M-22BB01(Q)

REACTOR COOLANT PUMP PBB01D
REACTOR COOLANT PUMP PBB01A
REACTOR COOLANT PUMP PBB01C
REACTOR COOLANT PUMP PBB01B
REACTOR VESSEL RBB01
STEAM GENERATOR EBB01D LOOP NO. 4
STEAM GENERATOR EBB01A LOOP NO. 1
STEAM GENERATOR EBB01C LOOP NO. 3
STEAM GENERATOR EBB01B LOOP NO. 2

NOTES:

1. DRILLED RESTRICTION 3/8" IN DIAMETER. POINT AT WHICH QUALITY GROUP CLASSIFICATION IS CHANGED FROM "A" TO "B".
2. SEE WESTINGHOUSE DRAWING 8756D37 SHT. 7.
3. SEE WESTINGHOUSE DRAWING 8756D37 SHT. 8.
4. SEE WESTINGHOUSE DRAWING 8756D37 SHT. 9.
5. SEE WESTINGHOUSE DRAWING 8756D37 SHT. 10.
6. DETAILS OF REACTOR COOLANT PUMP MOTOR COOLING, SEAL WATER INJECTION, AND INSTRUMENTATION AND CONTROLS ARE SHOWN ON M-22BB03.
7. RTD STRAPPED TO LINE.
8. TYGON HOSE TO BE INSTALLED AT THESE CONNECTIONS TO VENT PRESSURIZER DURING DRAINING AND FILLING.
9. DELETED.
10. REFERENCE WESTINGHOUSE DRAWINGS 1145E01 SHT. 1, 1145E01 SHT. 2, AND 1145E01 SHT. 3.
11. DELETED.
12. FOR P & ID LEGEND AND SYMBOLS SEE DRAWINGS M-220101 THRU M-220104.
13. DETAILS OF STEAM GENERATOR SECONDARY SIDE PIPING AND CONTROLS ARE PROVIDED ON M-22AB01, M-22AE02, AND M-22BM01.
14. A DIRECT READING DIGITAL PRESSURE INDICATOR IS CONNECTED TO THIS LINE AT THE NUCLEAR SAMPLE STATION, DOWN STREAM OF THE SAMPLE COOLER. FOR PURPOSES OF CALIBRATING THE PRESSURIZER PRESSURE INSTRUMENT CHANNELS.
15. DELETED.
16. PRESSURIZER SAFETY & RELIEF VALVE DISCHARGE LINE IS ANALYZED SO AS TO ASSURE THE INTEGRITY OF THE PRESSURIZER RELIEF TANK DURING & FOLLOWING AN SSE.
17. SG-AR-7: PEAK RECORDING ACCELEROMETER. TO BE MOUNTED ON SURFACE OF HORIZONTAL PIPE SECTION.
18. SEE WESTINGHOUSE DWG. 725OD64 SHT. 6. MCB ANNUCIATOR (PAH-455) IS PROVIDED FOR PZR HI PRESSURE PORV OPEN.
19. ASTS (AUXILIARY SHUTDOWN TRANSFER SIGNAL) IS INITIATED AT RP118B BY RP-HIS-3 WHICH TRANSFERS CONTROL TO THE AUXILIARY SHUTDOWN PANEL WHILE ISOLATING THE MAIN CONTROL BOARD CONTROLS AND INDICATION.
20. PRT IS A SEISMICALLY QUALIFIED ASME SECTION VIII COMPONENT.
21. THE INTERNALS OF THIS VALVE HAVE BEEN REMOVED AND REPLACED WITH A STAINLESS STEEL PLUG. THE VALVE HAS BEEN TRANSFORMED TO A 90° ELBOW.
22. DELETED.
23. DELETED.
24. DELETED.
25. THE INTERNALS OF VALVE BB8949A HAVE BEEN REMOVED: 6" CHECK VALVE BODY REMAINS IN SYSTEM.

REV.	DATE	DRAWN
20	111596	RLW
CHKD.	SUPV.	APPD.
DLBr	AMR	N/A

INCORP. RFR-101618.

REV.	DATE	DRAWN
21	022898	RBF
CHKD.	SUPV.	APPD.
DJB	AMR	N/A

INC'D DEC-1501

REV.	DATE	DRAWN
22	040198	RLW
CHKD.	SUPV.	APPD.
DJB	JHK	N/A

INC'D RFR-18663A.

REV.	DATE	DRAWN
23	122299	RLW
CHKD.	SUPV.	APPD.
DJB	JHC	N/A

INCORP. RFR-20059A.

REV.	DATE	DRAWN
24	041401	MAL
CHKD.	SUPV.	APPD.
RLW	DTW	N/A

INCORP. MP 00-1005 FCN-02.

REV.	DATE	DRAWN
25	041801	RLW
CHKD.	SUPV.	APPD.
MAL	DLB	N/A

INCORP. MP 97-1010 FCN-06

REV.	DATE
26	110402
DRAWN	CHKD.	SUPV.
---	---	---
MAL	RLW	DLB

INCORP. MP 01-1019A.

REV.	DATE
27	100704
DRAWN	CHKD.	SUPV.
---	---	---
RLW	MAL	TWS

INCORPORATE MINOR CHANGE CAR 200405780

REV.	DATE
28	041905
DRAWN	CHKD.	SUPV.
---	---	---
MAL	RLW	TWS

INCORP. RFR 22941A

REV.	DATE
29	071105
DRAWN	CHKD.	SUPV.
---	---	---
TJC	MAL	TWS

INCORPORATE MINOR CHANGE CARS-200503887.

REV.	DATE
30	102805
DRAWN	CHKD.	SUPV.
---	---	---
RLW	EWM	MWH

INCORPORATE MP 03-1011

REV.	DATE
31	070710
DRAWN	CHKD.	SUPV.
---	---	---
TJC	MAL	TWS

INCORP. CAR 201001930 ACTION 7.

AS-BUILT CLASS 1

DRAWN (DATE) N/A		PIPING AND INSTRUMENTATION DIAGRAM REACTOR COOLANT SYSTEM	
CHKD. (DATE) N/A		FSAR FIGURE 5.1-1 SHEET 1	
SUPV. (DATE) N/A			
APPD. (DATE) N/A	LOCATION	CALLAWAY PLANT	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO		M-22BB01(Q)	REV. 31

M-22BB02 (Q)

PRESSURIZER

TBB03

PRESSURIZER RELIEF TANK

TBB02 NOTE 20

NOTES:

SEE M-22BB01(Q) FOR NOTES.

AS-BUILT CLASS 1

DRAWN (DATE) N/A	PIPING AND INSTRUMENTATION DIAGRAM REACTOR COOLANT SYSTEM		
CHKD. (DATE) N/A	FSAR FIGURE 5.1-1 SHEET 2		
SUPV. (DATE) N/A			
APPD. (DATE) N/A	LOCATION: CALLAWAY PLANT	CLASS	
UNION ELECTRIC COMPANY ST. LOUIS, MO	M-22BB02 (Q)	REV. 33	

REV. 21 DATE 041401 DRAWN RLW; CHKD. MAL SUPV. DTW APPD. N/A; INCORP. MP 00-1005 FCN-02

REV. 22 DATE 081501 DRAWN RLW; CHKD. JHK SUPV. JAM APPD. N/A; INCORP. RFR-21330A

REV. 23 DATE 083002 DRAWN RLW; CHKD. EWM SUPV. TWS APPD. N/A; INCORP. RFR-22105A

REV. 24 DATE 082003 DRAWN RLW CHKD. MAL SUPV. TWS; INCORPORATE MINOR CHANGE CAR 200305155

REV. 25 DATE 051304 DRAWN RLW CHKD. MAL SUPV. RWW; INCORPORATE MP 89-1035A (PARTIAL)

REV. 26 DATE 110904 DRAWN TJC CHKD. MAL SUPV. TWS; INCORPORATE RFR-22941A.

REV. 27 DATE 080205 DRAWN RLW CHKD. MAL SUPV. TWS; INCORPORATE MINOR CHANGE CAR 200503892

REV. 28 DATE 111105 DRAWN RLW CHKD. EWM SUPV. SKC; INCORPORATE MP 89-1035A

REV. 29 DATE 102508 DRAWN RLW CHKD. EWM SUPV. LMR; INCORPORATE MP 07-0007

REV. 30 DATE 091009 DRAWN RLW CHKD. TJC SUPV. LMR; INCORPORATE AC. 09-000063; RFR 200801863

REV. 31 DATE 050910 DRAWN EWM CHKD. RLW SUPV. LMP; INCORPORATE CAR 201000409

REV. 32 DATE 070710 DRAWN TJC CHKD. MAL SUPV. TWS; INCORP. CAR 201001930 ACTION 7.

REV. 33 DATE 021611 DRAWN MAL CHKD. TJC SUPV. SKC; INCORP. CAR 201011348.

M-22BB03(Q)

REV.	DATE	DRAWN
9	090892	RLW
CHKD.	SUPV.	APPD.
GDC	TJM	N/A

INCORP. RFR-10375A & RFR-10333A. REDRAWN FOR CLARITY.

REV.	DATE	DRAWN
10	010494	MAL
CHKD.	SUPV.	APPD.
RLW	TJM	N/A

INCORP. RFR-14399A & EMP-93-3022.

REV.	DATE	DRAWN
11	111596	RLW
CHKD.	SUPV.	APPD.
DLBr	AMR	N/A

INCORP. RFR-10161B

REV.	DATE	DRAWN
12	012397	RLW
CHKD.	SUPV.	APPD.
DLBr	AMR	N/A

INCORP. RFR-17575A

REV.	DATE	DRAWN
13	022898	RBF
CHKD.	SUPV.	APPD.
DJB	AMR	N/A

INC'D DEC-1501

REV.	DATE
14	041905
DRAWN	CHKD.	SUPV.
MAL	RLW	TWS

INCORP. RFR 22941A

NOTES:

1. DELETED.
2. SINGLE ALARM POINT FOR ALL FOUR (4) PUMPS.
3. RESTRICTION ORIFICE 3/4" DIAMETER. POINT AT WHICH QUALITY GROUP CLASSIFICATION IS CHANGED FROM "A" TO "B".
4. DELETED
5. REFERENCE WESTINGHOUSE DRAWING: 1145E02 S001.
6. DELETED.
7. DELETED.
8. THERMAL BARRIER COOLING COIL HAS INTERNAL PRESSURE DESIGN RATING OF 150 PSIA.
9. DELETED.
10. DELETED.
11. DELETED.
12. DELETED.
13. DELETED.
14. LIGHT INDICATING ADEQUATE OIL PRESSURE IS AN INTEGRAL PART OF HIS.
15. DELETED.
16. ALTERNATE PRESSURE SWITCH BBPS0491A.
17. ALTERNATE PRESSURE SWITCH BBPS0492A.
18. ALTERNATE PRESSURE SWITCH BBPS0493A.
19. ALTERNATE PRESSURE SWITCH BBPS0494A.

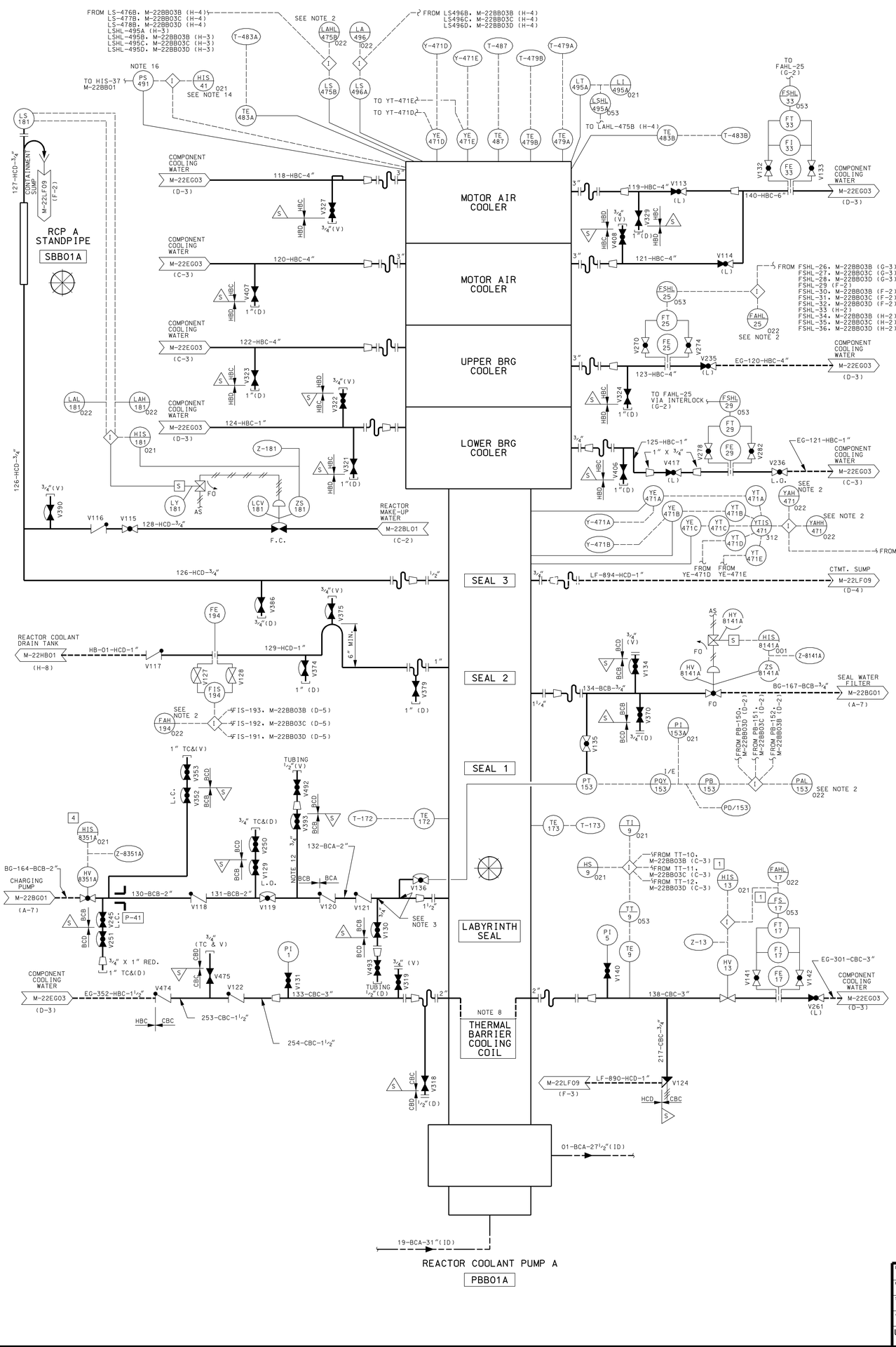
A SEPERATE RCP DRAWING EXISTS FOR EACH LOOP- SEE THE FOLLOWING DRAWING FOR THE APPLICABLE LOOP:

LOOP	DRAWING
A	M-22BB03A(Q)
B	M-22BB03B(Q)
C	M-22BB03C(Q)
D	M-22BB03D(Q)

AS-BUILT CLASS 1

DRAWN (DATE) N/A	PIPING AND INSTRUMENTATION DIAGRAM	
CHKD. (DATE) N/A	REACTOR COOLANT SYSTEM 1.d	
SUPV. (DATE) N/A	FSAR FIGURE 5.1-1 SHEET 3	
APPD. (DATE) N/A	LOCATION: CALLAWAY PLANT	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO	M-22BB03(Q)	REV. 14

M-22BB03A(Q)



SEE M-22BB03 FOR NOTES.
DO NOT ADD NOTES TO THIS DRAWING.

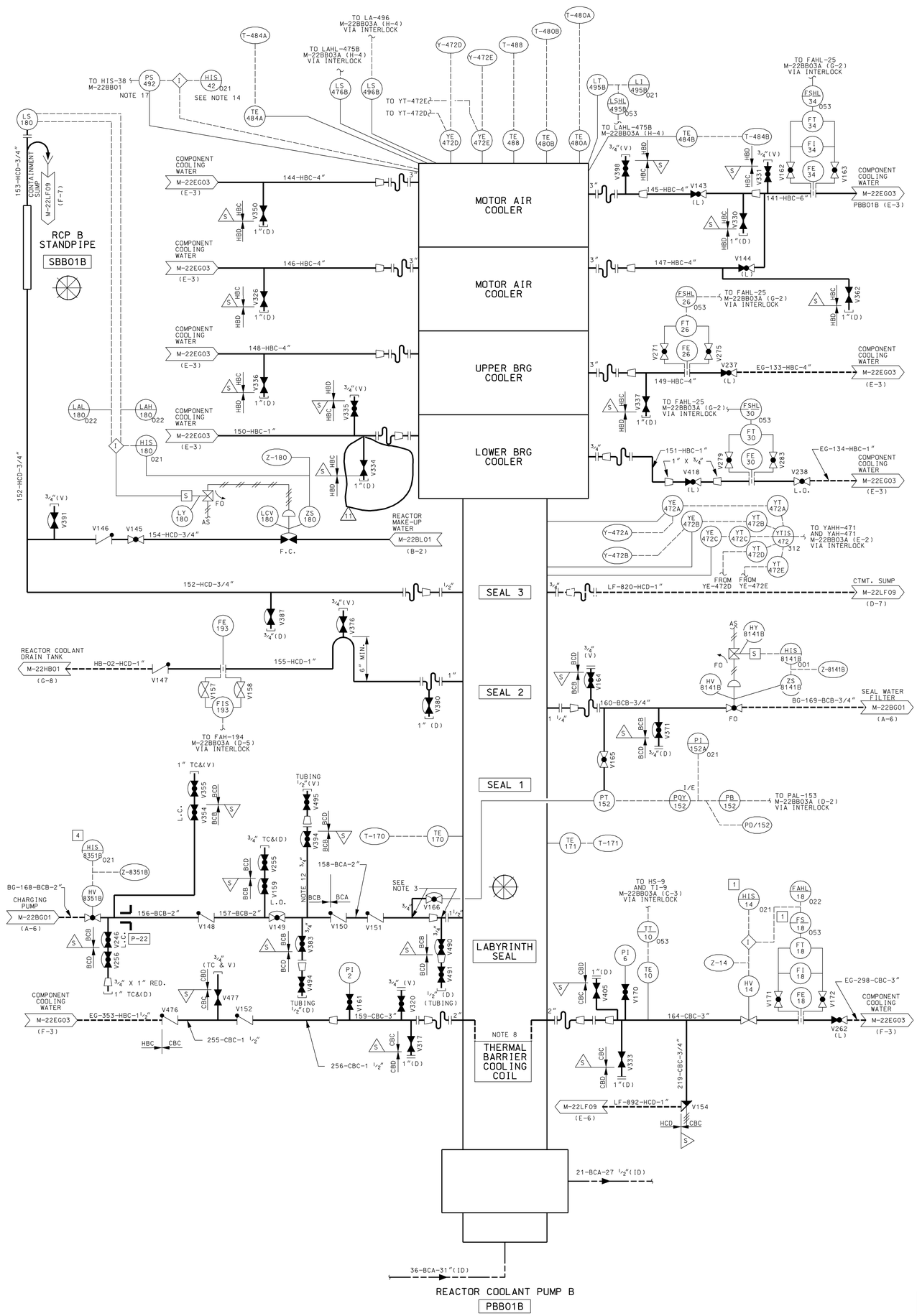
AS-BUILT CLASS 1

DRAWN (DATE) N/A	PIPING AND INSTRUMENTATION DIAGRAM		
CHKD. (DATE) N/A	REACTOR COOLANT SYSTEM		
SUPV. (DATE) N/A	FSAR FIGURE 5.1-1 SHEET 3A		9
APPD. (DATE) N/A	LOCATION: CALLAWAY PLANT		CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO	M-22BB03A(Q)		REV. 9

REV.	DATE	DRAWN
0	012397	RLW
CHKD. DLBr	SUPV. AMR	APPD. N/A
INITIAL ISSUE PER RFR-17575A.		
REV. 1	DATE 033197	DRAWN DLBr
CHKD. RLW	SUPV. AMR	APPD. N/A
INCORP. DEC-1402		
REV. 2	DATE 022498	DRAWN RBF
CHKD. DJB	SUPV. AMR	APPD. N/A
INC'D DEC-1501		
REV. 3	DATE 062598	DRAWN RAM
CHKD. JHK	SUPV. AMR	APPD. N/A
INCORPORATES RFR-18922A		
REV. 4	DATE 020199	DRAWN DJB
CHKD. RAM	SUPV. AMR	APPD. N/A
INCORPORATES RFR-19267A		
REV. 5	DATE 100899	DRAWN RLW
CHKD. DJB	SUPV. AMR	APPD. N/A
INCORPORATES MP 97-1008A.		
REV. 6	DATE 110399	DRAWN RLW
CHKD. DJB	SUPV. JHC	APPD. N/A
INCORPORATES MP 97-1008 FCN-01.		
REV. 7	DATE 041401	DRAWN EWM
CHKD. DJB	SUPV. AMR	APPD. N/A
INCORPORATES MP 97-1008 FCN-02.		
REV. 8	DATE 051804	
DRAWN JHK	CHKD. EWM	SUPV. MAM
INCORP. RFR-22310B.		
REV. 9	DATE 110904	
DRAWN TJC	CHKD. MAL	SUPV. TWS
INCORPORATE RFR-22941A.		

M-22BB03B(Q)

REV.	DATE	DRAWN
0	012397	RLW
CHKD.	SUPV.	APPD.
DLBr	AMR	N/A
INITIAL ISSUE PER RFR-17575A		
REV.	DATE	DRAWN
1	033197	DLBr
CHKD.	SUPV.	APPD.
RLW	AMR	N/A
INCORP DEC-1402		
REV.	DATE	DRAWN
2	040898	MAL
CHKD.	SUPV.	APPD.
EWM	JHK	N/A
INCORP DEC-1501.		
REV.	DATE	DRAWN
3	041398	DJB
CHKD.	SUPV.	APPD.
EWM	AEM	N/A
INCORP CMP 95-1028A		
REV.	DATE	DRAWN
4	062598	RAM
CHKD.	SUPV.	APPD.
JHK	AMR	N/A
INCORPORATES RFR-18922A		
REV.	DATE	DRAWN
5	020199	DJB
CHKD.	SUPV.	APPD.
RAM	AMR	N/A
INCORPORATES RFR-19267A		
REV.	DATE	DRAWN
6	100899	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A
INCORPORATES MP 97-1008A.		
REV.	DATE	DRAWN
7	110399	RLW
CHKD.	SUPV.	APPD.
DJB	JHC	N/A
INCORPORATES MP 97-1008 FCN-01.		
REV.	DATE	DRAWN
8	041301	EWM
CHKD.	SUPV.	APPD.
DJB	DMS	N/A
INCORPORATES MP 97-1008 FCN-02.		
REV.	DATE	
9	041905	
DRAWN	CHKD.	SUPV.
MAL	RLW	TWS
INCORP. RFR 22941A		
REV.	DATE	
10	100710	
DRAWN	CHKD.	SUPV.
TJC	MAL	TWS
INCORP. CAR 201006760.		
REV.	DATE	
11	071416	
DRAWN	CHKD.	SUPV.
JER	MAL	DME
INCORP. CAR 201603054.		



DRAWN (DATE) N/A	PIPING AND INSTRUMENTATION DIAGRAM REACTOR COOLANT SYSTEM		
CHKD. (DATE) N/A	FSAR FIGURE 5.1-1 SHEET 3B		
SUPV. (DATE) N/A			
APPD. (DATE) N/A	LOCATION CALLAWAY ENERGY CENTER	CLASS 1	
UNION ELECTRIC COMPANY ST. LOUIS, MO	M-22BB03B(Q)	REV. 11	

M-22BB03C(Q)

REV.	DATE	DRAWN
0	012397	RLW
CHKD.	SUPV.	APPD.
DLBr	AMR	N/A

INITIAL ISSUE PER RFR-17575A

REV.	DATE	DRAWN
1	033197	DLBr
CHKD.	SUPV.	APPD.
RLW	AMR	N/A

INCORP DEC-1402

REV.	DATE	DRAWN
2	040898	MAL
CHKD.	SUPV.	APPD.
EWM	JHK	N/A

INCORP DEC-1501.

REV.	DATE	DRAWN
3	062598	RAM
CHKD.	SUPV.	APPD.
JHK	AMR	N/A

INCORPORATES RFR-18922A

REV.	DATE	DRAWN
4	020199	DJB
CHKD.	SUPV.	APPD.
RAM	AMR	N/A

INCORPORATES RFR-19267A

REV.	DATE	DRAWN
5	100899	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A

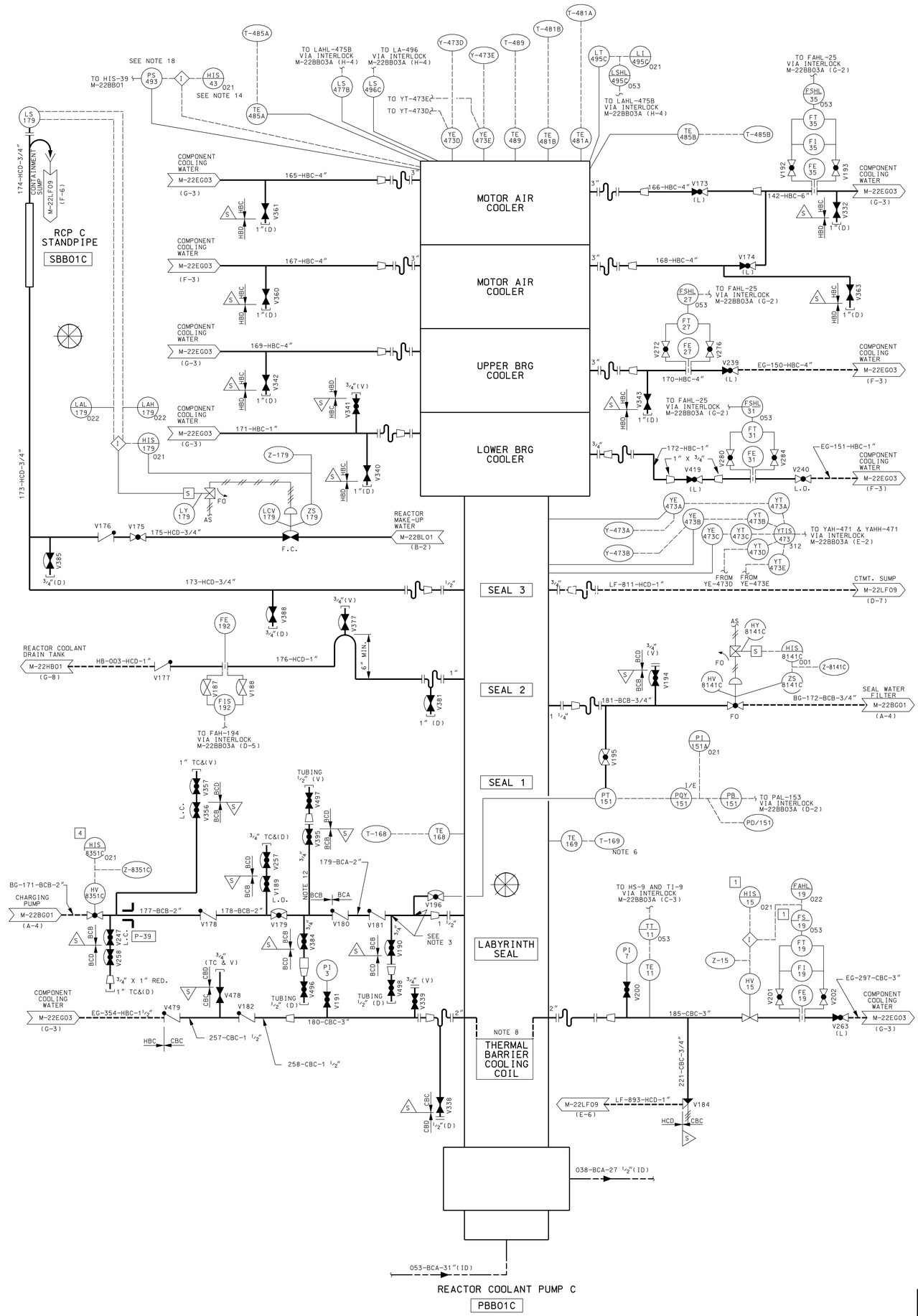
INCORPORATES MP 97-1008A.

REV.	DATE
6	120503
DRAWN	CHKD.	SUPV.
RLW	MAL	TWS

INCORPORATE MINOR CHANGE CAR 200307724

REV.	DATE
7	110904
DRAWN	CHKD.	SUPV.
MAL	RLW	TWS

INCORP. RFR-22941A



SEE M-22BB03 FOR NOTES.
DO NOT ADD NOTES TO THIS DRAWING.

AS-BUILT CLASS 1

DRAWN (DATE) N/A	PIPING AND INSTRUMENTATION DIAGRAM		
CHKD. (DATE) N/A	REACTOR COOLANT SYSTEM 7		
SUPV. (DATE) N/A	FSAR FIGURE 5.1-1 SHEET 3C		
APPD. (DATE) N/A	LOCATION	CLASS	
UNION ELECTRIC COMPANY ST. LOUIS, MO	CALLAWAY PLANT	M-22BB03C(Q)	REV. 7

M-22BB03D(Q)

REV.	DATE	DRAWN
0	012397	RLW
CHKD.	SUPV.	APPD.
DLB	AMR	N/A

INITIAL ISSUE PER RFR-17575A

REV.	DATE	DRAWN
1	020697	JHK
CHKD.	SUPV.	APPD.
RAM	AMR	N/A

INCORP. DEC-1403.

REV.	DATE	DRAWN
2	033197	DLB
CHKD.	SUPV.	APPD.
RLW	AMR	N/A

INCORP. DEC-1402.

REV.	DATE	DRAWN
3	040898	MAL
CHKD.	SUPV.	APPD.
EWM	JHK	N/A

INCORP. DEC-1501.

REV.	DATE	DRAWN
4	062598	RAM
CHKD.	SUPV.	APPD.
JHK	AMR	N/A

INCORPORATES RFR-18922A

REV.	DATE	DRAWN
5	020199	DJB
CHKD.	SUPV.	APPD.
RAM	AMR	N/A

INCORPORATES RFR-19267A

REV.	DATE	DRAWN
6	100899	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A

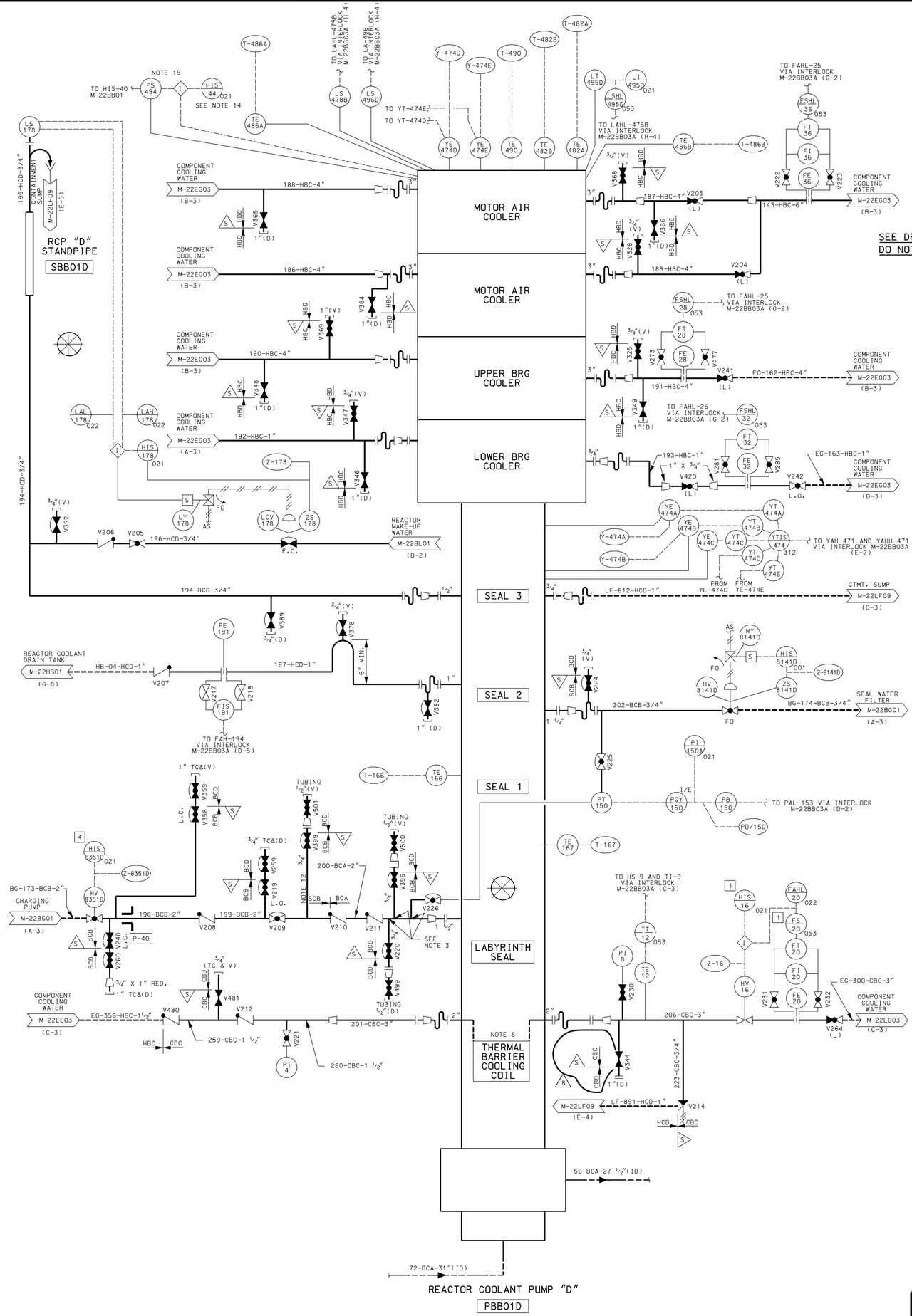
INCORPORATES MP 97-1008A.

REV.	DATE
7	041905
DRAWN	CHKD.	SUPV.
MAL	RLW	TWS

INCORP. RFR 22941A

REV.	DATE
8	100710
DRAWN	CHKD.	SUPV.
TJC	MAL	TWS

INCORP. CAR 201006760.



AS-BUILT CLASS 1

DRAWN (DATE) N/A	PIPING AND INSTRUMENTATION DIAGRAM REACTOR COOLANT SYSTEM FSAR FIGURE 5.1-1 SHEET 3D		
CHKD. (DATE) N/A			
SUPV. (DATE) N/A			
APPD. (DATE) N/A	LOCATION		CLASS
	CALLAWAY PLANT		
UNION ELECTRIC COMPANY ST. LOUIS, MO	M-22BB03D(Q)		REV. 8

M-22BB04(Q)

RV CORE SUBCOOLING MONITOR

TRAIN	SEP. GRP.	T/C JUNCT. BOX NO.	T/C NUMBER							PENE-TRATION NO.
A	1	BB04A	38	30	33	5	45	41 (NOTE 10)	SPR	75
			48	20	44	47	49	43	SPR	76
			42	39	15	35	13	46	7	77
			31	27	32	29 (NOTE 15)	4	1	SPR	78
B	4	BB04B	37	9	17	12 (NOTE 14)	36	11	SPR	75
			24	23	19	50	25	22	18	76
			40 (NOTE 11)	16 (NOTE 11)	14	34	10	21	SPR	77
			26	2	8	28	3	6 (NOTE 13)	SPR	78

RV CORE SUBCOOLING MONITOR
(NOTE 8)

THERMOCOUPLE/CORE COOLING MONITOR	
DISPLAY INSTRUMENTS FOR CONTROL BOARD SECTION AND/OR OTHER CABINETS	
INSTRUMENT TAG NO.	LOCATION
UU-1390A	RP081A
UU-1390B	RP081B
TR-1390A	RP081A
TR-1390B	RP081B
TI-1390A	RL022
TI-1390B	RL022
TAL-1390A	RK020
TALL-1390B	RK020

NOTES

1. REFER TO NOTE 1 ON M-22BB01(Q).
2. SEE WESTINGHOUSE PROCESS BLOCK DIAGRAMS-W DWG. NO. 2326D90 (4 SHEETS), AND WESTINGHOUSE INSTALLATION SCHEMATIC.
3. LIS-1311, 1312, 1321, AND 1322 ARE HYDRAULIC ISOLATORS WITH A MALFUNCTION INDICATION.
4. DELETED.
5. HYDRAULIC SENSORS.
6. LEVEL TRANSMITTER ELEVATION ABOVE HYDRAULIC ISOLATOR AND NEAR CONTAINMENT PENETRATION.
7. DELETED.
8. FOR THERMOCOUPLE/CORE COOLING MONITOR SEE WESTINGHOUSE DRAWING 2332D78. (5 SHEETS).
9. ONLY 53 OF THE 54 STUDS ARE REQUIRED TO BE TENSIONED TO ENSURE O-RING SEATING AND COMPLIANCE WITH THE ASME CODE STRESS CONCENTRATION FACTORS.
10. BBTC0041 HAS BEEN ABANDONED IN PLACE.
11. THERMOCOUPLES TC16 AND TC40 HAVE BEEN REMOVED FROM SERVICE AND CAPPED WITH A 1/8" SWAGELOK TUBING CAP (REF. CMP 92-1028).
12. DELETED.
13. THERMOCOUPLE TC6 HAS BEEN REMOVED FROM SERVICE AND CAPPED WITH A 1/8" SWAGELOK TUBING CAP. (REF. SOS 96-1664)
14. THERMOCOUPLE TC12 IS REMOVED FROM SERVICE AND CAPPED WITH A 1/8" SWAGELOK TUBING CAP. (REF. SOS 96-1664 AND RFR-17473B)
15. THERMOCOUPLE TC29 IS NOT CONNECTED AT THE TRANSITION CABLE (1BBS33AX – P4, N4, AND SH4) ASSEMBLY TWIN PIN CONNECTOR. REF.: SOS 99-2143 AND RFR-17473C.
16. QUALITY GROUP CLASSIFICATION IS CHANGED FROM "A" TO "B" AT THE 3/8" ADAPTOR FROM 1" PIPE TO 3/8" TUBING.

REV.	DATE	DRAWN
4	072191	RLW
CHKD.	SUPV.	APPD.
DLB	TJM	N/A

REDRAWN FOR CLARITY

REV.	DATE	DRAWN
5	050692	MAL
CHKD.	SUPV.	APPD.
RLW	TJM	N/A

REDRAWN FOR CLARITY. INCORP., CMP 91-1016.

REV.	DATE	DRAWN
6	10993	SBR
CHKD.	SUPV.	APPD.
RLW	DME	N/A

INCORP. CMP 92-1028 FCN 03.

REV.	DATE	DRAWN
7	101596	DJB
CHKD.	SUPV.	APPD.
RLW	AMR	N/A

INCORP. CMP 95-1012

REV.	DATE	DRAWN
8	103096	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A

INCORP. RFR-10372C.

REV.	DATE	DRAWN
9	013197	RLW
CHKD.	SUPV.	APPD.
DLB	AMR	N/A

INCORP. RFR-17473A.

REV.	DATE	DRAWN
10	040198	RLW
CHKD.	SUPV.	APPD.
DJB	JHK	N/A

INCORP. RFR-18663A.

REV.	DATE	DRAWN
11	040898	RLW
CHKD.	SUPV.	APPD.
MAL	JHK	N/A

INCORP. RFR-17473B.

REV.	DATE	DRAWN
12	01050	RLW
CHKD.	SUPV.	APPD.
DJB	AMR	N/A

INCORP. RFR-17473C.

REV.	DATE
13	022204
DRAWN	CHKD. SUPV.
RLW	MAL SKC

INCORPORATE MINOR CHANGE CAR 200309298

REV.	DATE
14	100704
DRAWN	CHKD. SUPV.
RLW	MAL TWS

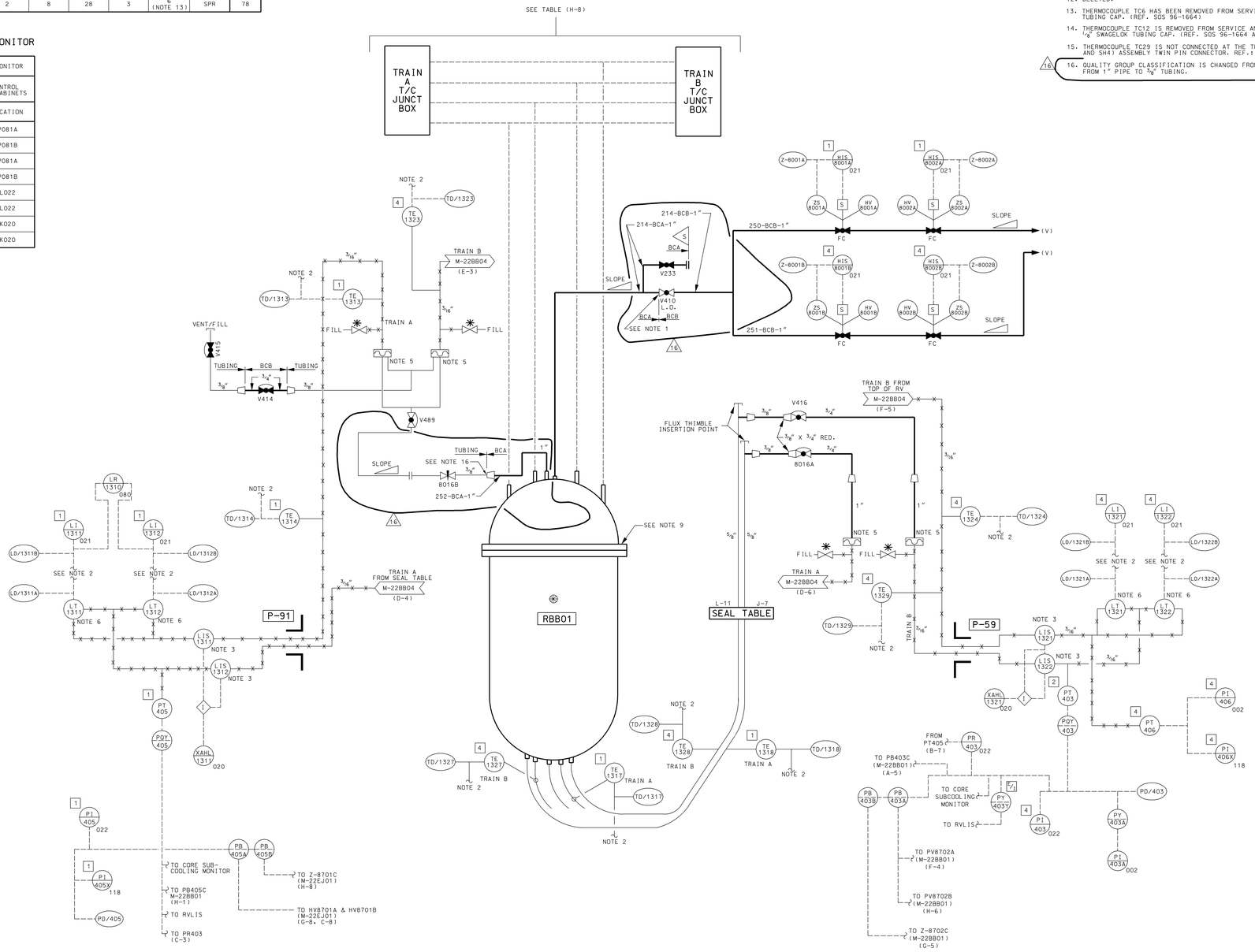
INCORPORATE MINOR CHANGE CAR 200406193

REV.	DATE
15	110904
DRAWN	CHKD. SUPV.
MAL	RLW TWS

INCORP. RFR 22941A.

REV.	DATE
16	102814
DRAWN	CHKD. SUPV.
RLW	MAL DME

INCORPORATE MP 10-0001 FCN-01



AS-BUILT CLASS 1

DRAWN	(DATE) N/A	PIPING & INSTRUMENTATION DIAGRAM REACTOR COOLANT SYSTEM	
CHKD.	(DATE) N/A		
SUPV.	(DATE) N/A	16 FSAR FIGURE 5.1-1 SHEET 4	
APPD.	(DATE) N/A	LOCATION: CALLAWAY ENERGY CENTER	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO		M-22BB04(Q)	REV. 16

NOTES TO FIGURE 5.1-2

Mode A Steady State Full Power Operation

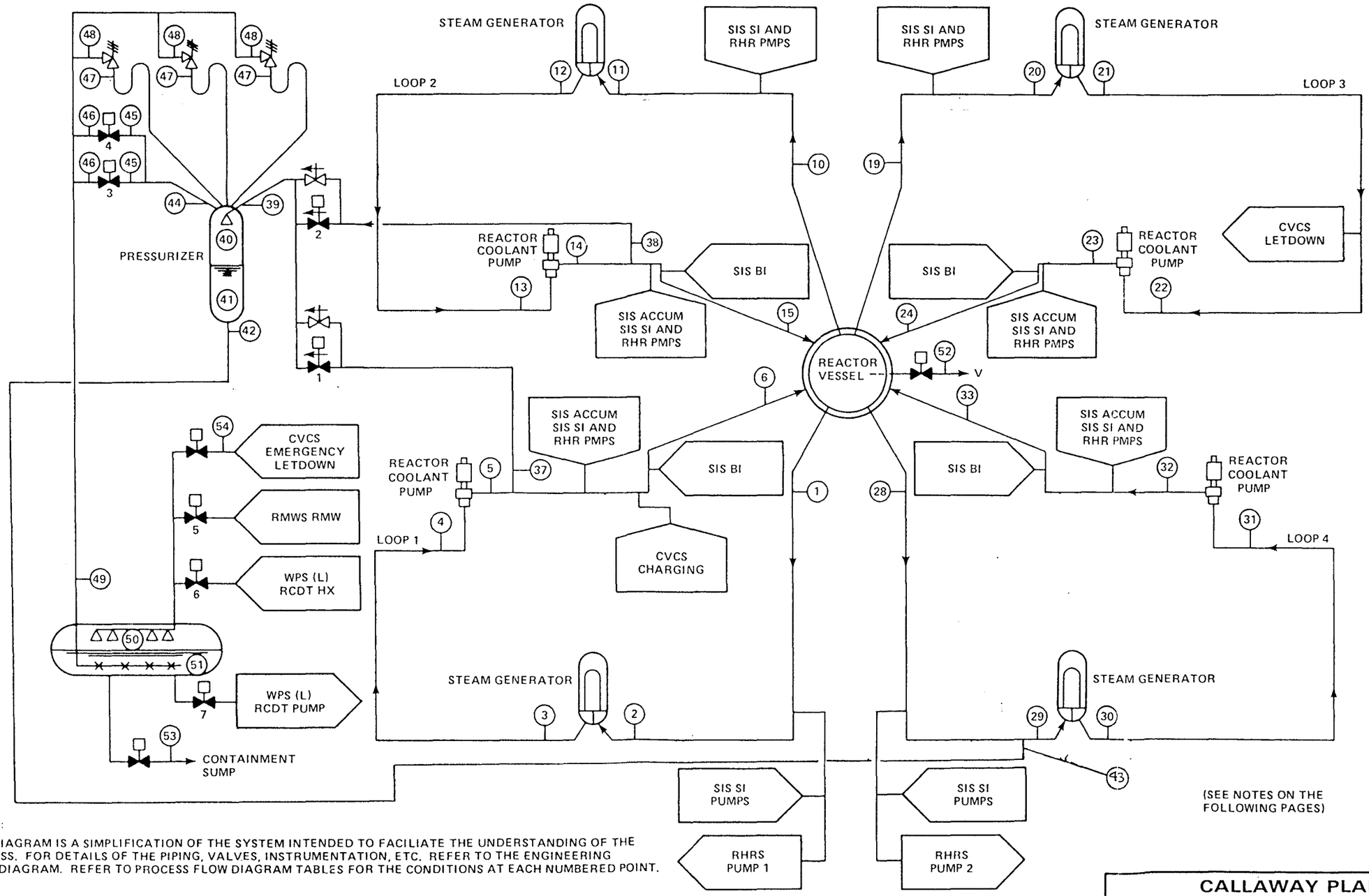
		Pressure	Temperature	Flow		
Location	**Fluid**	**(psig)**	**(°F)**	**gpm (1)**	**lb/hr (2)**	**Volume**
1	Reactor coolant	2,235.0	618.8	108,781	36.2040	-
2	Reactor coolant	2,233.7	618.8	108,781	36.2040	-
3	Reactor coolant	2,189.7	557.7	97,452	36.2040	-
4	Reactor coolant	2,186.1	557.7	97,453	36.2040	-
5	Reactor coolant	2,282.3	558.0	97,368	36.2065	-
6	Reactor coolant	2,281.0	558.0	97,361	36.2040	-
10-15	Reactor coolant	See Loop #1 Specifications				
19-24	Reactor coolant	See Loop #1 Specifications				
28-33	Reactor coolant	See Loop #1 Specifications				
37	Reactor coolant	2,282.3	558.0	1.0	0.00037	-
38	Reactor coolant	2,282.3	558.0	1.0	0.00037	-
39	Reactor coolant	2,282.3	558.0	2.0	0.00074	-

NOTES TO FIGURE 5.1-2 (Sheet 2)

Location	Fluid	Pressure (psig)	Temperature (°F)	Flow gpm (1)	Flow lb/hr (2)	Volume
40	Steam	2,235.0	652.7	-	-	720
41	Reactor coolant	2,235.0	652.7	-	-	1,080
42	Reactor coolant	2,235.0	652.7	2.5	0.0007	-
43	Reactor coolant	2,235.0	652.7	2.5	0.0007	-
44	Steam	2,235.0	652.7	0	0	-
45	Reactor coolant	2,235.0	≤300	0	0	Minimize
46	N_2	3.0	120	0	0	-
47	Reactor coolant	2,235.0	≤300	0	0	Minimize
48	N_2	3.0	120	0	0	-
49	N_2	3.0	120	0	0	-
50	N_2	3.0	120	-	-	450
51	Pressurizer relief tank water	3.0	120	-	-	1,350
52	Steam/H_2	2,235.0	559	0	0	-
53	Reactor coolant	3.0	120	0	0	-
54	Reactor coolant	50	170	0	0	-

(1) At the conditions specified.

(2) X 10^6.



(SEE NOTES ON THE FOLLOWING PAGES)

NOTES:

THIS DIAGRAM IS A SIMPLIFICATION OF THE SYSTEM INTENDED TO FACILIATE THE UNDERSTANDING OF THE PROCESS. FOR DETAILS OF THE PIPING, VALVES, INSTRUMENTATION, ETC. REFER TO THE ENGINEERING FLOW DIAGRAM. REFER TO PROCESS FLOW DIAGRAM TABLES FOR THE CONDITIONS AT EACH NUMBERED POINT.

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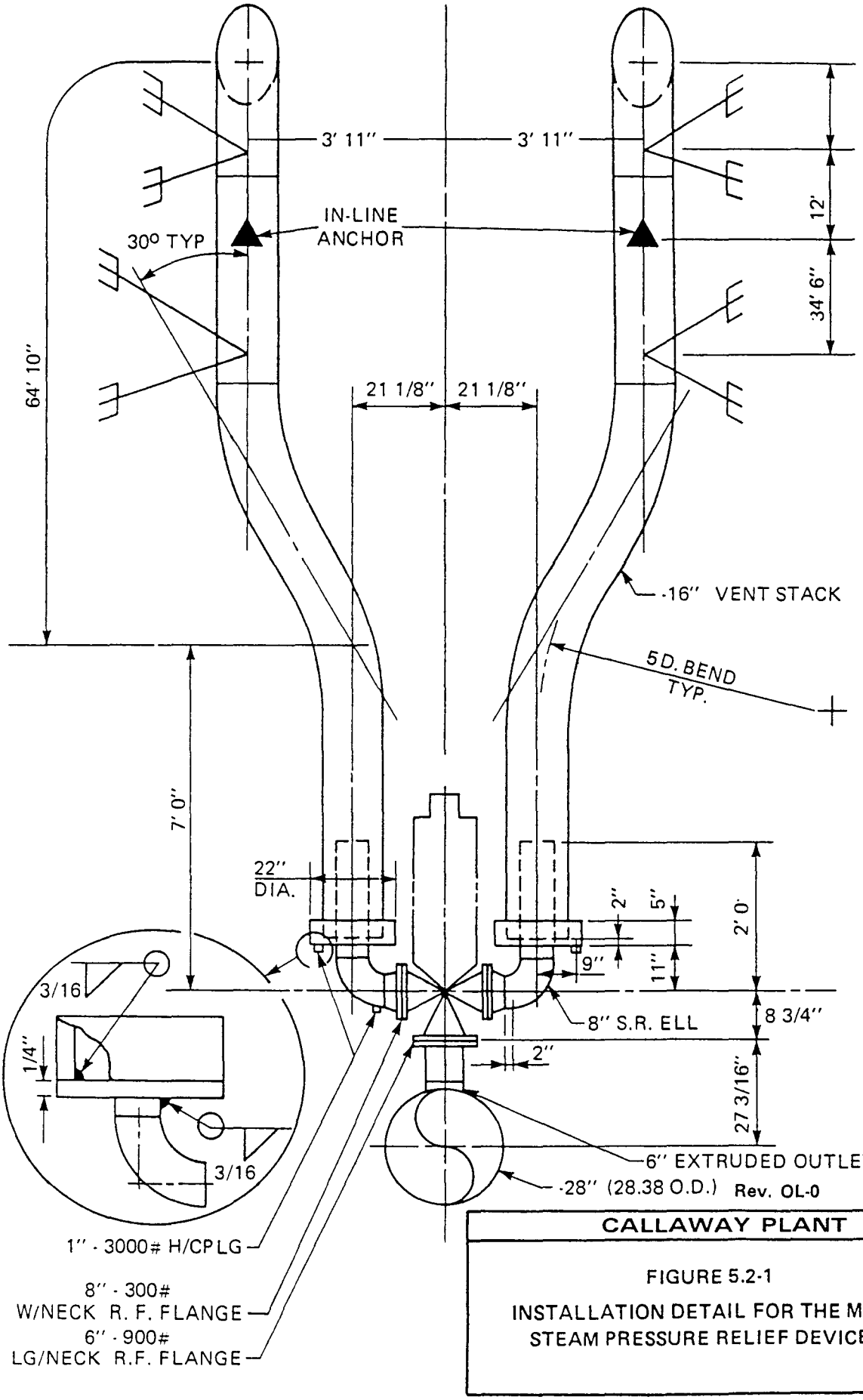
11/95

CALLAWAY PLANT

FIGURE 5.1-2

REACTOR COOLANT SYSTEM
PROCESS FLOW DIAGRAM



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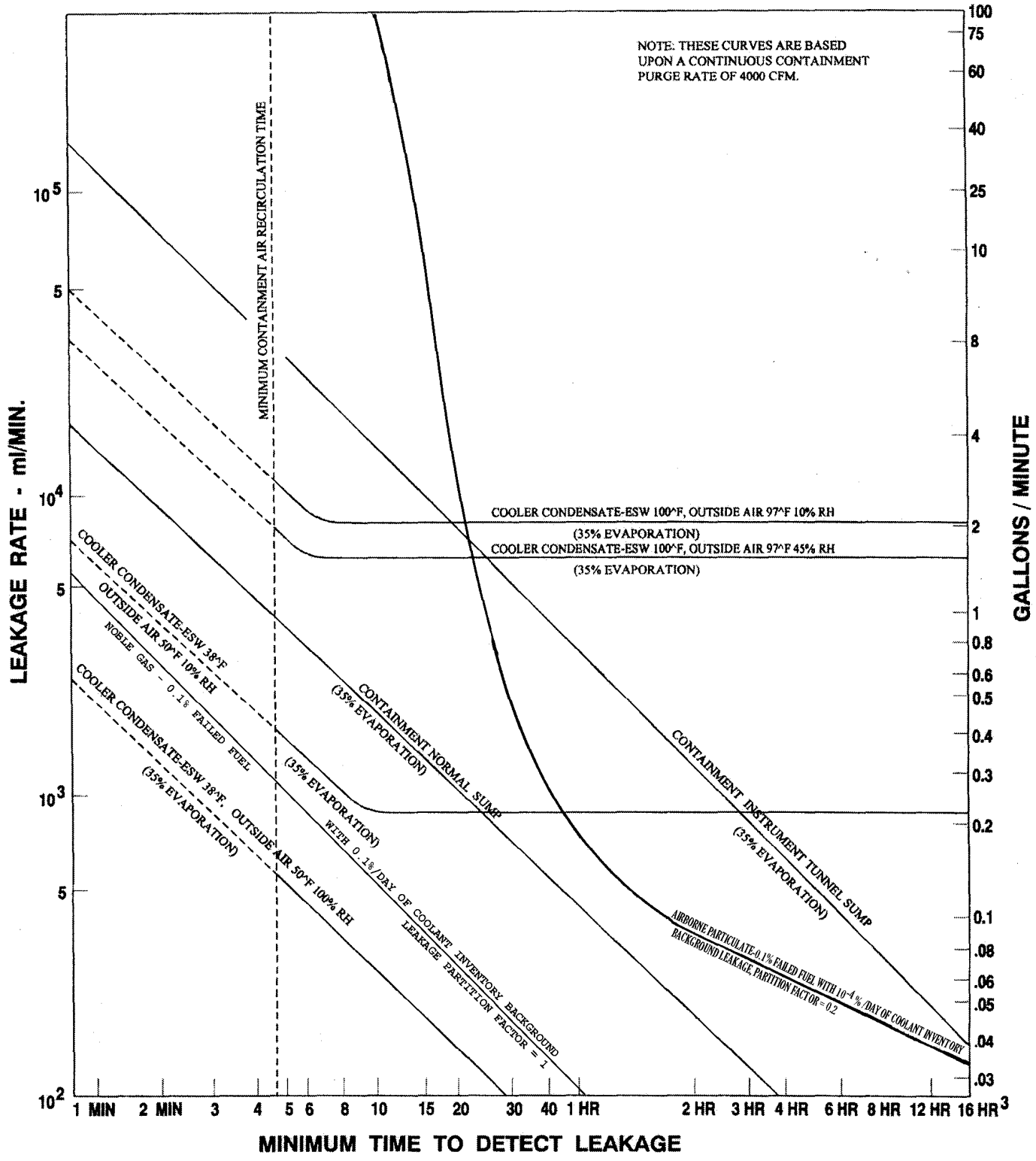
CALLAWAY PLANT

FIGURE 5.2-1

INSTALLATION DETAIL FOR THE MAIN STEAM PRESSURE RELIEF DEVICES

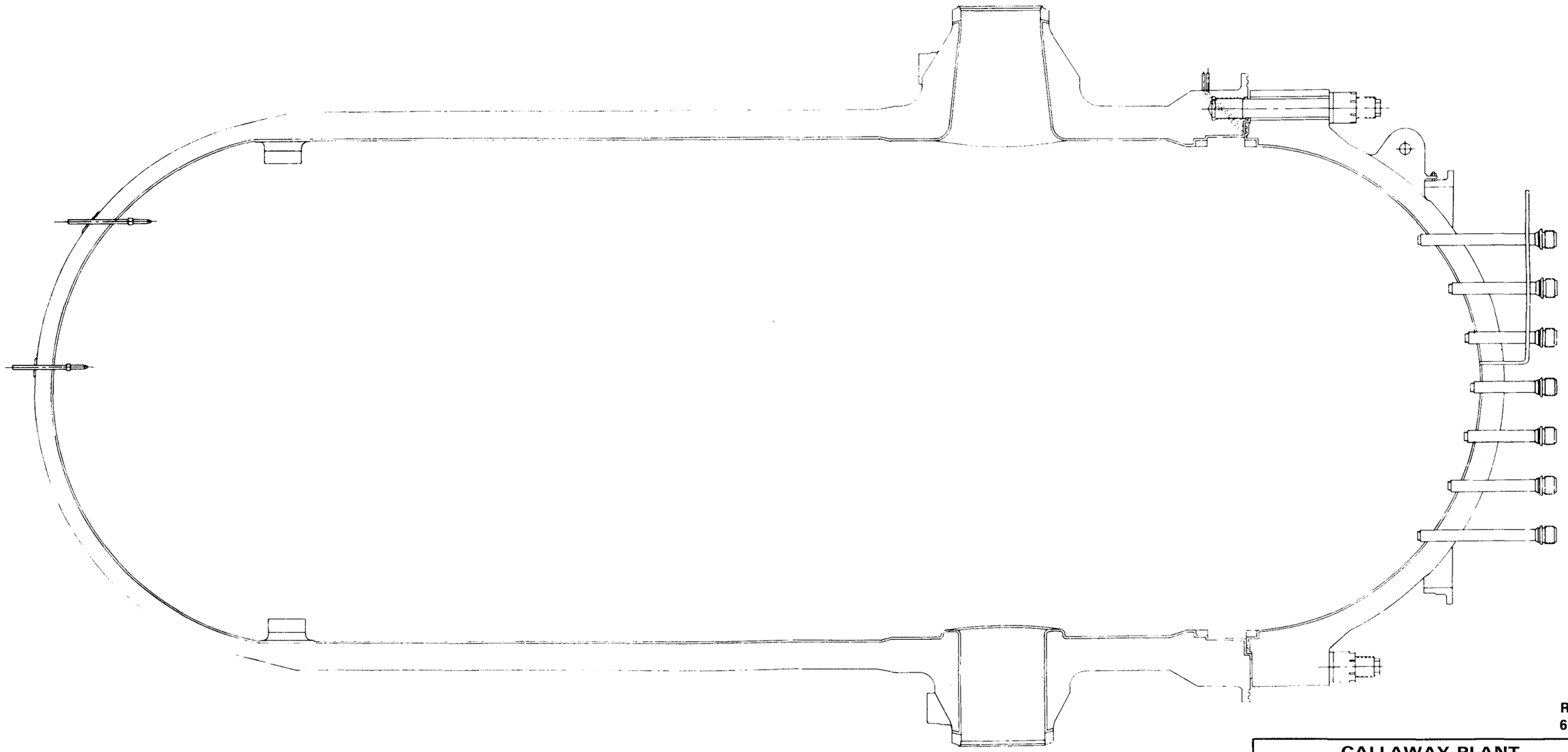


CALLAWAY PLANT

FIGURE 5.2 - 2

PRIMARY COOLANT LEAK DETECTION RESPONSE TIME

REV. OL-14 12/04



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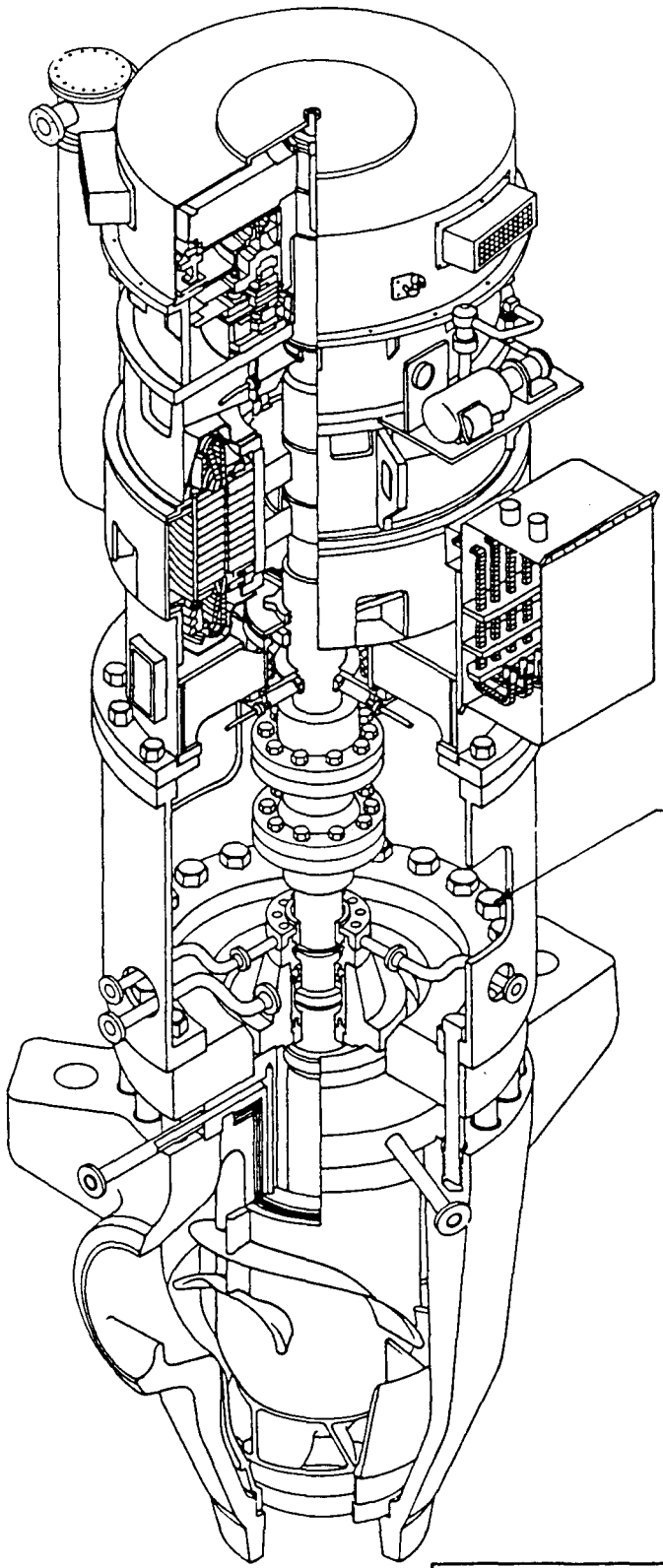
6/86

CALLAWAY PLANT

FIGURE 5.3-1

REACTOR VESSEL

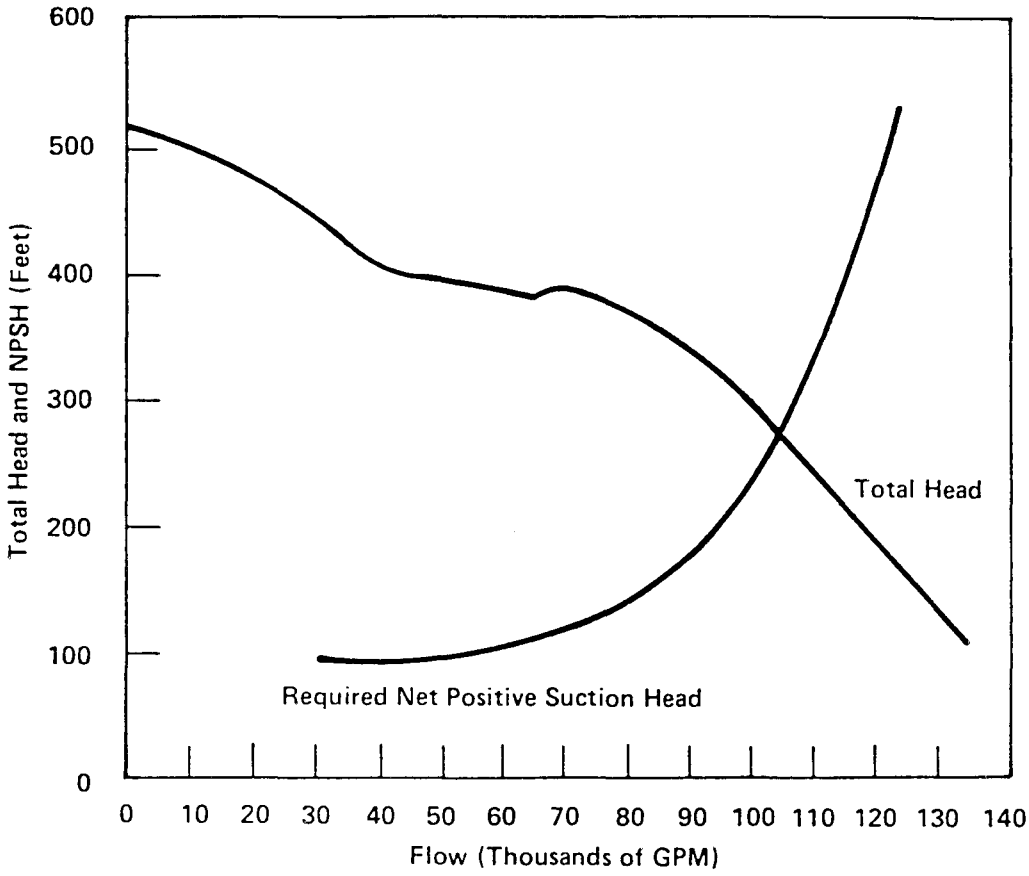


REV. OL-9
5/97

CALLAWAY PLANT

FIGURE 5.4-1

REACTOR COOLANT CONTROLLED
LEAKAGE PUMP



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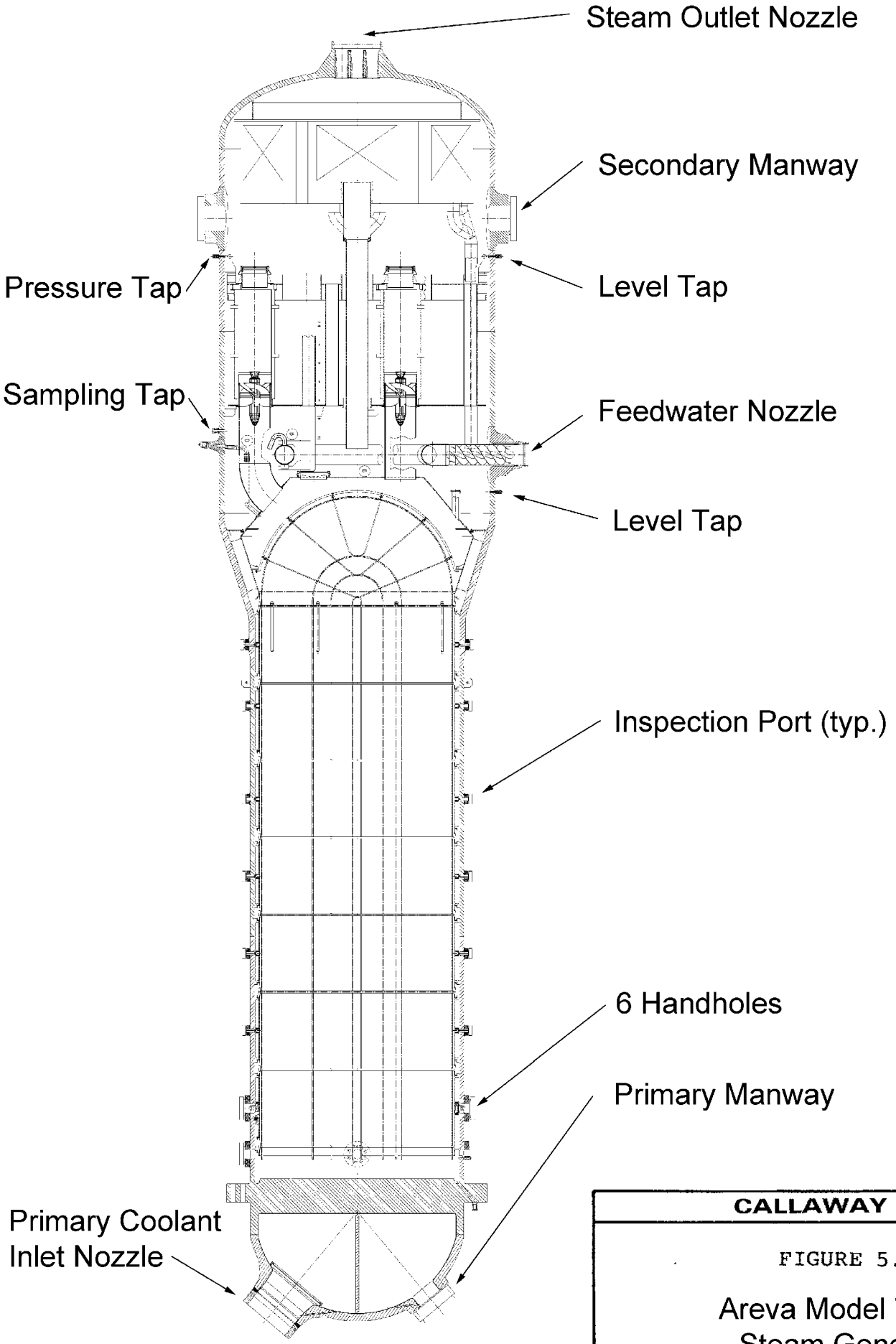
6/86

CALLAWAY PLANT

FIGURE 5.4-2

REACTOR COOLANT PUMP ESTIMATED PERFORMANCE CHARACTERISTIC



REV. OL-15
5/06

CALLAWAY PLANT

FIGURE 5.4-3

Areva Model 73/19T
Steam Generator

Figure 5.4-4 Deleted

Figure 5.4-5 Deleted

Figure 5.4-6 Deleted

M-22EJ01 (Q)

REV.	DATE	DRAWN	CHKD.	SUPV.
62	092815	RLW	TJC	DME
INCORPORATE MP 13-0023 FCN-03				
61	110414	DRAWN	CHKD.	SUPV.
INCORPORATE MP 14-0024.		TJC	MAL	LMP
60	102914	DRAWN	CHKD.	SUPV.
INCORP. MP 13-0023 REV. 0 & FCN-01.		MAL	RLW	LMP
59	051010	DRAWN	CHKD.	SUPV.
INCORPORATE MP 08-0016 FCN-04		EWM	RLW	LMP
58	042910	DRAWN	CHKD.	SUPV.
INCORPORATE MP 08-0016 FCN-03		RLW	EWM	LMP
57	011708	DRAWN	CHKD.	SUPV.
INCORPORATE CR CAR 07-000257; CAR 200711457		RLW	EWM	TWS
56	041807	DRAWN	CHKD.	SUPV.
INCORPORATE MP 06-0029		EWM	RLW	LMP
55	103105	DRAWN	CHKD.	SUPV.
INCORPORATE MP 03-1014A		EWM	RLW	WMH
54	051005	DRAWN	CHKD.	SUPV.
INCORPORATE MP 01-1018 FCN-02		RLW	MAL	TWS
53	050605	DRAWN	CHKD.	SUPV.
INCORP. MP 01-1018 FCN-02 (PARTIAL PER REDLINE).		RLW	MAL	SKC
52	110904	DRAWN	CHKD.	SUPV.
INCORP. RFR-22941A		MAL	RLW	TWS

NOTES:

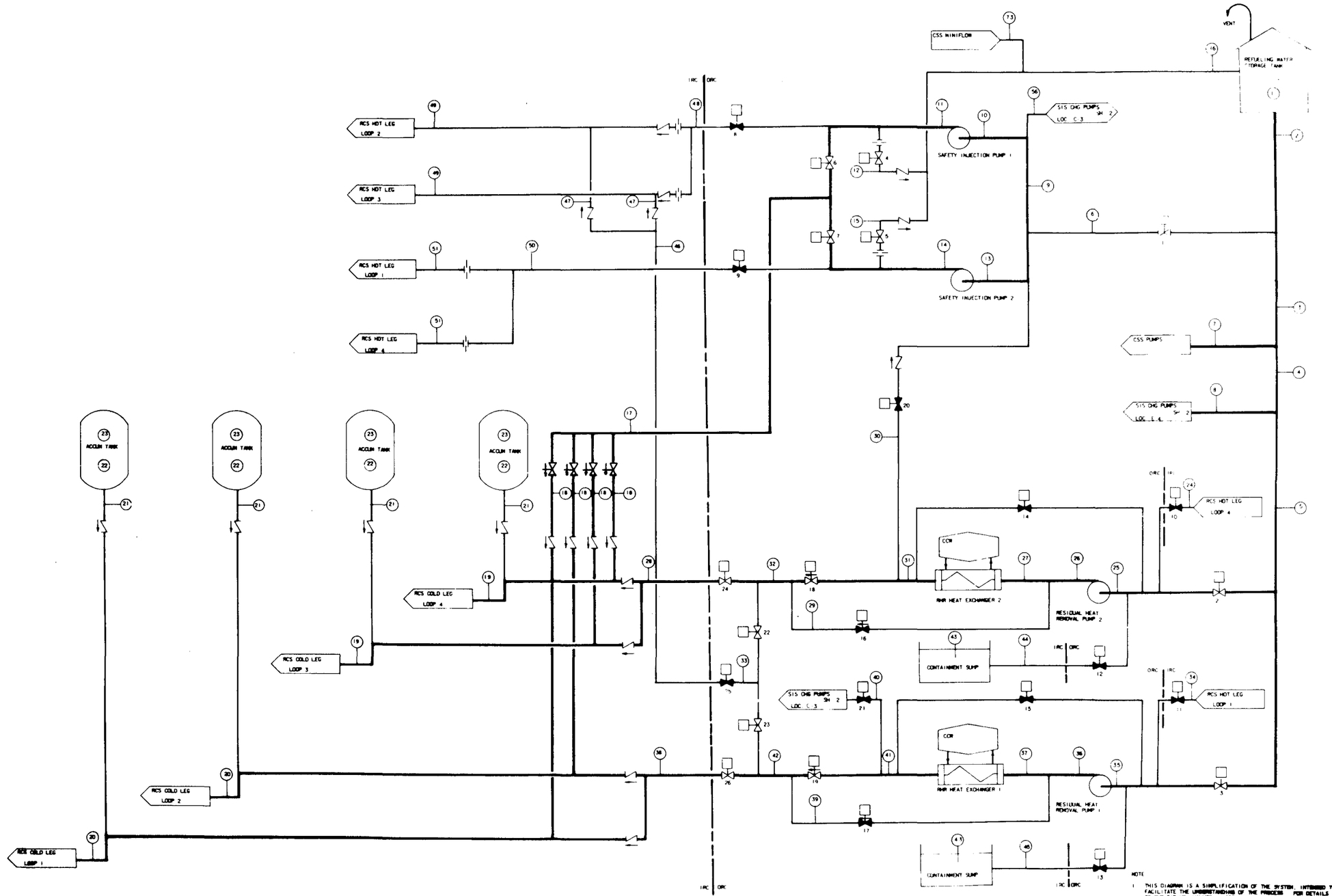
1. DELETED
2. DELETED
3. THIS DRAWING IS BASED ON WESTINGHOUSE DRAWING 1145E03
4. DELETED
5. VORTEX BREAKER LOCATED IN PIPE INLET.
6. DELETED.
7. PROVIDED 3/8"ID FLOW RESTRICTOR FOR INTERFACE BOUNDARY BETWEEN QUALITY GROUP CLASSIFICATIONS "A" AND "B".
8. WESTINGHOUSE NSSS COMPUTER INPUT.
9. TEE-TYPE 10" FITTING FOR CTMT. RECIRC. SUMP TEST. TO BE CLOSED OFF AFTER SUMP TEST. FITTING TO BE LOCATED IN PIPING PENETRATION ROOM.
10. COMPLETE AUTOMATIC SWITCHOVER TO BE DETERMINED LATER FOLLOWING RECEIPT OF WESTINGHOUSE INFORMATION.
11. ISOLATION SWITCH PROVIDED IN THE CONTROL ROOM FOR POWER LOCKOUT OF VALVES HV-8840 AND HV-8809A AND B.
12. DELETED.
13. WELD CAP TO BE INSTALLED ON 1/2" TEST CONNECTION AFTER HYDROTEST HAS BEEN PERFORMED.
14. DELETED
15. DELETED.
16. SEE DRAWING 135128 FOR ANTI-PRESSURE LOCKING BYPASS.
17. TYGON HOSES ARE INSTALLED AT THE NOTED LOCATIONS.
18. FOR INSTRUMENT PIPING CLASS SPECIFICATION FOR SS TUBING SEE DWG. J-27010.
19. POWER HAS BEEN REMOVED FROM EJHV0021 & EJHV0022 BY MP 01-1002.
20. THIS CONNECTION IS FOR BEYOND-DESIGN-BASIS (FLEX) REACTOR COOLANT SYSTEM MAKE-UP.

CHEMICAL ADDITION LINE DETAILS

RHR TRAIN	DRAWING ZONE	RHR PUMP SUCTION LINE	ISOLATION VALVE A	ADDITION VALVE B
A	G-6	03-ECB-14"	V064	V211
B	C-6	10-ECB-14"	V066	V212

AS-BUILT CLASS 1

DRAWN	(DATE) N/A	PIPING AND INSTRUMENTATION DIAGRAM RESIDUAL HEAT REMOVAL SYSTEM	
CHKD.	(DATE) N/A	FSAR FIGURE 5.4-7	
SUPV.	(DATE) N/A		
APPD.	(DATE) N/A	LOCATION: CALLAWAY ENERGY CENTER	CLASS
UNION ELECTRIC COMPANY ST. LOUIS, MO		M-22EJ01(Q)	REV. 62



NOTE

1 THIS DIAGRAM IS A SIMPLIFICATION OF THE SYSTEM, INTENDED TO FACILITATE THE UNDERSTANDING OF THE PROCESS. FOR DETAILS OF THE PIPING, VALVES, INSTRUMENTATION, ETC. REFER TO THE ENGINEERING FLOW DIAGRAM. REFER TO PROCESS FLOW DIAGRAM TABLES FOR THE CONDITION AT EACH NUMBERED POINT.

(SEE NOTES ON THE FOLLOWING PAGES)

CALLAWAY PLANT

FIGURE 5.4-8

RESIDUAL HEAT REMOVAL SYSTEM
PROCESS FLOW DIAGRAM

NOTES TO FIGURE 5.4-8

MODES OF OPERATION

MODE A - INITIATION OF RHR OPERATION

When the reactor coolant temperature and pressure are reduced below approximately 350°F and 400 psig, approximately 4 hours after reactor shutdown, the second phase of plant cooldown starts with the RHRS being placed in operation. Before starting the pumps, the inlet isolation valves are opened, the heat exchanger flow control valves are set at minimum flow, and the outlet valves are verified open. The automatic miniflow valves are open and remain so until the pump flow exceeds approximately 1,650 gpm (at 300°F) at which time they close. Should the pump flow drop below approximately 816 gpm (at 300°F), the miniflow valves open automatically.

Startup of the RHRS includes a warmup period during which time reactor coolant flow through the heat exchangers is limited to minimize thermal shock on the RCS. The rate of heat removal from the reactor coolant is controlled manually by regulating the reactor coolant flow through the residual heat exchangers. The total flow is regulated automatically by control valves in the heat exchanger bypass line to maintain a constant total flow. The cooldown rate is limited to 100°F/hr, based on equipment stress limits and a 120°F maximum component cooling water temperature at the RHR heat exchanger inlet.

MODE B - END CONDITIONS OF A NORMAL COOLDOWN

This situation characterizes most of the RHRS operation. As the reactor coolant temperature decreases, the flow through the residual heat exchanger is increased until all of the flow is directed through the heat exchanger to obtain maximum cooling.

Note:

For the safeguards functions performed by the RHRS, refer to Section 6.3, ECCS.

NOTES TO FIGURE 5.4-8 (Sheet 2)

VALVE ALIGNMENT CHART

Valve No.	Operational Mode	
	A	B
2	C	C
3	C	C
10	O	O
11	O	O
12	C	C
13	C	C
14	C	C
15	C	C
16	P	C
17	P	C
18	P	O
19	P	O
20	C	C
21	C	C
22	O	O
23	O	O
24	O	O
26	O	O

O = Open
C = Closed
P = Partially Open

NOTES TO FIGURE 5.4-8 (Sheet 3)

MODE A - INITIATION OF RHR OPERATION

Location	Fluid	Pressure (psig)	Temperature (F)	Flow (gpm) [a]	Flow (lb/hr)
24	Reactor coolant	400	350	3,800	1.60×10^6
25	"	407	350	3,800	1.60×10^6
26	"	542	350	3,800	1.60×10^6
27	"	541	350	1,259	0.56×10^6
31	"	539	140	1,259	0.56×10^6
29	"	496	350	2,541	1.13×10^6
32	"	496	280	3,800	1.69×10^6
28	"	480	280	3,690	1.64×10^6
19 Loop 4	"	404	280	1,992	0.885×10^6
19 Loop 3	"	419	280	1,698	0.755×10^6
34	"	400	350	3,800	1.69×10^6
35	"	407	350	3,800	1.69×10^6
36	"	542	350	3,800	1.69×10^6
37	"	541	350	1,259	0.56×10^6
41	"	539	140	1,259	0.56×10^6
39	"	496	350	2,541	1.13×10^6
42	"	496	280	3,800	1.69×10^6
38	"	479	280	3,910	1.74×10^6
20 Loop 1	"	404	280	1,955	0.87×10^6
20 Loop 2	"	404	280	1,955	0.87×10^6

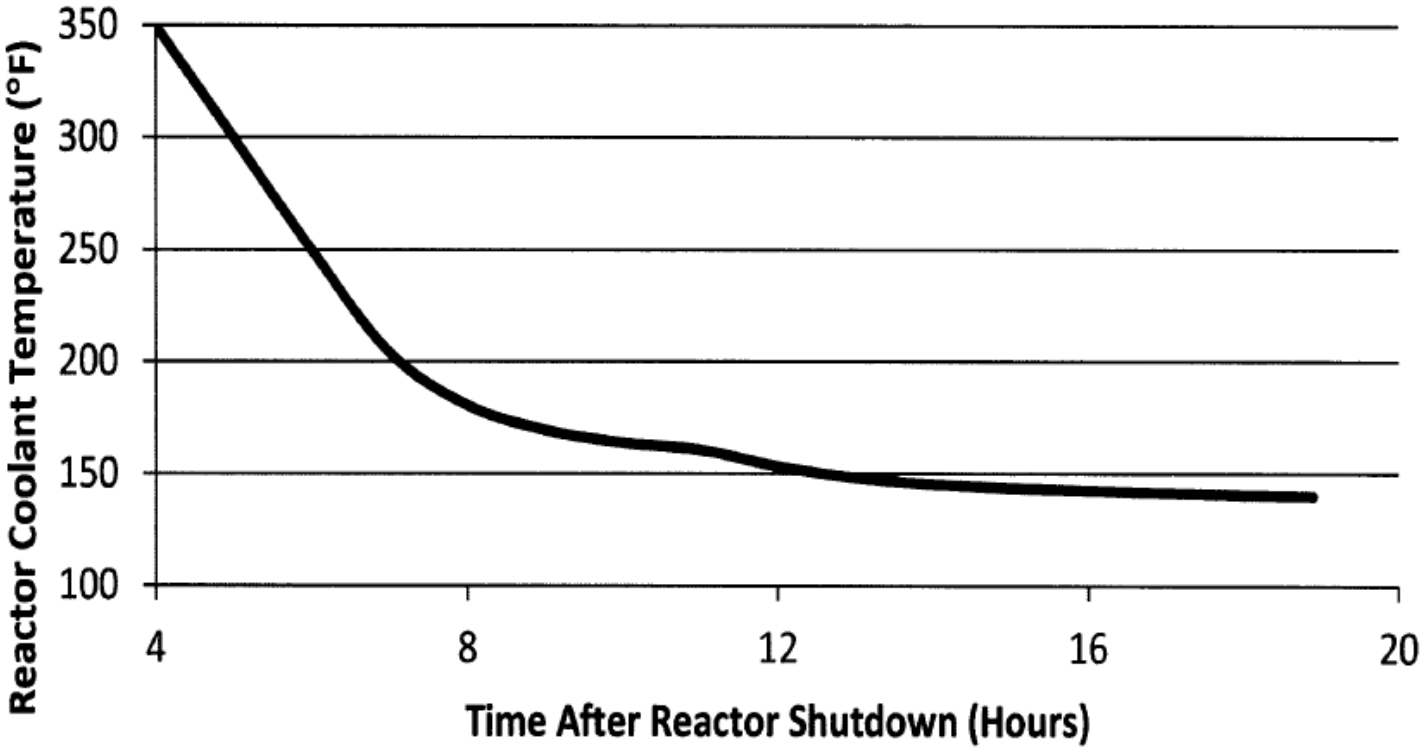
(a) At reference conditions 350°F and 400 psig

NOTES TO FIGURE 5.4-8 (Sheet 4)

MODE B - END CONDITIONS OF A NORMAL COOLDOWN

Location	Fluid	Pressure (psig)	Temperature (F)	Flow (gpm) [(a)]	(lb/hr)
24	Reactor coolant	0	140	3,800	1.87×10^6
25	"	7	140	3,800	1.87×10^6
26	"	156	140	3,800	1.87×10^6
27	"	149	140	3,800	1.87×10^6
31	"	129	120	3,800	1.87×10^6
29	"	93	120	0	0
32	"	93	120	3,800	1.87×10^6
28	"	75	120	3,800	1.87×10^6
19	"	2	120	1,900	0.935×10^6
34	"	0	140	3,800	1.87×10^6
35	"	7	140	3,800	1.87×10^6
36	"	156	140	3,800	1.87×10^6
37	"	149	140	3,800	1.87×10^6
41	"	129	120	3,800	1.87×10^6
39	"	93	120	0	0
42	"	93	120	3,800	1.87×10^6
38	"	75	120	3,800	1.87×10^6
20	"	2	120	1,900	0.935×10^6

(a) At reference conditions 140°F and 0 psig.

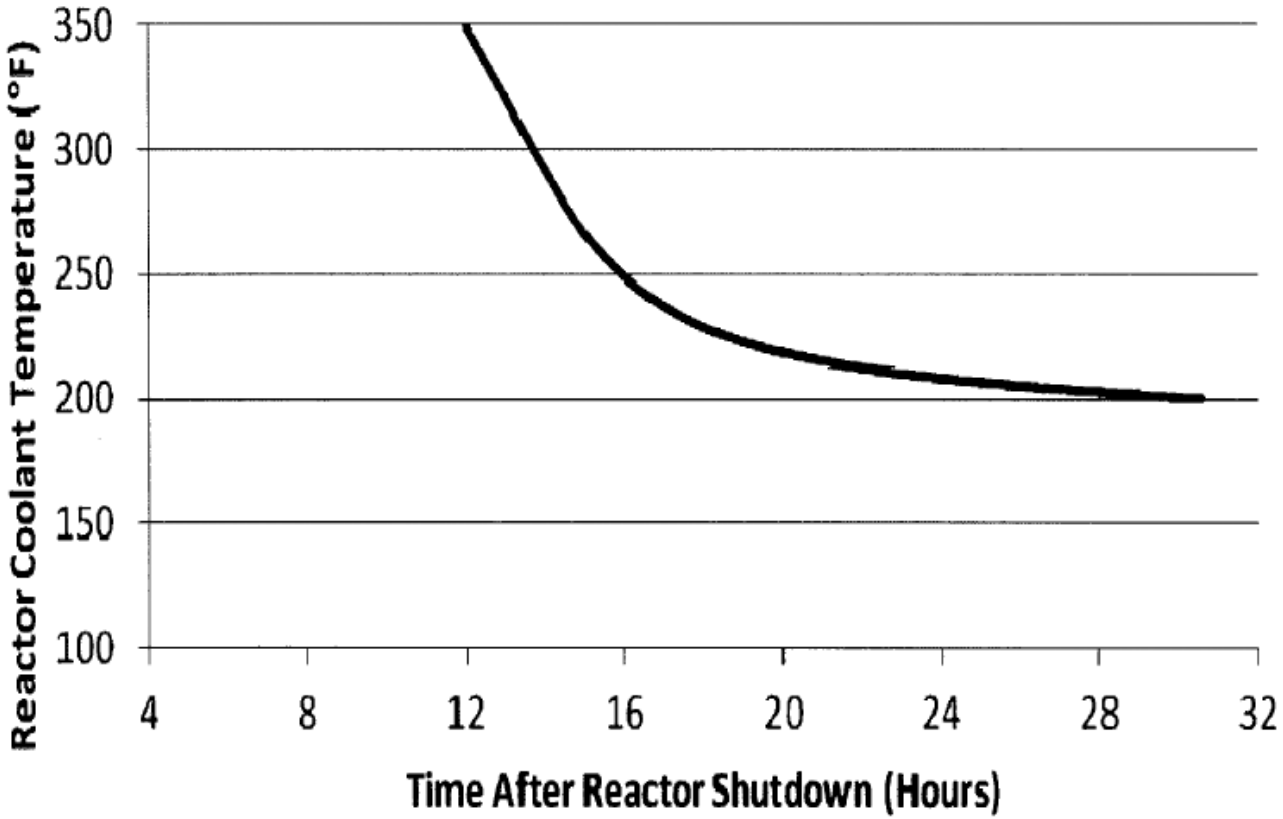


CALLAWAY PLANT

FIGURE 5.4-9

NORMAL RESIDUAL HEAT REMOVAL COOLDOWN

REV. 16 9/14

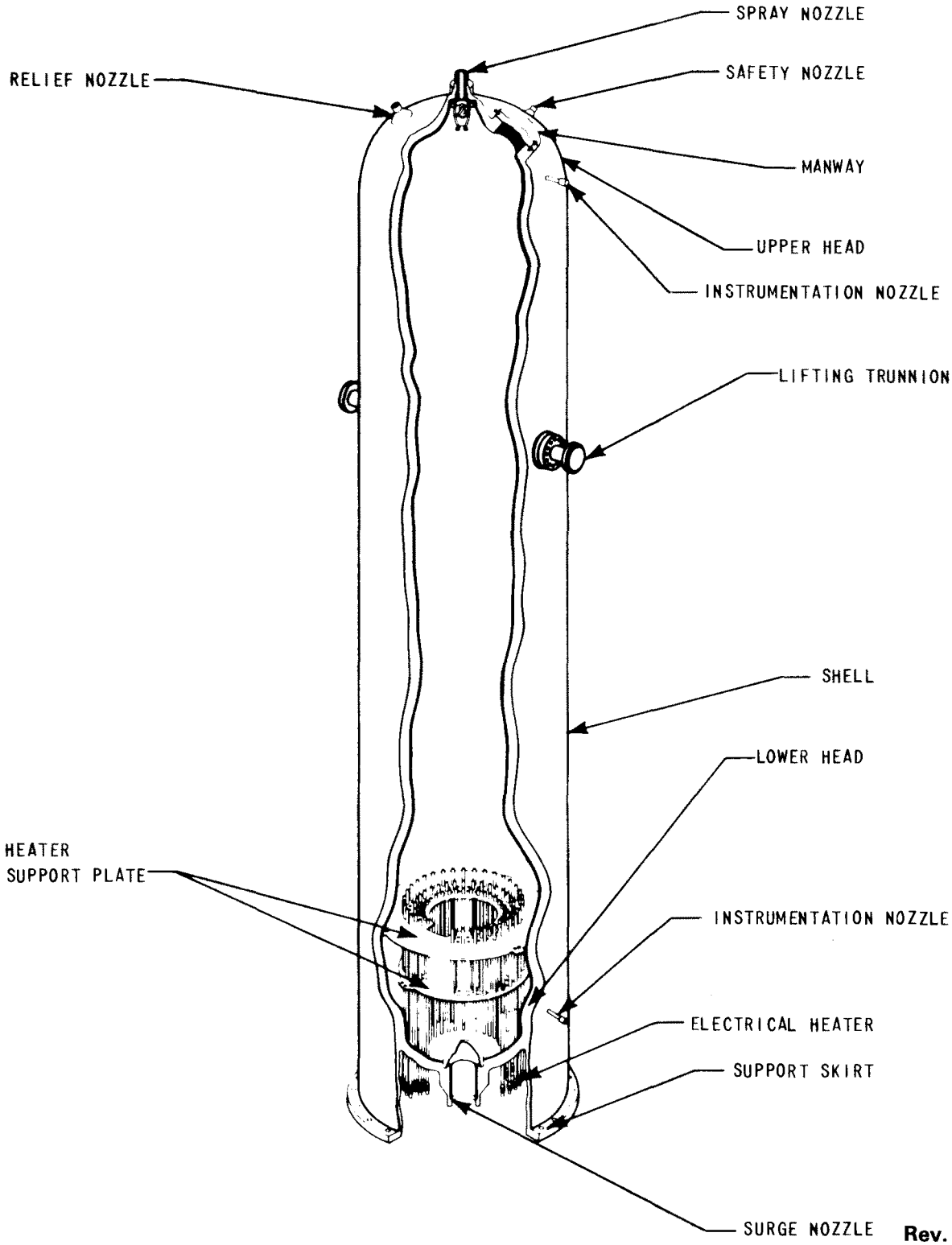


CALLAWAY PLANT

FIGURE 5.4-10

SINGLE RESIDUAL HEAT REMOVAL TRAIN COOLDOWN

REV. 16 9/14



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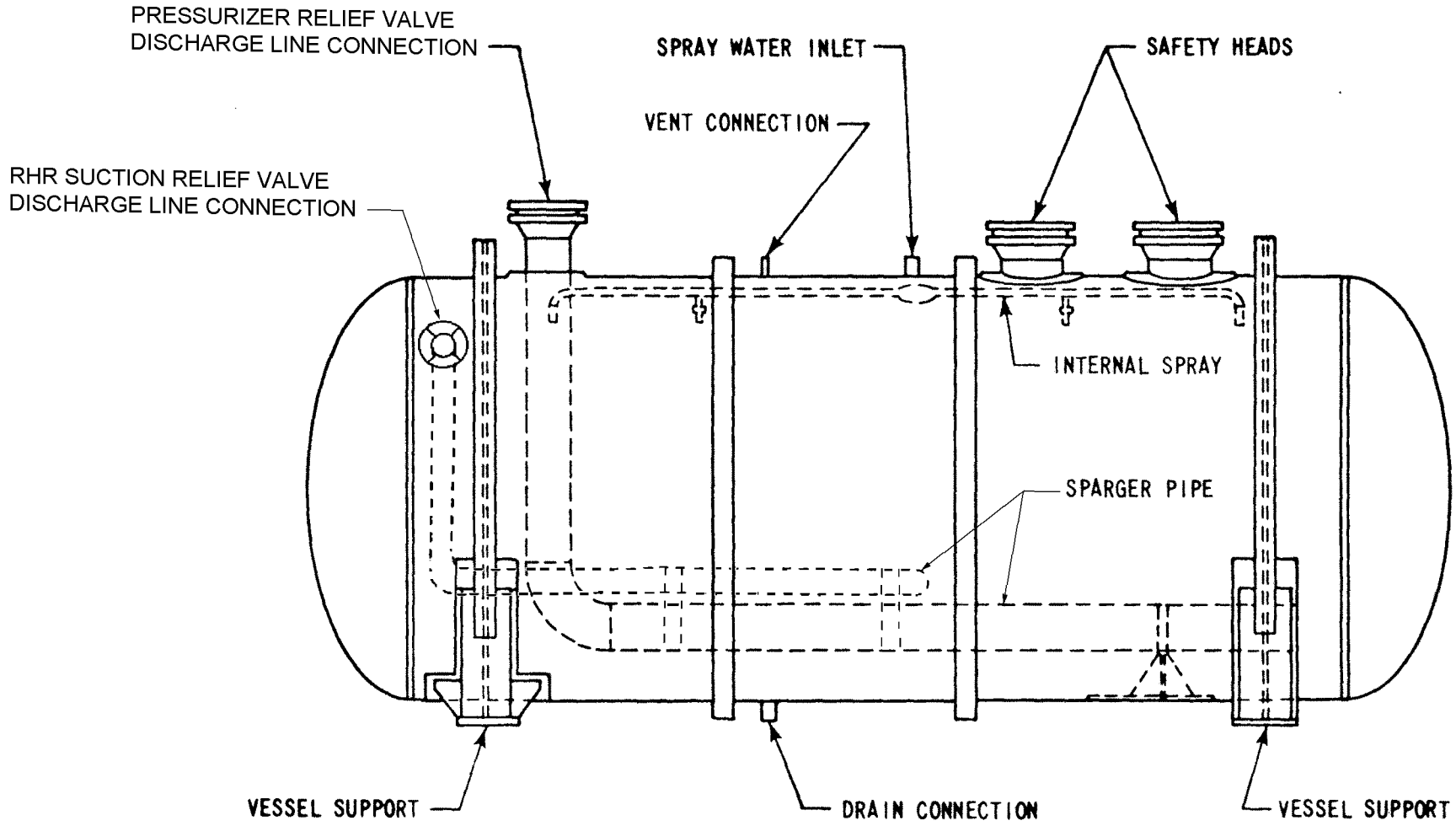
6/86

CALLAWAY PLANT

FIGURE 5.4-11

PRESSURIZER

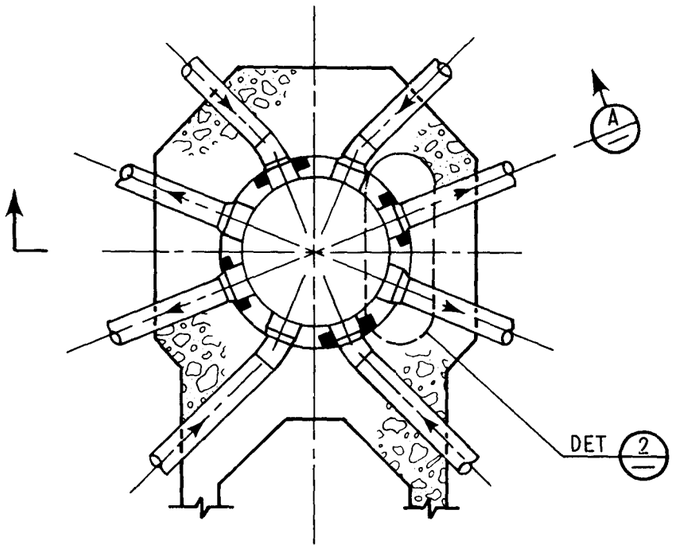


CALLAWAY PLANT

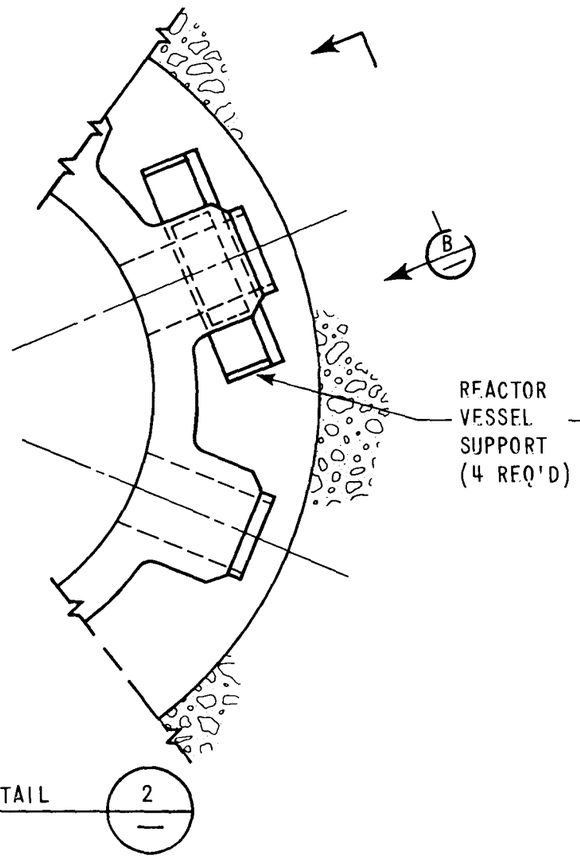
FIGURE 5.4-12

PRESSURIZER RELIEF TANK

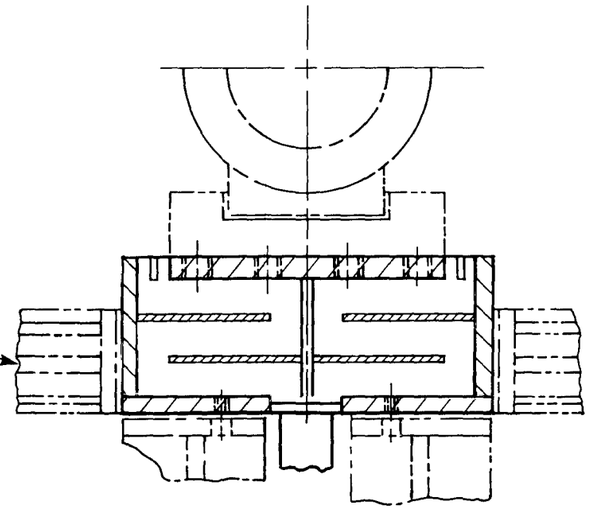
REV. 1 3/09



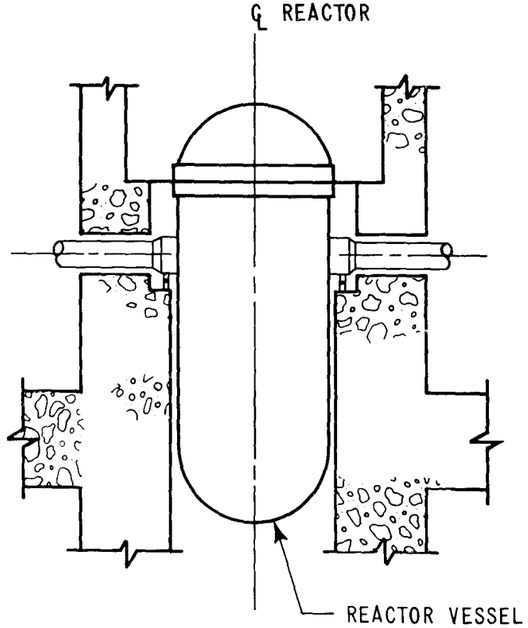
PLAN VIEW



DETAIL 2



SECTION B B



SECTION A

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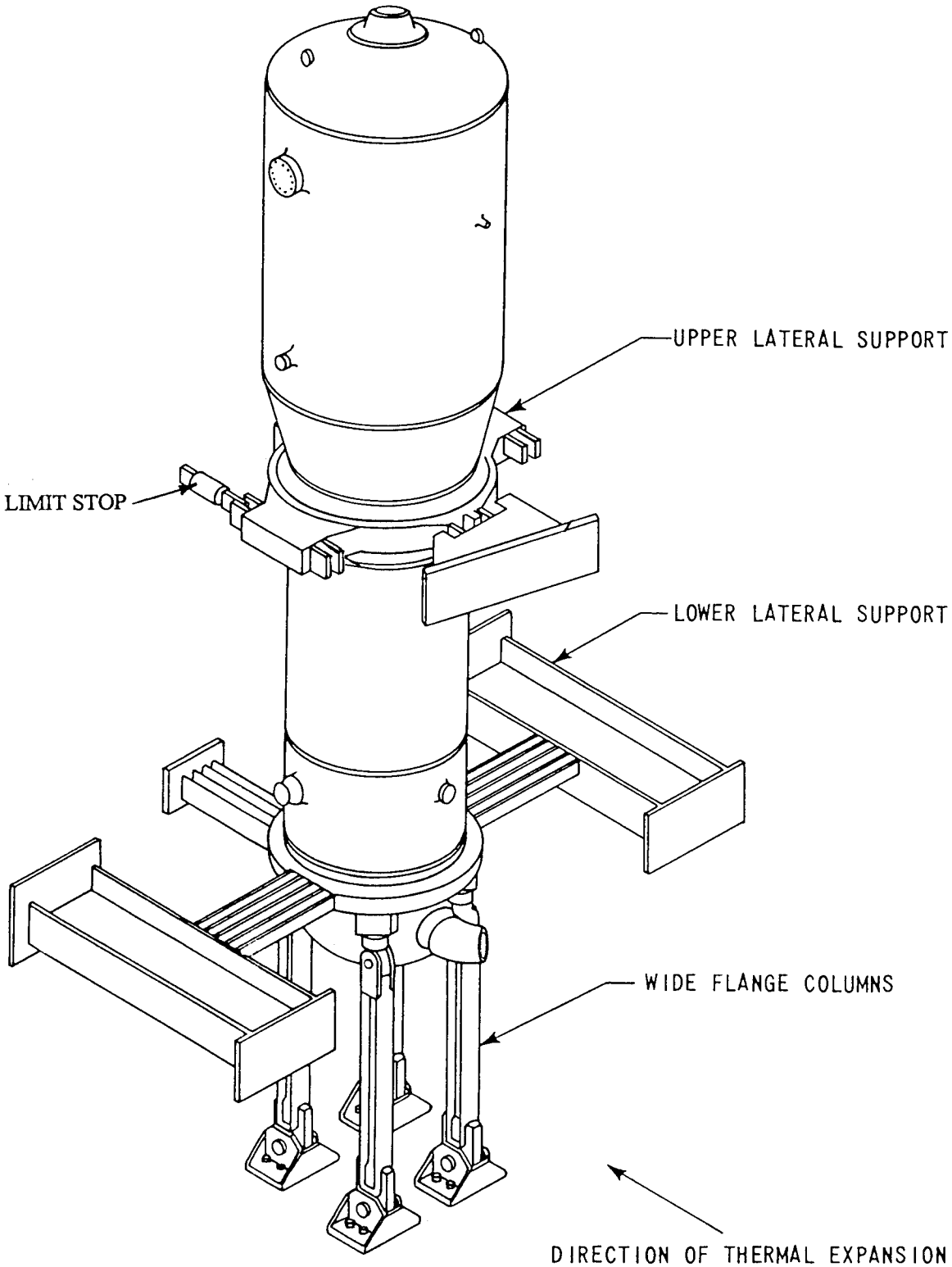
6/86

CALLAWAY PLANT

FIGURE 5.4-13

REACTOR VESSEL SUPPORTS



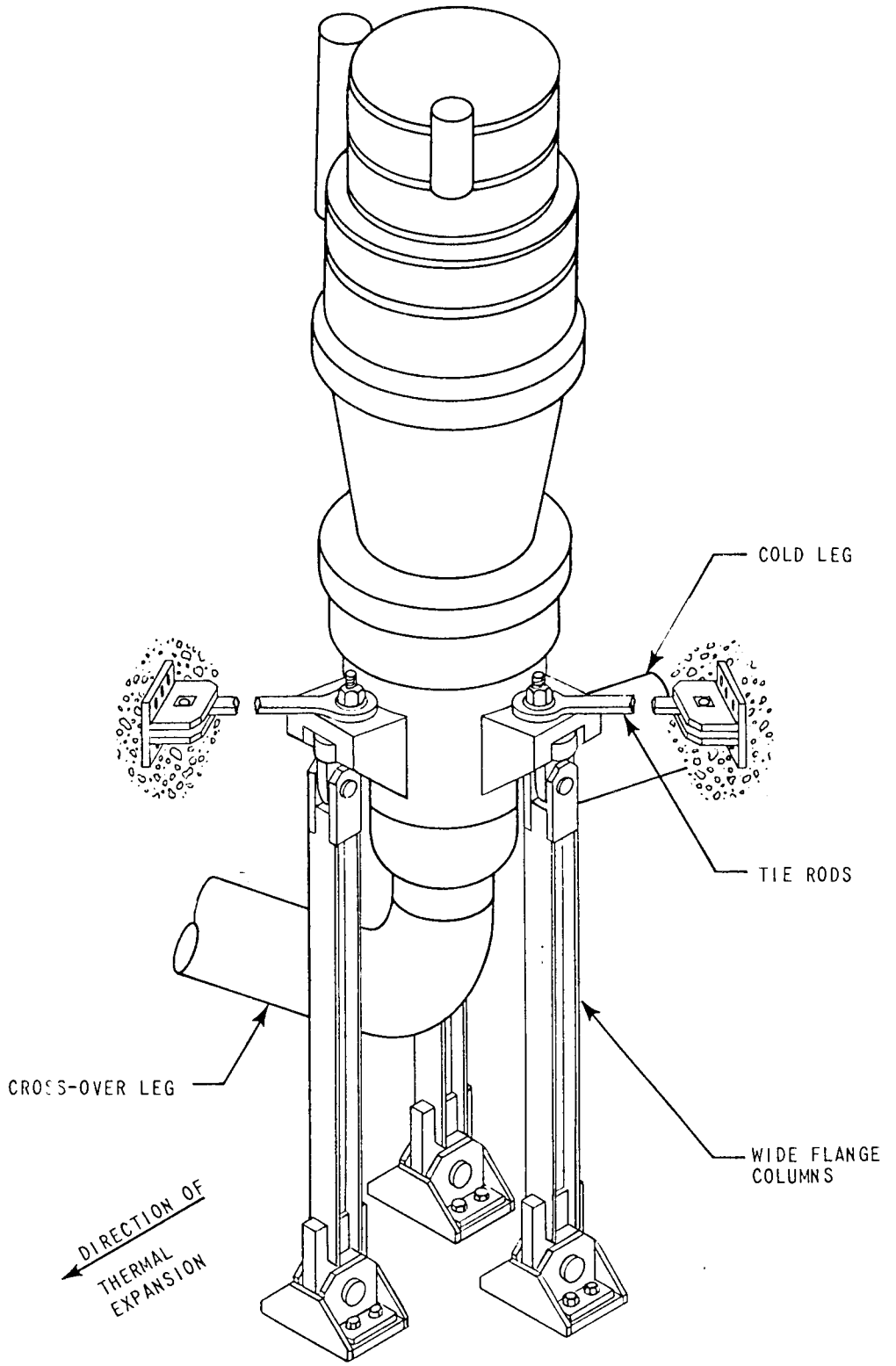
REV. OL-15
5/06

CALLAWAY PLANT

FIGURE 5.4-14

STEAM GENERATOR SUPPORTS

12999



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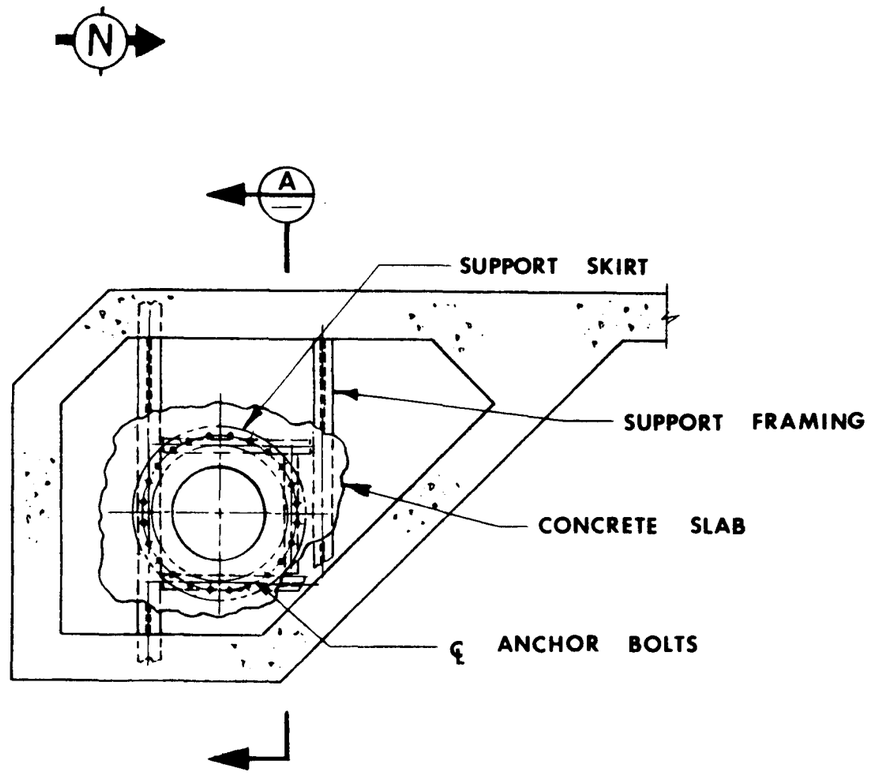
6/86

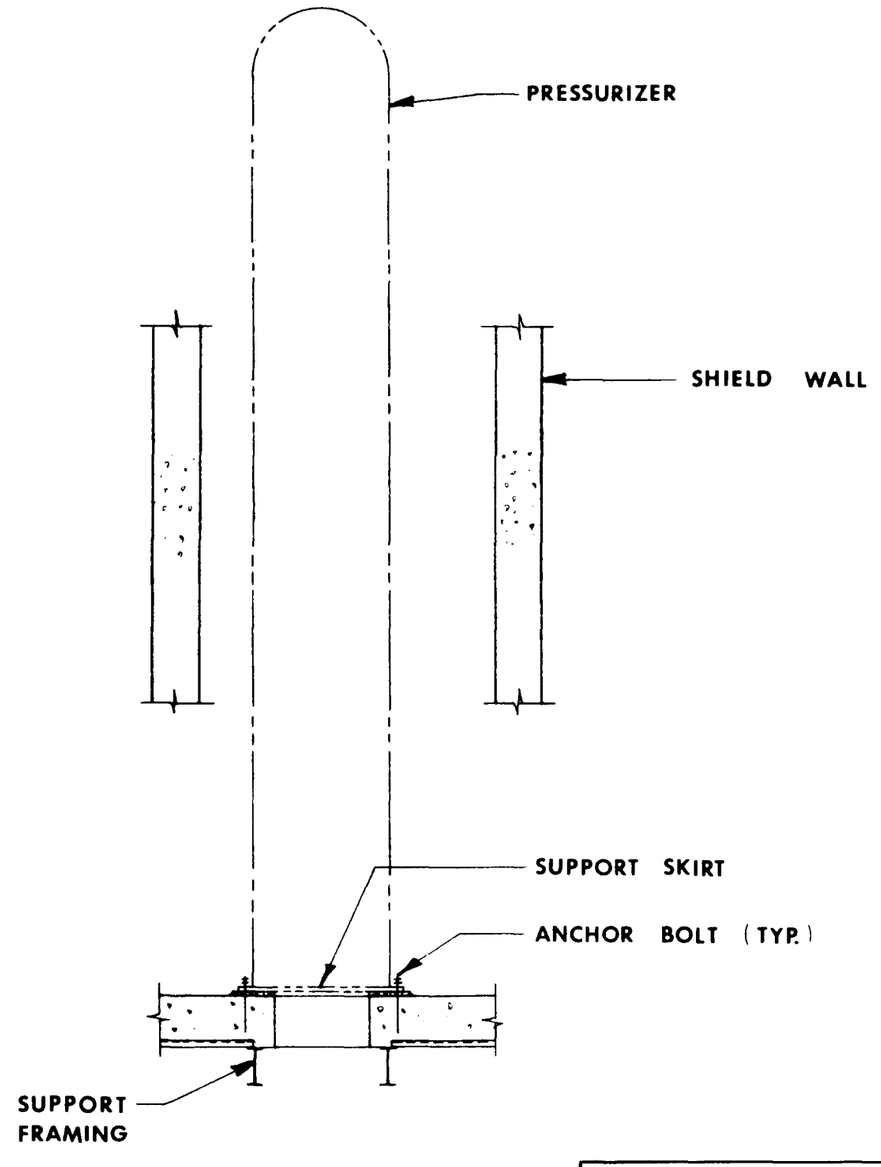
CALLAWAY PLANT

FIGURE 5.4-15

REACTOR COOLANT PUMP SUPPORTS



PLAN AT SUPPORT SKIRT



SECTION A

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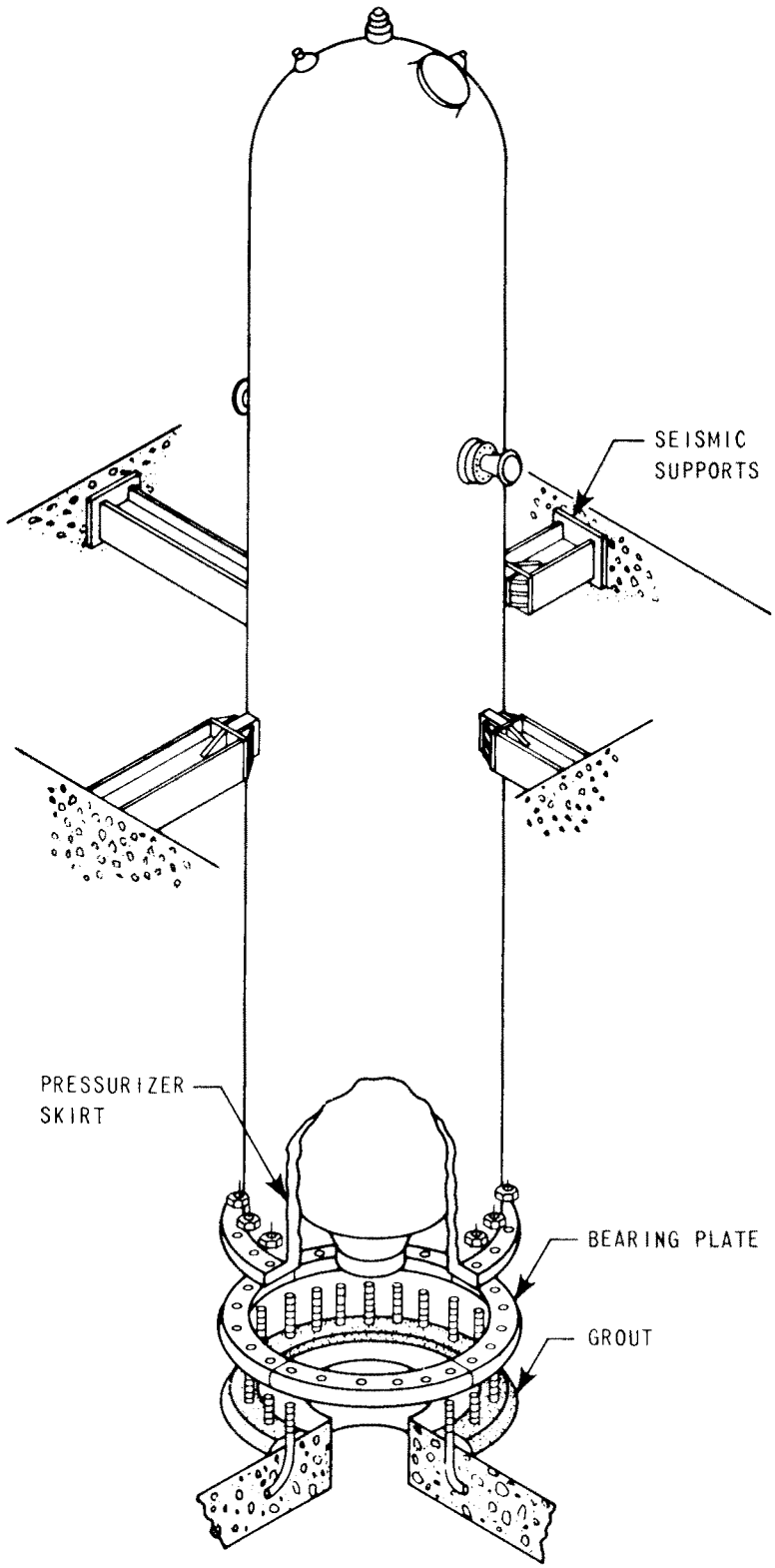
6/86

CALLAWAY PLANT

FIGURE 5.4-16

REACTOR BUILDING INTERNALS
PRESSURIZER SUPPORTS



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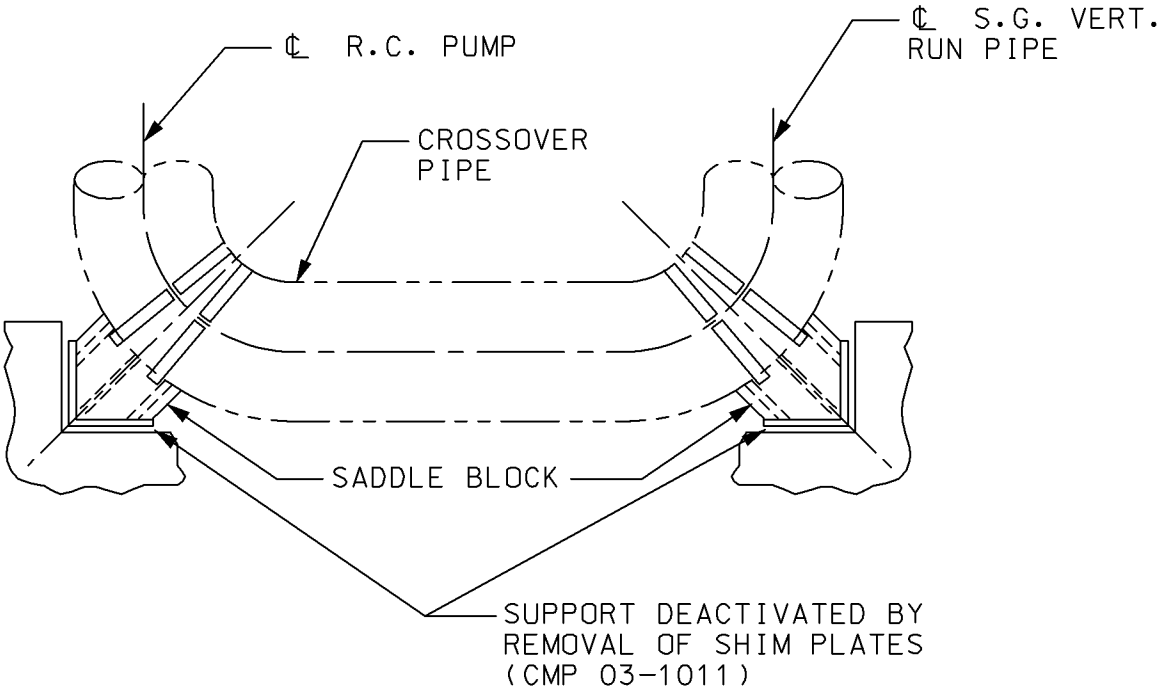
CALLAWAY PLANT

FIGURE 5.4-17

PRESSURIZER SUPPORTS

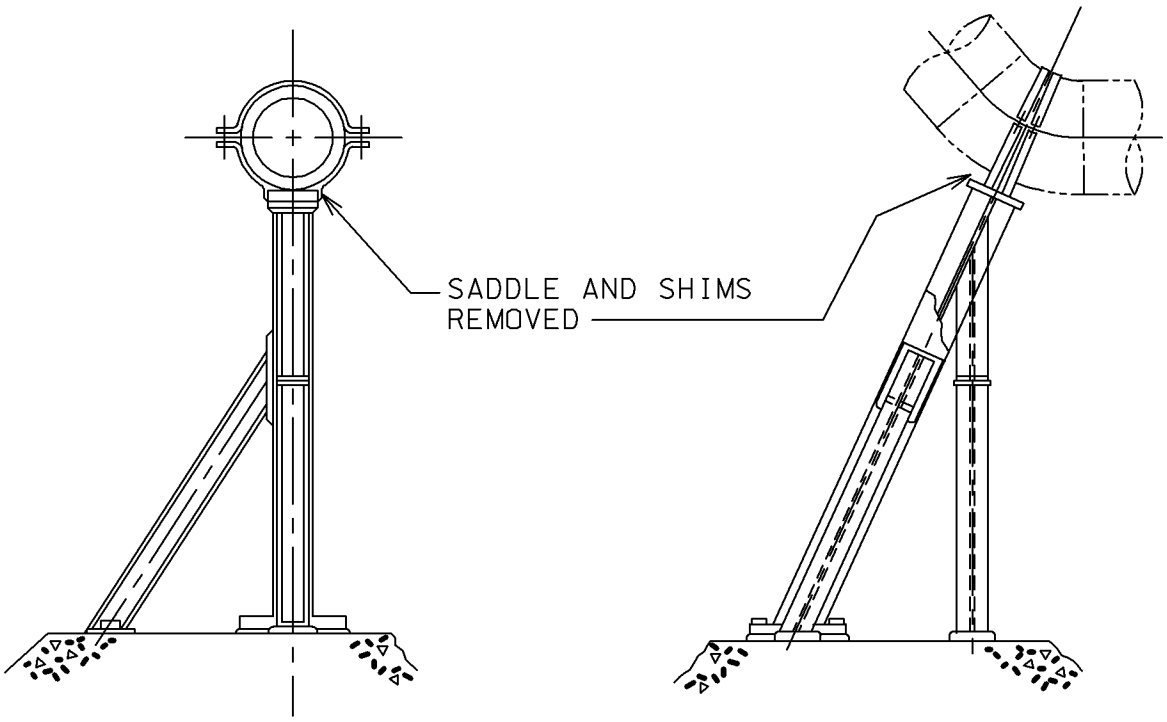


CALLAWAY PLANT

FIGURE 5.4 - 18
CROSSOVER LEG RESTRAINT

REV. OL-15 5/06

Figure 5.4-19 Deleted

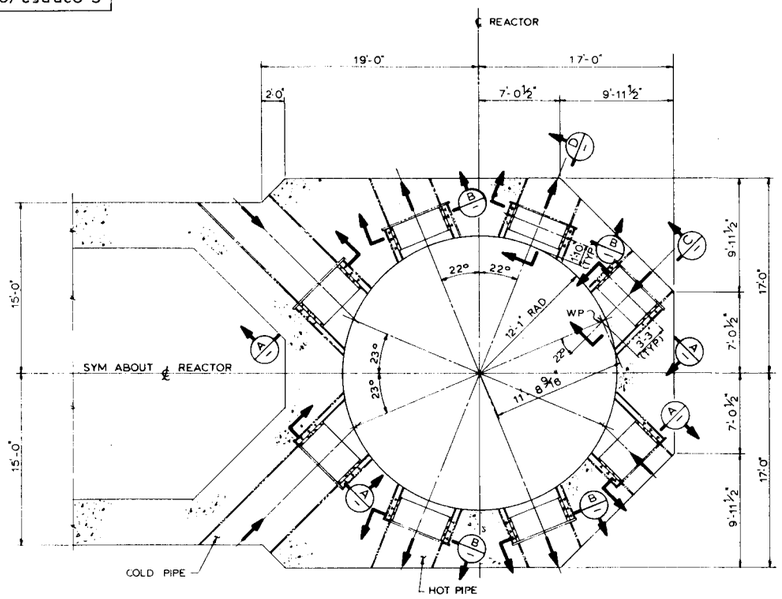


CALLAWAY PLANT

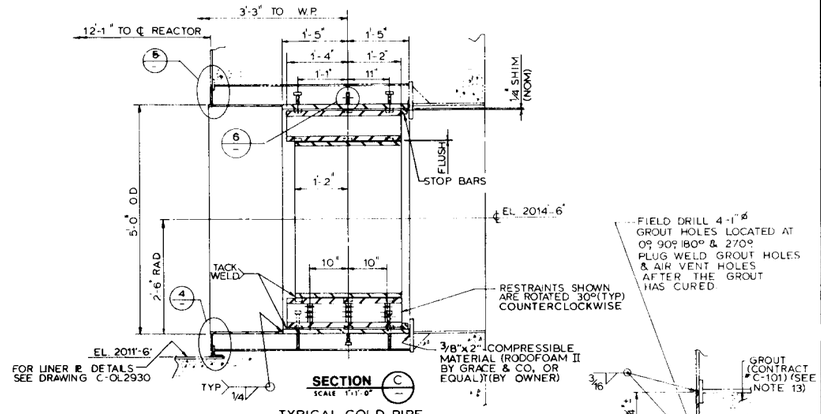
FIGURE 5.4 - 20
HOT LEG RESTRAINT

REV. OL-15 5/06

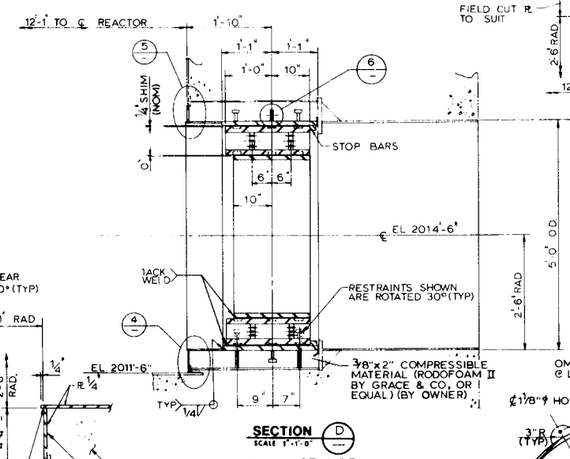
C-03BB53 (Q)



PLAN AT EL 2014'-6"
SCALE ¼"=1'-0"



TYPICAL COLD PIPE



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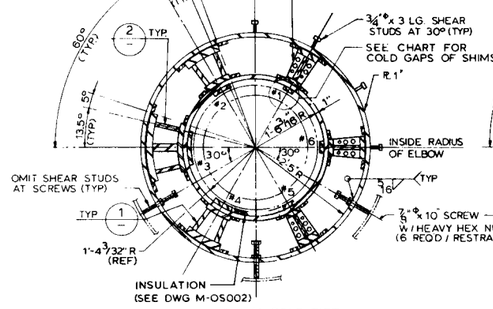
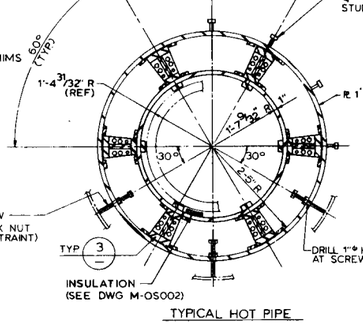
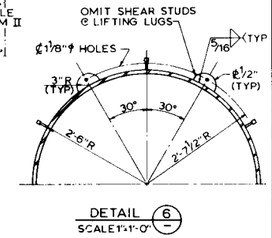
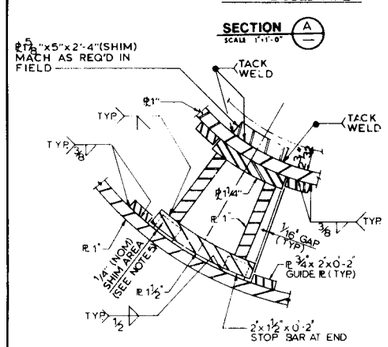


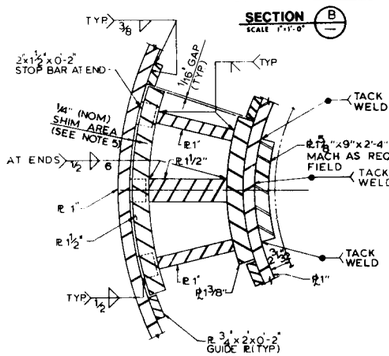
TYPICAL COLD PIPE

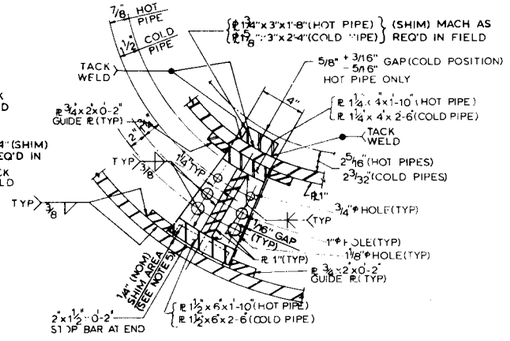


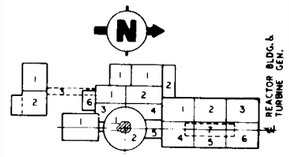
TYPICAL HOT PIPE











KEY PLAN

NOTES

1. ALL DIMENSIONS GIVEN ARE IN COLD POSITION U.N.O.
2. MATERIAL FOR THE 1" THICK COLLAR RING SHALL BE ASTM A516 GR 70
3. THE 1" THICK COLLAR RING AND BUILT UP FILLER MEMBERS SHALL BE POST WELD HEAT TREATED
4. SURFACES WHICH RECEIVE SHIMS AND/OR BEARING SHALL BE MACHINED TO THE DESIGN CONTOUR
5. SHIM AREA AS INDICATED ON THE DRAWING SHALL BE PROVIDED WITH NOT LESS THAN 50% OF THE BEARING AREA
6. SHIM PLATES SHALL BE SHOP TACK WELDED TO THE BUILT UP FILLER MEMBER AFTER PROPERLY ALIGNED
7. THE RADIAL LOCATION FOR INSIDE RADIUS AT ANY POINT OF THE 1" THICK COLLAR RING SHALL NOT VARY FROM THE DESIGN RADIUS BY MORE THAN 1/8"
8. RESTRAINT ASSEMBLIES SHALL BE SHOP PRE ASSEMBLED TO INSURE PROPER ALIGNMENT AND DELIVER TO SITE AS ONE UNIT FOR EACH RESTRAINT
9. THE MAXIMUM ALLOWABLE GAP AT THE SHIM OR BEARING SURFACES SHALL BE 1/16". SHIMS MAY BE ADDED BETWEEN THE OUTSIDE FACE OF THE INNER RING AND THE INSIDE FACE OF THE SPOKE TO MEET THIS REQUIREMENT.
10. THE FIELD MACHINED SHIMS SHALL ACCOUNT FOR THE AS BUILT DIMENSIONS OF THE RESTRAINT RING, THE INSIDE FACE OF THE INNER RING, AND THE OUTSIDE DIAMETER OF THE HOT AND COLD PIPES AT EACH LOCATION.
11. DELETED
12. THE OUTER RING SHALL BE PRESSED AGAINST THE COMPRESSIBLE MATERIAL AS MUCH AS POSSIBLE TO PREVENT LEAKAGE OF GROUT.
13. DELETED
14. THE AS-BUILT COLD GAP AT SHIM#3 MUST BE:
    A) SMALLER THAN (OR EQUAL TO) THE AS-BUILT COLD GAP AT SHIM #2.
    B) SMALLER THAN (OR EQUAL TO) THE AS-BUILT COLD GAP AT SHIM#4 PLUS 7/16".

REFERENCE DRAWINGS

C-OL2930 REACTOR BUILDING LINER PLATE REACTOR CAVITY WALL

MATERIAL RESPONSIBILITY

1. STEEL TO BE FURNISHED UNDER SPEC 10466-C202

Rev. OL-0
6/86

CALLAWAY PLANT

FIGURE 5.4-21

HOT AND COLD LEG LATERAL RESTRAINTS (C-03BB53(Q)-4)

8 NOV. 74 — 34x44 — E" SIZE