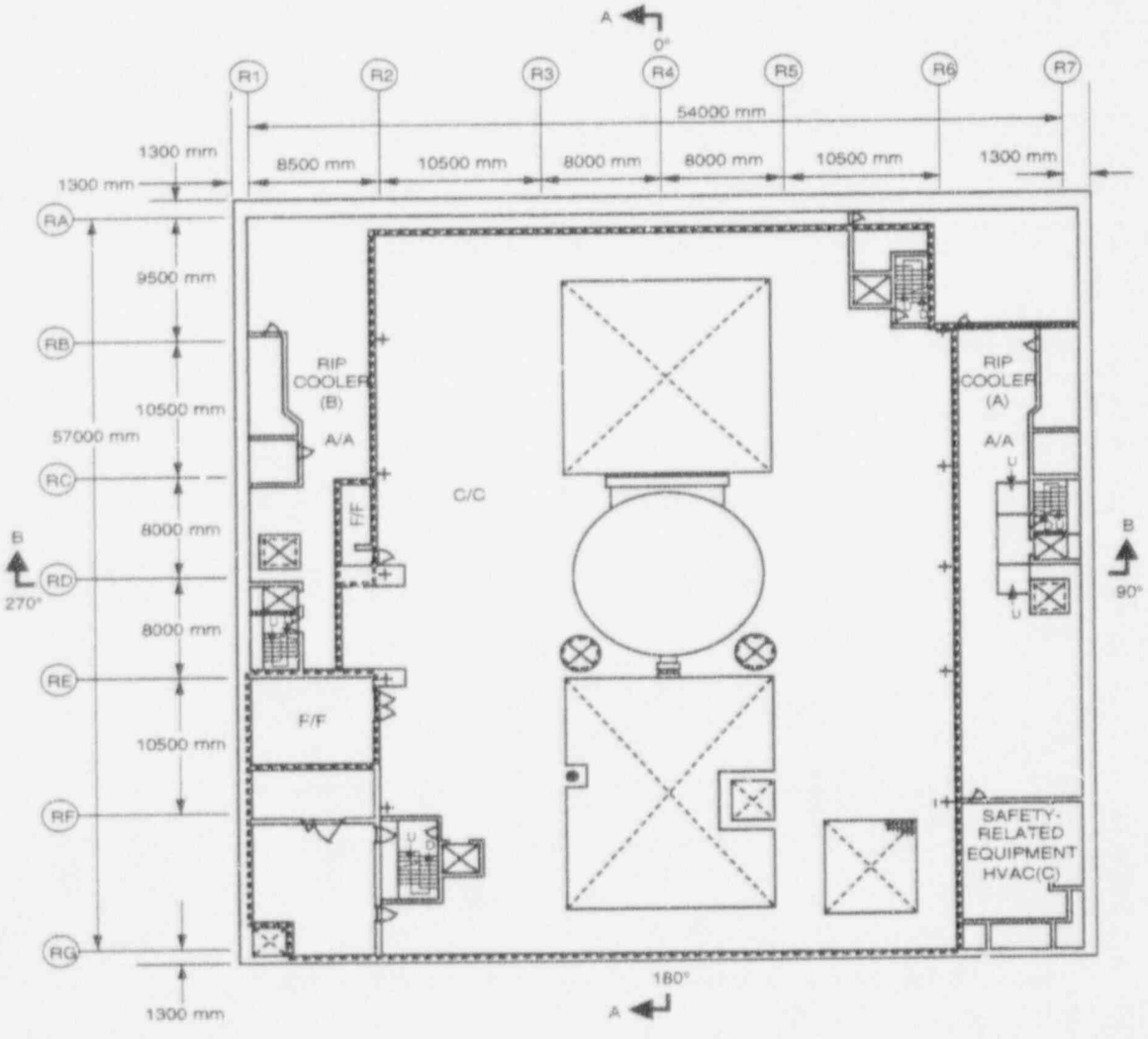


Figure 3.2I Reactor Building Radiation Zone Map for Full Power and Shutdown Operations—Elevation 27200 mm



FULL POWER/SHUTDOWN OPERATION (μSv/h)

A ≤ 6
B < 10
C < 50
D < 250
E < 1000
F ≥ 1000

Figure 3.2m Reactor Building Radiation Zone Map for Full Power and Shutdown Operations, Floor 4F—Elevation 31700mm

3.6 Design Reliability Assurance Program

Design Description

The Design Reliability Assurance Program (D-RAP) is a program that will be performed during the detailed design and equipment specification phase prior to initial fuel load. The D-RAP evaluates and prioritizes the structures, systems and components (SSCs) in the design, based on their degree of risk significance. The D-RAP will identify the dominant failure modes for the risk-significant SSCs. The D-RAP will also identify the key assumptions and risk insights for the risk-significant SSCs.

The D-RAP scope includes risk-significant SSCs as determined by probabilistic, deterministic, or other methods used for design certification to identify and prioritize risk-significant SSCs.

The D-RAP purpose is to provide reasonable assurance that the plant design proceeds in a manner that is consistent with the original bases and design assumptions for the risk insights for the risk-significant SSCs.

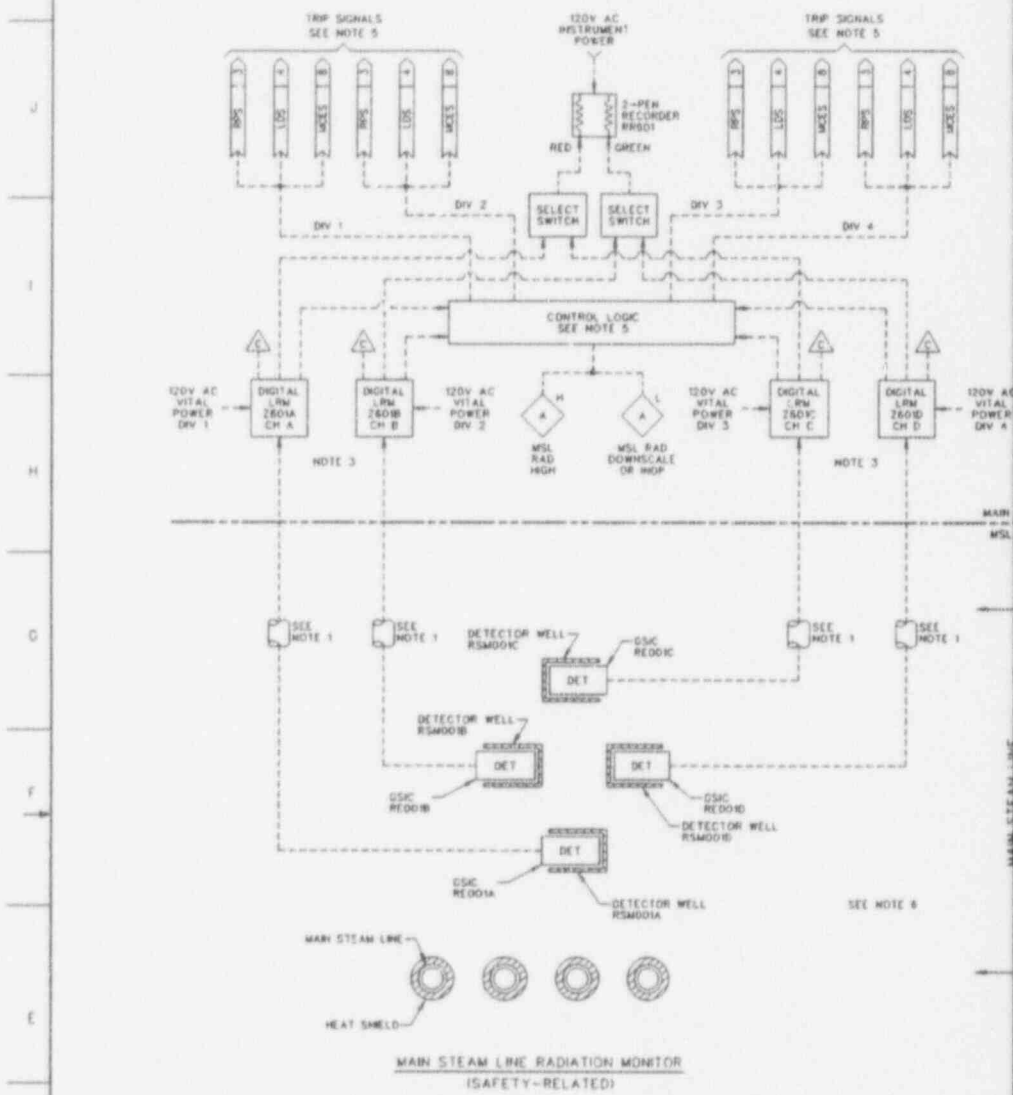
The D-RAP objectives are to provide reasonable assurance that the plant is designed such that: (1) it is consistent with the assumptions and risk insights for these risk-significant SSCs, (2) the risk-significant SSCs will not degrade to an unacceptable level during their design life, (3) the frequency of transients that challenge these SSCs will be acceptably low, and (4) these SSCs will function reliably when challenged.

Inspections, Tests, Analyses and Acceptance Criteria

Table 3.6 provides a definition of the inspections, tests, analyses, and associated acceptance criteria, which will be performed for Advanced Boiling Water Reactor (ABWR) D-RAP.

Table 3.6 Design Reliability Assurance Program

Inspections, Tests, Analyses and Acceptance Criteria		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
1. The Design Reliability Assurance Program (D-RAP) includes: scope, purpose, objectives; the process used to evaluate and prioritize the structures, systems and components (SSCs); and the list of SSCs designated as risk-significant. For those SSCs designated as risk-significant, the process used to determine dominant failure modes considered industry experience, analytical models, and applicable requirements. Also, for those SSCs designated as risk-significant, the key assumptions and risk insights considered operations, maintenance, and monitoring activities.	1. Inspections of the design reliability assurance program will be conducted.	1. a. Documentation exists that describes the scope, purpose, and objectives of D-RAP used during plant design, and concludes that the detailed design of risk-significant SSCs is consistent with the D-RAP Design Description. b. Documentation exists and concludes that the process (probabilistic, deterministic, or other methods) used to evaluate and prioritize the SSCs in the design is based on the risk–significance of the SSCs. c. A list of SSCs exists that is based on the risk-significance of SSCs. d. For those SSCs designated as risk significant: i) Documentation exists and concludes that the process to determine dominant failure modes considered industry experience, analytical models, and applicable requirements. ii) Documentation exists and concludes that the key assumptions and risk insights from probabilistic, deterministic, or other methods considered operations, maintenance, and monitoring activities.



MAIN STEAM LINE RADIATION MONITOR
(SAFETY-RELATED)

REFERENCE DOCUMENTS	REFERENCE DESIGNATOR
1. SPECIAL WIRE & CABLE REQUIREMENTS SPEC	A11-3080
2. ELECTRICAL EQUIPMENT SEPARATION SPEC	A11-3120
3. REACTOR PROTECTION SYSTEM IED	C71-1040
4. LEAK DETECTION AND ISOLATION SYSTEM IED	E31-1040
5. RADWASTE SYSTEM P&ID	K17-1010
6. MAKEUP WATER SYSTEM (PURIFIED) P&ID	P11-1010
7. REACTOR BUILDING COOLING WATER SYSTEM P&ID	P21-1010
8. MAIN CONDENSER EVACUATION SYSTEM P&ID	M61-1010
9. OFFGAS SYSTEM P&ID	M62-1010
10. INSTRUMENT AIR SYSTEM P&ID	P52-1010
11. STANDBY GAS TREATMENT SYSTEM P&ID	T22-1010
12. HEATING, VENTILATING & AIR CONDITIONING SYSTEM P&ID	U41-1010

NOTES

1. ALL CABLES AND WIRING SHALL CONFORM TO THE SPECIAL WIRE AND CABLE REQUIREMENTS AS SPECIFIED IN REF DOC 1.

2. THE SAFETY RELATED SUBSYSTEMS OF THE PROCESS RADIATION MONITORING SYSTEM SHALL CONFORM TO THE CRITERIA AND REQUIREMENTS FOR ELECTRICAL SEPARATION AS DEFINED IN REF DOC 2.

3. FIBER OPTIC CABLES MAY BE USED IN THE DESIGN OF THIS SYSTEM PROVIDED THESE CABLES CONFORM TO THE REQUIREMENTS STIPULATED IN REF DOC(S) 1&2.

4. EACH DIGITAL ARM (2802A,B,C,D & 2803) AND LCRM (Z701 TO Z704) CAN ACCOMODATE MULTIPLE CHANNELS. THESE MONITORS ARE SHARED WITH THE OTHER SUBSYSTEMS AS INDICATED IN THIS DRAWING.

5. EACH MSL RADIATION MONITOR SHALL PROVIDE A DIVISIONAL TRIP SIGNAL OR EITHER RADIATION HIGH-HIGH OR ON DOWNSCALE INOPERATIVE (INOP) TO INITIATE THE FOLLOWING FUNCTIONS ON A COINCIDENCE VOTE OF ANY TWO OUT OF FOUR CHANNEL TRIPS.

   A. REACTOR SCRAM
   B. CLOSURE OF THE MSIVs AND LIS DRAIN LINE VALVES
   C. SHUTDOWN OF THE MAIN CONDENSER MECHANICAL VACUUM PUMP AND CLOSURE OF THE EXIT LINE ISOLATION VALVE

6. THE MSL ION CHAMBERS SHALL BE SENSITIVE TO GAMMA RAYS (GSIC) AND SHALL BE ARRANGED INSIDE THE MSL TUNNEL IN A MANNER SO EACH CAN PROVIDE APPROXIMATELY THE SAME RESPONSE FROM ALL THE STEAM LINES. EACH DETECTOR ASSEMBLY SHALL BE INSERTED INTO A SEALED PIPE WELL TO BE RETRIEVABLE FROM OUTSIDE THE TUNNEL.

7. THESE DETECTORS ARE PROVIDED TO MONITOR RADIATION THAT MAY RESULT FROM A FUEL HANDLING ACCIDENT IN THE FUEL POOL OR THE REACTOR WELL.

8. EACH HVAC AIR EXHAUST RADIATION MONITOR IN THE REACTOR BUILDING AND IN THE FUEL HANDLING AREA PROVIDES A CHANNEL TRIP SIGNAL TO INITIATE THE FOLLOWING FUNCTIONS ON A COINCIDENCE VOTE OF ANY TWO OUT OF FOUR CHANNEL TRIPS.

   A. INITIATE OPERATION OF THE STANDBY GAS TREATMENT SYSTEM (SGTS)
   B. ISOLATE THE AIR INTAKE AND EXHAUST DUCTS OF THE HVAC SYSTEM
   C. ISOLATE THE PURGE AND VENT VALVES OF SECONDARY CONTAINMENT

   THE CHANNEL TRIP SIGNAL FROM EACH MONITOR SHALL CONSIST OF EITHER RADIATION HIGH-HIGH TRIP OR RADIATION DOWNSCALE/INOPERATIVE (INOP) TRIP.

9. THE OFF-GAS SAMPLE CHAMBER SHALL BE MOUNTED VERTICALLY WITH ITS PIPING SLOPED AWAY FROM THE CHAMBER TO PERMIT THE CONDENSATE TO DRAIN TO THE PROCESS LINE. A DRAIN SHALL BE PROVIDED AT THE BOTTOM OF THE SAMPLE CHAMBER.

10. EACH RADIATION MONITOR SHALL PROVIDE TRIP SIGNALS TO THE OFF-GAS SYSTEM TO PERFORM THE FOLLOWING FUNCTIONS.

    A. BASED ON ONE-OUT-TWO LOGIC SIGNAL, THE RADIATION HIGH-HIGH TRIP SIGNAL FROM EITHER MONITOR SHALL INITIATE VALVE ALIGNMENT OF THE OFF-GAS SYSTEM TO FORCE THE GASEOUS EFFLUENTS THROUGH THE CHARCOAL VAULT FOR TREATMENT PRIOR TO RELEASE TO THE STACK.

    B. BASED ON TWO-OUT-OF-TWO LOGIC SIGNALS,THE RADIATION MONITOR CHANNEL TRIP SIGNALS SHALL INITIATE CLOSURE OF THE OFF-GAS SYSTEM VENT RELEASE VALVE ON RADIATION HIGH-HIGH/HIGH (HIGH) CHANNEL TRIP FROM BOTH MONITORS, OR ON DOWNSCALE/INOPERATIVE CHANNEL TRIP FROM BOTH MONITORS, OR ON ONE HIGH CHANNEL TRIP FROM ONE MONITOR AND ONE DOWNSCALE/INOPERATIVE CHANNEL TRIP FROM THE SECOND MONITOR.

11. HEATING OF THESE LINES MAY BE REQUIRED TO PREVENT CONDENSATION. HEATERS SHALL BE SIZED SO THE TEMPERATURE IS KEPT ABOVE THE DEW POINT.

12. THE RADIATION HIGH-HIGH TRIP SIGNAL FROM EACH MONITOR SHALL INITIATE CLOSURE OF ITS RESPECTIVE LOW AND HOW OUTBOARD DRAIN LINE ISOLATION VALVE.

13. THE RADIATION HIGH-HIGH TRIP, THE DOWNSCALE/INOPERATIVE, OR A HOT SAMPLING CONDITION SHALL CAUSE SHUTDOWN OF THE RADWASTE SYSTEM LIQUID EFFLUENT DISCHARGE PUMPS AND CLOSURE OF THE OUTLET VALVE IN THE DISCHARGE LINE.

14. THE RADIATION MONITORS OF EACH SUBSYSTEM SHALL ISOLATE ITS RESPECTIVE AIR INTAKE DUCTS TO THE CONTROL BUILDING AND START THE EMERGENCY AIR CIRCULATING FAN ON A COINCIDENCE VOTE OF ANY TWO OUT OF FOUR CHANNEL TRIPS ON EITHER RADIATION HIGH-HIGH OR ON DOWNSCALE/INOPERATIVE INDICATION.

15. TEE SHALL BE UNION TEE SWAGELOCK TYPE SS-1610-3.

16. THE SAMPLE LINE SHALL BE 25.4mm X 1.47mm WALL THICKNESS SEAMLESS STAINLESS STEEL TUBING. THE TUBING MINIMUM BEND RADIUS SHALL BE 508mm. THE TUBING LENGTH SHALL BE JOINED WITH SWAGELOCK TYPE SS-1610-6 UNIONS. THE TUBING SHALL SLOPE SO THAT THE CONDENSATE WILL RUN TO DRAIN TEE.

17. REMOVABLE SECTION SHALL BE PROVIDED NEAR THE ISOKINETIC PROBE FOR THE INSERTION OF A CHARCOAL FILTER HOLDER IF SIGNIFICANT DEPOSITION IS SUSPECTED. THE LITTINGS ETC. SHALL PROVIDE SMOOTH TRANSITIONS WITHOUT EITHER INTRODUCING DISCONTINUITIES OR REDUCING THE CROSS SECTIONAL AREA OF THE FLOW STREAM.

18. HEATER AND CONDENSATE DRAIN WITH TRAP TO BE SIZED SO THAT TEMPERATURE OF SAMPLE STREAM IS KEPT ABOVE DEW POINT.

19. CONTROL OF THE CHECK SOURCE CAN BE INTEGRATED INTO THE DIGITAL LCRM AS PART OF THE MONITOR.

20. THE RADIATION HIGH-HIGH TRIP OR THE DOWNSCALE/INOPERATIVE TRIP SHALL TERMINATE OPERATION OF THE INCINERATOR FANS.

LEGEND

ARM - AREA RADIATION MONITOR
LCRM - DIGITAL LOG COUNT RATE METER
GM-B - BETA SENSITIVE GM DETECTOR
GSIC - GAMMA SENSITIVE ION CHAMBER
S/C - DIGITAL GAMMA SENSITIVE GM DETECTOR
LRM - LOG RADIATION MONITOR
USC - ULTRASONIC CLEANING
⇒ - SERIAL MULTIPLEXED SIGNALS

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FIGURE 7.6-5 PROCESS RADIATION MONITORING SYSTEM (EL SH 1 OF 11)

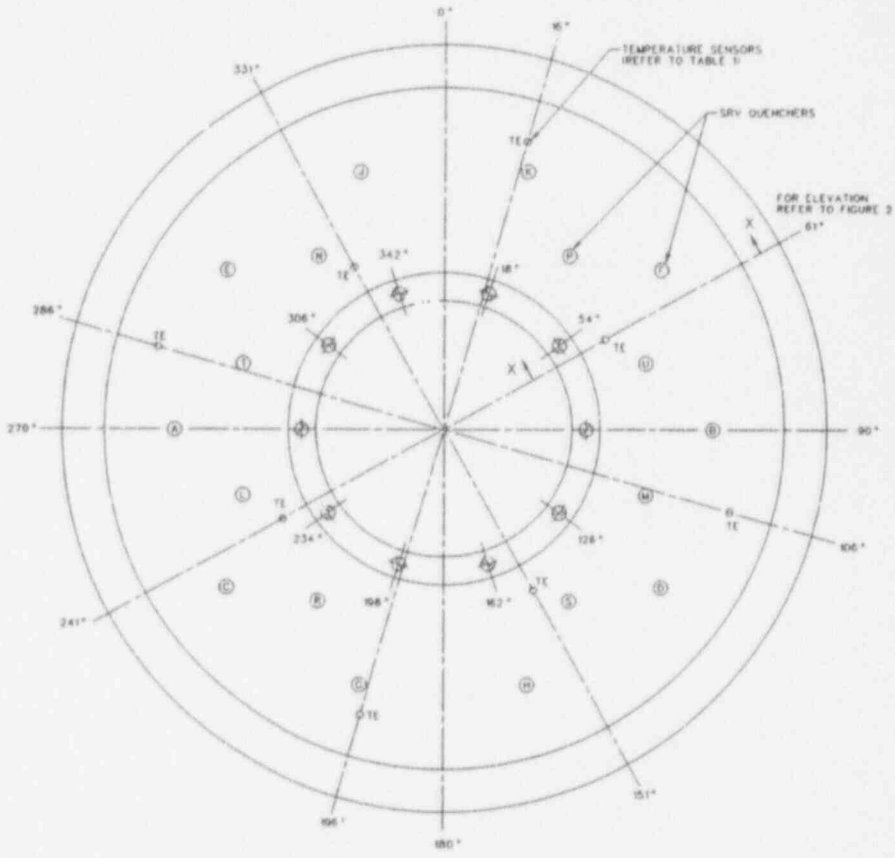

FIGURE 1 INSTRUMENTATION LOCATION DEFINITION

TABLE 1 SENSOR DIVISION ASSIGNMENT

	DIVISION I	DIVISION II	DIVISION III	DIVISION IV
16°	TE-001A,E,J,N		TE-001C,G,L,R	
61°		TE-002B,F,K,P		TE-002D,H,M,S
106°		TE-003B,F,K,P		TE-003D,H,M,S
151°	TE-004A,E,J,N		TE-004C,G,L,R	
196°	TE-005A,E,J,N		TE-005C,G,L,R	
241°		TE-006B,F,K,P		TE-006D,H,M,S
286°		TE-007B,F,K,P		TE-007D,H,M,S
331°	TE-008A,E,J,N		TE-008C,G,L,R	

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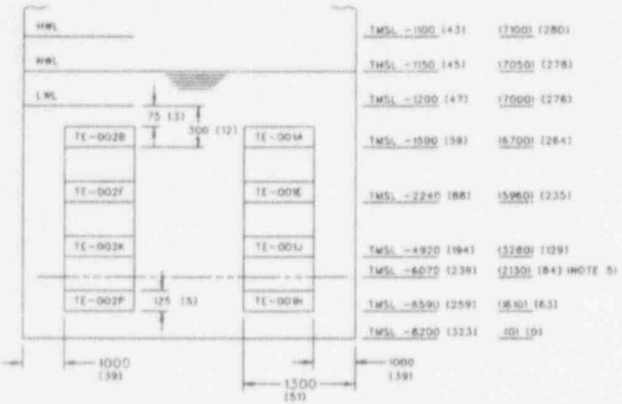

VIEW X-X FROM FIGURE 1
NOTES 2,6,7

FIGURE 2 SENSOR AND ENVELOPE DEFINITION

NOTES:

1. DIVISION I AND DIVISION III AND DIVISION II AND DIVISION IV TEMPERATURE SENSORS AT EACH LOCATION SHALL BE SEPARATED BY 150~300 MM (6~12 INCHES).
2. TYPICAL OF DIVISION I AND DIVISION II SENSORS AT AZIMUTHAL LOCATIONS 15° AND 81° DIVISION III AND DIVISION IV SENSORS ARE NOT SHOWN.
3. BULK AVERAGE TEMPERATURE ALARM.
4. SIGNALS FROM TE WHICH ARE LOCATED AT THE SAME LEVEL SHALL BE OMITTED FROM AVERAGE TEMPERATURE CALCULATION WHEN S/P WATER LEVEL DECREASE BELOW SENSOR LEVEL.
5. MIDDLE QUENCHER LEVEL.
6. TMSL = TYPICAL MEAN SEA LEVEL.
7. NUMBER ARE IN MILIMETER EXCEPT () WHICH ARE IN INCHES.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES SHALL BE USED IN CONJUNCTION WITH THIS DRAWING:

		REFERENCE DESIGNATOR
1.	ATMOSPHERIC CONTROL SYSTEM P&ID	T51-1010
2.	REMOTE SHUTDOWN SYSTEM IED	C61-1010
3.	RESIDUAL HEAT REMOVAL SYS P&ID	E11-1010
4.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030
5.	REACTOR PROTECTION SYSTEM IED	C71-1010
6.	REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010

MFL NO. T53-1010

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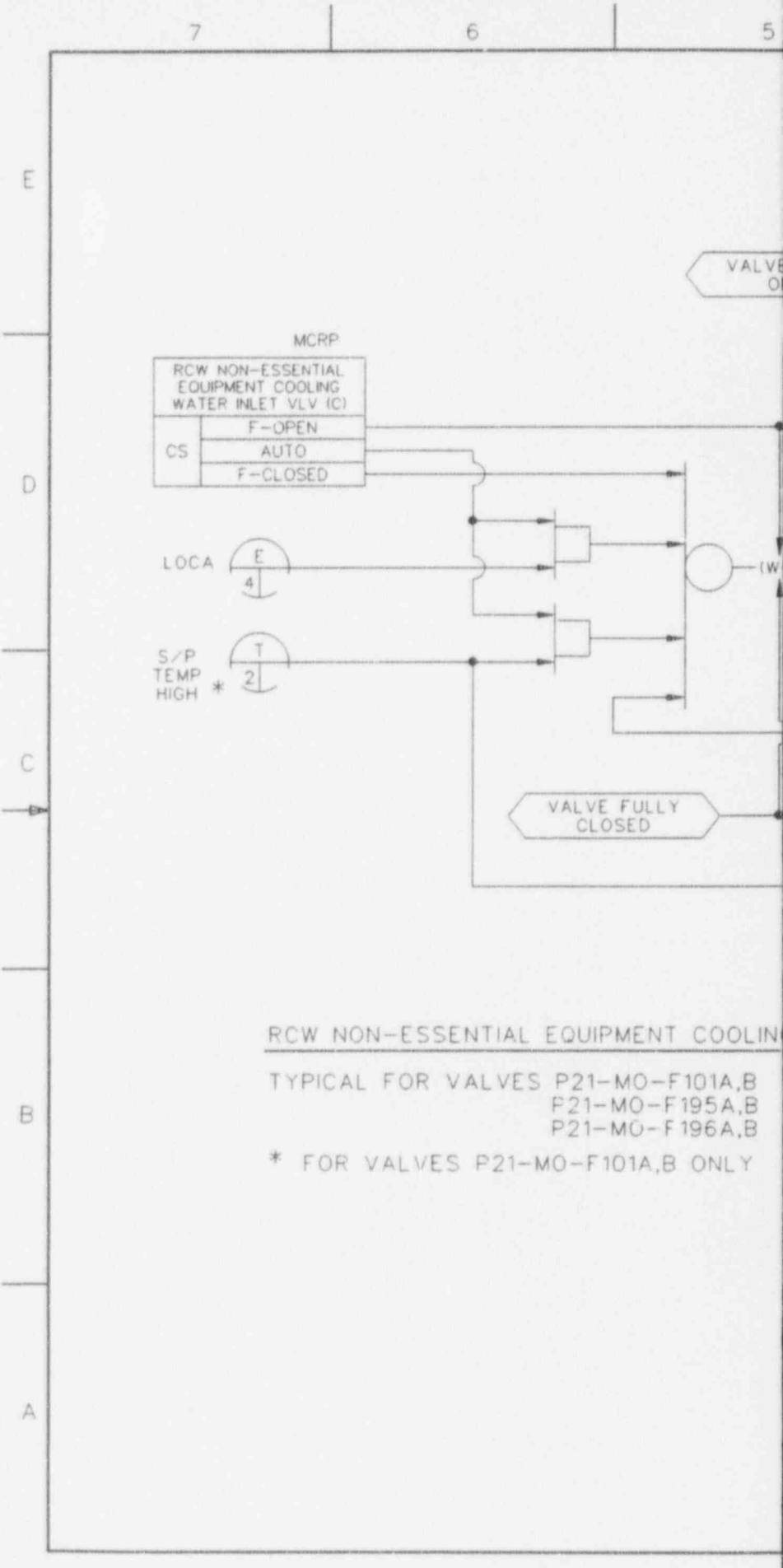
FIGURE 7.6-11 SUPPRESSION POOL TEMPERATURE MONITORING SYSTEM IED (Sheet 1 of 3)



RCW NON-ESSENTIAL EQUIPMENT COOLIN

TYPICAL FOR VALVES P21-MO-F101A,B
P21-MO-F195A,B
P21-MO-F196A,B

* FOR VALVES P21-MO-F101A,B ONLY

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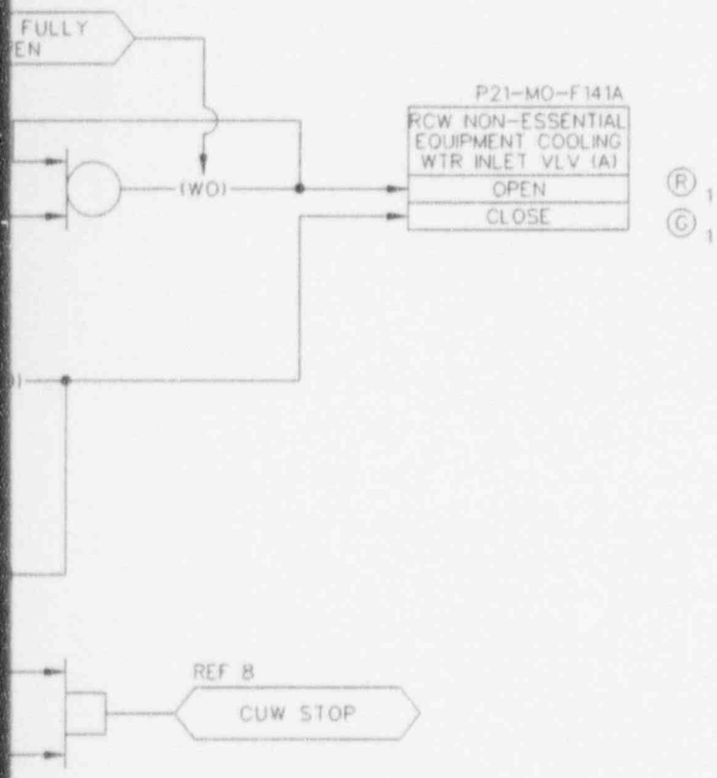

WATER STOP VALVE P21-MO-F141A

CONTROL SWITCH
F-CLOSE / AUTO / F-OPEN  CSX2

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION
STATUS INDICATOR	Ⓖ 1 Ⓡ 1	MCRP
	Ⓖ 2 Ⓡ 2	MCRP

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTER MEAS		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	T
		CLOSED SIDE	TL
	THERMAL BYPASS	EXIST	O
		NOT EXIST	
SWGR PWR SUPPLY OBSERVATION		EXIST	O
		NOT EXIST	
ELECTRICAL SOL VLV PWR SUPPLY		AC V	
		DC V	

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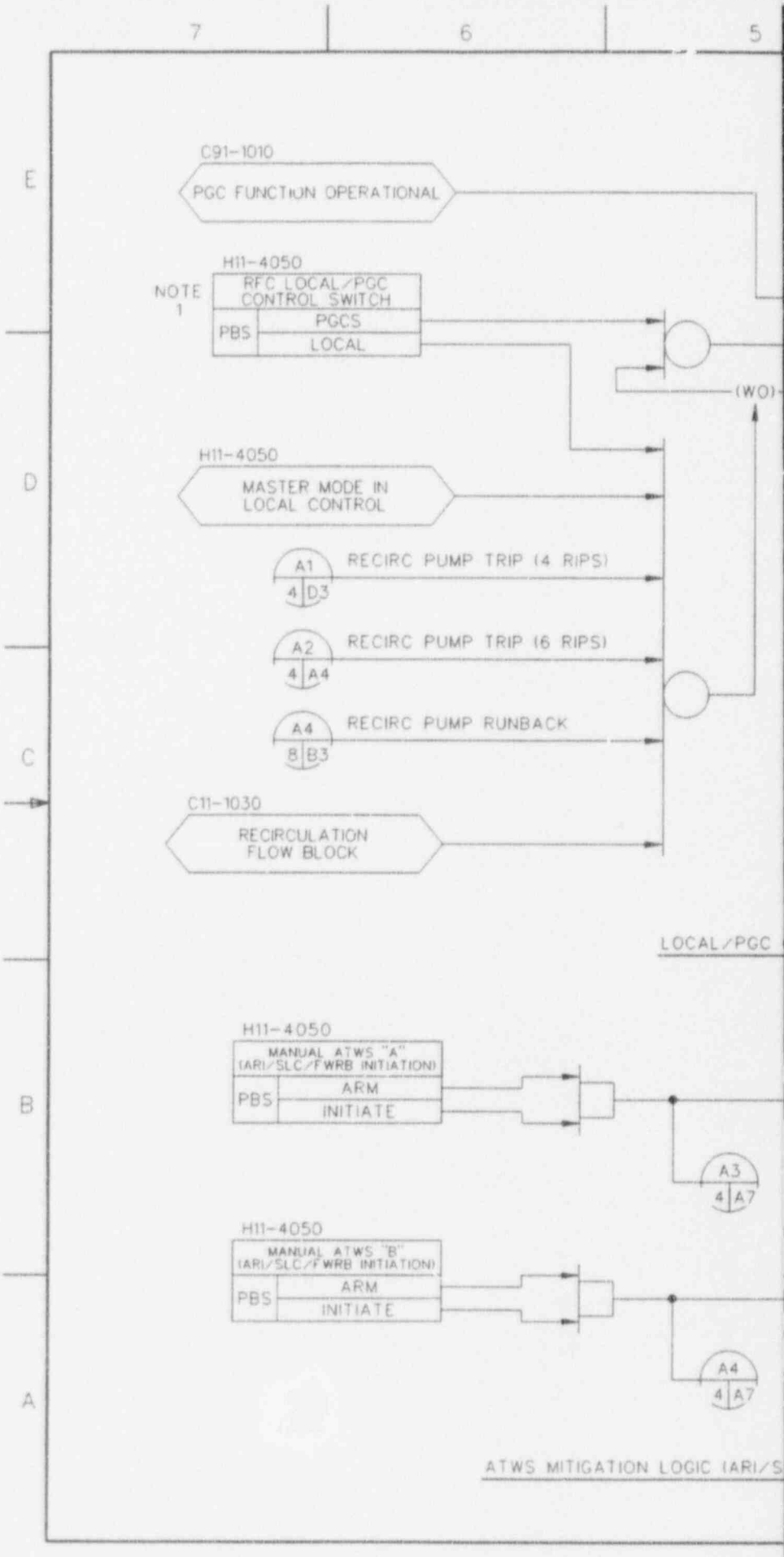
FIGURE 7.3-7 REACTOR BUILDING COOLING WATER/REACTOR SERVICE WATER SYSTEM IBD (Sheet 10 of 19)


7
6
5
E
D
C
B
A
C91-1010
PGC FUNCTION OPERATIONAL
H11-4050
NOTE 1
RFC LOCAL/PGC CONTROL SWITCH
PBS
PGCS
LOCAL
(WO)
H11-4050
MASTER MODE IN LOCAL CONTROL
A1
4 D3
RECIRC PUMP TRIP (4 RIPS)
A2
4 A4
RECIRC PUMP TRIP (6 RIPS)
A4
8 B3
RECIRC PUMP RUNBACK
C11-1030
RECIRCULATION FLOW BLOCK
LOCAL/PGC
H11-4050
MANUAL ATWS "A" (ARI/SLC/FWRB INITIATION)
PBS
ARM
INITIATE
A3
4 A7
H11-4050
MANUAL ATWS "B" (ARI/SLC/FWRB INITIATION)
PBS
ARM
INITIATE
A4
4 A7
ATWS MITIGATION LOGIC (ARI/S

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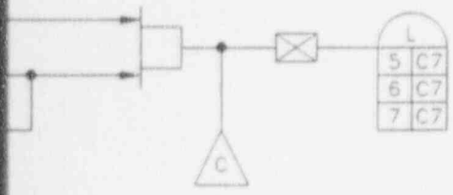

CONTROL SWITCH			
RFC LOCAL/PGC CONTROL SWITCH			
PBS	PGCS	LOCAL	

OBSERVATIONAL MEASURES		
USE	SPECIFICATION	LOCATION

ANNUNCIATOR		
NO.	INDICATOR	LOCATION

OTHERS			
INSTANT INTERRUPTION COUNTERMEASURE		NEED	
		NOT NEED	
VALVE	INCHING OPERATION	NEED	
		NOT NEED	
	SEATING FORM	OPEN SIDE	
		CLOSED SIDE	
	THERMAL BYPASS	EXIST	
		NOT EXIST	
SWGR POWER SUPPLY OBSERVATION		EXIST	
		NOT EXIST	
ELECTRICAL SOLENOID VALVE POWER SUPPLY		AC V	
		DC V	

ONTROL LOGIC

SSLC
ARI/SLC/FWRB
INITIATION

SSLC
ARI/SLC/FWRB
INITIATION

C/FWRB INITIATION)

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FIGURE 7.7-7 RECIRCULATION FLOW CONTROL SYSTEM IBD (Sheet 2 of 9)