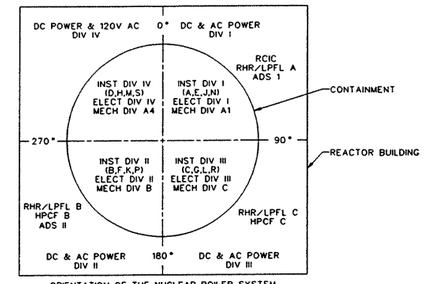


ORIENTATION OF THE NUCLEAR BOILER SYSTEM INSTRUMENTS TO MEET SEPARATION REQUIREMENTS (INCLUDES ASSOCIATED INSTRUMENT SUFFIX AND ECCS LOCATION)

NOTES

1. ENCLOSED EQUIPMENT AND COMPONENTS ARE TYPICAL FOR THE OTHER STEAMLINES AND HAVE THE SAME PART NUMBERS UNLESS OTHERWISE NOTED.
   EXAMPLE: XXNB IS ON LINE "B"
   EXAMPLE: XXNC IS ON LINE "C"
2. SEE REFERENCE DOCUMENT 40 FOR THE SIZE OF THE INLET FLANGE FOR THE SAFETY RELIEF VALVES (SRVS).
3. PIPE SIZES SHOWN ON THIS DRAWING ARE APPROXIMATE EXCEPT AT POINTS OF CONNECTION WITH THE SUPPLIED EQUIPMENT OR PIPING. THE PIPING DESIGNER SHALL CHECK AND ADJUST PIPING SIZE IN ACCORDANCE WITH HIS PIPING LAYOUT FOR CONFORMANCE WITH THE NUCLEAR BOILER SYSTEM DESIGN SPECIFICATION (B21-40101) AND PROCESS DIAGRAM (B21-10201).
4. THE GLOBE VALVE F707 MAY NOT BE PROVIDED IF A SHUTOFF VALVE IS SUPPLIED WITH THE LEVEL TRANSMITTER LT004. IF THE SECOND SHUT-OFF VALVE IS PART OF LT004, THE DESIGN PRESSURE FOR THIS INSTRUMENT LINE IS 8.62 MPa G ALL THE WAY TO LT004.
5. (P2) TO BE CONNECTED IN TO THE STRAIGHT RUN OF PIPE DOWNSTREAM OF F009 WITH UPSTREAM AND DOWNSTREAM STRAIGHT LENGTH FROM THE TAP TO GIVE AS ACCURATE A PRESSURE MEASUREMENT AS FEASIBLE. TAPS TO MEET ASME PTC 6 1964 "STEAM TURBINE" PARAGRAPH 4.74.
6. AN EXPANSION LEG SHALL BE PROVIDED IN THE INSTRUMENT LINE BETWEEN THE CONDENSING POT D011 AND THE WATER TIGHT PENETRATION IN THE REFUELING BELLOWS. THE EXPANSION LEG AND PIPING INSTALLATION SHALL BE DESIGNED TO ALLOW FOR THE MAXIMUM CHANGE OF VESSEL LENGTH WITH TEMPERATURE TO AVOID OVERSTRESSING THE PIPING OR THE SEAL OR DAMAGE TO THE INSULATION AROUND THE VESSEL. ELEVATION "A" SHALL BE AT OR ABOVE THE CENTERLINE OF THE RPV HEAD VENT LINE. THE INSTRUMENT LINE FROM ELEVATION "A" TO ELEVATION "B" SHALL BE SLOPED CONTINUOUSLY UPWARD ≥ 1/24 AND BE KEPT AS SHORT AS PRACTICAL. THE INSTRUMENT LINE SHALL BE KEPT INSULATED FROM THE CONNECTION WITH THE RPV HEAD VENT LINE TO THE CONDENSING POT. THE INSULATION SHALL HAVE A MAXIMUM CONDUCTANCE OF 4.103E−01 J/h.cm².°C.
7. PROVISIONS FOR INSTRUMENT LINE ISOLATION SHALL BE IN ACCORDANCE WITH SUPPORTING DOCUMENTS 3 & 4. ONE ORIFICE SHALL BE INSTALLED IN EACH INSTRUMENT LINE CONNECTED TO THE REACTOR COOLANT PRESSURE BOUNDARY (RCPB). ORIFICE SIZE IS 6.4mm AND MAXIMUM NUMBER OF ORIFICES PER LINE IS ONE.
8. VALVE MOTOR OPERATORS AND PILOT SOLENOIDS ARE AC OPERATED UNLESS OTHERWISE SPECIFIED.
9. THE CONDENSING CHAMBER SHALL BE CLOSE COUPLED TO THE 50A RPV INSTRUMENT LINE NOZZLE BY A 50A PIPE. THE 50A PIPE FROM THE REACTOR VESSEL INSTRUMENT LINE NOZZLE SHALL BE LEVEL IN THE HORIZONTAL PLANE FOR ALL CONDITIONS WITHIN 3 mm.

   THE INSTRUMENT LINE CONNECTED TO THE BOTTOM OF THE CONDENSING CHAMBER SHALL HAVE A DOWNWARD SLOPE ≥ 1/25. INSIDE THE PRIMARY CONTAINMENT, THE TOTAL VERTICAL DROP FROM THE CONDENSING CHAMBER TO THE CONTAINMENT WALL, SHALL NOT EXCEED 0.9 METERS. AT THE BOTTOM CONNECTION TO THE CONDENSING CHAMBER, THE INSTRUMENT LINE SHALL BE 25A PIPE, BUT PRIOR TO PENETRATING THE PRIMARY CONTAINMENT, SHALL BE REDUCED TO 20A PIPE.

   IN ADDITION, THE CONDENSING CHAMBER HAS A 25A DRAIN LINE WHICH DRAINS THE EXCESS CONDENSATE OR WATER TO THE VARIABLE LEG INSTRUMENT LINES FOR THE RPV WIDE RANGE WATER LEVEL INSTRUMENTATION. FLEXIBILITY SHALL BE PROVIDED IN THE INSTRUMENT LINE AND CONDENSING CHAMBER DRAIN LINE SUCH THAT THE CONDENSING CHAMBER IS FREE TO MOVE WITH THE REACTOR VESSEL AS IT THERMALLY EXPANDS AND CONTRACTS. THERMAL EXPANSION SHALL NOT CHANGE THE ELEVATION OF THE CONDENSING CHAMBER WITH RESPECT TO THE RPV INSTRUMENT LINE NOZZLE BY MORE THAN 3 mm.

   INSULATE THE 50A PIPE WHICH ATTACHES THE RPV INSTRUMENT LINE NOZZLE TO THE CONDENSING CHAMBER WITH INSULATION WHICH HAS A MAXIMUM CONDUCTANCE OF 4.103E−01 J/h.cm².°C. THE INSULATION SHALL EXTEND FROM THE RPV INSTRUMENT LINE NOZZLE TO THE CONDENSING CHAMBER. THE CONDENSING CHAMBER AND THE INSTRUMENT LINE FROM THE CONDENSING CHAMBER TO THE CONTAINMENT PENETRATION SHALL NOT BE INSULATED. THE 25A DRAIN LINE SHALL BE INSULATED.
10. LOCATE THE TEE AS CLOSE AS POSSIBLE TO REACTOR VESSEL.
11. THE MAXIMUM OPERATING PRESSURE OF AT LEAST 2.82 MPa G, AND TEMPERATURE FOR THE PORTION OF THE MAIN STEAM LINE DRAIN LINE HEADER DOWNSTREAM OF THE MOTOR OPERATED VALVES (MOVS) F014 AND F016 AND THE RESTRICTING ORIFICE D005 AND D007 TO BE DETERMINED BY THE DESIGNERS OF THE MAIN CONDENSER SYSTEM.
12. LOCATE THE DRAIN LINE 20A−NB−542 AND ASSOCIATED EQUIPMENT FOR DETECTING THE LEAKAGE AS CLOSE AS PRACTICAL TO THE RPV.
13. FOR DETAILS, SEE B11-D021 & D025.
14. THERMAL SLEEVE IS SHOWN AS ONE POSSIBLE METHOD OF ACCOMODATING ΔT BETWEEN RCIC/RHR/CUW AND FEEDWATER STREAMS. OTHER METHODS WHICH MEET APPLICABLE CODE REQUIREMENTS MAY BE USED.
15. SPRING CLOSING CHECK VALVE, SPRING ACTUATOR HELD IN OPEN POSITION BY AIR PRESSURE DURING NORMAL OPERATION. IF NO OTHER CHECK VALVE BETWEEN THE REACTOR AND THE FEEDWATER PUMPS IS DESIGNED TO CLOSE PRIOR TO APPRECIABLE FLOW REVERSAL, F003 SHOULD BE INTERLOCKED TO DUMP AIR PRESSURE AUTOMATICALLY IN THE EVENT ALL FEEDWATER PUMPS TRIP.
16. TRANSITION FROM 250A TO 300A PIPING TO BE DETERMINED BY THE PLANT ARRANGEMENT OF THE SRV DISCHARGE LINES.
17. SRV DISCHARGE LINE PIPING TO THE QUENCHER SHALL BE QUALITY GROUP C. IN ADDITION ALL WELDS IN THE SRV DISCHARGE LINE PIPING IN THE WETWELL ABOVE THE SURFACE OF THE SUPPRESSION POOL SHALL BE NON−DESTRUCTIVELY EXAMINED TO THE REQUIREMENTS OF ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, CLASS 2.
18. NOT USED
19. WHEN ALL FEEDWATER FLOW IS THROUGH A LOW FLOW FEEDWATER CONTROL VALVE, ONE FEEDWATER LINE TO THE REACTOR VESSEL IS TO BE SHUT−OFF TO MINIMIZE THERMAL CYCLING OF THE FEEDWATER NOZZLES ON THE RPV. WITH BOTH FEEDWATER LINES OPEN, FLOW MAY OSCILLATE BETWEEN THE TWO LINES DUE TO THE PARTIALLY OPEN CHECK VALVE.
20. ROUTE THE PIPE THROUGH THE MANHOLE IN BETWEEN THE DRYWELL AND THE RPV FLANGE.
21. WATER LEVEL INSTRUMENTS FOR VARIOUS RANGES ARE CALIBRATED AS STATED BELOW. ALL WATER LEVEL SWITCH SETPOINTS ARE NOMINAL. I.E., THE ANALYSES ARE PERFORMED WITH THE SWITCH TRIP UNCERTAINTY INCLUDED. THE CONTAINMENT BUILDING TEMPERATURE ASSUMED TO BE 26.7°C.
   A. FUEL ZONE: THE INSTRUMENTS ARE CALIBRATED FOR SATURATED WATER AND STEAM CONDITIONS AT 0 kPa G IN THE VESSEL AND DRYWELL WITH NO PUMP FLOW.
   B. WIDE RANGE: THE INSTRUMENTS ARE CALIBRATED FOR 7.07 MPa G IN THE VESSEL 57.2°C IN THE DRYWELL AND 46.47 kJ/kg SUB−COOLING BELOW THE MIDDLE WATER LEVEL NOZZLE.
   C. NARROW RANGE: (SAFEGUARDS AND FEEDWATER) THE INSTRUMENTS ARE CALIBRATED FOR SATURATED WATER AND STEAM CONDITIONS AT 7.07 MPa G IN THE VESSEL AND 57.2°C IN THE DRYWELL.
   D. SHUTDOWN: THE INSTRUMENT IS CALIBRATED FOR 48.9°C WATER AT 0 MPa IN THE VESSEL AND 26.7°C IN THE DRYWELL.
22. THE TEMPERATURE ELEMENT MPL B21−TE032 MAY BE LOCATED ON THE RPV HEAD VENT LINE BETWEEN THE MOTOR−OPERATED VALVES MPL B21−F019 AND B21−F020 PROVIDING THE FOLLOWING CONDITION IS SATISFIED. THE TEMPERATURE ELEMENT MPL B21−TE032 SHALL NOT BE INFLUENCED BY THE POTENTIALLY HIGH TEMPERATURES UPSTREAM OF THE MOTOR−OPERATED VALVE MPL B21−F019 WHEN THERE IS ZERO LEAKAGE THROUGH THE MOTOR−OPERATED VALVES B21−F019 & B21−F020.
23. UNLESS OTHERWISE INDICATED, ALL REFERENCED MPL ARE PREFIXED BY B21−
24. SEE MAIN STEAM PIPING DESIGN SPECIFICATION (B21−G001) FOR THE SPECIAL DESIGN REQUIREMENTS WHICH ARE APPLICABLE TO THE PIPING BETWEEN THE STEAM LINE INBOARD AND OUTBOARD CONTAINMENT ISOLATION VALVES.
25. SEE FEEDWATER PIPING DESIGN SPECIFICATION (B21−G010) FOR THE SPECIAL DESIGN REQUIREMENTS WHICH ARE APPLICABLE TO THE PIPING BETWEEN THE FEEDWATER LINE INBOARD AND OUTBOARD CONTAINMENT ISOLATION VALVES.
26. OPERATION OF 2 OF 2 MANUAL SWITCHES IS REQUIRED FOR GANGED OPERATION OF THE 8 SRV'S USED FOR THE ADS.
27. SEE SUPPORTING DOCUMENT 1 FOR SYSTEM IDENTIFICATION AT INTERCONNECTIONS.
28. PNEUMATIC SUPPLY FROM REFERENCE DOCUMENT 33.
29. THE CONDENSING CHAMBER SHALL CONSIST OF A 25A X 25A PIPE ELBOW WHICH IS CLOSE−COUPLED TO THE MAIN STEAM LINE FLOW RESTRICTOR INSTRUMENT LINE TAPS. THE RUN OF 25A INSTRUMENT LINE FROM THE TAP ON THE MAIN STEAM LINE FLOW RESTRICTOR TO THE ELBOW SHALL BE LEVEL IN THE HORIZONTAL PLANE WITHIN 0.50 CM FOR ALL CONDITIONS. THE 25A INSTRUMENT LINE CONNECTION TO THE ELBOW SHALL BE LOCATED VERTICALLY AND EXTEND DOWNWARD. THE 25A PIPE SHALL HAVE A DOWNWARD SLOPE ≥ 1/24 PRIOR TO PENETRATING THE CONTAINMENT WALL. THE 25A PIPE SHALL BE REDUCED TO 20A. FLEXIBILITY SHALL BE PROVIDED IN THE 25A AND 20A PIPE SUCH THAT THE CONDENSING CHAMBER MOVES WITH THE RPV AS IT THERMALLY EXPANDS AND CONTRACTS.
30. INSULATE WITH INSULATION THAT HAS A MAXIMUM CONDUCTANCE OF 4.103E−01 J/h.cm².°C. THE INSULATION SHALL EXTEND FROM THE INSTRUMENT LINE TAP TO WITHIN 5.1 CM OF THE DOWNWARD EXTENDING INSTRUMENT LINE. THE HORIZONTAL INSTRUMENT LINE TAP TO THE JUNCTION WITH THE DOWNWARD EXTENDING INSTRUMENT LINE SHOULD BE LESS THAN ONE (1) METER.
31. THE MOTOR−OPERATED VALVES (MOVS) MPL B21−F007A&B IN THE CLEAN−UP WATER (CUW) SYSTEM INJECTION LINES TO THE FEEDWATER LINES MAY BE DELETED IF THE RPV FEEDWATER NOZZLE FATIGUE USAGE IS ≤1.0 WITHOUT THE CUW SYS FEEDWATER LINE SELECTION FEATURE.
32. THE THERMAL SLEEVE SHOWN MAY BE DELETED IF THE STRESS ANALYSIS SHOWS THAT IT IS NOT REQUIRED.
33. SEE REFERENCE DOCUMENT 3 FOR THE INSTRUMENT SETPOINT REQUIREMENTS.
34. FOR INTERFACE CONNECTIONS, SEE THE MSIV EQUIPMENT REQUIREMENTS, SPECIFICATION SUPPORT DRAWING MPL F008 AND F009.
35. FOR VENT AND DRAIN LINES OPEN TO THE ATMOSPHERE, DOWNSTREAM OF THE OUTBOARD SHUT−OFF VALVE, THE FOLLOWING BOUNDARY CONDITIONS APPLY:
   MAXIMUM OPERATING PRESSURE − 0 MPa G
   MAXIMUM OPERATING TEMPERATURE − 66°C
   DESIGN CLASS AND QA CLASS − 7G
   SEISMIC CLASS − C
36. PIPING DESIGN SPECIFICATION AS FOLLOWS:
   A. MAXIMUM OPERATING PRESSURE − SEE SPECIFIC BOUNDARIES ON DRAWING
   B. MAXIMUM OPERATING TEMPERATURE − SEE SPECIFIC BOUNDARIES ON DRAWING
   C. MATERIAL − SEE TABLE 5
   D. PIPING THICKNESS − SEE TABLE 5
   E. ASME CLASS − SEE SPECIFIC BOUNDARIES ON DRAWING
   F. QUALITY CLASS − SEE SPECIFIC BOUNDARIES ON DRAWING
   G. SEISMIC CLASS − SEE SPECIFIC BOUNDARIES ON DRAWING
   H. FLUID − SEE TABLE 5
37. THE RELIEF VALVE F708 IS NOT REQUIRED IF INTERNAL PROTECTION IS PROVIDED WITHIN LT004 TO LIMIT THE DIFFERENTIAL PRESSURE ACROSS THE SENSING ELEMENT.
38. THE INSTRUMENT LINES SHALL BE SEISMIC CLASS As FROM THE LAST ANCHOR POINT TO THE PRESSURE TRANSMITTERS PT028 AND PT301.
39. PROVIDES INTERFACE BETWEEN SEISMIC CATEGORY I AND NON−SEISMIC CATEGORY PIPING.
40. THE MAXIMUM OPERATING TEMPERATURE OF THE FEEDWATER LINE FROM THE SEISMIC INTERFACE TO THE UPSTREAM SIDE OF THE MOTOR OPERATED VALVE MPL B21−F001 SHALL BE DETERMINED BY THE DESIGNER OF THE FEEDWATER SYSTEM.
41. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
42. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa G OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.
43. THE FLOW CONTROL STATION CONTAINS THE EQUIPMENT NECESSARY FOR LOCAL FLOW INDICATION AND LOCAL FLOW CONTROL.

REFERENCE DOCUMENT UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

	MPL NO
1. WATER QUALITY REQUIREMENTS	A11−3040
2. REACTOR PRESSURE VESSEL SYSTEM, ICD	B11−2020
3. NUCLEAR BOILER SYS, P&ID DATA	B21−1010
4. NUCLEAR BOILER SYSTEM, PFD	B21−1020
5. NUCLEAR BOILER SYSTEM, IBD	B21−1030
6. NOT USED	------
7. NOT USED	------
8. NOT USED	------
9. CONTROL ROD DRIVE SYSTEM, P&ID	C12−1010
10. REACTOR RECIRCULATION SYSTEM, P&ID	B31−1010
11. FEEDWATER CONTROL SYSTEM IBD	C31−1030
12. FEEDWATER CONTROL SYSTEM, IED	C31−1040
13. REMOTE SHUTDOWN SYSTEM, IED	C61−1040
14. REACTOR PROTECTION SYSTEM, IED	C71−1040
15. RECIRCULATION FLOW CONTROL SYS, IBD	C81−1030
16. RECIRCULATION FLOW CONTROL SYS, IED	C81−1040
17. RESIDUAL HEAT REMOVAL SYSTEM, P&ID	E11−1010
18. RESIDUAL HEAT REMOVAL SYSTEM, IBD	E11−1030
19. HIGH PRESSURE CORE FLOODER SYSTEM, IBD	E22−1030
20. LEAK DETECTION AND ISOLATION SYSTEM, IBD	E31−1030
21. LEAK DETECTION AND ISOLATION SYSTEM, IED	E31−1040
22. REACTOR CORE ISOLATION COOLING SYSTEM, P&ID	E51−1010
23. REACTOR CORE ISOLATION COOLING SYSTEM, IBD	E51−1030
24. REACTOR WATER CLEANUP SYS, P&ID	G31−1010
25. LIQUID WASTE, RADWASTE SYSTEM, P&ID	K17−1010
26. LOW CONDUCTIVITY WASTE, RADWASTE SYSTEM, P&ID	K17−1010
27. TURBINE MAIN STEAM SYSTEM, P&ID	N11−1010
28. CONDENSATE AND FEEDWATER SYSTEM, P&ID	N21−1010
29. TURBINE CONTROL SYSTEM, IBD	N32−1030
30. TURBINE CONTROL SYSTEM, IED	N32−1040
31. STEAM BYPASS & PRESSURE CONTROL SYS, IED	C85−1040
32. MAIN CONDENSER	N61−1010
33. INSTRUMENT AIR SYSTEM, P&ID	P52−1010
34. HIGH PRESS NITROGEN GAS SUPPLY SYS, P&ID	P54−1010
35. VALVE GLAND LEAKAGE TREATMENT, RADWASTE SYS, P&ID	K17−1010
36. SAMPLING SYSTEM, P&ID	P91−1010
37. NOT USED	------
38. NOT USED	------
39. ATMOSPHERIC CONTROL SYSTEM P&ID	T31−1010
*40. MAIN STEAM PIPING EQUIPMENT REQUIREMENTS SPECIFICATION SUPPORT DRAWING	B21−G001

* DENOTES THAT THIS COMPONENT IS PART OF AN ASSEMBLY WHERE THE ENTIRE ASSEMBLY HAS ONE MPL NUMBER.

** REFERENCE INFORMATION TO BE PROVIDED AS: INTERFACE. DOES NOT AFFECT THE DESIGN INFORMATION SHOWN ON THIS DRAWING OR ITS VERIFICATION.

SUPPORTING DOCUMENTS	MPL NO.
1. NUCLEAR PLANT SYSTEM STRUCTURE	A10−3010
2. PIPING AND INSTRUMENT SYMBOLS	A10−3030
3. GROUP CLASSIFICATION AND CONTAINMENT ISOLATION DIAGRAM	A11−1030
4. PROCESS INSTRUMENTATION REQUIREMENT SPEC	A11−3030

MPL NO. B21−1010

Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 1 of 11)

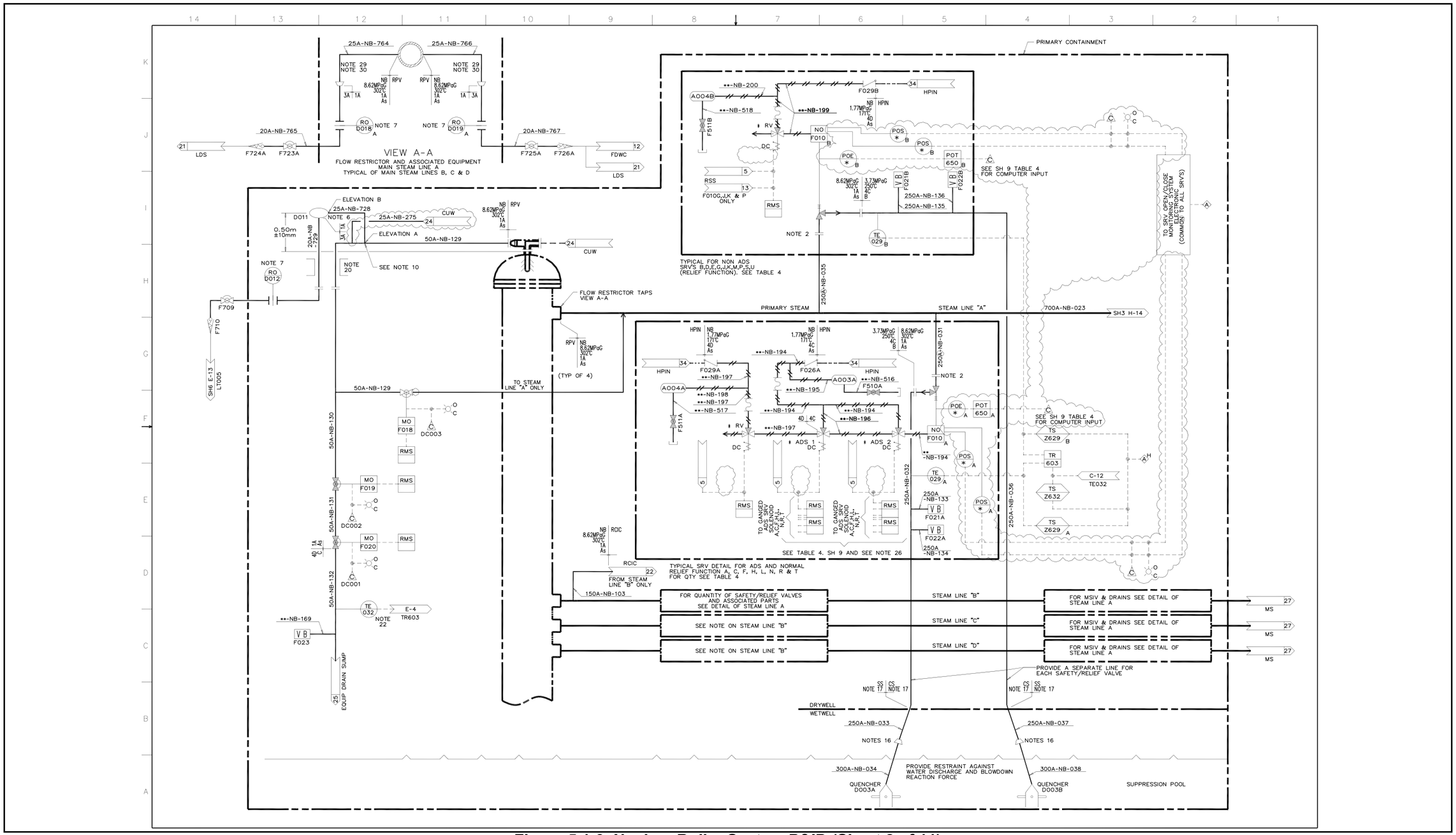


Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 2 of 11)

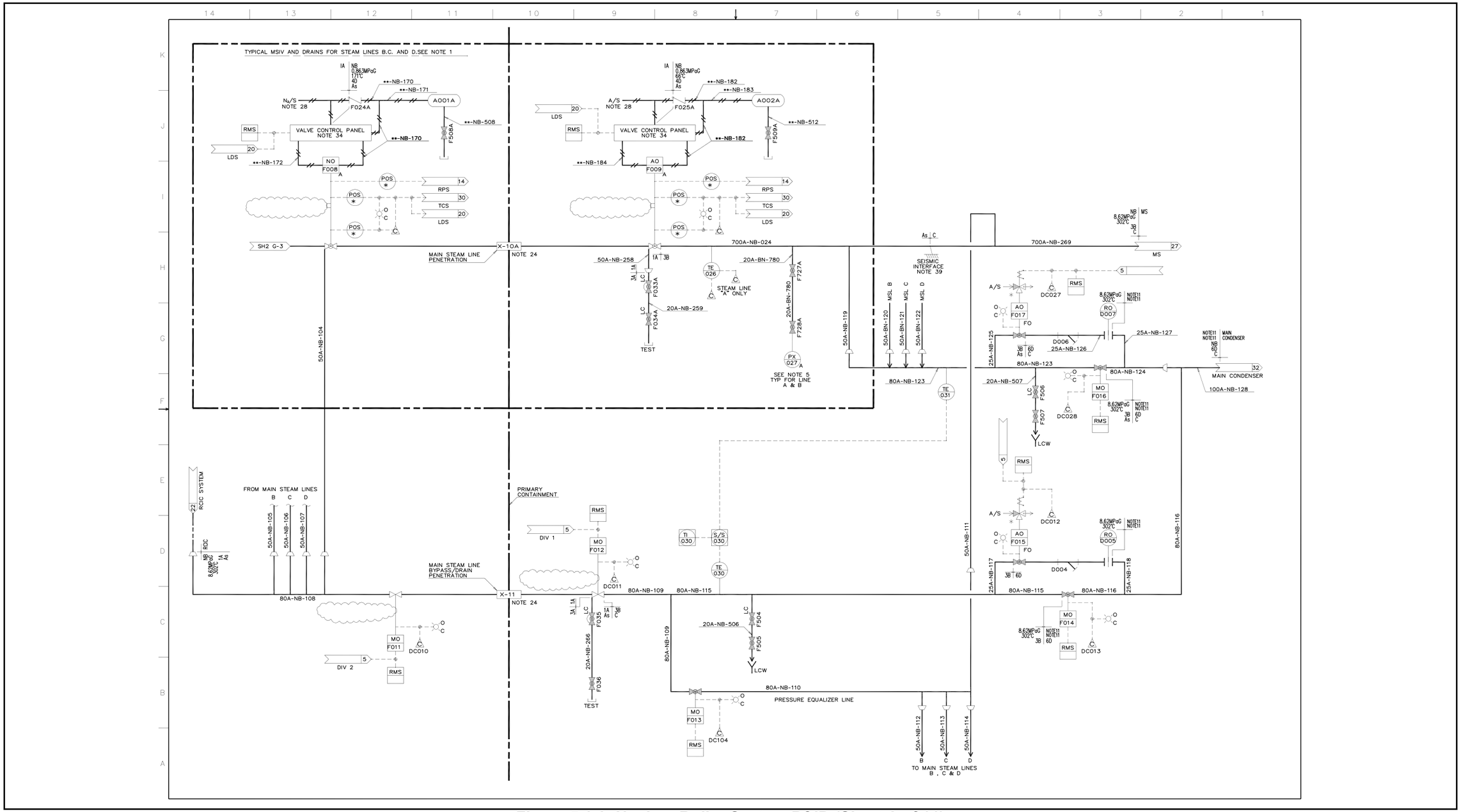


Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 3 of 11)

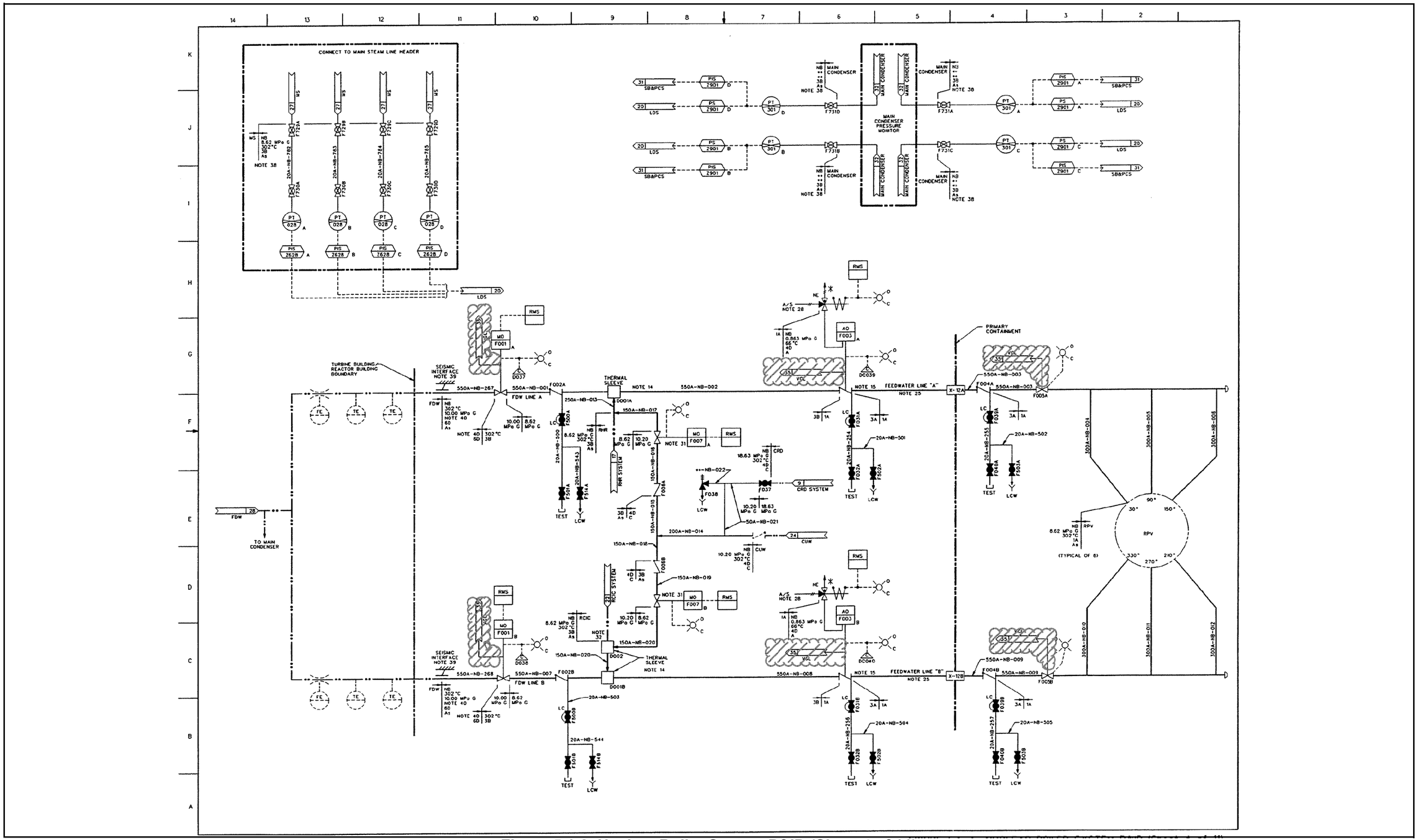


Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 4 of 11)

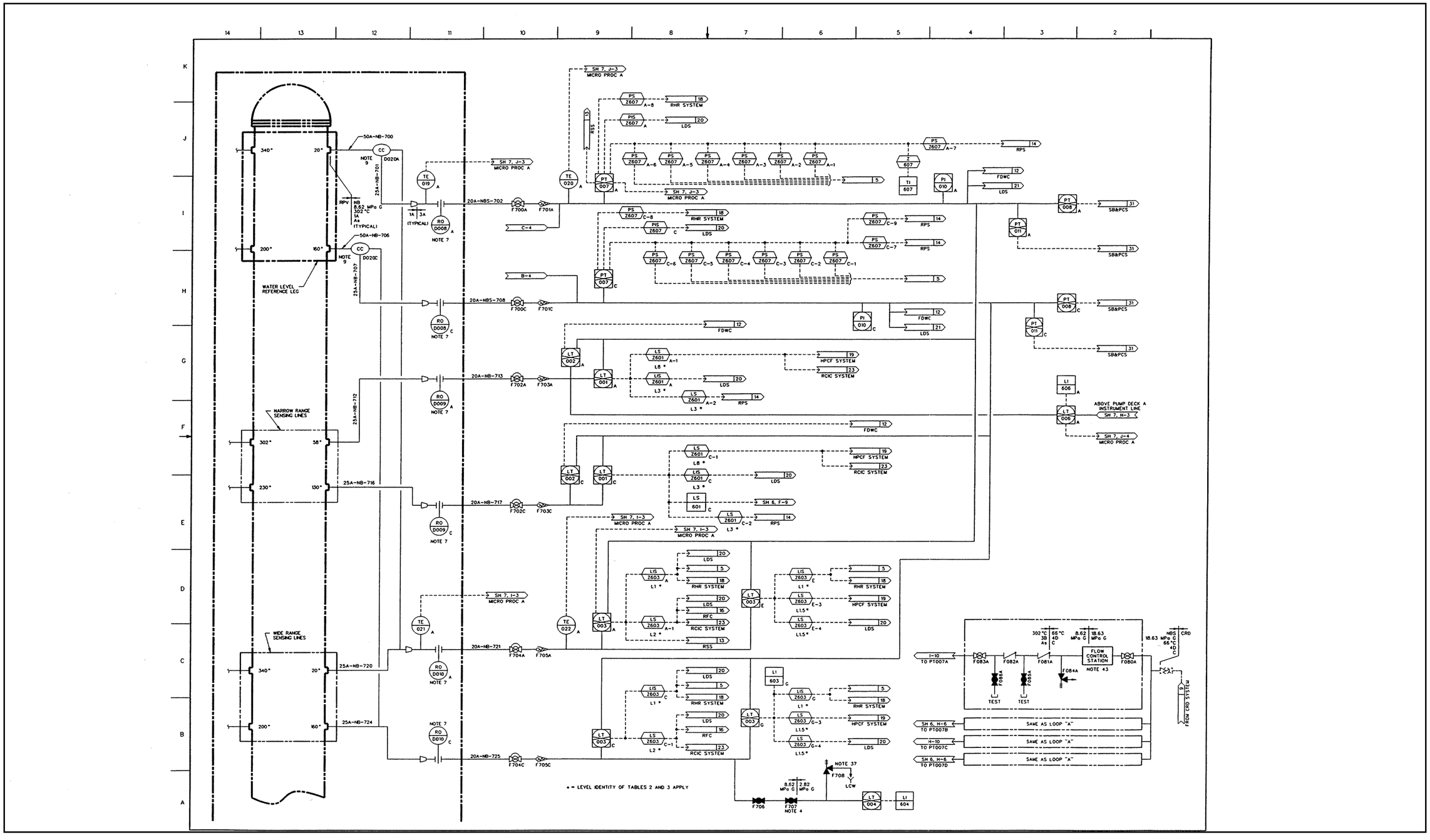


Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 5 of 11)

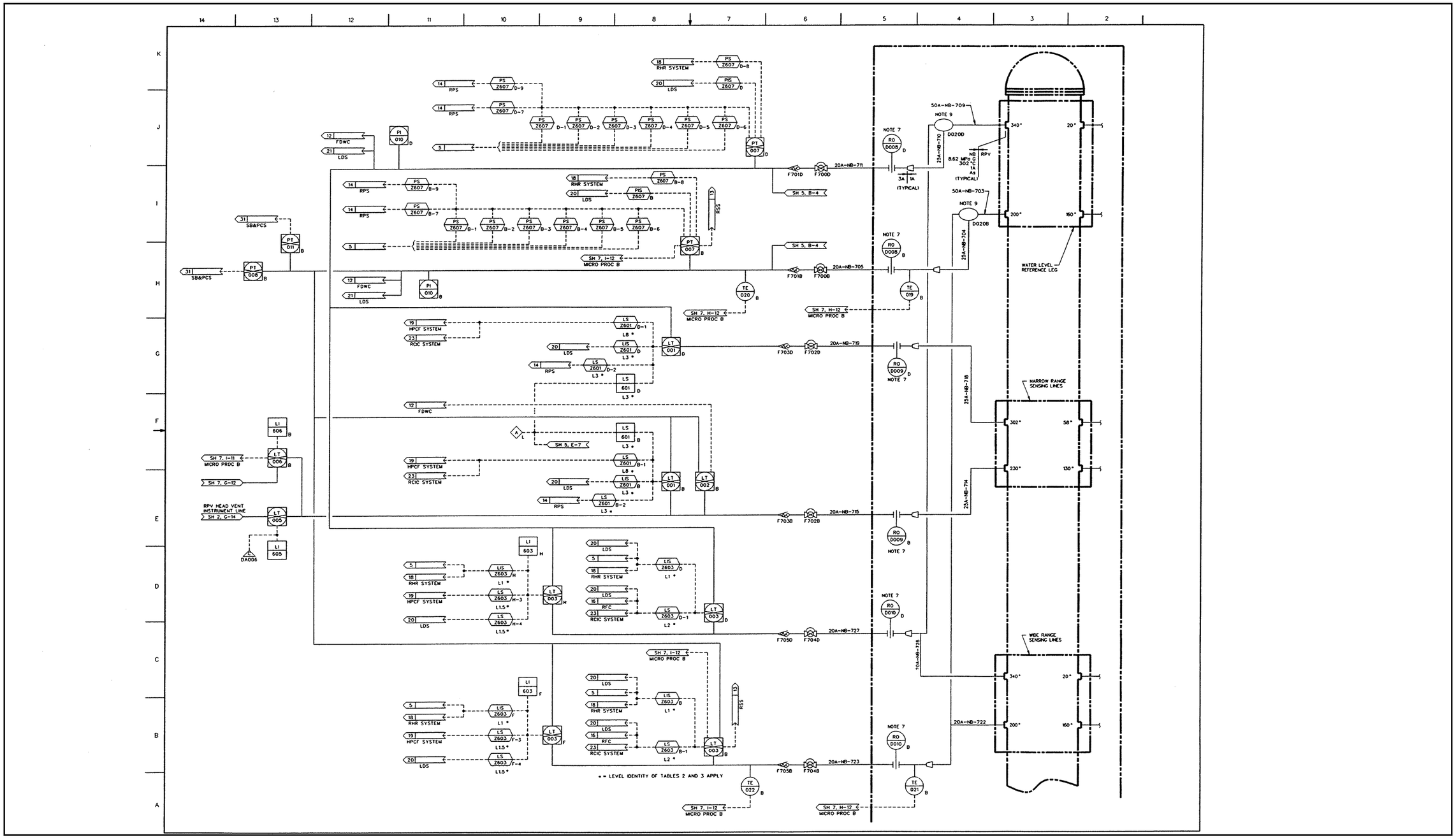


Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 6 of 11)

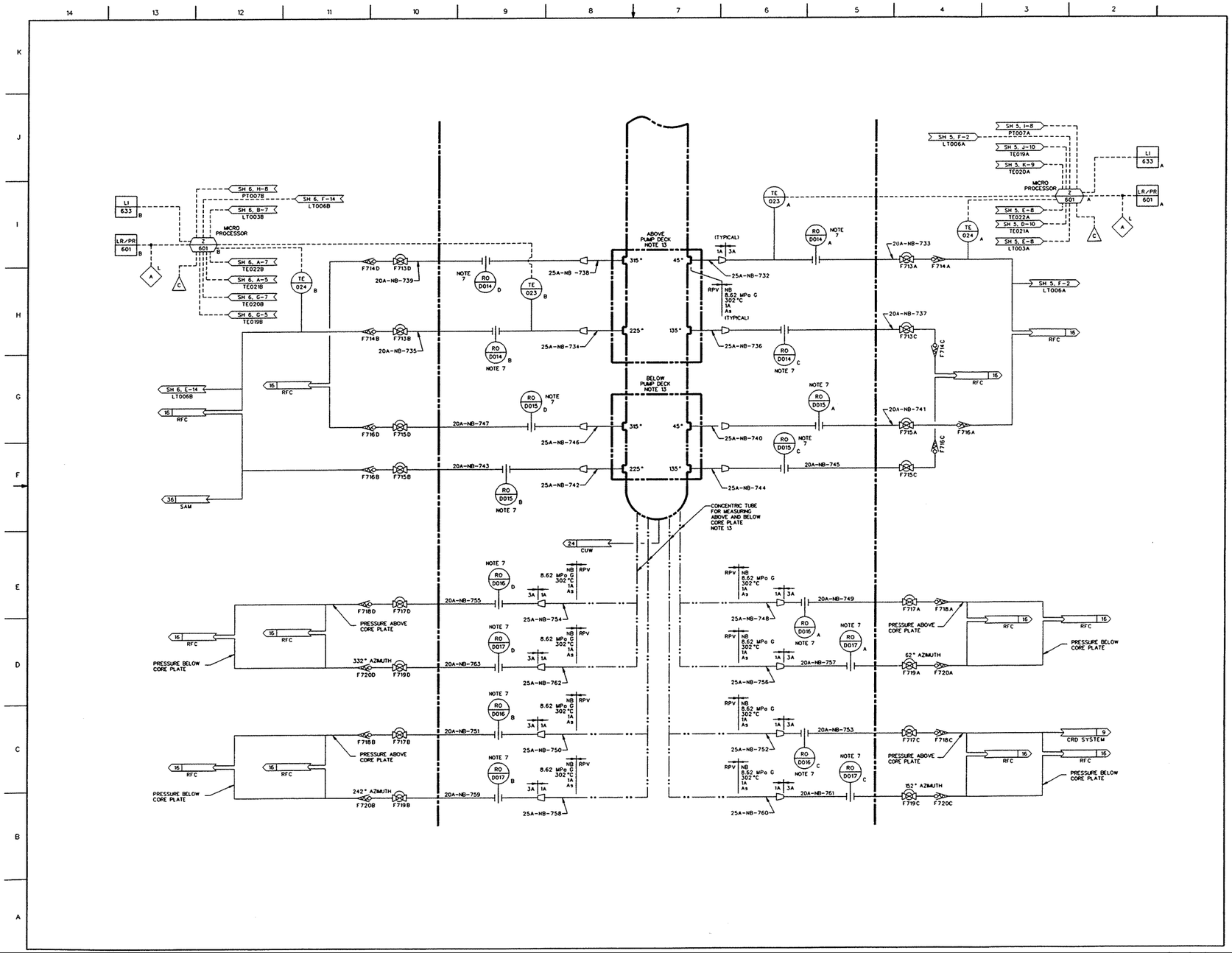


Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 7 of 11)

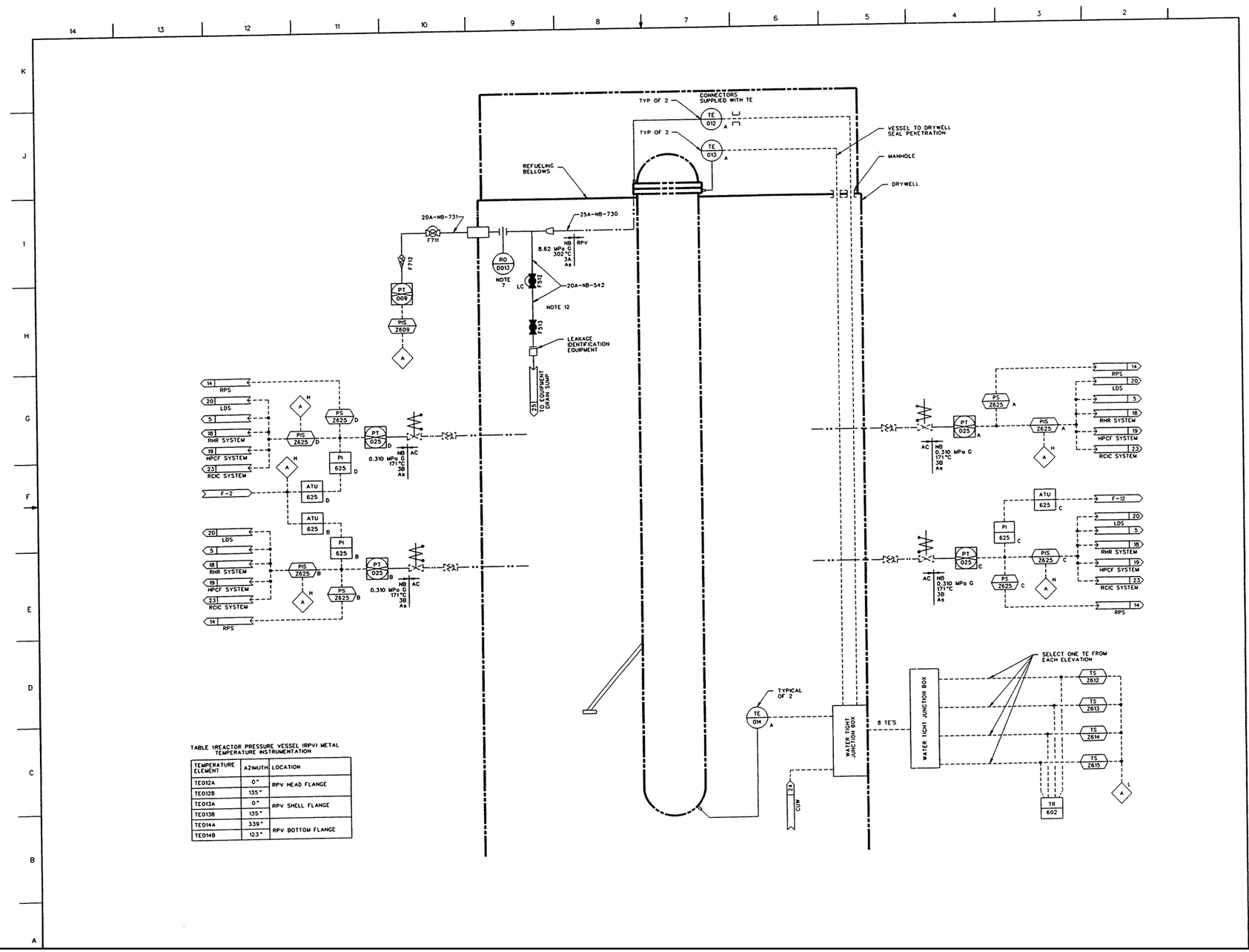


TABLE 1REACTOR PRESSURE VESSEL (RPV) METAL TEMPERATURE INSTRUMENTATION

TEMPERATURE ELEMENT	AZIMUTH	LOCATION
TE012A	0°	RPV HEAD FLANGE
TE012B	135°	
TE013A	0°	RPV SHELL FLANGE
TE013B	135°	
TE014A	339°	RPV BOTTOM FLANGE
TE014B	123°	

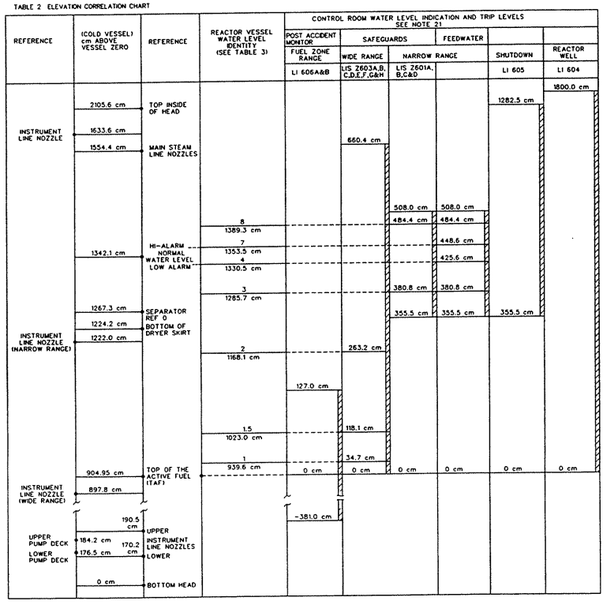
Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 8 of 11)

TABLE 4: SUFFIX LETTER ASSIGNMENTS FOR SAFETY/RELIEF VALVES AND ASSOCIATED EQUIPMENT

SAFETY/RELIEF VALVE F010		P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
TEMPERATURE ELEMENT T1029		P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
SOLENOID VALVE	ADS 1											N	H	T	C	L	F	R	A
	ADS 2											N	H	T	C	L	F	R	A
	RV	P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
ACCUMULATOR	A003											N	H	T	C	L	F	R	A
	A004	P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
CHECK VALVE	T026											N	H	T	C	L	F	R	A
	T029	P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
SRV OPEN CLOSE MONITORING SYSTEM		P	J	M	G	S	B	K	E	U	D	N	H	T	C	L	F	R	A
	COMPUTER INPUT ⚠	NC041	NC042	NC043	NC044	NC045	NC046	NC047	NC048	NC049	NC050	NC051	NC052	NC053	NC054	NC055	NC056	NC057	NC058
* COMPUTER INPUT ⚠		B21 NC023	B21 NC024	B21 NC025	B21 NC026	B21 NC027	B21 NC028	B31 NC029	B21 NC030	B21 NC031	B21 NC032	B21 NC033	B21 NC034	B21 NC035	B21 NC036	B21 NC037	B21 NC038	B21 NC039	B21 NC040
SPRING SET PRESSURE (MPa G)		7.92	7.92	7.99	7.99	7.99	7.99	8.06	8.06	8.06	8.06	8.13	8.13	8.13	8.13	8.20	8.20	8.20	8.20
SPRING RESEAT PRESSURE (MPa G)		7.37	7.37	7.44	7.44	7.44	7.44	7.50	7.50	7.50	7.50	7.56	7.56	7.56	7.56	7.63	7.63	7.63	7.63
RELIEF SET PRESSURE (MPa G)		7.51	7.58	7.65	7.65	7.65	7.65	7.72	7.72	7.72	7.72	7.79	7.79	7.79	7.79	7.86	7.86	7.86	7.86
RELIEF RESEAT PRESSURE (MPa G)		7.00	7.07	7.14	7.14	7.14	7.14	7.21	7.21	7.21	7.21	7.28	7.28	7.28	7.28	7.35	7.35	7.35	7.35
	PTI007A THRU D/ PS-2607A-6 THRU D-6	≥2 OF A,B,C,D																	
	PTI007A THRU D/ PS-2607A-5 THRU D-5		≥2 OF A,B,C,D																
	PTI007A THRU D/ PS-2607A-4 THRU D-4			≥2 OF A,B,C,D															
	PTI007A THRU D/ PS-2607A-3 THRU D-3							≥2 OF A,B,C,D											
	PTI007A THRU D/ PS-2607A-2 THRU D-2											≥2 OF A,B,C,D							
	PTI007A THRU D/ PS-2607A-1 THRU D-1															≥2 OF A,B,C,D			

* COMPUTER INPUTS FOR SRV POSITION SEE PERFORMANCE MONITORING AND CONTROL SYSTEM C91-4010

TABLE 2 ELEVATION CORRELATION CHART



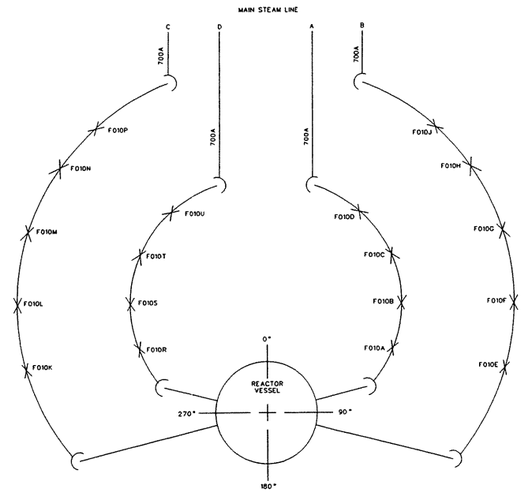


FIG. 3
SAFETY/RELIEF VALVE ORIENTATION AND STEAM PIPING LINE SIZES

TABLE 3 WATER LEVEL TRIP FUNCTION

REACTOR VESSEL WATER LEVEL	DESCRIPTION OF TRIPS	INSTRUMENT PROVIDING TRIP SIGNAL	NOTES
8	TRIPS RCIC TURBINE	LIS-2601A-1 THRU D-1	NARROW RANGE
	TRIP HPCF INJECTION VALVES	LIS-2601A-1 THRU D-1	NARROW RANGE
	CLOSE MAIN TURBINE STOP VALVES TRIPS FEEDWATER PUMPS	SEE REFERENCE DOCUMENT 12	NARROW RANGE
7	HIGH LEVEL ALARM	SEE REFERENCE DOCUMENT 12	NARROW RANGE
4	LOW LEVEL ALARM (RRS FLOW RUN BACK ON TRIP OF FEED PUMP)		NARROW RANGE
3	SCRAMS REACTOR	LIS-2601A THRU D	NARROW RANGE
	CLOSE RHR SHUTDOWN COOLING ISOLATION VALVES	LIS-2601A THRU D	NARROW RANGE
	CLOSE CONTAINMENT ISOL VALVES LDS EXCEPT DW COOLING AND CSW ISOL VALVES AND MSIV'S	LIS-2601A THRU D	NARROW RANGE
	TRIP 4 OF RRS PUMPS	SEE REFERENCE DOCUMENT 12	NARROW RANGE
2	INITIATES RCIC	LS-2603A-1 THRU D-1	WIDE RANGE
	TRIP REMAINING 6 RRS PUMPS	LS-2603A-1 THRU D-1	WIDE RANGE
	CLOSE CUW ISOL VALVES	LS-2603A-2 THRU D-2	WIDE RANGE
1.5	INITIATES HPCF B & C	LS-2603E-3 THRU H-3	WIDE RANGE
	CLOSE MSIV'S & DW COOLING SYSTEM ISOL VALVES	LS-2603E-4 THRU H-4	WIDE RANGE
1	INITIATES ADS	LIS-2603A THRU H	WIDE RANGE
	INITIATES RHR/LPFL MODE	LIS-2603A THRU H	WIDE RANGE

Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 9 of 11)

TABLE 5: PIPING SPECIFICATIONS

PIPE NO.	SCHEDULE	MATERIAL	FLUID
001	**	CS	W
002	**	CS	W
003	100	CS	W
004	100	CS	W
005	100	CS	W
006	100	CS	W
007	**	CS	W
008	**	CS	W
009	100	CS	W
010	100	CS	W
011	100	CS	W
012	100	CS	W
013	**	CS	W
014	**	CS	W
015	**	CS	W
016	**	CS	W
017	**	CS	W
018	**	CS	W
019	**	CS	W
020	**	CS	W
021	**	CS	W
022	**	CS	W
023	80	CS	S
024	**	CS	S
025	80	CS	S
026	**	CS	S
027	80	CS	S
028	**	CS	S
029	80	CS	S
030	**	CS	S
031	N/A	CS	S
032	80	CS	S
033	60	SS	S
034	60	SS	S
035	N/A	CS	S
036	80	CS	S
037	60	SS	S
038	60	SS	S
039	N/A	CS	S
040	80	CS	S
041	60	SS	S
042	60	SS	S
043	N/A	CS	S
044	80	CS	S
045	60	SS	S
046	60	SS	S
047	N/A	CS	S
048	80	CS	S
049	60	SS	S
050	60	SS	S
051	N/A	CS	S
052	80	CS	S
053	60	SS	S
054	60	SS	S
055	N/A	CS	S
056	80	CS	S
057	60	SS	S
058	60	SS	S
059	N/A	CS	S
060	80	CS	S
061	60	SS	S
062	60	SS	S
063	N/A	CS	S
064	80	CS	S
065	60	SS	S
066	60	SS	S
067	N/A	CS	S
068	80	CS	S
069	60	SS	S
070	60	SS	S
071	N/A	CS	S
072	80	CS	S
073	60	SS	S
074	60	SS	S
075	N/A	CS	S
076	80	CS	S
077	60	SS	S
078	60	SS	S
079	N/A	CS	S
080	80	CS	S

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
081	60	SS	S
082	60	SS	S
083	N/A	CS	S
084	80	CS	S
085	60	SS	S
086	60	SS	S
087	N/A	CS	S
088	80	CS	S
089	60	SS	S
090	60	SS	S
091	N/A	CS	S
092	80	CS	S
093	60	SS	S
094	60	SS	S
095	N/A	CS	S
096	80	CS	S
097	60	SS	S
098	60	SS	S
099	N/A	CS	S
100	80	CS	S
101	60	SS	S
102	60	SS	S
103	120	CS	S
104	160	CS	S
105	160	CS	S
106	160	CS	S
107	160	CS	S
108	160	CS	S
109	**	CS	S
110	**	CS	S
111	**	CS	S
112	**	CS	S
113	**	CS	S
114	**	CS	S
115	**	CS	S
116	**	CS	S
117	**	CS	S
118	**	CS	S
119	**	CS	S
120	**	CS	S
121	**	CS	S
122	**	CS	S
123	**	CS	S
124	**	CS	S
125	**	CS	S
126	**	CS	S
127	**	CS	S
128	**	CS	S
129	80	CS	S
130	80	CS	S
131	80	CS	S
132	**	CS	S
133	80	CS	S
134	80	CS	S
135	80	CS	S
136	80	CS	S
137	80	CS	S
138	80	CS	S
139	80	CS	S
140	80	CS	S
141	80	CS	S
142	80	CS	S
143	80	CS	S
144	80	CS	S
145	80	CS	S
146	80	CS	S
147	80	CS	S
148	80	CS	S
149	80	CS	S
150	80	CS	S
151	80	CS	S
152	80	CS	S
153	80	CS	S
154	80	CS	S
155	80	CS	S
156	80	CS	S
157	80	CS	S
158	80	CS	S
159	80	CS	S
160	80	CS	S

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
161	80	CS	S
162	80	CS	S
163	80	CS	S
164	80	CS	S
165	80	CS	S
166	80	CS	S
167	80	CS	S
168	80	CS	S
169	**	CS	S
170	**	SS	N
171	**	SS	N
172	**	SS	N
173	**	SS	N
174	**	SS	N
175	**	SS	N
176	**	SS	N
177	**	SS	N
178	**	SS	N
179	**	SS	N
180	**	SS	N
181	**	SS	N
182	**	SS	A
183	**	SS	A
184	**	SS	A
185	**	SS	A
186	**	SS	A
187	**	SS	A
188	**	SS	A
189	**	SS	A
190	**	SS	A
191	**	SS	A
192	**	SS	A
193	**	SS	A
194	**	SS	N
195	**	SS	N
196	**	SS	N
197	**	SS	N
198	**	SS	N
199	**	SS	N
200	**	SS	N
201	**	SS	N
202	**	SS	N
203	**	SS	N
204	**	SS	N
205	**	SS	N
206	**	SS	N
207	**	SS	N
208	**	SS	N
209	**	SS	N
210	**	SS	N
211	**	SS	N
212	**	SS	N
213	**	SS	N
214	**	SS	N
215	**	SS	N
216	**	SS	N
217	**	SS	N
218	**	SS	N
219	**	SS	N
220	**	SS	N
221	**	SS	N
222	**	SS	N
223	**	SS	N
224	**	SS	N
225	**	SS	N
226	**	SS	N
227	**	SS	N
228	**	SS	N
229	**	SS	N
230	**	SS	N
231	**	SS	N
232	**	SS	N
233	**	SS	N
234	**	SS	N
235	**	SS	N
236	**	SS	N
237	**	SS	N
238	**	SS	N
239	**	SS	N
240	**	SS	N

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
241	**	SS	N
242	**	SS	N
243	**	SS	N
244	**	SS	N
245	**	SS	N
246	**	SS	N
247	**	SS	N
248	**	SS	N
249	**	SS	N
250	**	SS	N
251	**	SS	N
252	**	SS	N
253	**	SS	N
254	160	CS	W
255	160	CS	W
256	160	CS	W
257	160	CS	W
258	160	CS	S
259	160	CS	S
260	160	CS	S
261	160	CS	S
262	160	CS	S
263	160	CS	S
264	160	CS	S
265	160	CS	S
266	**	CS	S
267	**	CS	W
268	**	CS	W
269	**	CS	S
270	**	CS	S
271	**	CS	S
272	**	CS	S
275	160	CS	S
500	**	CS	W
501	160	CS	W
502	160	CS	W
503	**	CS	W
504	160	CS	W
505	160	CS	W
506	**	CS	S
507	**	CS	S
508	**	SS	N
509	**	SS	A
510	**	SS	N
511	**	SS	A
512	**	SS	N
513	**	SS	A
514	**	SS	N
515	**	SS	A
516	**	SS	N
517	**	SS	N
518	**	SS	N
519	**	SS	N
520	**	SS	N
521	**	SS	N
522	**	SS	N
523	**	SS	N
524	**	SS	N
525	**	SS	N
526	**	SS	N
527	**	SS	N
528	**	SS	N
529	**	SS	N
530	**	SS	N
531	**	SS	N
532	**	SS	N
533	**	SS	N
534	**	SS	N
535	**	SS	N
536	**	SS	N
537	**	SS	N
538	**	SS	N
539	**	SS	N
540	**	SS	N
541	**	SS	N
542	**	CS	S
543	160	CS	W
544	160	CS	W

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
700	80	SS	S
701	**	SS	W
702	**	SS	W
703	80	SS	S
704	**	SS	W
705	**	SS	W
706	80	SS	S
707	**	SS	W
708	**	SS	W
709	80	SS	S
710	**	SS	W
711	**	SS	W
712	80	SS	W
713	**	SS	W
714	80	SS	W
715	**	SS	W
716	80	SS	W
717	**	SS	W
718	80	SS	W
719	**	SS	W
720	80	SS	W
721	**	SS	W
722	80	SS	W
723	**	SS	W
724	80	SS	W
725	**	SS	W
726	80	SS	W
727	**	SS	W
728	**	CS	S
729	**	SS	W
730	**	SS	S
731	**	SS	S
732	80	SS	W
733	**	SS	W
734	80	SS	W
735	**	SS	W
736	80	SS	W
737	**	SS	W
738	80	SS	W
739	**	SS	W
740	80	SS	W
741	**	SS	W
742	80	SS	W
743	**	SS	W
744	80	SS	W
745	**	SS	W
746	80	SS	W
747	**	SS	W
748	80	SS	W
749	**	SS	W
750	80	SS	W
751	**	SS	W
752	80	SS	W
753	**	SS	W
754	80	SS	W
755	**	SS	W
756	80	SS	W
757	**	SS	W
758	80	SS	W
759	**	SS	W
760	80	SS	W
761	**	SS	W
762	80	SS	W
763	**	SS	W
764	**	SS	S
765	**	SS	W
766	**	SS	S
767	**	SS	W
768	**	SS	S
769	**	SS	W
770	**	SS	S
771	**	SS	W
772	**	SS	S
773	**	SS	W
774	**	SS	S
775	**	SS	W
776	**	SS	S
777	**	SS	W
778	**	SS	S
779	**	SS	W

TABLE 5: PIPING SPECIFICATIONS (CONT'D)

PIPE NO.	SCHEDULE	MATERIAL	FLUID
780	**	CS	S
781	**	CS	S
782	**	SS	S
783	**	SS	S
784	**	SS	S
785	**	SS	S

Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 10 of 11)

TABLE 6 : PIPE NUMBERS FOR THE MAIN STEAM LINES

MAIN STEAM LINE	RPV TO THE OUTBOARD MSIV	OUTBOARD MSIV TO SEISMIC INTERFACE	SEISMIC INTERFACE TO MAIN STEAM SYSTEM	OUTBOARD MSIV TEST LINE	
				OUTBOARD MSIV TO REDUCER	DOWNSTREAM OF REDUCER
A	700A-NB-023	700A-NB-024	700A-NB-269	50A-NB-258	20A-NB-259
B	700A-NB-025	700A-NB-026	700A-NB-270	50A-NB-260	20A-NB-261
C	700A-NB-027	700A-NB-028	700A-NB-271	50A-NB-262	20A-NB-263
D	700A-NB-029	700A-NB-030	700A-NB-272	50A-NB-264	20A-NB-265

TABLE 7 : PIPE NUMBERS FOR THE SAFETY/RELIEF VALVE (SRV) DISCHARGE LINES

SRV	SRV DISCHARGE LINE				VACUUM BREAKER LINES	
	MSL TO SRV NOTE 2	SRV TO DIAPHRAGM FLOOR	DIAPHRAGM FLOOR TO REDUCER	REDUCER TO QUENCHER	UPSTREAM	DOWNSTREAM
F010A	250A-NB-031	250A-NB-032	250A-NB-033	300A-NB-034	250A-NB-133	250A-NB-134
F010B	250A-NB-035	250A-NB-036	250A-NB-037	300A-NB-038	250A-NB-135	250A-NB-136
F010C	250A-NB-039	250A-NB-040	250A-NB-041	300A-NB-042	250A-NB-137	250A-NB-138
F010D	250A-NB-043	250A-NB-044	250A-NB-045	300A-NB-046	250A-NB-139	250A-NB-140
F010E	250A-NB-047	250A-NB-048	250A-NB-049	300A-NB-050	250A-NB-141	250A-NB-142
F010F	250A-NB-051	250A-NB-052	250A-NB-053	300A-NB-054	250A-NB-143	250A-NB-144
F010G	250A-NB-055	250A-NB-056	250A-NB-057	300A-NB-058	250A-NB-145	250A-NB-146
F010H	250A-NB-059	250A-NB-060	250A-NB-061	300A-NB-062	250A-NB-147	250A-NB-148
F010J	250A-NB-063	250A-NB-064	250A-NB-065	300A-NB-066	250A-NB-149	250A-NB-150
F010K	250A-NB-067	250A-NB-068	250A-NB-069	300A-NB-070	250A-NB-151	250A-NB-152
F010L	250A-NB-071	250A-NB-072	250A-NB-073	300A-NB-074	250A-NB-153	250A-NB-154
F010M	250A-NB-075	250A-NB-076	250A-NB-077	300A-NB-078	250A-NB-155	250A-NB-156
F010N	250A-NB-079	250A-NB-080	250A-NB-081	300A-NB-082	250A-NB-157	250A-NB-158
F010P	250A-NB-083	250A-NB-084	250A-NB-085	300A-NB-086	250A-NB-159	250A-NB-160
F010R	250A-NB-087	250A-NB-088	250A-NB-089	300A-NB-090	250A-NB-161	250A-NB-162
F010S	250A-NB-091	250A-NB-092	250A-NB-093	300A-NB-094	250A-NB-163	250A-NB-164
F010T	250A-NB-095	250A-NB-096	250A-NB-097	300A-NB-098	250A-NB-165	250A-NB-166
F010U	250A-NB-099	250A-NB-100	250A-NB-101	300A-NB-102	250A-NB-167	250A-NB-168

TABLE 8 : PIPE NUMBERS FOR THE MAIN STEAM ISOLATION VALVE (MSIV) PNEUMATIC LINES

MSIV	OPENING-CHECK VALVE TO MSIV	OPENING-FROM ACCUMULATOR	CLOSING-VALVE CONTROL PANEL TO MSIV	DRAIN LINE
F008A	**-NB-170	**-NB-171	**-NB-172	**-NB-508
F008B	**-NB-173	**-NB-174	**-NB-175	**-NB-509
F008C	**-NB-176	**-NB-177	**-NB-178	**-NB-510
F008D	**-NB-179	**-NB-180	**-NB-181	**-NB-511
F009A	**-NB-182	**-NB-183	**-NB-184	**-NB-512
F009B	**-NB-185	**-NB-186	**-NB-187	**-NB-513
F009C	**-NB-188	**-NB-189	**-NB-190	**-NB-514
F009D	**-NB-191	**-NB-192	**-NB-193	**-NB-515

TABLE 9 : PIPE NUMBERS FOR THE SAFETY/RELIEF VALVE (SRV) PNEUMATIC LINES

SRV	ADS PNEUMATIC LINES				PNEUMATIC LINES FOR POWER-ACTUATED RELIEF		
	CHECK VALVE TO SOV "ADS 2" TO SRV	BRANCH LINE FROM ACCUMULATOR	BRANCH LINE THRU SOV "ADS 1" TO SOV "ADS 2"	ACCUMULATOR DRAIN LINE	CHECK VALVE TO SOV "ADS 1" (ADS SRV) OR SRV (NON-ADS SRV)	BRANCH LINE FROM ACCUMULATOR	ACCUMULATOR DRAIN LINE
F010A	**-NB-194	**-NB-195	**-NB-196	**-NB-516	**-NB-197	**-NB-198	**-NB-517
F010B					**-NB-199	**-NB-200	**-NB-518
F010C	**-NB-201	**-NB-202	**-NB-203	**-NB-519	**-NB-204	**-NB-205	**-NB-520
F010D					**-NB-206	**-NB-207	**-NB-521
F010E					**-NB-208	**-NB-209	**-NB-522
F010F	**-NB-210	**-NB-211	**-NB-212	**-NB-523	**-NB-213	**-NB-214	**-NB-524
F010G					**-NB-215	**-NB-216	**-NB-525
F010H	**-NB-217	**-NB-218	**-NB-219	**-NB-526	**-NB-220	**-NB-221	**-NB-527
F010J					**-NB-222	**-NB-223	**-NB-528
F010K					**-NB-224	**-NB-225	**-NB-529
F010L	**-NB-226	**-NB-227	**-NB-228	**-NB-530	**-NB-229	**-NB-230	**-NB-531
F010M					**-NB-231	**-NB-232	**-NB-532
F010N	**-NB-233	**-NB-234	**-NB-235	**-NB-533	**-NB-236	**-NB-237	**-NB-534
F010P					**-NB-238	**-NB-239	**-NB-535
F010R	**-NB-240	**-NB-241	**-NB-242	**-NB-536	**-NB-243	**-NB-244	**-NB-537
F010S					**-NB-245	**-NB-246	**-NB-538
F010T	**-NB-247	**-NB-248	**-NB-249	**-NB-539	**-NB-250	**-NB-251	**-NB-540
F010U					**-NB-252	**-NB-253	**-NB-541

TABLE 10 : PIPE NUMBERS FOR THE MAIN STEAM LINE (MSL) INSTRUMENT LINES

MAIN STEAM LINE	MSL FLOW RESTRICTOR INSTRUMENT LINES				MSL PRESSURE TEST POINT
	INSTRUMENT LINE TO LDS		INSTRUMENT LINE TO LDS & FDWC		
	MSL TO REDUCER	REDUCER TO EXCESS FLOW CHECK VALVE	MSL TO REDUCER	REDUCER TO EXCESS FLOW CHECK VALVE	
A	25A-NB-764	20A-NB-765	25A-NB-766	20A-NB-767	20A-NB-780
B	25A-NB-768	20A-NB-769	25A-NB-770	20A-NB-771	20A-NB-781
C	25A-NB-772	20A-NB-773	25A-NB-774	20A-NB-775	-
D	25A-NB-776	20A-NB-777	25A-NB-778	20A-NB-779	-

Figure 5.1-3 Nuclear Boiler System P&ID (Sheet 11 of 11)

NOTES:

1. ALL SIGNALS ARE TRANSMITTED AS SERIAL DATA TO EACH TLU OR SLU THROUGH EACH SERIAL OUTPUT.
2. FOUR TEMPERATURE ELEMENTS SHALL BE LOCATED AT APPROXIMATELY EQUAL INTERVALS IN THE VERTICAL DIRECTION SO AS TO MONITOR AMBIENT TEMPERATURES OVER THE FULL HEIGHT OF THE DRYWELL.
3. TEMPERATURE DETECTORS SHALL BE LOCATED OR SHIELDED SO THAT THE DETECTOR IS SENSITIVE TO THE AIR TEMPERATURE AND NOT THE RADIATED HEAT FROM HOT EQUIPMENT.
4. ALL INSTRUMENT LINES THAT CONNECT TO THE REACTOR COOLANT PRESSURE BOUNDARY AND PENETRATE THE CONTAINMENT WALL SHALL HAVE 6.35 MM RESTRICTING ORIFICES INSIDE THE CONTAINMENT. SEE SUPPORTING DOCUMENTS 2&3 FOR ADDITIONAL REQUIREMENTS.
5. EACH INSTRUMENT LINE THROUGH THE CONTAINMENT WALL SHALL HAVE TWO ISOLATION VALVES OUTSIDE THE CONTAINMENT LOCATED AS CLOSE TO THE CONTAINMENT AS PRACTICAL.
6. SOLENOID OPERATED GLOBE VALVES MAY BE ADOPTED FOR THE AIR OPERATED VALVES.
7. THIS DOCUMENT PROVIDES A FUNCTIONAL DEFINITION OF THE REQUIRED SYSTEM LEVEL PROCESS MONITORING AND CONTROL INSTRUMENTATION. IT DOES NOT ADDRESS DETAILS OF THE METHODS BY WHICH SIGNALS FROM THESE COMPONENTS WILL BE PROCESSED. THIS PROCESSING MAY INVOLVE THE PLANT MULTIPLEXING SYSTEM (H23) OR MAY UTILIZE HARDWIRING. SPECIFIC ELECTRICAL ISOLATION REQUIREMENTS SHOWN ON THIS DRAWING MAY BE UNNECESSARY IF MULTIPLEXED SIGNAL TRANSMISSION PROVIDES INHERENT ISOLATION.
8. ALL ALARMS SHALL BE LOCATED IN THE MAIN CONTROL ROOM.
9. ALL INPUTS TO C91/PMCS SHALL BE CONTINUOUSLY RECORDED.
10. THE LDS SHALL BE DESIGNED IN ACCORDANCE WITH THE SYSTEM DESIGN SPECIFICATION (E31-4010). OTHER PRIMARY CONTAINMENT ISOLATION (PCV) VALVES, WHICH ARE PART OF OTHER SYSTEMS, ARE NOT SHOWN IN THIS IED. THOSE VALVES ARE SHOWN ON THE LDS/IBD - INTERLOCK BLOCK DIAGRAM (E31-1030).
11. FOR REACTOR WATER LEVELS MONITORING, SEE B21-1010.
12. FOR DRYWELL PRESSURE MONITORING, SEE B21-1010.
13. FOR DETECTION OF RADIATION LEAKAGE INTO COOLING WATER SUPPLYING RECIRC PUMP, RHR AND CUW HEAT EXCHANGERS, SEE D11-1040.
14. LETTER DESIGNATIONS FOR FOUR DIVISIONS ARE AS FOLLOWS:

    A,E,J,N - DIVISION 1
    B,F,K,P - DIVISION 2
    C,G,L,R - DIVISION 3
    D,H,M,S - DIVISION 4

15. IF HEAT TRACING OF SAMPLE LINE IS NECESSARY TO PREVENT CONDENSATION, THE MAXIMUM ALLOWABLE SAMPLE TEMPERATURE IS LIMITED BY THE PHOTO MULTIPLIER TUBES IN THE MONITORING CHANNELS.
16. BALL VALVE MAY BE ADOPTED FOR THIS GATE VALVE.
17. DTM, TLU, SLU, OLU ARE PART OF SAFETY SYSTEM LOGIC AND CONTROL, (SEE REFERENCE DOCUMENT 12).
    A. DTMs SHOWN ON SHEETS 3 & 4 PROCESS SENSOR INPUTS FOR MSIV ISOLATION TRIP LOGIC.
    B. DTMs SHOWN ON SHEETS 5 & 6 PROCESS SENSOR INPUTS FOR ECCS ISOLATION TRIP LOGIC.
    C. DTMs SHOWN ON SHEETS 7 & 10 PROCESS SENSOR INPUTS FOR AUXILIARY ESF ISOLATION TRIP LOGIC.
    D. TLUs AND OLUs SHOWN ON SHEET 3 AND SHEET 4 PROCESS 2-OUT-OF-4 COINCIDENCE LOGIC FOR MSIV CLOSURE TRIP.
    E. SLUs SHOWN ON SHEETS 5 & 6 PROCESS 2-OUT-OF-4 COINCIDENCE LOGIC FOR ECCS ISOLATION.
    F. SLUs SHOWN ON SHEETS 7 & 10 PROCESS 2-OUT-OF-4 COINCIDENCE LOGIC FOR AUXILIARY ESF ISOLATION.
18. RMUs, MUX, EMS AND NEMS ARE PART OF THE MULTIPLEXING SYSTEM (H23).
19. ALL INSTRUMENT LINES ARE 20A-SS (STAINLESS STEEL) SCHEDULE 40. SAMPLING LINES ARE 32A-SS SCHEDULE 40.

REFERENCES

		MPL NO.
1.	REACTOR CORE ISOLATION COOLING SYSTEM P&ID	E51-1010
2.	NUCLEAR BOILER SYSTEM P&ID	B21-1010
3.	REACTOR WATER CLEANUP SYSTEM P&ID	G31-1010
4.	SAMPLING SYSTEM P&ID	P91-1010
5.	PROCESS RADIATION MONITORING SYSTEM IED	D11-1040
6.	RADWASTE SYSTEM P&ID	K17-1010
7.	INSTRUMENT AIR SYSTEM P&ID	P52-1010
8.	ESSENTIAL MULTIPLEXING SYSTEM	H23-1030
9.	LEAK DETECTION & ISOLATION SYSTEM IBD	E31-1030
10.	REACTOR PROTECTION SYSTEM IED	C71-1040
11.	STANDBY LIQUID CONTROL SYSTEM IBD	C41-1030
12.	SAFETY SYSTEM & LOGIC CONTROL DS	A32-5280
13.	PERFORMANCE MONITORING & CONTROL SYSTEM IED	C91-1010
14.	NEUTRON MONITORING SYSTEM IED	C51-1010
15.	SUPPRESSION POOL CLEAN-UP SYSTEM P&ID	G51-1010
16.	REACTOR BUILDING WATER CLEAN-UP SYSTEM P&ID	P21-1010
17.	HVAC NORMAL COOLING WATER SYSTEM P&ID	P24-1010
18.	STANDBY GAS TREATMENT SYSTEM P&ID	T22-1010
19.	ATMOSPHERIC CONTROL SYSTEM P&ID	T31-1010
20.	NOT USED	
21.	HEATING, VENTILATING & AIR CONDITIONING P&ID	U41-1010

SUPPORTING DOCUMENTS

		MPL NO.
1.	PIPING AND INSTRUMENT DIAGRAM SYMBLOS	A10-3030
2.	PROCESS INSTRUMENTATION	A11-3030
3.	GROUP CLASSIFICATION & CONTAINMENT ISOLATION DIAG	A11-1030

LEGEND

SERIAL MULTIPLEXED DATA

MULTIPLE INSTRUMENT ELECTRICAL WIRING

SERIAL DATA

ABBREVIATIONS:

OLU - OUTPUT LOGIC UNIT

TLU - TRIP LOGIC UNIT

MPL NO. E31-1040

Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 1 of 10)

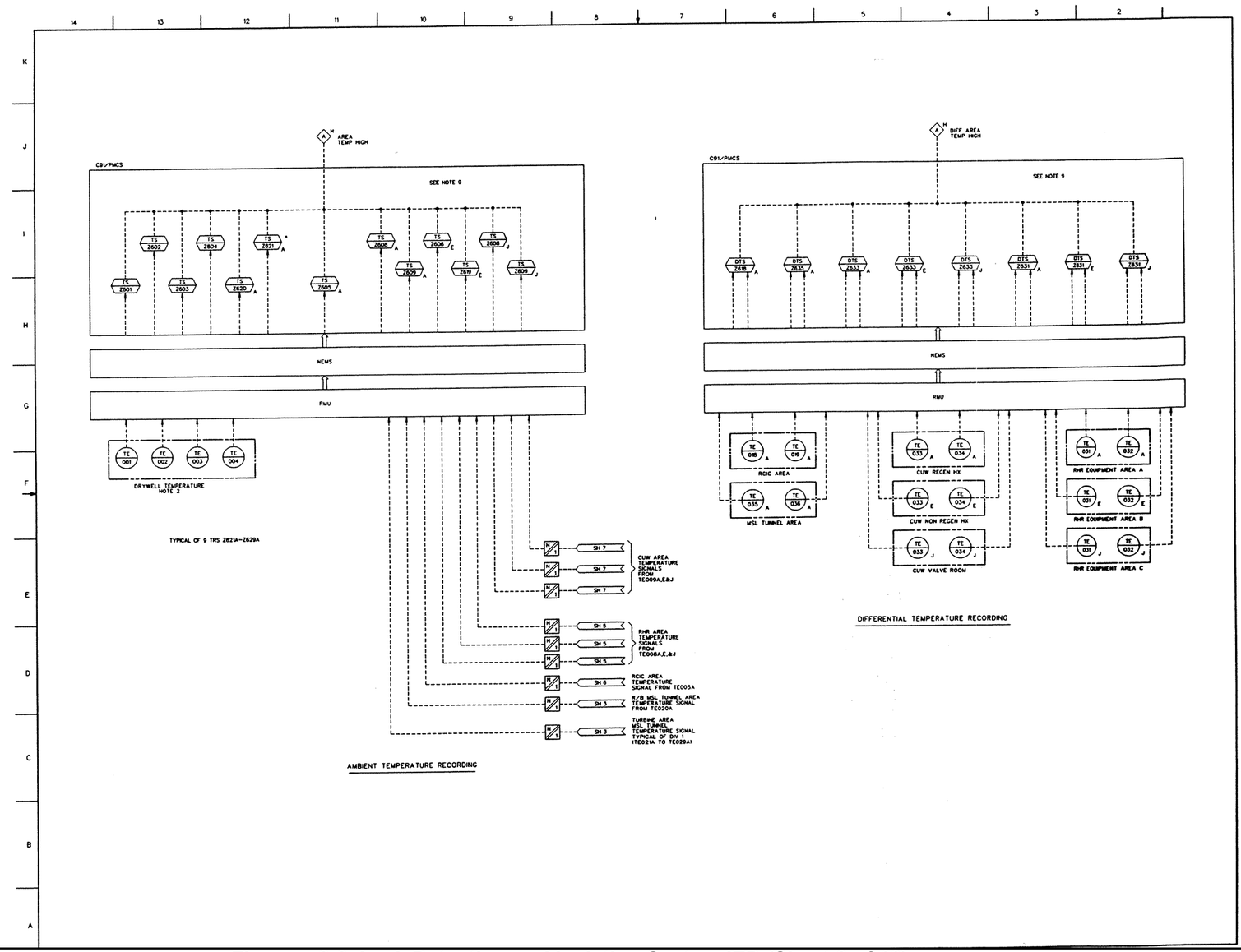


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 2 of 10)

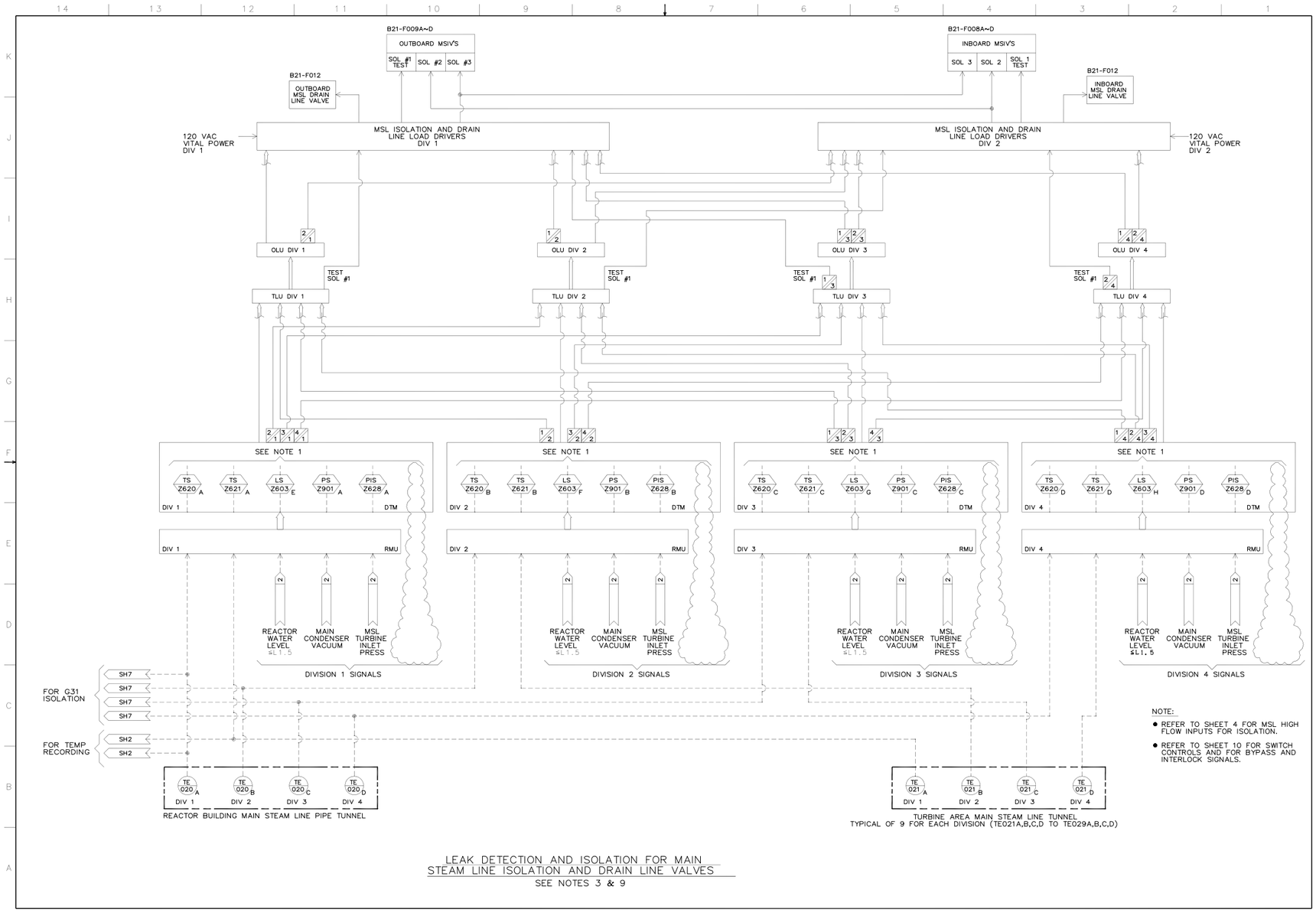


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 3 of 10)

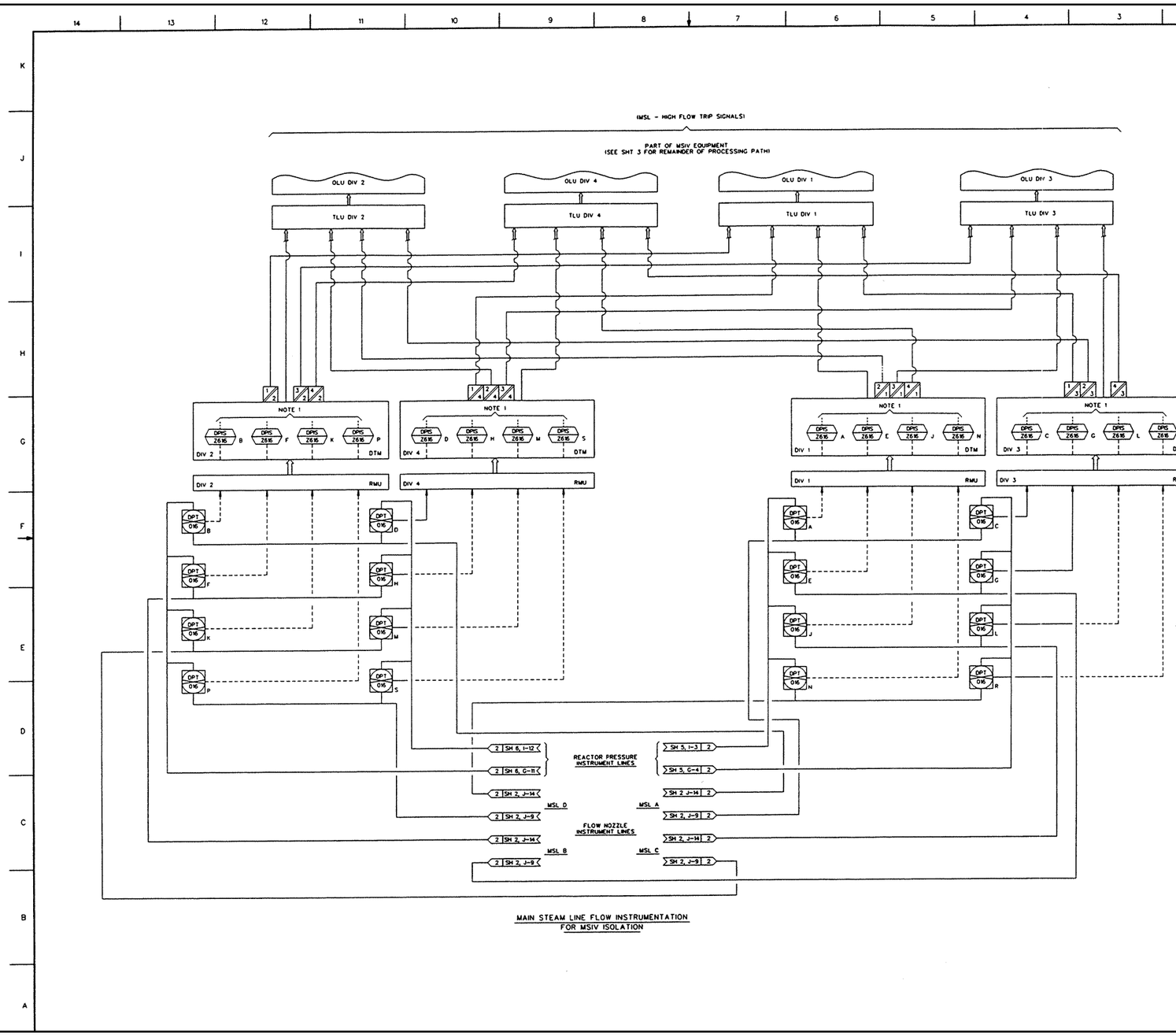


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 4 of 10)

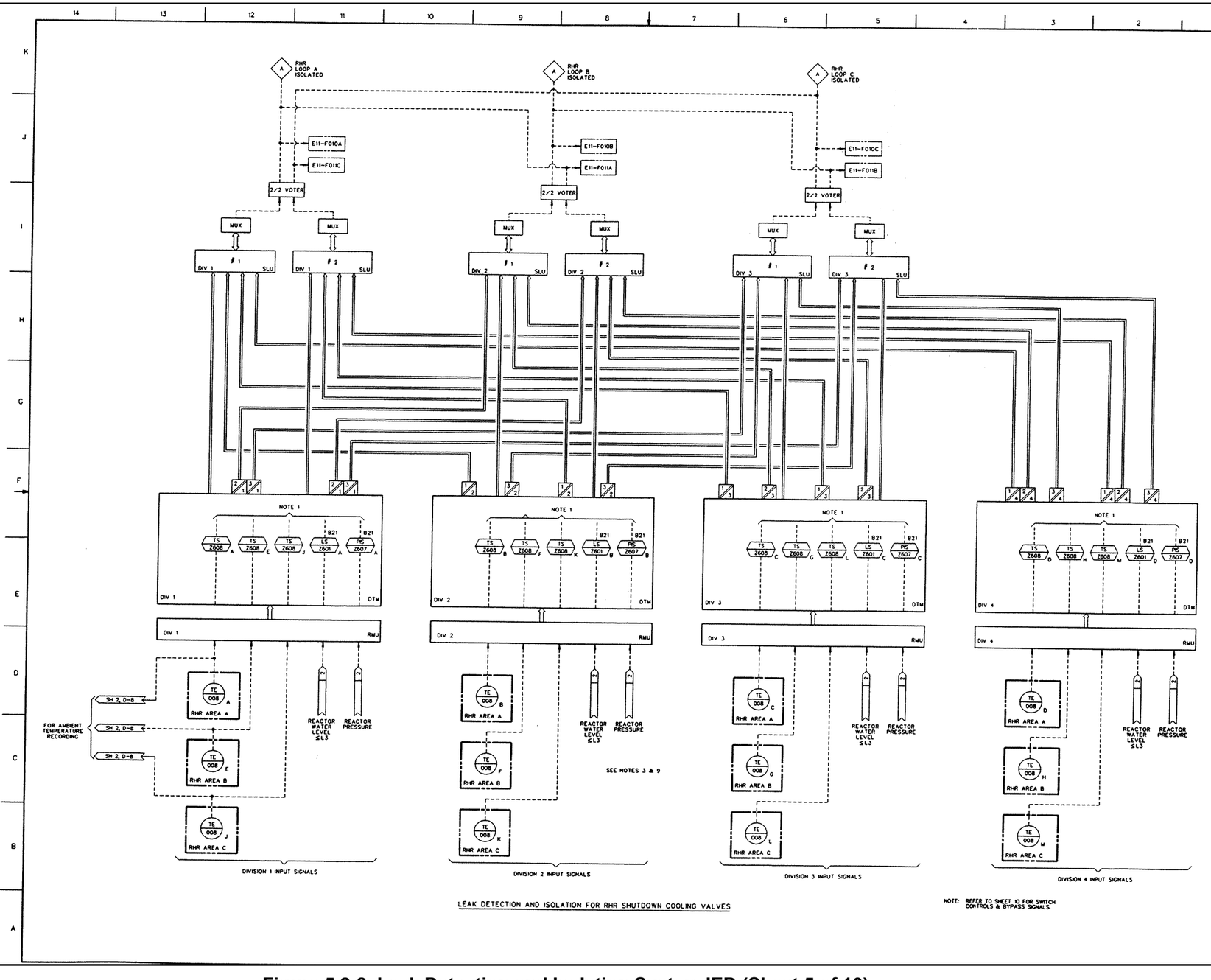


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 5 of 10)

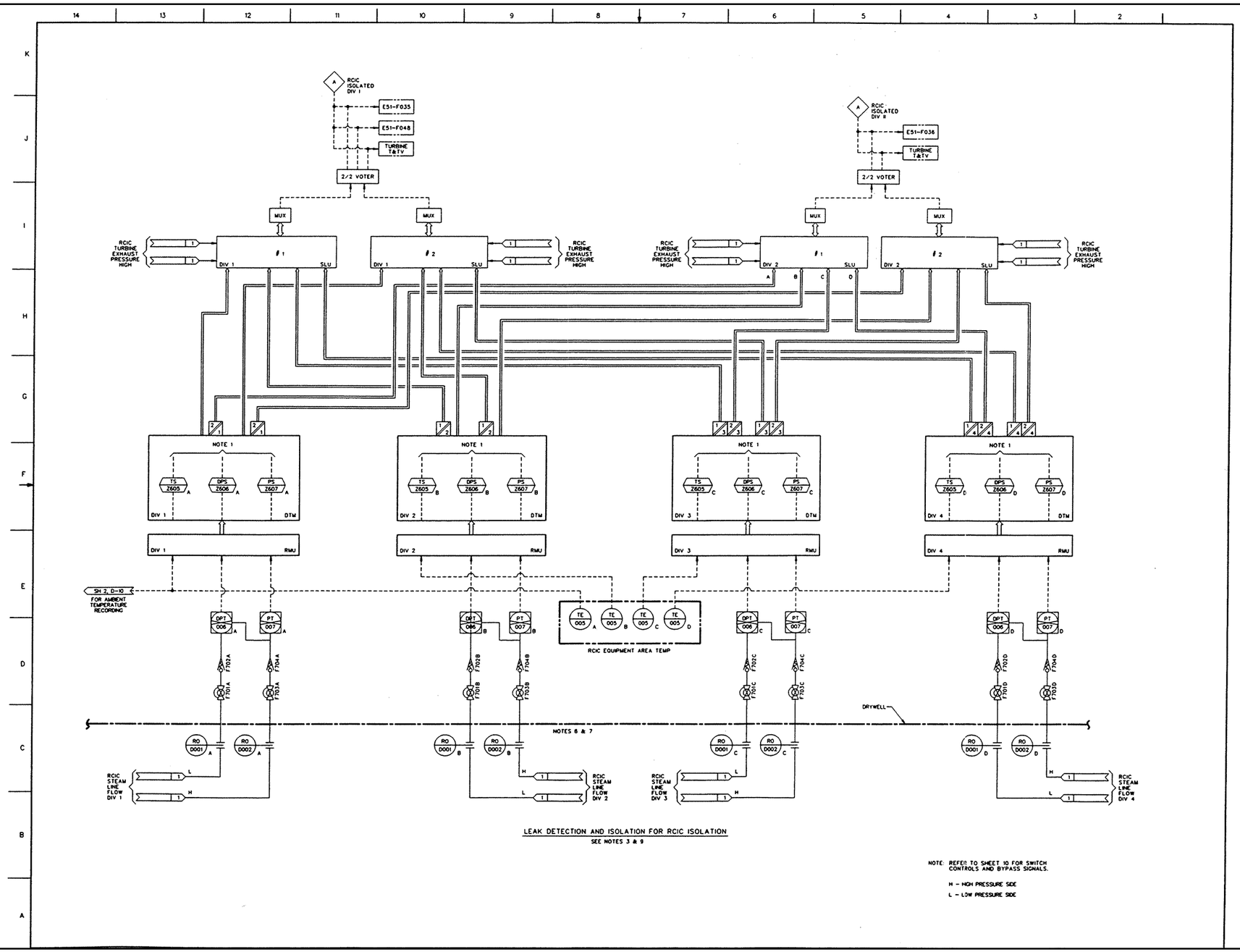


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 6 of 10)

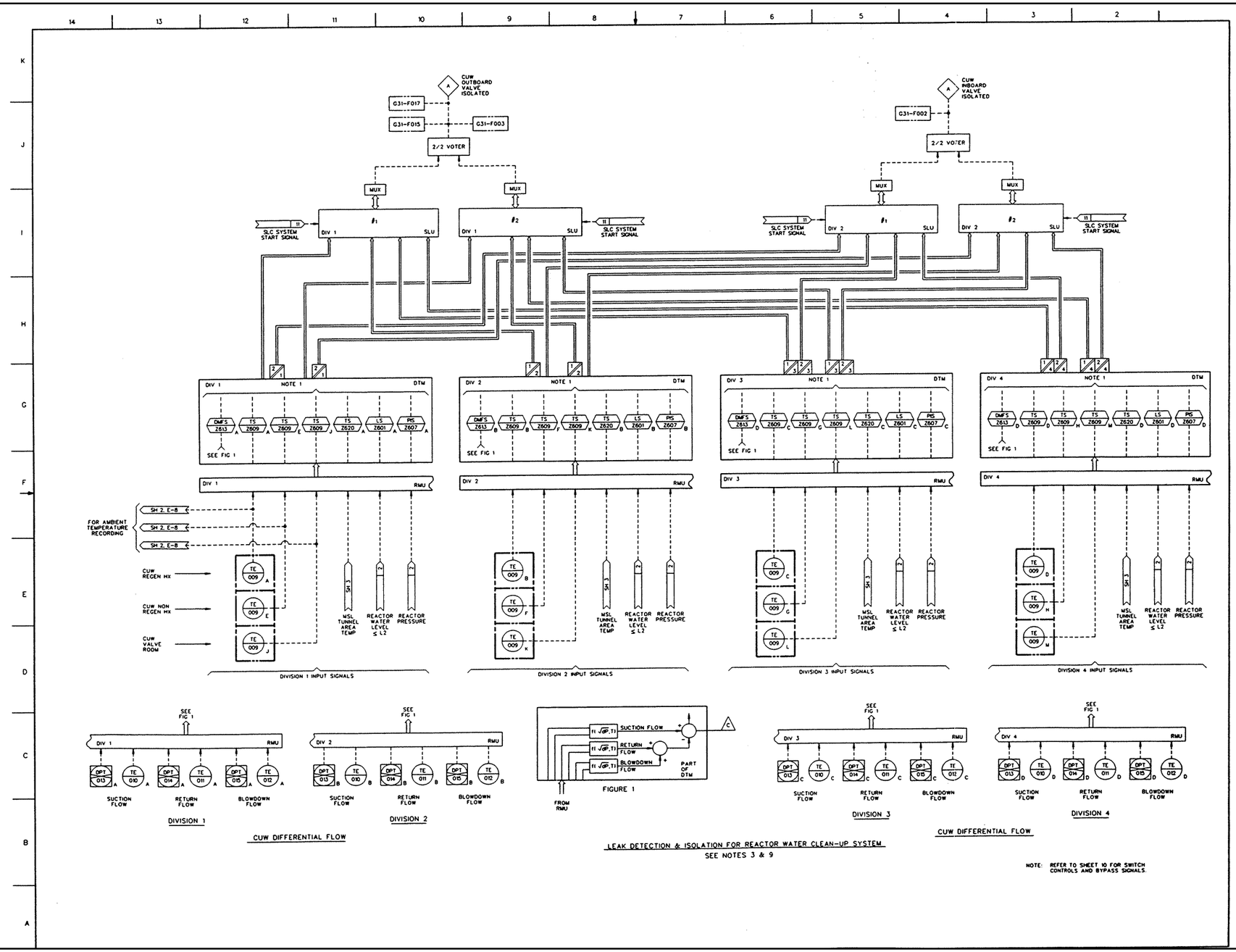


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 7 of 10)

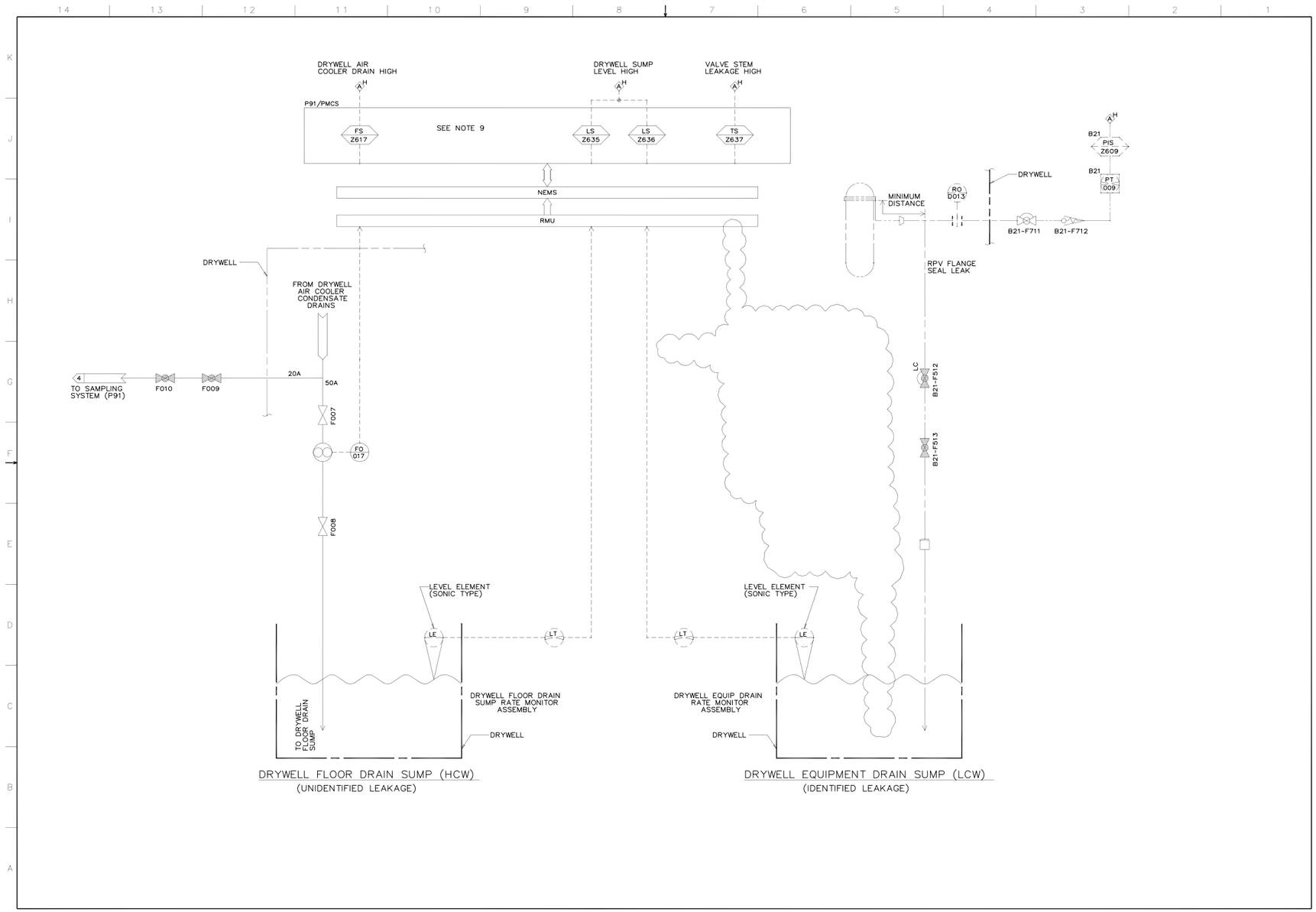


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 8 of 10)

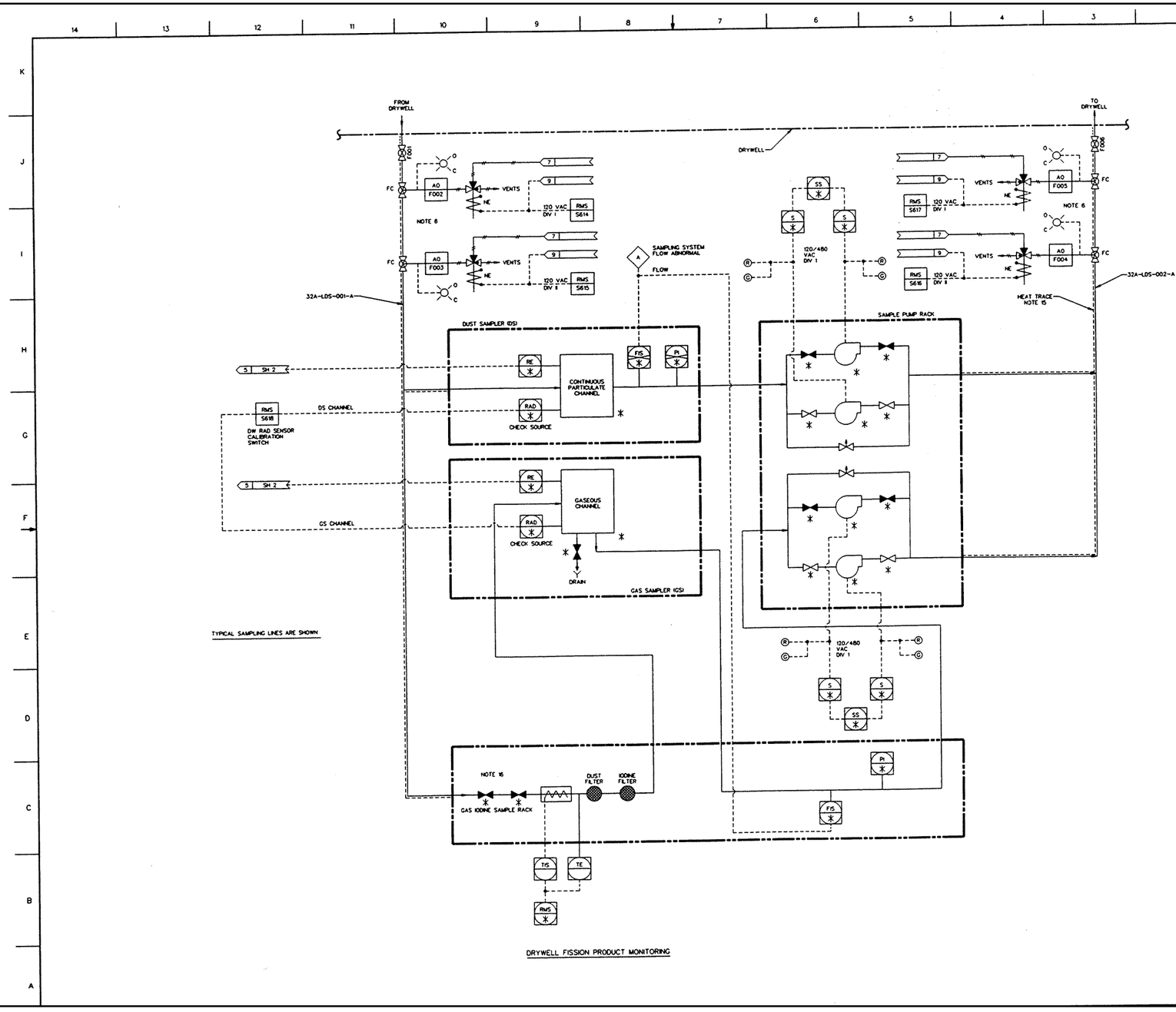


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 9 of 10)

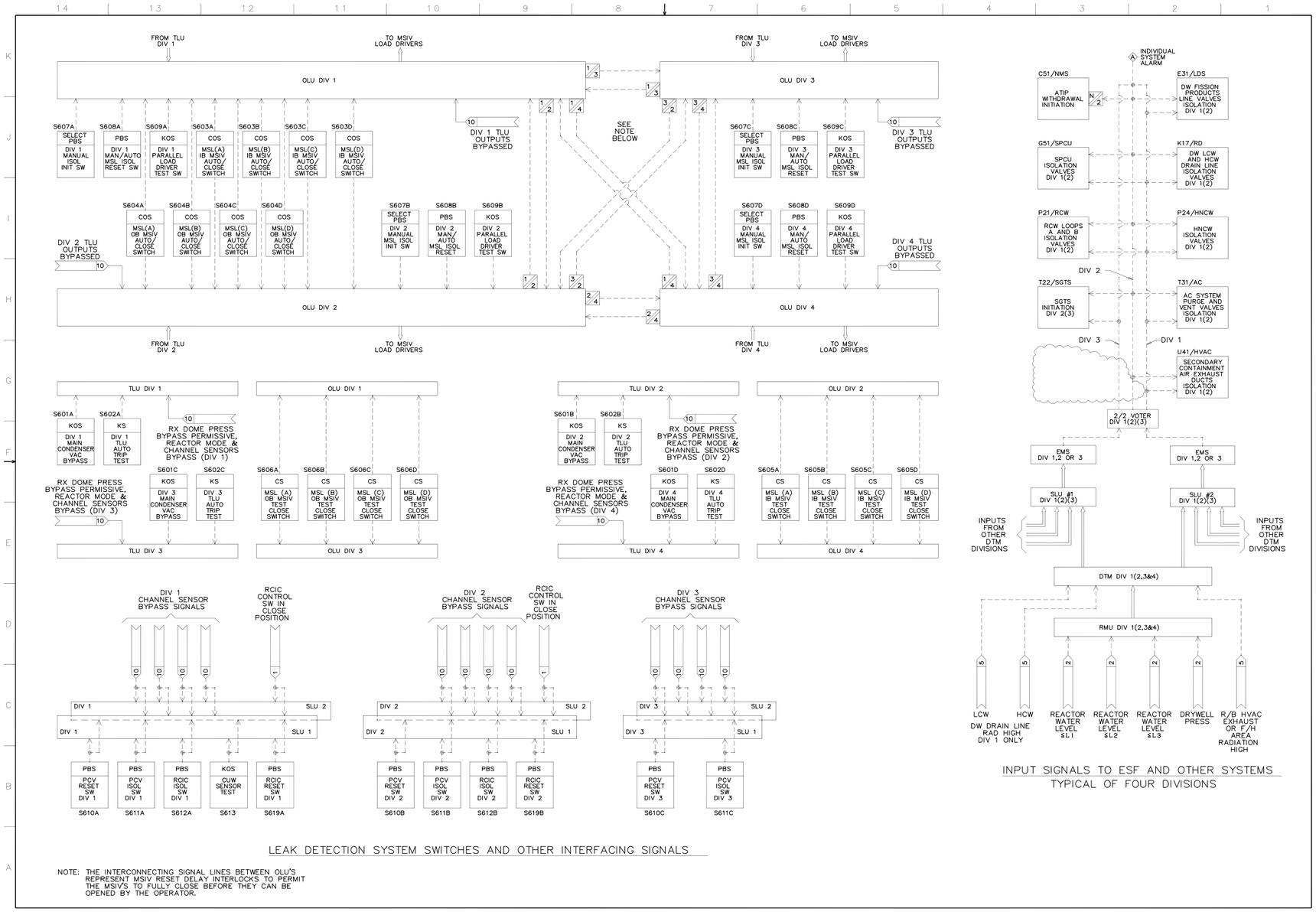
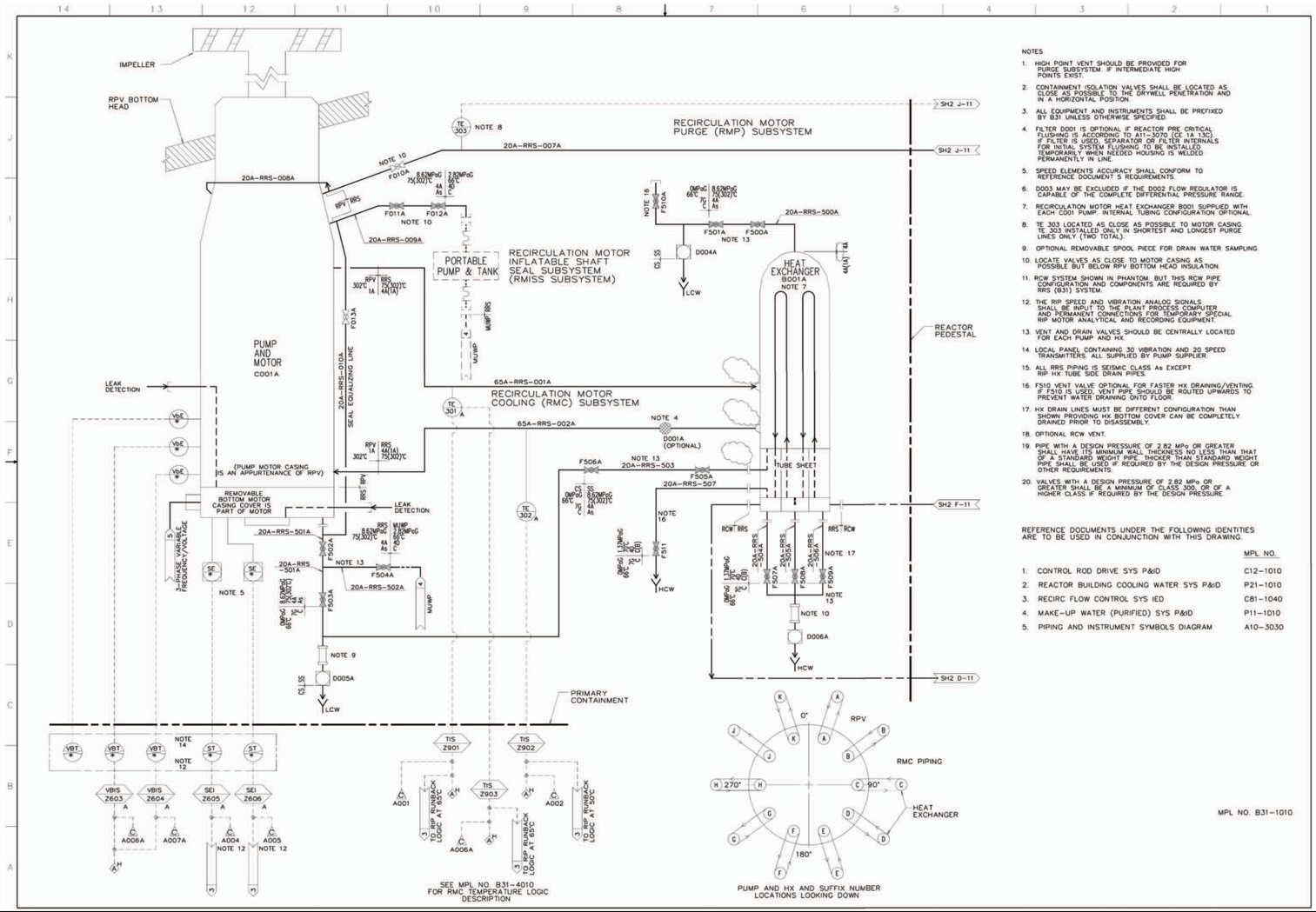


Figure 5.2-8 Leak Detection and Isolation System IED (Sheet 10 of 10)



NOTES:

1. HIGH POINT VENT SHOULD BE PROVIDED FOR PURGE SUBSYSTEM. IF INTERMEDIATE HIGH POINTS EXIST.
2. CONTAINMENT ISOLATION VALVES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO THE DRYWELL PENETRATION AND IN A HORIZONTAL POSITION.
3. ALL EQUIPMENT AND INSTRUMENTS SHALL BE PREFIXED BY B31 UNLESS OTHERWISE SPECIFIED.
4. FILTER D001 IS OPTIONAL IF REACTOR PRE CRITICAL FLUSHING IS ACCORDING TO A11-3070 (CE 1A 13C). IF FILTER IS USED, SEPARATOR OR FILTER INTERNALS FOR INITIAL SYSTEM FLUSHING TO BE INSTALLED TEMPORARILY WHEN NEEDED HOUSING IS WELDED PERMANENTLY IN LINE.
5. SPEED ELEMENTS ACCURACY SHALL CONFORM TO REFERENCE DOCUMENT 5 REQUIREMENTS.
6. D003 MAY BE EXCLUDED IF THE D002 FLOW REGULATOR IS CAPABLE OF THE COMPLETE DIFFERENTIAL PRESSURE RANGE.
7. RECIRCULATION MOTOR HEAT EXCHANGER B001 SUPPLIED WITH EACH C001 PUMP. INTERNAL TUBING CONFIGURATION OPTIONAL.
8. TE 303 LOCATED AS CLOSE AS POSSIBLE TO MOTOR CASING. TE 303 INSTALLED ONLY IN SHORTEST AND LONGEST PURGE LINES ONLY (TWO TOTAL).
9. OPTIONAL REMOVABLE SPOOL PIECE FOR DRAIN WATER SAMPLING.
10. LOCATE VALVES AS CLOSE TO MOTOR CASING AS POSSIBLE BUT BELOW RPV BOTTOM HEAD INSULATION.
11. RCW SYSTEM SHOWN IN PHANTOM, BUT THIS RCW PIPE CONFIGURATION AND COMPONENTS ARE REQUIRED BY RRS (B31) SYSTEM.
12. THE RIP SPEED AND VIBRATION ANALOG SIGNALS SHALL BE INPUT TO THE PLANT PROCESS COMPUTER AND PERMANENT CONNECTIONS FOR TEMPORARY SPECIAL RIP MOTOR ANALYTICAL AND RECORDING EQUIPMENT.
13. VENT AND DRAIN VALVES SHOULD BE CENTRALLY LOCATED FOR EACH PUMP AND HX.
14. LOCAL PANEL CONTAINING 30 VIBRATION AND 20 SPEED TRANSMITTERS. ALL SUPPLIED BY PUMP SUPPLIER.
15. ALL RRS PIPING IS SEISMIC CLASS As EXCEPT RIP HX TUBE SIDE DRAIN PIPES.
16. F510 VENT VALVE OPTIONAL FOR FASTER HX DRAINING/VENTING. IF F510 IS USED, VENT PIPE SHOULD BE ROUTED UPWARDS TO PREVENT WATER DRAINING ONTO FLOOR.
17. HX DRAIN LINES MUST BE DIFFERENT CONFIGURATION THAN SHOWN PROVIDING HX BOTTOM COVER CAN BE COMPLETELY DRAINED PRIOR TO DISASSEMBLY.
18. OPTIONAL RCW VENT.
19. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
20. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.

REFERENCE DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

		MPL NO.
1.	CONTROL ROD DRIVE SYS P&ID	C12-1010
2.	REACTOR BUILDING COOLING WATER SYS P&ID	P21-1010
3.	RECIRC FLOW CONTROL SYS IED	C81-1040
4.	MAKE-UP WATER (PURIFIED) SYS P&ID	P11-1010
5.	PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

Figure 5.4-4 Reactor Recirculation System P&ID (Sheet 1 of 2)

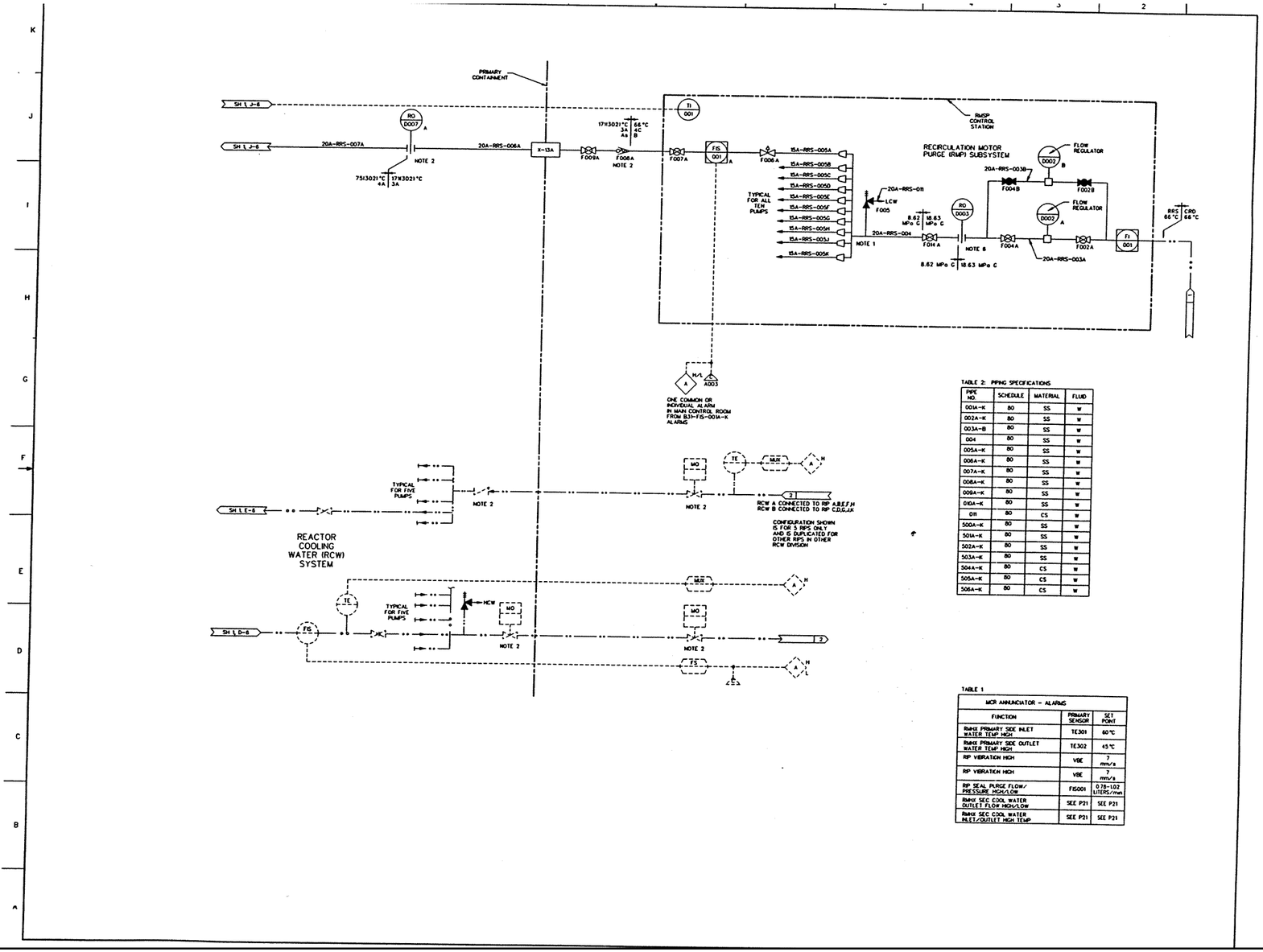


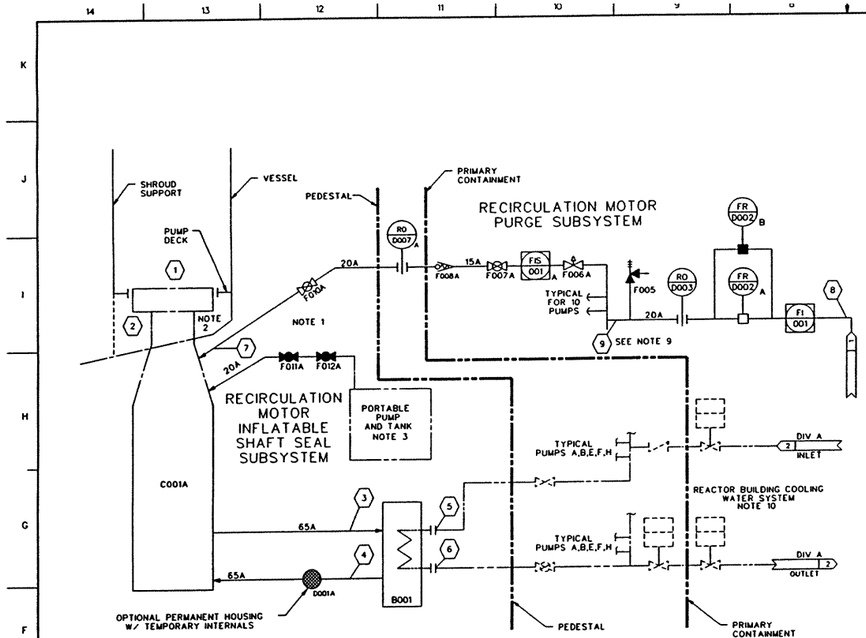
TABLE 2: PIPING SPECIFICATIONS

PIPE NO.	SCHEDULE	MATERIAL	FLUID
001A-K	80	SS	W
002A-K	80	SS	W
003A-B	80	SS	W
004	80	SS	W
005A-K	80	SS	W
006A-K	80	SS	W
007A-K	80	SS	W
008A-K	80	SS	W
009A-K	80	SS	W
010A-K	80	SS	W
011	80	CS	W
500A-K	80	SS	W
501A-K	80	SS	W
502A-K	80	SS	W
503A-K	80	SS	W
504A-K	80	CS	W
505A-K	80	CS	W
506A-K	80	CS	W

TABLE 1

MCR ANNUNCIATOR – ALARMS		
FUNCTION	PRIMARY SENSOR	SET POINT
RWSP PRIMARY SIDE INLET WATER TEMP HIGH	TE301	60°C
RWSP PRIMARY SIDE OUTLET WATER TEMP HIGH	TE302	45°C
RP VIBRATION HIGH	VBE	7 mm/s
RP VIBRATION HIGH	VBE	7 mm/s
RP SEAL PURGE FLOW/ PRESSURE HIGH/LOW	FIS001	0.78-1.02 LITERS/min
RWSP SEC COOL WATER OUTLET FLOW HIGH/LOW	SEE P21	SEE P21
RWSP SEC COOL WATER INLET/OUTLET HIGH TEMP	SEE P21	SEE P21

Figure 5.4-4 Reactor Recirculation System P&ID (Sheet 2 of 2)



RECIRCULATION MOTOR COOLING SUBSYSTEM
REPEATED FOR PUMPS C,D,G,J,K

MODE "A1" REACTOR NORMAL OPERATION (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 111% -- RATED DESIGN
PUMP SPEED ≤ 100% OF RATED (NOTE 6) SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	7700	7700	8	8	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	279	279	55	39	35		30/70	40/60
PRESS MPa A	7.25 TDH=40.0 m	7.54	7.65	7.63	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	121							

MODE "A2" REACTOR NORMAL OPERATION (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 100% -- RATED DESIGN
PUMP SPEED ≤ 90% OF RATED (NOTE 6) SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	6912	6912	7	7	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	278	278	49	38	35		30/70	40/60
PRESS MPa A	7.25 TDH=32.8 m	7.49	7.59	7.57	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	134							

MODE "B1" REACTOR NORMAL OPERATION (9 PUMPS OPERATING)
ONE PUMP OUT OF SERVICE
CORE FLOW = 100% -- (RUNNING PUMP DATA)
PUMP SPEED ≤ 100% OF RATED (NOTE 6) SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	8291	8291	8	8	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	278	278	55	39	35		30/70	40/60
PRESS MPa A	7.25 TDH=35.8 m	7.51	7.59	7.57	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	134							

MODE "B2" REACTOR NORMAL OPERATION -- (9 PUMPS OPERATING)
DATA SHOWN FOR THE PUMP OUT OF SERVICE
CORE FLOW = 100%
PUMP SPEED = 0.0% OF RATED SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	-5370 NOTE 7	-5370 NOTE 7	NAT. CIRC.		30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	278	278			35		30/70	40/60
PRESS MPa A	7.25	7.51	7.59	7.57	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	134							

MODE "C" REACTOR HOT STANDBY -- (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 32.2%
PUMP SPEED = 47.12 rad/s SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	2295	2295	2	2	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	282	282	36	35	35		30/70	40/60
PRESS MPa A	6.70 TDH= ≥ 3.6m	6.73	6.89	6.86	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	16							

MODE "D" REACTOR COLD STARTUP -- (10 PUMPS OPERATING)
ALL PUMPS ARE AT SAME SPEED
CORE FLOW = 32.2%
PUMP SPEED = 47.12 rad/s SEE NOTE 5

POSITION ○	1	2	3	4	5	6	7	8
FLOW m^3/h	2250	2250	2	2	30 Max	30 Max	0.78/1.02 NOTES 4&11	7.8/10.2 NOTES 4&11
TEMP (°C)	<100	<100	36	35	35		10/70	40/60
PRESS MPa A	0.18 TDH= ≥ 3.8m	0.22	0.18	0.22	Δ P = 0.098 Max			15.30
AVAILABLE NPSH (m)	20							

NOTES:
1. ALL VALVES SHOWN IN THIER NORMAL PLANT OPERATING POSITION AND ARE IN THE SAME POSITION FOR ALL OPERATING MODES.
2. THE PURGE FLOW (RWP) 7 FLOWS IN TO THE REACTOR AT 2.
3. THE RECIRCULATION MOTOR INFLATABLE SHAFT SEAL SUBSYSTEM IS USED ONLY DURING SHUTDOWN.
4. XX/YY MEANS MIN/MAX CONDITIONS.
5. VALUES GIVEN FOR POSITION 1-7 ARE FOR EACH ONE OF THE PUMPS OPERATING IN THE DEFINED MODE CONDITION (9 OR 10 PUMPS OPERATING).
6. PUMP RATED SPEED ASSUMED AT 157.08 rad/s.
7. THIS VALUE IS MAXIMUM REVERSE FLOW.
8. TDH VALUES INCLUDE 5 PERCENT MARGIN.
9. POSITION "9" CREATED EXCLUSIVELY FOR DEFINING DESIGN PRESSURE/TEMPERATURE CONDITIONS (NOT PROCESS CONDITIONS).
10. RCW (P21) FOR RIP'S C,D,G,J,K, IS SIMILAR TO RIP'S A,B,E,F,H.
11. POSITIONS 7 & 8 FLOW IS Liter/min FOR ALL MODES.

REFERENCE DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

	MPL NO.
1. CONTROL ROD DRIVE SYS, PFD	C12-1020
2. REAC BUILDING COOLING WATER SYSTEM, PFD	P21-1020
3. REAC RECIRC SYS P&ID	B31-1010
4. PIPING AND INSTRUMENT SYMBOLS DIAGRAM	A10-3030

MPL NO. B31-1020

Figure 5.4-5 Reactor Recirculation System PFD

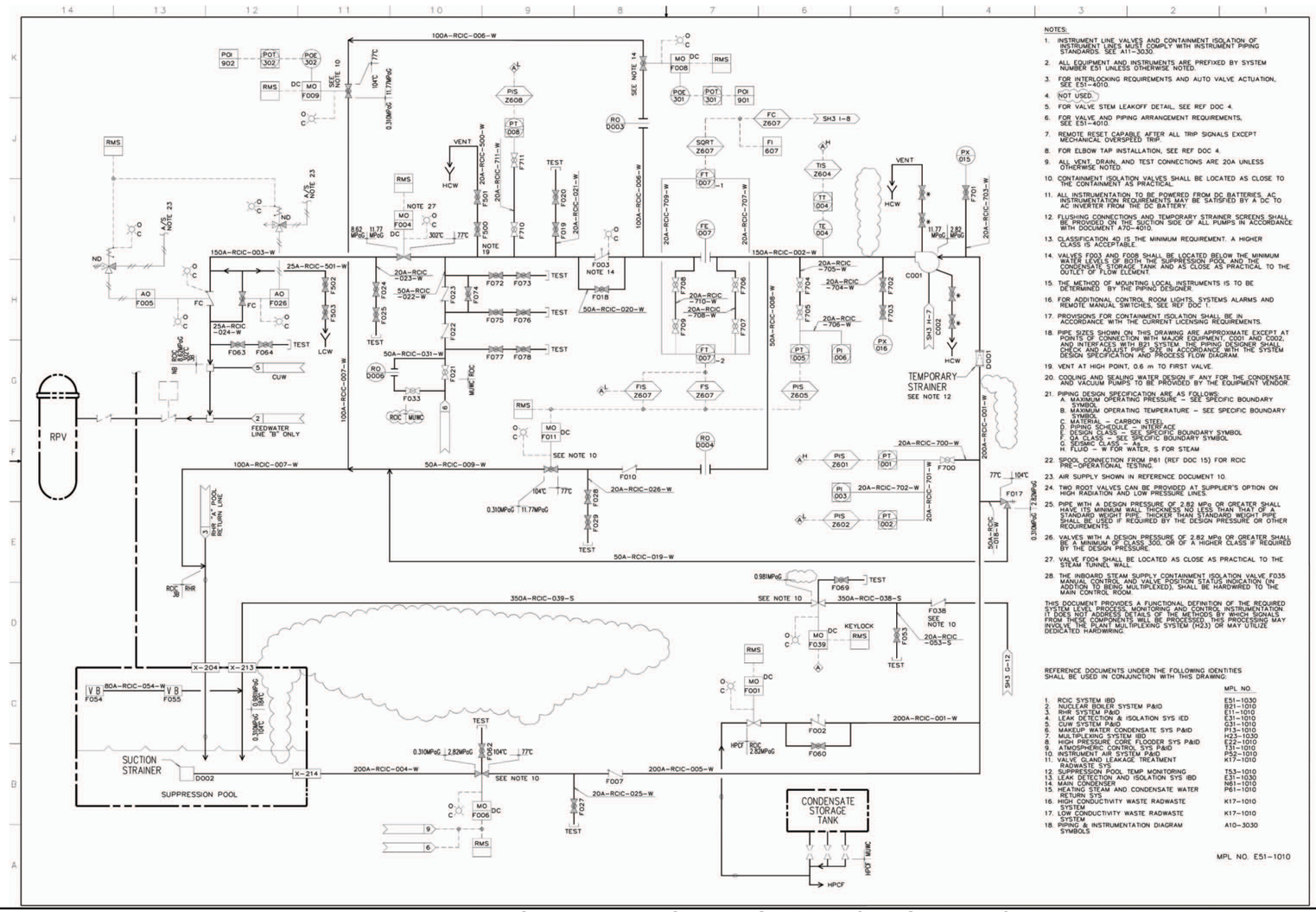


Figure 5.4-8 Reactor Core Isolation Cooling System P&ID (Sheet 1 of 3)

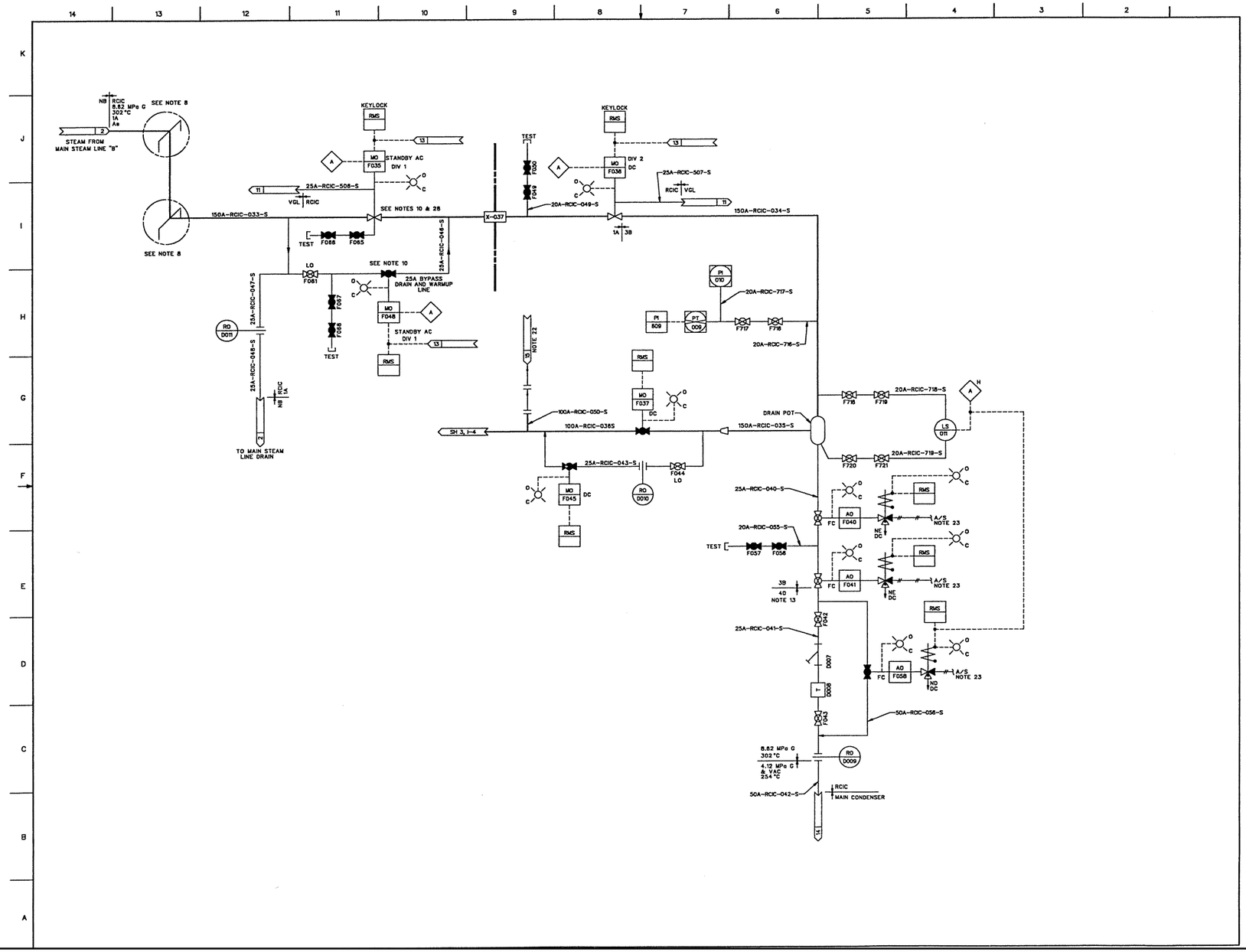


Figure 5.4-8 Reactor Core Isolation Cooling System P&ID (Sheet 2 of 3)

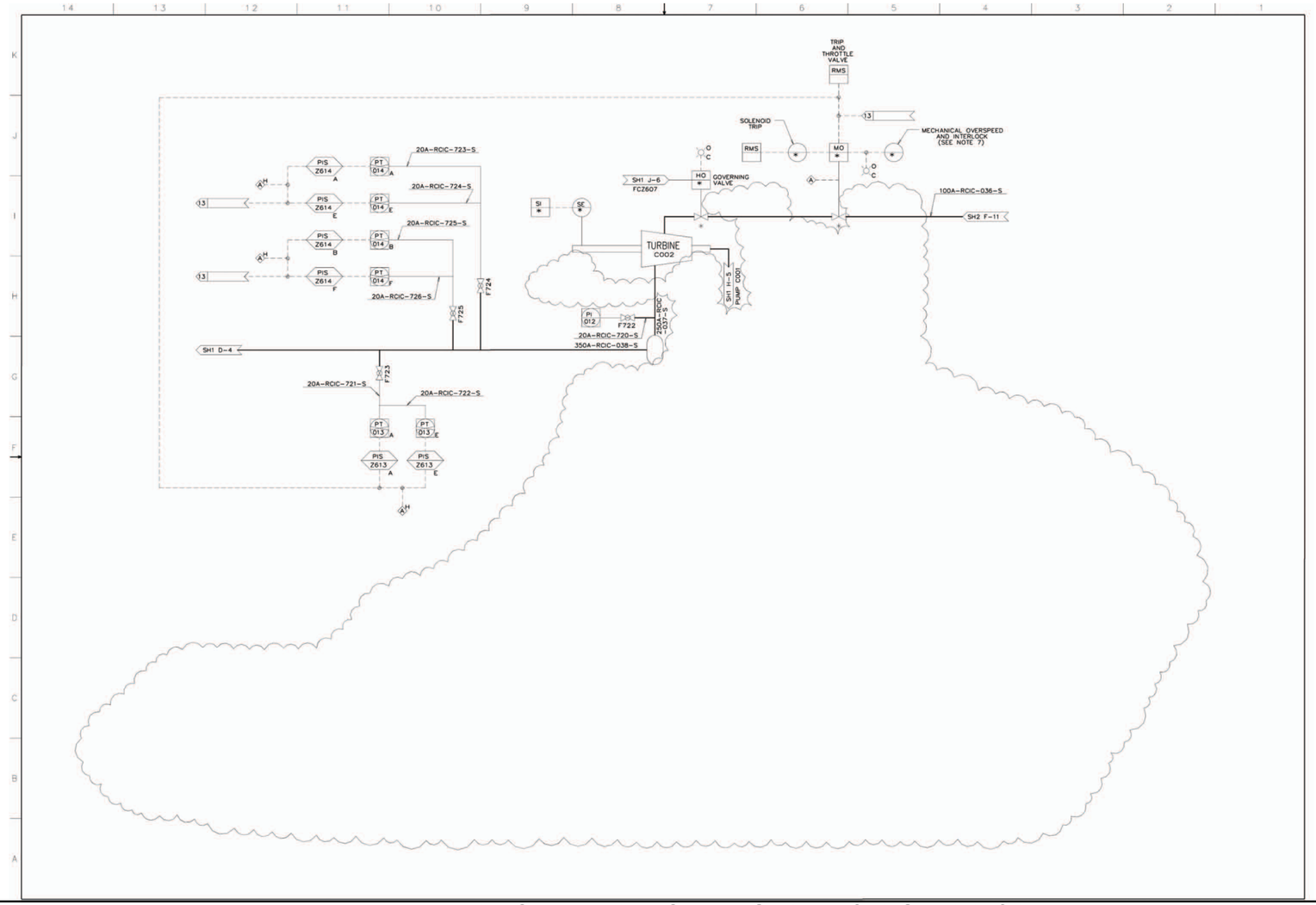
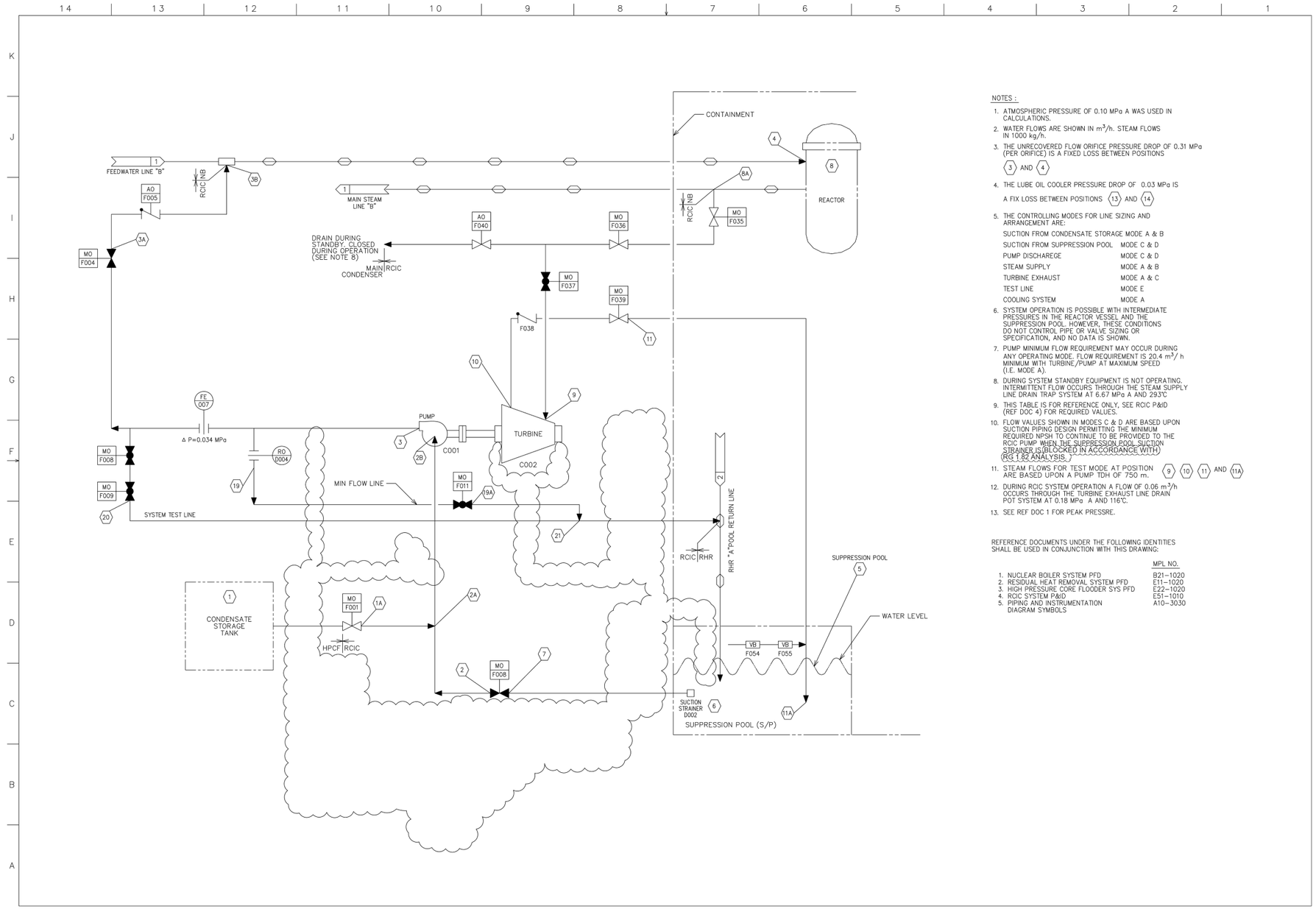


Figure 5.4-8 Reactor Core Isolation Cooling System P&ID (Sheet 3 of 3)



NOTES :

1. ATMOSPHERIC PRESSURE OF 0.10 MPa A WAS USED IN CALCULATIONS.
2. WATER FLOWS ARE SHOWN IN m^3/h. STEAM FLOWS IN 1000 kg/h.
3. THE UNRECOVERED FLOW ORIFICE PRESSURE DROP OF 0.31 MPa (PER ORIFICE) IS A FIXED LOSS BETWEEN POSITIONS (3) AND (4)
4. THE LUBE OIL COOLER PRESSURE DROP OF 0.03 MPa IS A FIX LOSS BETWEEN POSITIONS (13) AND (14)
5. THE CONTROLLING MODES FOR LINE SIZING AND ARRANGEMENT ARE:

SUCTION FROM CONDENSATE STORAGE	MODE A & B
SUCTION FROM SUPPRESSION POOL	MODE C & D
PUMP DISCHAREGE	MODE C & D
STEAM SUPPLY	MODE A & B
TURBINE EXHAUST	MODE A & C
TEST LINE	MODE E
COOLING SYSTEM	MODE A

6. SYSTEM OPERATION IS POSSIBLE WITH INTERMEDIATE PRESSURES IN THE REACTOR VESSEL AND THE SUPPRESSION POOL. HOWEVER, THESE CONDITIONS DO NOT CONTROL PIPE OR VALVE SIZING OR SPECIFICATION, AND NO DATA IS SHOWN.
7. PUMP MINIMUM FLOW REQUIREMENT MAY OCCUR DURING ANY OPERATING MODE. FLOW REQUIREMENT IS 20.4 m^3/h MINIMUM WITH TURBINE/PUMP AT MAXIMUM SPEED (I.E. MODE A).
8. DURING SYSTEM STANDBY EQUIPMENT IS NOT OPERATING. INTERMITTENT FLOW OCCURS THROUGH THE STEAM SUPPLY LINE DRAIN TRAP SYSTEM AT 6.67 MPa A AND 293°C
9. THIS TABLE IS FOR REFERENCE ONLY, SEE RCIC P&ID (REF DOC 4) FOR REQUIRED VALUES.
10. FLOW VALUES SHOWN IN MODES C & D ARE BASED UPON SUCTION PIPING DESIGN PERMITTING THE MINIMUM REQUIRED NPSH TO CONTINUE TO BE PROVIDED TO THE RCIC PUMP WHEN THE SUPPRESSION POOL SUCTION STRAINER IS BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS.
11. STEAM FLOWS FOR TEST MODE AT POSITION ARE BASED UPON A PUMP TDH OF 750 m. (9) (10) (11) AND (11A)
12. DURING RCIC SYSTEM OPERATION A FLOW OF 0.06 m^3/h OCCURS THROUGH THE TURBINE EXHAUST LINE DRAIN POT SYSTEM AT 0.18 MPa A AND 116°C.
13. SEE REF DOC 1 FOR PEAK PRESSRE.

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

	MPL NO.
1. NUCLEAR BOILER SYSTEM PFD	B21–1020
2. RESIDUAL HEAT REMOVAL SYSTEM PFD	E11–1020
3. HIGH PRESSURE CORE FLOODER SYS PFD	E22–1020
4. RCIC SYSTEM P&ID	E51–1010
5. PIPING AND INSTRUMENTATION DIAGRAM SYMBOLS	A10–3030

Figure 5.4-9 Reactor Core Isolation Cooling System PFD (Sheet 1 of 2)

MODE A — SUCTION FROM CONDENSATE STORAGE, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT ELEVATED PRESSURE

POSITION ⬡	1	2A	3	4	5	6	7	8	9	10	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	20	21
FLOW	—	182	188	182	—	—	0	—	16.4	16.4	16.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—	0	0
PRESS MPa A	0.10	*	*	8.24	0.13	—	—	8.24	*	*	0.14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*	—	—
TEMP °C	40	40	40	40	60	—	—	296	SAT	SAT	109	N/A	N/A	N/A	N/A	N/A	N/A	N/A	40	—	—
Max /Min TEMP °C	40/10	40/10	40/10	40/10	77/10	—	—	296/16	296/16	121/16	121/10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	40/10	—	—

MODE B — SUCTION FROM CONDENSATE STORAGE, REACTOR AT LOW PRESSURE, SUPPRESSION POOL AT ELEVATED PRESSURE

POSITION ⬡	1	2A	3	4	5	6	7	8	9	10	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	20	21
FLOW	—	182	188	182	—	—	0	—	5.4	5.3	5.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—	0	0
PRESS MPa A	0.10	*	*	1.18	0.13	—	—	1.18	*	*	0.14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*	—	—
TEMP °C	40	40	40	40	60	—	—	185	SAT	SAT	109	N/A	N/A	N/A	N/A	N/A	N/A	N/A	40	—	—
Max /Min TEMP °C	40/10	40/10	40/10	40/10	77/10	—	—	186/16	186/16	121/16	121/16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	40/10	—	—

MODE C — SUCTION FROM SUPPRESSION POOL, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT LOW PRESSURE

POSITION ⬡	1	2	3	4	5	6	7	8	9	10	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	20	21
FLOW SEE NOTE 2	—	182	188	182	—	—	182	—	16.4	16.4	16.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—	0	0
PRESS MPa A	—	*	*	8.24	0.10	0.14	0.14	8.24	*	*	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*	—	—
TEMP °C	—	60	60	60	60	60	60	296	SAT	SAT	103	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60	—	—
Max /Min TEMP °C	—	77/10	77/10	77/10	77/10	77/10	77/10	296/16	296/16	121/16	121/10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	77/10	—	—

MODE D — SUCTION FROM SUPPRESSION POOL, REACTOR AT LOW PRESSURE, SUPPRESSION POOL AT LOW PRESSURE

POSITION ⬡	1	2	3	4	5	6	7	8	9	10	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	20	21
FLOW SEE NOTE 2	—	182	188	182	—	—	182	—	5.4	5.3	5.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—	0	0
PRESS MPa A	—	*	*	1.18	0.10	0.14	0.13	1.18	*	*	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*	—	—
TEMP °C	—	60	60	60	60	60	60	185	SAT	SAT	103	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60	—	—
Max /Min TEMP °C	—	77/10	77/10	77/10	77/10	77/10	77/10	186/16	186/16	121/16	121/16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	77/10	—	—

MODE E — TEST MODE: SUCTION FROM SUPPRESSION POOL, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT LOW PRESSURE

POSITION ⬡	1	2	3	4	5	6	7	8	9	10	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	20	21
FLOW SEE NOTE 2	—	182	188	—	—	—	182	—	14.15	14.1	14.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—	182	182
PRESS MPa A	—	*	*	—	0.10	0.14	0.14	7.17	*	*	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*	*	*
TEMP °C	—	35	35	—	35	35	35	285	SAT	SAT	103	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35	35	35
Max /Min TEMP °C	—	77/10	77/10	—	77/10	77/10	77/10	285/16	285/16	121/16	121/16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	77/10	77/10	77/10

(SEE NOTE 9)

POSITION ⬡	1A–2A	2–2B	3–3A	3A–3B	6–7	8A–9	10–11	11–11A	N/A	N/A	N/A	N/A	N/A	N/A	3–19	19–19A	19A–21	3–20	20–21
PEAK PRESS MPa G	N/A	N/A	12.65	NOTE 13	N/A	10.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.65	12.65	N/A	12.65	N/A
DESIGN MPa G	2.82	2.82	11.77	8.62	0.31	8.62	8.62	0.98	N/A	N/A	N/A	N/A	N/A	N/A	11.77	11.77	0.31	11.77	0.31
DESIGN TEMP °C	77	77	77	302	77	302	302	104	N/A	N/A	N/A	N/A	N/A	N/A	77	77	104	77	104
ESTIMATED LINE SIZE mmA	200	200	150	150	200	200	350	350	N/A	N/A	N/A	N/A	N/A	N/A	50	50	50	100	100

PEAK PRESSURE– IS THE MAXIMUM PRESSURE ANTICIPATED DURING A TRANSIENT PERIOD WITH ALL OF THE CONTRIBUTING ELEMENTS AT A MAXIMUM. IT WOULD BE EXPECTED TO OCCUR LESS THAN 1% OF SYSTEM OPERATING TIME.

* THE PRESSURE AT THIS POSITION DEPENDS ON PIPING ARRANGEMENT AND MAY BE VARIED WITHIN THE FOLLOWING LIMITS.

POSITION

- ⬡1A⬡ INLET TO PUMP FROM CONDENSATE STORAGE TANK
- ⬡2⬡ MINIMUM NPSH = ⬡20 m⬡ (1 METER ABOVE PUMP FLOOR)
- ⬡3⬡ MAXIMUM PUMP TOTAL DYNAMIC HEAD 900 m FOR MODES A & C 186 m FOR MODES B & D
- ⬡9⬡ MAXIMUM PRESSURE DROP BETWEEN POSITION ⬡8⬡ AND ⬡9⬡ = 0.11 MPa (SEE NOTE 5)
- ⬡10⬡ MAXIMUM PRESSURE ALLOWED FOR RATED SYSTEM PERFORMANCE = 0.18 MPa A
- ⬡19⬡ SUFFICIENT PRESSURE TO RETURN TO SUPPRESSION POOL
- ⬡20⬡ ⬡21⬡ SUFFICIENT PRESSURE TO RETURN TO SUPPRESSION POOL

TABLE 1 VALVE POSITION CHART

VALVE	F004	F006	F001	F035	F036	F037	F039	F011	F009	F008
MODE A	O	C	O	O	O	O	O	C	C	C
MODE B	O	C	O	O	O	O	O	C	C	C
MODE C	O	O	C	O	O	O	O	C	C	C
MODE D	O	O	C	O	O	O	O	C	C	C
MODE E	C	O	C	O	O	O	O	C	T	T

O = OPEN C = CLOSE T = THROTTLE

E51–1020

Figure 5.4-9 Reactor Core Isolation Cooling System PFD (Sheet 2 of 2)

NOTES:

1. PIPING HIGH POINT VENTS AND LOW POINT DRAINS ARE TO BE ADDED AS NECESSARY.
2. INSTRUMENT LINE DESIGN AND VALVING SHALL BE IN ACCORDANCE WITH INSTRUMENT PIPING SPECIFICATION A11-3030.
3. VALVE F028 IS REQUIRED IF THERE IS POTENTIAL FOR OVERPRESSURE.
4. FOR ADDITIONAL CONTROL ROOM LIGHTS, SYSTEM ALARMS AND REMOTE MANUAL SWITCHES, SEE THE RHR IBD E11-1030.
5. PROVISIONS FOR CONTAINMENT ISOLATION SHALL BE IN ACCORDANCE WITH CURRENT LICENSING REQUIREMENTS.
6. VALVE F002 SHALL BE LOCATED AT AN ELEVATION LOWER THAN THE SUPPRESSION POOL MINIMUM WATER LEVEL.
7. PUMP C001 COOLING WATER, IF REQUIRED, IS SPECIFIED IN P21-1010.
8. ALL PRIMARY CONTAINMENT ISOLATION VALVES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO THE CONTAINMENT PENETRATION.
9. ALL MOTOR OPERATED VALVES ARE AC OPERATED UNLESS OTHERWISE NOTED.
10. EQUIPMENT IN SUBSYSTEMS A, B AND C SHALL HAVE THE SUFFIX LETTER A, B AND C RESPECTIVELY AFTER THE EQUIPMENT NUMBER.
11. FLUSHING CONNECTIONS AND TEMPORARY STRAINER SCREENS ON THE SUCTION SIDE OF ALL PUMPS SHALL BE PROVIDED.
12. DRYWELL PIPING RUNS SHALL BE HORIZONTAL OR VERTICAL UPWARDS FROM THE DRYWELL WALL TO THE POINT OF ATTACHMENT WITH THE REACTOR VESSEL.
13. THIS HIGH POINT VENT SHALL BE LOCATED AT THE HIGHEST POINT IN THE PIPING OUTSIDE THE DRYWELL BETWEEN VALVES F017 AND F018.
14. SUBSYSTEM "A" RETURNS TO RPV THROUGH FEEDWATER LINE "A".
15. DISCHARGE LINES FOR COOLING WATER TO BE ROUTED UPSTREAM OF SERVICE WATER RADIATION MONITORS.
16. VALVE F014 SHALL BE AS CLOSE AS POSSIBLE TO THE CONNECTIONS TO THE MAIN LINE.
17. DESIGN LINE SIZE WILL BE FINALIZED AT THE DETAILED DESIGN PHASE. ACTUAL LINE SIZES DETERMINED BY THE PIPING DESIGNER SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENTS.
18. CHECK VALVE F006B(C) SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE REACTOR VESSEL NOZZLE.
19. VALVES F011A, F011B AND F011C ARE IN ELECTRICAL DIVISIONS 2, 3 AND 1 RESPECTIVELY. THE MANUAL CONTROL SWITCHES FOR VALVES F011A, F011B AND F011C ARE IN ELECTRICAL DIVISIONS 1,2 AND 3 RESPECTIVELY.
20. PIPING DESIGN SPECIFICATIONS ARE AS FOLLOWS:
    A. MAXIMUM OPERATING PRESSURE - SEE SPECIFIC BOUNDARY SYMBOL
    B. MAXIMUM OPERATING TEMPERATURE - SEE SPECIFIC BOUNDARY SYMBOL
    C. MATERIAL - CARBON STEEL
    D. PIPING SCHEDULE - INTERFACE
    E. DESIGN CLASS - SEE SPECIFIC BOUNDARY SYMBOL
    F. QC CLASS - SEE SPECIFIC BOUNDARY SYMBOL
    G. SEISMIC CLASS - RHR - As
    H. FLUID - WATER
21. AIR SUPPLY IS FROM INSTRUMENT AIR SYSTEM, SUPPL DOC 15. NITROGEN SUPPLY IS FROM HIGH PRESSURE NITROGEN GAS SUPPLY SYSTEM, SUPPL DOC 4.
22. STRAINER TYPE AS SUPPLIED WITH PUMP C002.
23. FLANGE CONNECTION USED FOR OCCASSIONAL SUPPRESSION POOL DRAINING.
24. DRAIN AND VENT PIPING DESIGN CONDITIONS ARE:

    MAXIMUM OPERATING PRESSURE - SAME AS MAIN LINE UPSTREAM OF VALVE (ATMOSPHERIC PRESSURE FROM LAST VALVE TO FUNNEL).

    MAXIMUM OPERATING TEMPERATURE - SAME AS MAIN LINE UPSTREAM OF VALVE (66°C FROM LAST VALVE TO FUNNEL).
25. UNIQUE PIPE NUMBERS ARE ASSIGNED SEQUENTIALLY FOR EACH RHR LOOP. RANGES OF NUMBERS ARE ALLOCATED FOR EACH LOOP AND TYPE OF PIPE AS FOLLOWS:

	LOOP A	LOOP B	LOOP C
PROCESS PIPING	001-100	101-200	201-300
DRAIN AND VENT PIPING	500-529	530-559	560-589
INSTRUMENT PIPING	700-729	730-759	760-789

26. THE VALVE TYPE FOR F043 AND F044 WILL BE DECIDED IN THE FINAL DESIGN.
27. THE RECORDING FUNCTION IS ACCOMPLISHED THROUGH MICROPROCESSOR CHANNEL OUTPUT TO PRINTER.
28. TWO ROOT VALVES CAN BE PROVIDED AT THE SUPPLIERS OPTION ON HIGH RADIATION/LOW PRESSURE DRAIN AND VENT LINES.
29. BYPASS VALVES F036A,B,C SHALL BE UTILIZED FOR WARMING UP THE RHR PIPING SYSTEM. THE FLOW WILL BE FROM THE REACTOR SIDE. THESE VALVES ARE ALSO USED DURING OPERABILITY TESTING OF TESTABLE CHECK VALVE F006.
30. PIPE WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL HAVE ITS MINIMUM WALL THICKNESS NO LESS THAN THAT OF A STANDARD WEIGHT PIPE. THICKER THAN STANDARD WEIGHT PIPE SHALL BE USED IF REQUIRED BY THE DESIGN PRESSURE OR OTHER REQUIREMENTS.
31. VALVES WITH A DESIGN PRESSURE OF 2.82 MPa OR GREATER SHALL BE A MINIMUM OF CLASS 300, OR OF A HIGHER CLASS IF REQUIRED BY THE DESIGN PRESSURE.
32. [LOCATE THE GATE VALVE OF THIS SPRING SECTION AT A DISTANCE GREATER THAN OR EQUAL TO 25 PIPE DIAMETERS FROM THE RPV NOZZLE. OTHERWISE, PERFORM STRESS ANALYSIS TO SHOW THAT STRESSES AND FATIGUE ARE ACCEPTABLE PER THE ASME CODE FROM THE CONCERN OF NRC BULLETIN 88-08, SUPPLEMENT 3(APRIL 11,1989) ON POTENTIAL THERMAL STRATIFICATION AND STRIPING DUE TO PERIODIC EXTERNAL LEAKAGE OF THE GATE VALVE.] *
33. THE THREE RETURN LINES BRINGING FLOW INTO THE SUPPRESSION POOL (S/P) SHALL HAVE AN EXIT DESIGN THAT PROMOTES S/P CIRCULATION AND MIXING FOR EFFICIENT COOLING. CONSIDERATIONS SHALL INCLUDE: (1) DIRECTING THE FLOW HORIZONTALLY WITH THE THREE LINES WORKING TOGETHER TO ACHIEVE CIRCULATION AROUND THE S/P'S ANNULAR SHAPE, (2) DIRECTING THE RETURN FLOW TO AVOID DIRECTLY ENTERING A SUCTION INLET, AND (3) SEPARATE THE RETURN LINES FROM THE SUCTION STRAINERS IN THE ELEVATION PLANE TO THE GREATEST EXTENT PRACTICAL. WITH THE RETURN LINES LOCATED NEAR THE S/P TOP AND THE SUCTION STRAINERS NEAR THE S/P BOTTOM.
34. VALVE TO HAVE MANUAL HAND WHEEL OPERABLE AT LOW DELTA PRESSURE FOR POTENTIAL NEED DURING FIRE WATER ADDITION MODE (NOTE VALVES F005C, F017C, AND F018C).
35. VALVE F005A SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE STEAM TUNNEL WALL.

* SEE SUBSECTION 3.9.1.7.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

	MPL NO.
1. RESIDUAL HEAT REMOVAL SYSTEM PFD	E11-1020
2. RESIDUAL HEAT REMOVAL SYSTEM IBD	E11-1030
3. SAMPLING SYSTEM P&ID	P91-1010
4. HIGH PRESSURE NITROGEN GAS SUPPLY SYSTEM P&ID	P54-1010
5. REACTOR WATER CLEANUP SYSTEM P&ID	G31-1010
6. FUEL POOL COOLING AND CLEANUP SYSTEM P&ID	G41-1010
7. VALVE GLAND LEAKAGE TREATMENT, RADWASTE SYSTEM P&ID	K17-1010
8. MAKE-UP WATER SYSTEM (CONDENSATE) P&ID	P13-1010
9. REMOTE SHUTDOWN SYSTEM IED	C61-1040
10. HIGH PRESSURE CORE FLOODER P&ID	E22-1010
11. REACTOR CORE ISOLATION COOLING SYSTEM P&ID	E51-1010
12. NUCLEAR BOILER SYSTEM P&ID	B21-1010
13. HIGH CONDUCTIVITY WASTE, RADWASTE SYSTEM P&ID	K17-1010
14. REACTOR BUILDING COOLING WATER SYSTEM P&ID	P21-1010
15. INSTRUMENT AIR SYSTEM P&ID	P52-1010
16. NOT USED	
17. NUCLEAR BOILER SYSTEM IBD	B21-1030
18. SAMPLING SYSTEM P&ID (INCLUDES PASS)	P91-1010
19. FIRE PROTECTION SYSTEM P&ID	U43-1010
20. LOW CONDUCTIVITY WASTE, RADWASTE SYSTEM P&ID	K17-1010
21. REACTOR ICD	B11-2020

SUPPORTING DOCUMENTS

1. PIPING AND INSTRUMENT SYMBOLS	A10-3030

LEGEND:

—▷|◁— LEAK TESTABLE DOUBLE DISC GATE VALVE

MPL NO. E11-1010

Figure 5.4-10 Residual Heat Removal System P&ID (Sheet 1 of 7)

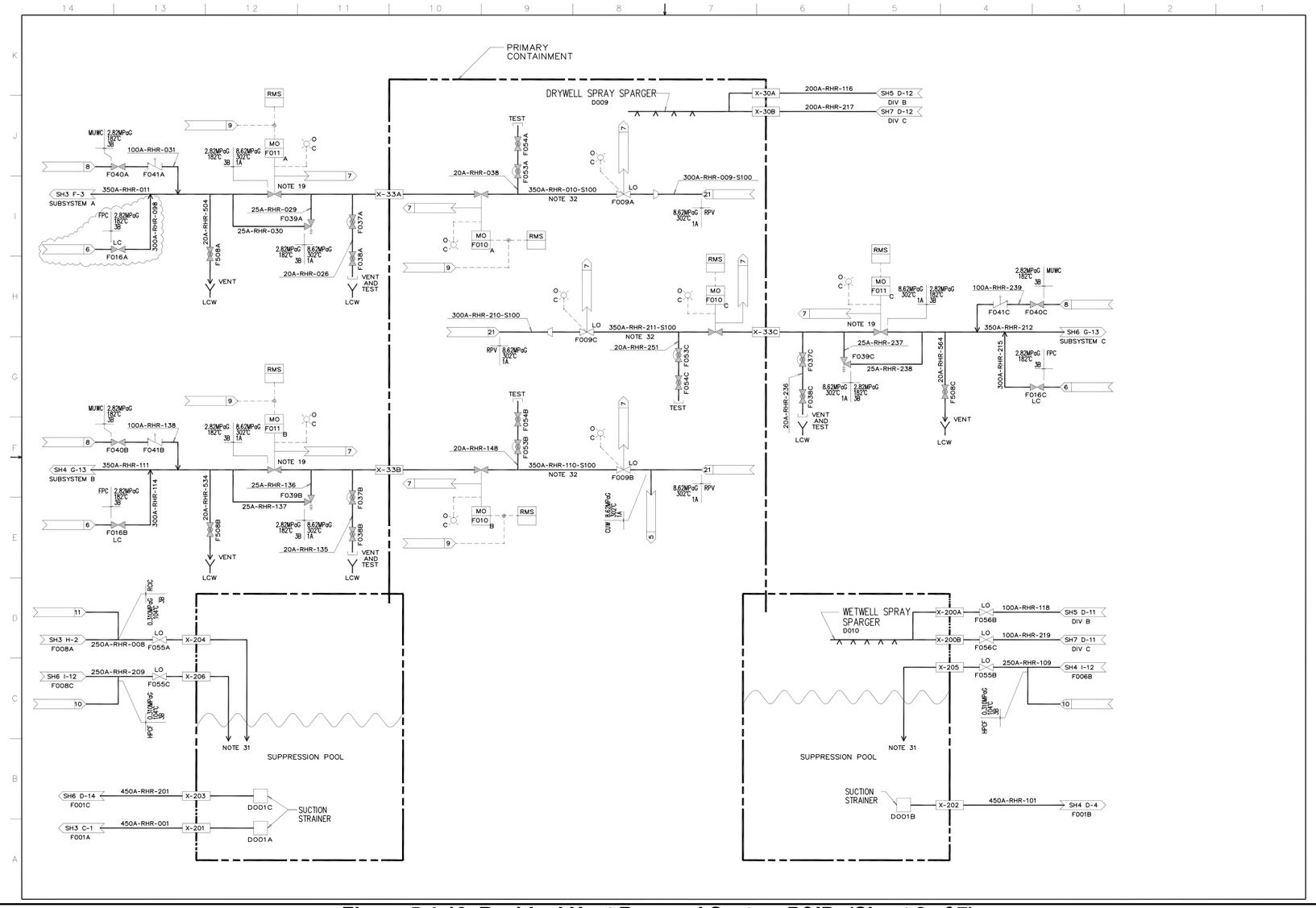


Figure 5.4-10 Residual Heat Removal System P&ID (Sheet 2 of 7)

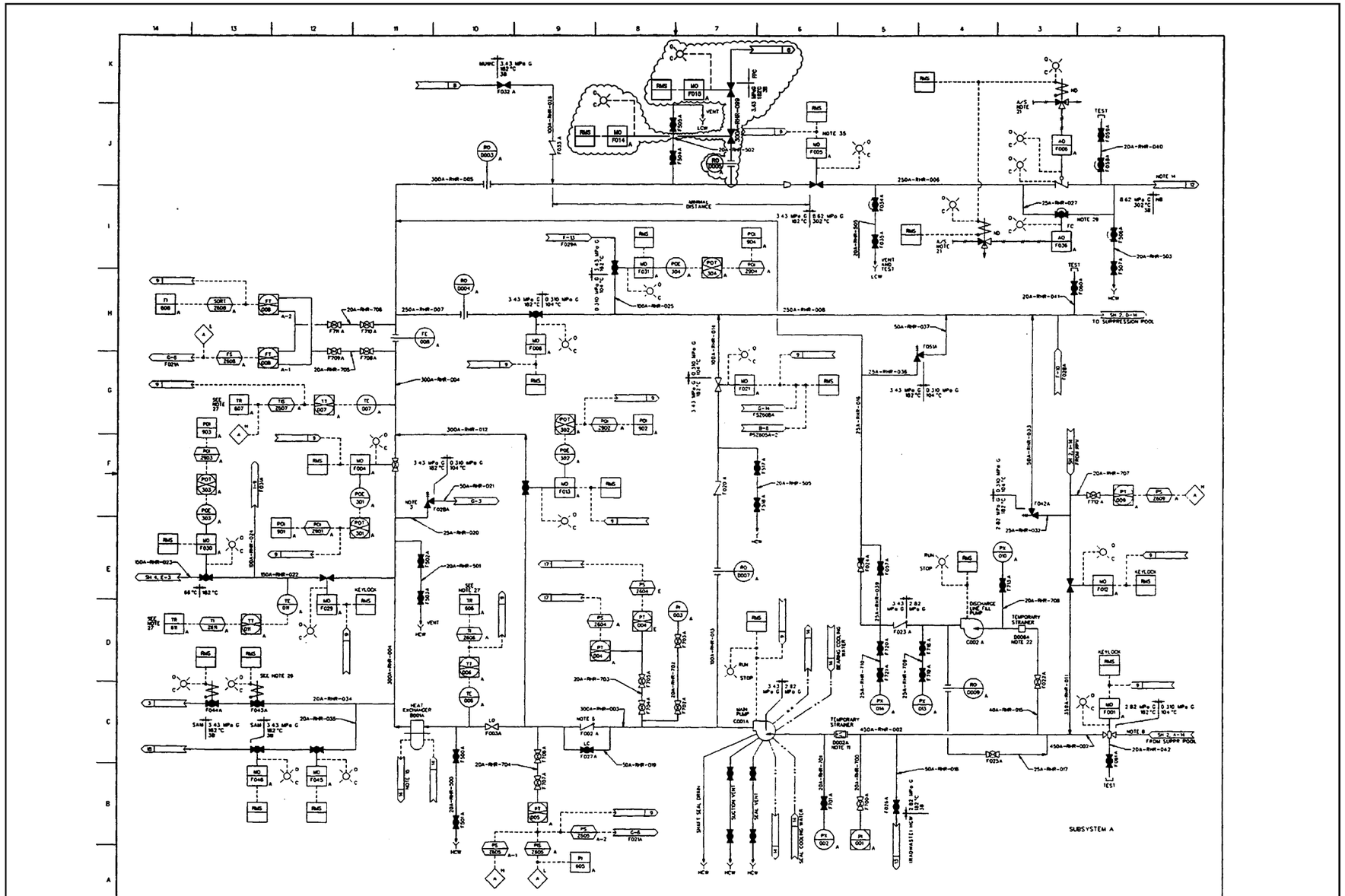


Figure 5.4-10 Residual Heat Removal System P&ID (Sheet 3 of 7)

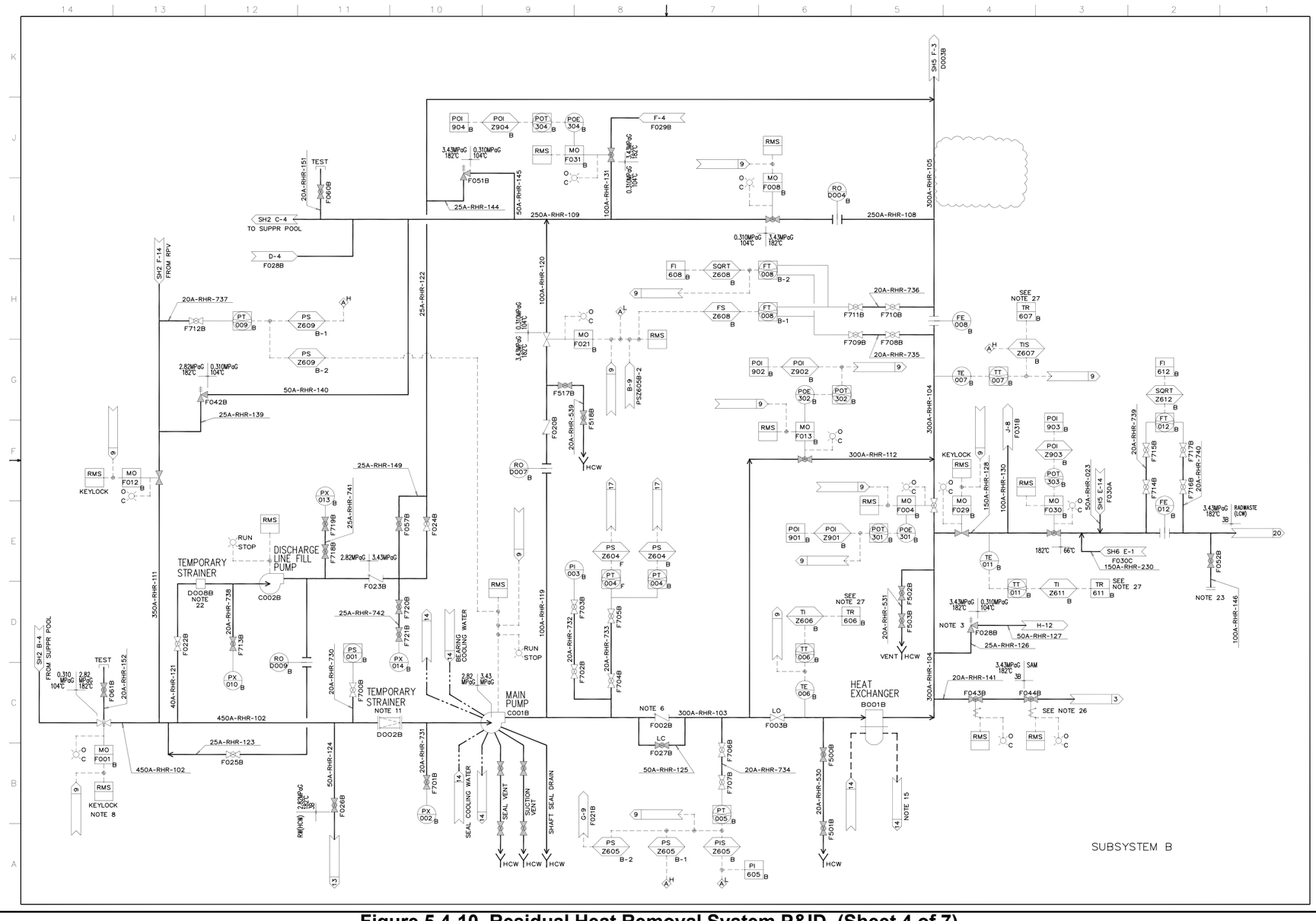


Figure 5.4-10 Residual Heat Removal System P&ID (Sheet 4 of 7)

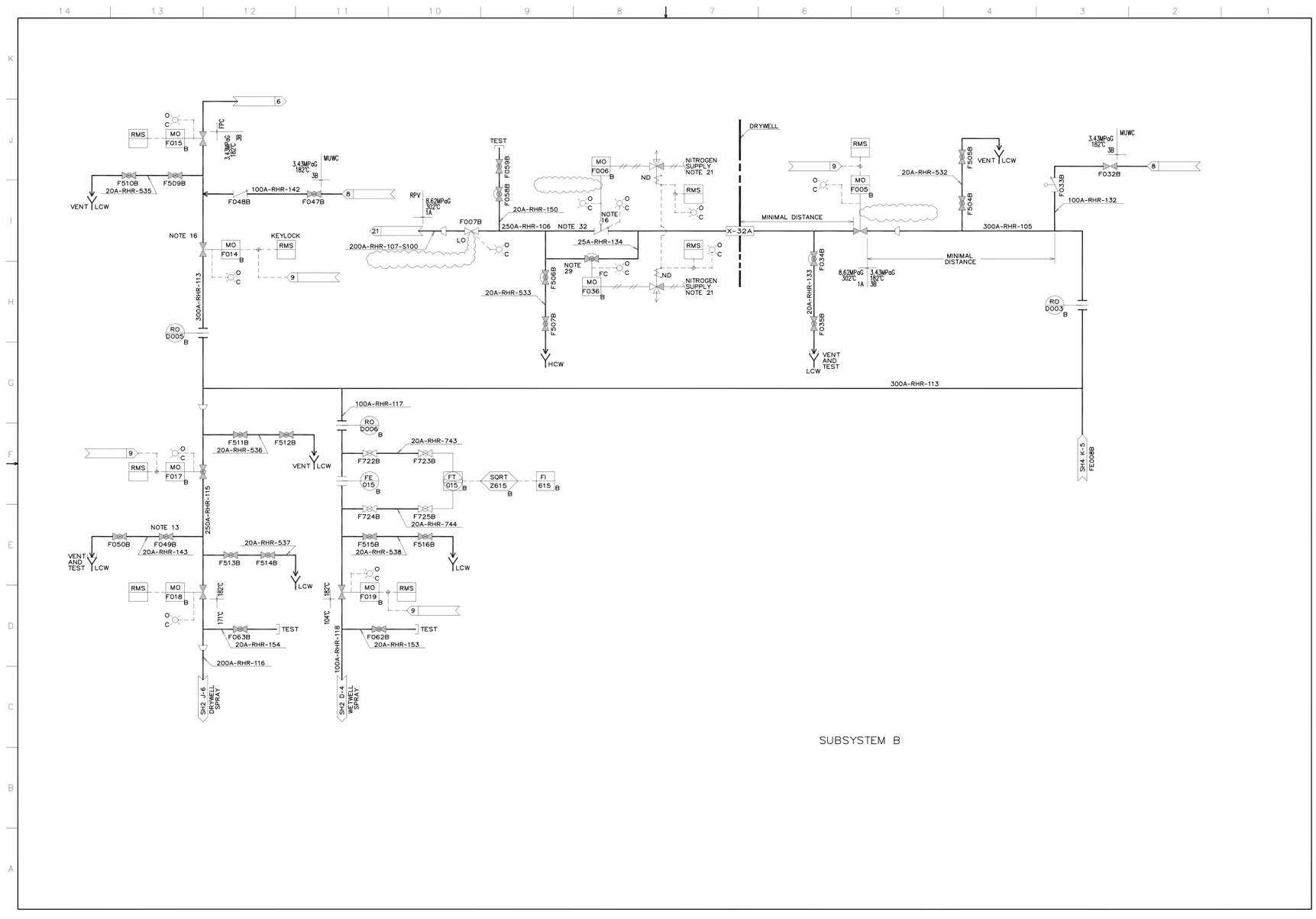


Figure 5.4-10 Residual Heat Removal System P&ID (Sheet 5 of 7)

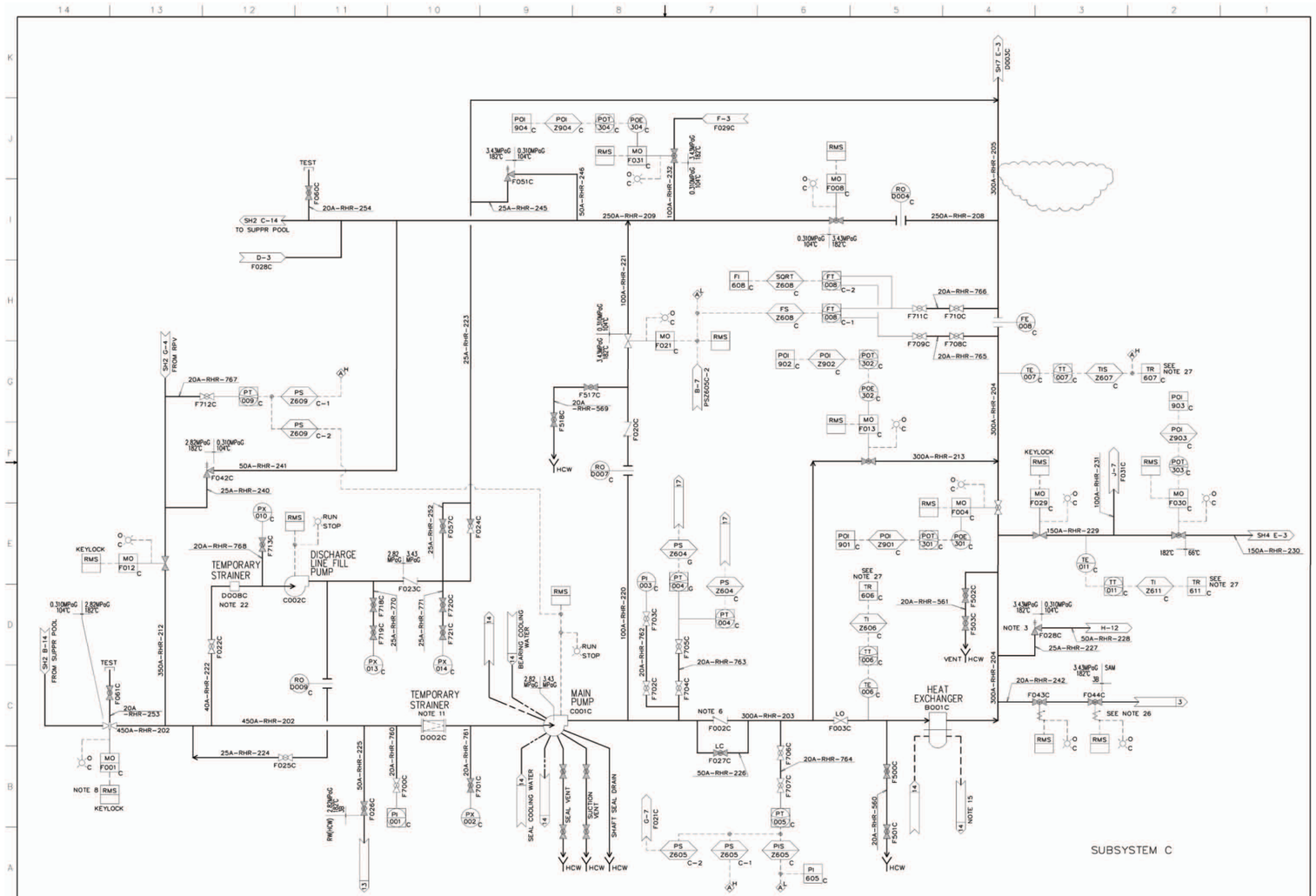


Figure 5.4-10 Residual Heat Removal System P&ID (Sheet 6 of 7)

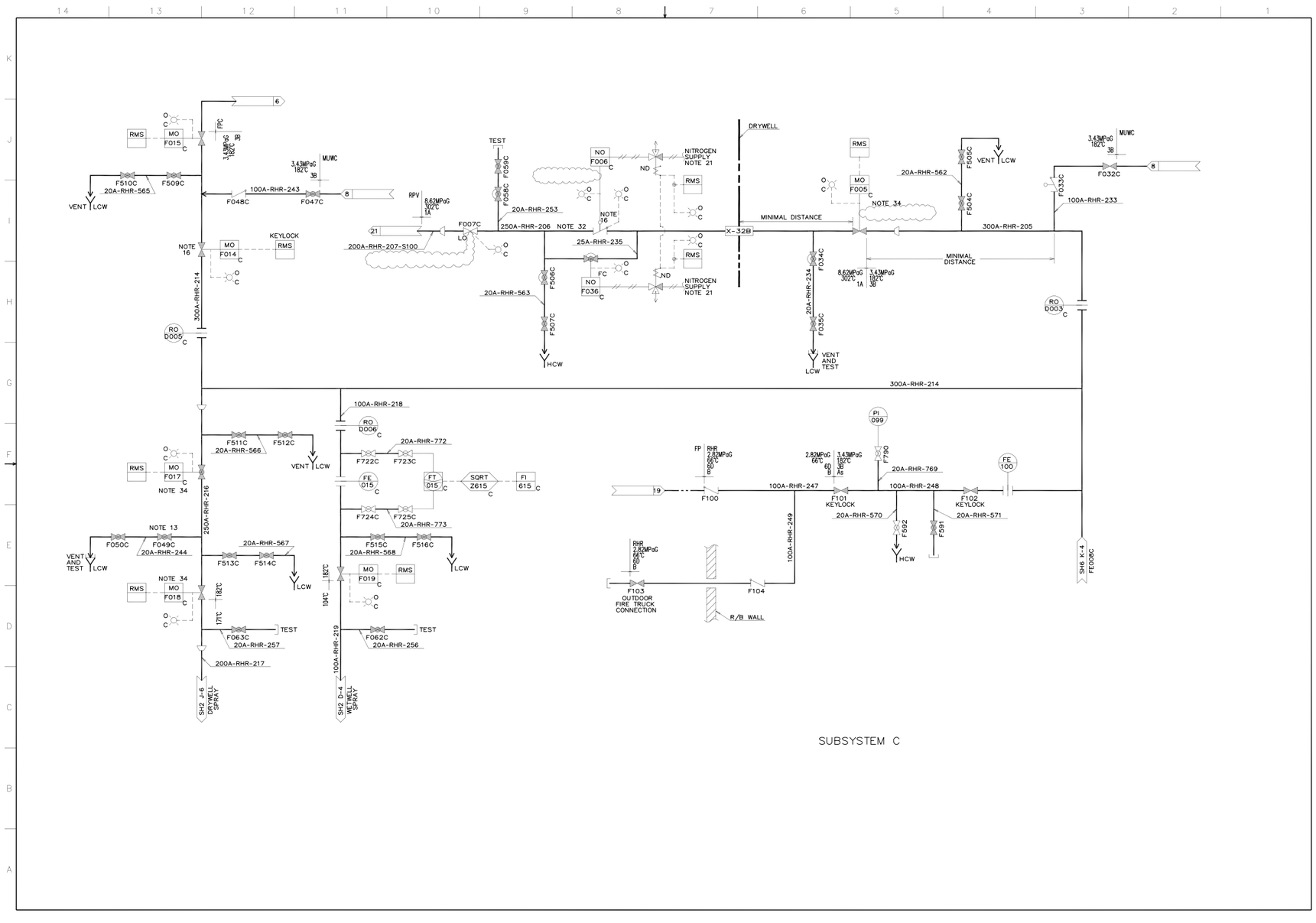
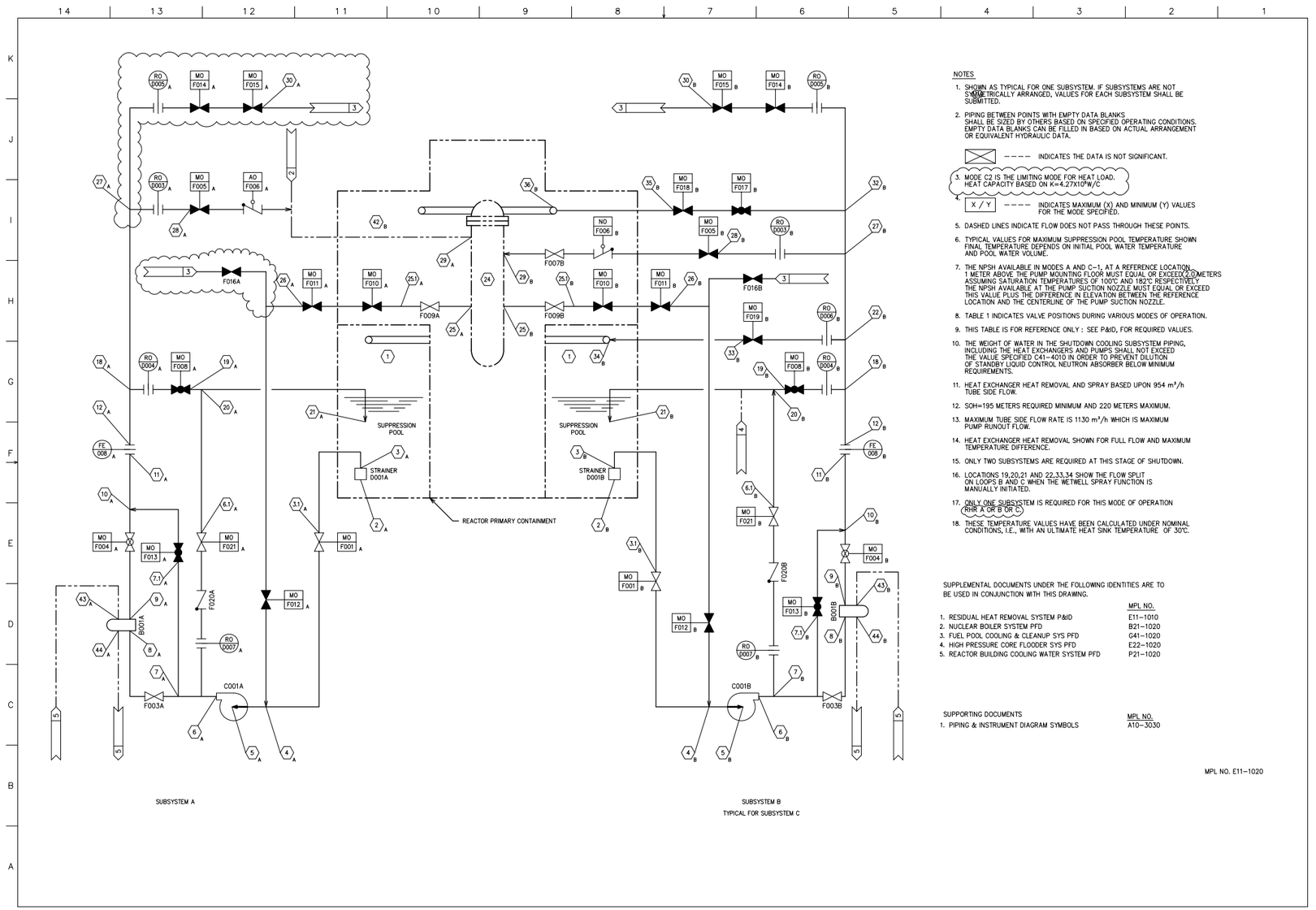


Figure 5.4-10 Residual Heat Removal System P&ID (Sheet 7 of 7)



NOTES

1. SHOWN AS TYPICAL FOR ONE SUBSYSTEM. IF SUBSYSTEMS ARE NOT SYMMETRICALLY ARRANGED, VALUES FOR EACH SUBSYSTEM SHALL BE SUBMITTED.
2. PIPING BETWEEN POINTS WITH EMPTY DATA BLANKS SHALL BE SIZED BY OTHERS BASED ON SPECIFIED OPERATING CONDITIONS. EMPTY DATA BLANKS CAN BE FILLED IN BASED ON ACTUAL ARRANGEMENT OR EQUIVALENT HYDRAULIC DATA.

   ⟨ ⟩ ---- INDICATES THE DATA IS NOT SIGNIFICANT.
3. MODE C2 IS THE LIMITING MODE FOR HEAT LOAD. HEAT CAPACITY BASED ON K=4.27X10^{6}W/C
4. X / Y ---- INDICATES MAXIMUM (X) AND MINIMUM (Y) VALUES FOR THE MODE SPECIFIED.
5. DASHED LINES INDICATE FLOW DOES NOT PASS THROUGH THESE POINTS.
6. TYPICAL VALUES FOR MAXIMUM SUPPRESSION POOL TEMPERATURE SHOWN FINAL TEMPERATURE DEPENDS ON INITIAL POOL WATER TEMPERATURE AND POOL WATER VOLUME.
7. THE NPSH AVAILABLE IN MODES A AND C–1, AT A REFERENCE LOCATION 1 METER ABOVE THE PUMP MOUNTING FLOOR MUST EQUAL OR EXCEED 2.0 METERS ASSUMING SATURATION TEMPERATURES OF 100°C AND 182°C RESPECTIVELY. THE NPSH AVAILABLE AT THE PUMP SUCTION NOZZLE MUST EQUAL OR EXCEED THIS VALUE PLUS THE DIFFERENCE IN ELEVATION BETWEEN THE REFERENCE LOCATION AND THE CENTERLINE OF THE PUMP SUCTION NOZZLE.
8. TABLE 1 INDICATES VALVE POSITIONS DURING VARIOUS MODES OF OPERATION.
9. THIS TABLE IS FOR REFERENCE ONLY : SEE P&ID, FOR REQUIRED VALUES.
10. THE WEIGHT OF WATER IN THE SHUTDOWN COOLING SUBSYSTEM PIPING, INCLUDING THE HEAT EXCHANGERS AND PUMPS SHALL NOT EXCEED THE VALUE SPECIFIED C41–4010 IN ORDER TO PREVENT DILUTION OF STANDBY LIQUID CONTROL NEUTRON ABSORBER BELOW MINIMUM REQUIREMENTS.
11. HEAT EXCHANGER HEAT REMOVAL AND SPRAY BASED UPON 954 m^3/h TUBE SIDE FLOW.
12. SOH=195 METERS REQUIRED MINIMUM AND 220 METERS MAXIMUM.
13. MAXIMUM TUBE SIDE FLOW RATE IS 1130 m^3/h WHICH IS MAXIMUM PUMP RUNOUT FLOW.
14. HEAT EXCHANGER HEAT REMOVAL SHOWN FOR FULL FLOW AND MAXIMUM TEMPERATURE DIFFERENCE.
15. ONLY TWO SUBSYSTEMS ARE REQUIRED AT THIS STAGE OF SHUTDOWN.
16. LOCATIONS 19,20,21 AND 22,33,34 SHOW THE FLOW SPLIT ON LOOPS B AND C WHEN THE WETWELL SPRAY FUNCTION IS MANUALLY INITIATED.
17. ONLY ONE SUBSYSTEM IS REQUIRED FOR THIS MODE OF OPERATION (RHR A OR B OR C)
18. THESE TEMPERATURE VALUES HAVE BEEN CALCULATED UNDER NOMINAL CONDITIONS, I.E., WITH AN ULTIMATE HEAT SINK TEMPERATURE OF 30°C.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

	MPL NO.
1. RESIDUAL HEAT REMOVAL SYSTEM P&ID	E11–1010
2. NUCLEAR BOILER SYSTEM PFD	B21–1020
3. FUEL POOL COOLING & CLEANUP SYS PFD	G41–1020
4. HIGH PRESSURE CORE FLOODER SYS PFD	E22–1020
5. REACTOR BUILDING COOLING WATER SYSTEM PFD	P21–1020

SUPPORTING DOCUMENTS

	MPL NO.
1. PIPING & INSTRUMENT DIAGRAM SYMBOLS	A10–3030

MPL NO. E11–1020

Figure 5.4-11 Residual Heat Removal System PFD (Sheet 1 of 2)

MODE A POST ACCIDENT CORE COOLING WITH STRAINER BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS (SEE NOTE 1)

POSITION	1	2	3	4	5	6	7	8	9	10	11	12	27	28	29	24	43	44
FLOW m³/h	-	954	←												954	-		
TEMP °C	-	97/35	←					97/35								-		
PRESS MPa A	0.41/0.10	-	-	-	-											0.41/0.10		
Max PRESS DIFF-METERS	-				Δ TDH = 125		-	Δ H = 7.0		-	Δ H = 6.1		-	-				Δ H = 7.0

HEAT REMOVAL CAPACITY PER HX LOOP = 82.48×10^4 kJ/h

ALL SUBSYSTEMS

MODE C4 FUEL POOL COOLING - CLOSED LOOP WITH FUEL POOL (SEE NOTE 17)

POSITION	4	5	6	7	8	9	10	11	12	27	30	43	44
FLOW m³/h	350	←									350		
TEMP °C	≤52	←			≤52								
PRESS MPa A													
Max PRESS DIFF-METERS	←												Δ H = 7.0

MODE B1 POST ACCIDENT SUPPRESSION POOL COOLING WITH STRAINER BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS (SEE NOTES 6 & 16)

POSITION	1	2	3	4	5	6	7	8	9	10	11	12	18	19B&C	20B&C	21B&C	1	22B&C	33B&C	34B&C	1	19A	20A	21A	1	43	44
FLOW m³/h	-	954	←										954	840	840	840	-	114	114	114	-	954	954	954	-		
TEMP °C	-	97	←					97									-				-				-		
PRESS MPa A	0.41/0.10	-	-	-	-												0.41/0.10				0.41/0.10				0.41/0.10		
Max PRESS DIFF-METERS	←				Δ TDH = 125			Δ H = 7.0			Δ H = 6.1															Δ H = 7.0	

HEAT REMOVAL CAPACITY PER HX LOOP = 82.48×10^4 kJ/h (3 HX'S OPERATING)(SEE NOTE 3)

SUBSYSTEM B & C

SEE NOTE 5 TYP ALL TABLES

SUBSYSTEM A

MODE B2 SUPPRESSION POOL COOLING DURING REACTOR HOT STANDBY OPERATION

POSITION	1	2	3	4	5	6	8	9	11	12	18	19	20	21	1	43	44
FLOW m³/h	-	954	←											954	-		
TEMP °C	-	49	←				49								-		
PRESS MPa A	0.10	-	-	-	-										0.10		
Max PRESS DIFF-METERS	←				Δ TDH = 125		Δ H = 7.0		Δ H = 6.1								Δ H = 7.0

HEAT REMOVAL CAPACITY PER HX LOOP = 18.67×10^4 kJ/h

SUBSYSTEM B & C

NOTES

A POST ACCIDENT CORE COOLING WITH STRAINER BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS

B-1 POST ACCIDENT SUPPRESSION POOL COOLING WITH STRAINER BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS

B-2 SUPPRESSION POOL COOLING DURING HOT STANDBY OPERATION

C-1 INITIATION OF SHUTDOWN COOLING AFTER BLOWDOWN TO MAIN CONDENSER AT FOUR HOURS

C-2 CONTINUATION OF SHUTDOWN COOLING AT 20 HOURS

C-3 CONTINUATION OF SHUTDOWN COOLING WITH RETURN TO UPPER CONTAINMENT POOL AT GREATER THAN 20 HOURS

C-4 FUEL POOL COOLING - CLOSED LOOP WITH FUEL POOL

D RHR TEST DURING PLANT OPERATION

E POST ACCIDENT CONTAINMENT SPRAY WITH HEAT REJECTION AND BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS

F MINIMUM FLOW BYPASS MODE

S SYSTEM ON STANDBY DUTY

MODE C1 INITIATION OF SHUTDOWN COOLING AFTER BLOWDOWN TO MAIN CONDENSER AT 4 HOURS Rx PRESS = 1.03 MPa A (SEE NOTES 1&13)

POSITION	24	25	4	5	6	7	8	9	10	11	12	27	28	29	24	43	44
FLOW m³/h	-	954	←											954	-		
TEMP °C	-	182	←				182								-		
PRESS MPa A	1.03	-	-	-											1.03		
Max PRESS DIFF-METERS				Δ TDH = 125			Δ H = 7.0			Δ H = 6.1							Δ H = 7.0

HEAT REMOVAL CAPACITY PER HX LOOP = 195.94×10^4 kJ/h

ALL SUBSYSTEMS (3 HX'S OPERATING)

MODE S STANDBY DUTY

POSITION	1	2	3	4	5	6	8	9	11	12	19	26	28	32	33B&C
FLOW m³/h	N/A	←													N/A
TEMP °C	-	35/10	←								35/10	AMBIENT	35/10	35/10	35/10
PRESS MPa A		←													
Max PRESS DIFF-METERS	-	-	-	-	TDH = 0	-	-	-	-	-	-	-	-	-	-

MODE C2 CONTINUATION OF SHUTDOWN COOLING AT 20 HOURS RX PRESS = 0 MPa

POSITION	24	25	4	5	6	7	8	9	10	11	12	27	28	29	24	43	44
FLOW m³/h	-	954	←											954	-		
TEMP °C	-	≤52	←				≤52										
PRESS MPa A	0.10	-	-	-											0.10		
Max PRESS DIFF-METERS				Δ TDH = 125			Δ H = 7.0			Δ H = 6.1							Δ H = 7.0

HEAT REMOVAL CAPACITY PER HX LOOP = 22.65×10^4 kJ/h

ALL SUBSYSTEMS (3 HX'S OPERATING)(SEE NOTE 15)

TABLE 1 VALVE POSITION CHART (SEE NOTE 8)

MODE	F001	F004	F005	F008	F010	F011	F012	F013	F014	F015	F016	F017	F018	F019	F021	STRAINER
A	O	O	O													P
B-1	O	O		O										O		P
B-2	O	O		O												P
C-1		O-T	O		O	O	O	T-C								CLEAR
C-2		O-T	O		O	O	O	T-C								CLEAR
C-3		O-T			O	O	O	T-C	O	O						CLEAR
C-4		O-T					O	T-C	O	O	O					CLEAR
D	O	O		O-T												CLEAR
E	O	O										T	O	O		P
F - POOL	O	O-T													O	CLEAR
S	O	O													O	CLEAR

O = VALVE OPEN
T = VALVE THROTTLED
T-C = VALVE THROTTLED OR CLOSED
O-T = VALVE OPEN OR THROTTLED
P = STRAINER PLUGGED BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS
BLANK SPACE INDICATE VALVE IS CLOSED

LEGEND

Rx PRESS ---- REACTOR VESSEL PRESSURE
TDH --------- TOTAL DYNAMIC HEAD
SOH --------- SHUTOFF HEAD
ΔH ---------- HEAD LOSS

MODE C3 CONTINUATION OF SHUTDOWN COOLING WITH RETURN TO UPPER CONTAINMENT POOL AT GREATER 20 HOURS Rx PRESS = 0 MPa

POSITION	24	25	4	5	6	7	8	9	10	11	12	27	30	43	44
FLOW m³/h	-	954	←										954		
TEMP °C	-	≤52	←				≤52								
PRESS MPa A	0.10														
Max PRESS DIFF-METERS	←			Δ TDH = 125			Δ H = 7.0			Δ H = 6.1					Δ H = 7.0

HEAT REMOVAL CAPACITY PER HX LOOP = 22.65×10^4 kJ/h

SUBSYSTEM B & C (2 HX'S OPERATING)(SEE NOTE 15)

MODE D RHR TEST DURING PLANT OPERATION

POSITION	1	2	3	4	5	6	7	8	9	10	11	12	18	19	20	21	1	43	44
FLOW m³/h	-	954	←													954	-		
TEMP °C	-	35/10	←													35/10	-		
PRESS MPa A	0.10																0.10		
Max PRESS DIFF-METERS	←				Δ TDH = 125			Δ H = 7.0			Δ H = 6.1								Δ H = 7.0

ALL SUBSYSTEMS

MODE E POST ACCIDENT CONTAINMENT SPRAY WITH HEAT REMOVAL AND STRAINER BLOCKED IN ACCORDANCE WITH RG 1.82 ANALYSIS

POSITION	1	2	3	4	5	6	7	8	9	10	11	12	22	33	34	1	32	35	36	42	43	44
FLOW m³/h	-	954	←										954	114	114	-	840	840	840	-		
TEMP °C	-	97/52	←					97/52								-				-		
PRESS MPa A	0.41/0.10	-	-	-	-											0.41/0.10				0.41/0.10		
Max PRESS DIFF-METERS	←				Δ TDH = 125			Δ H = 7.0			Δ H = 6.1					Δ H = 28				Δ H = 28		Δ H = 7.0

HEAT REMOVAL CAPACITY PER HX LOOP = 82.48×10^4 kJ/h

SUBSYSTEM B & C (2 HX'S OPERATING)(SEE NOTE 11)

MODE F MINIMUM FLOW BYPASS MODE

POSITION	1	2	3	4	5	6	61	20	21	1
FLOW m³/h	-	148	←						148	-
TEMP °C	-	35/10	←						35/10	-
PRESS MPa A	0.10									0.10
Max PRESS DIFF-METERS					SEE NOTE 12					

ALL SUB SYSTEMS

DESIGN PRESSURE AND TEMPERATURE TABLE (SEE NOTE 9)

POSITION	3	3.1	4	5	6	7	8	9	10	7	7.1	10	10	11	12	12	18	22 B & C	27	28	29 B & C	29A	12	18	19	21	12 B & C	18 B & C	22 B & C	33 B & C	34 B & C	25	25.1	26	4	18	27	28	29 B & C	29A	27	30		6	6.1	20	32	35	36
DESIGN PRESS MPa G	0.31		2.82		RHR PUMP	3.43	3.43	RHR HX	3.43	3.43		3.43		3.43		3.43		8.62				SEE B21-1020	3.43		0.31		3.43		3.43		3.43	8.62		2.82		3.43	8.62		SEE B21-1020	3.43		SEE G41-1020	3.43	0.31	3.43	3.43				
DESIGN TEMP °C	104		182			182	182		182	182		182		182		182		302					182		104		182		182		104	302		182		182	302			182			182	104	182	171			
EST LINE SIZE mm	450A					300A	300A		300A	300A		300A	300A	FLOW ELEM	300A	300A		250A					300A		250A		300A		100A		300A	350A		350A		300A	250A			300A			100A		250A	200A			
	POOL TO PUMP					PUMP TO HX BYPASS LINE	HEAT EXCHANGER LINE		HX BYPASS LINE	HX TO FLOW ELEMENT		FLOW ELEMENT TO Rx VESSEL											FLOW ELEMENT TO SUPPRESSION POOL				FLOW ELEMENT TO WETWELL SPRAY					SHUTDOWN SUCTION			SHUTDOWN RETURN TO Rx VESSEL						SHUTDOWN RETURN TO UPPER POOL			MINIMUM FLOW BYPASS			FLOW TO DRYWELL SPRAY			

Figure 5.4-11 Residual Heat Removal System PFD (Sheet 2 of 2)

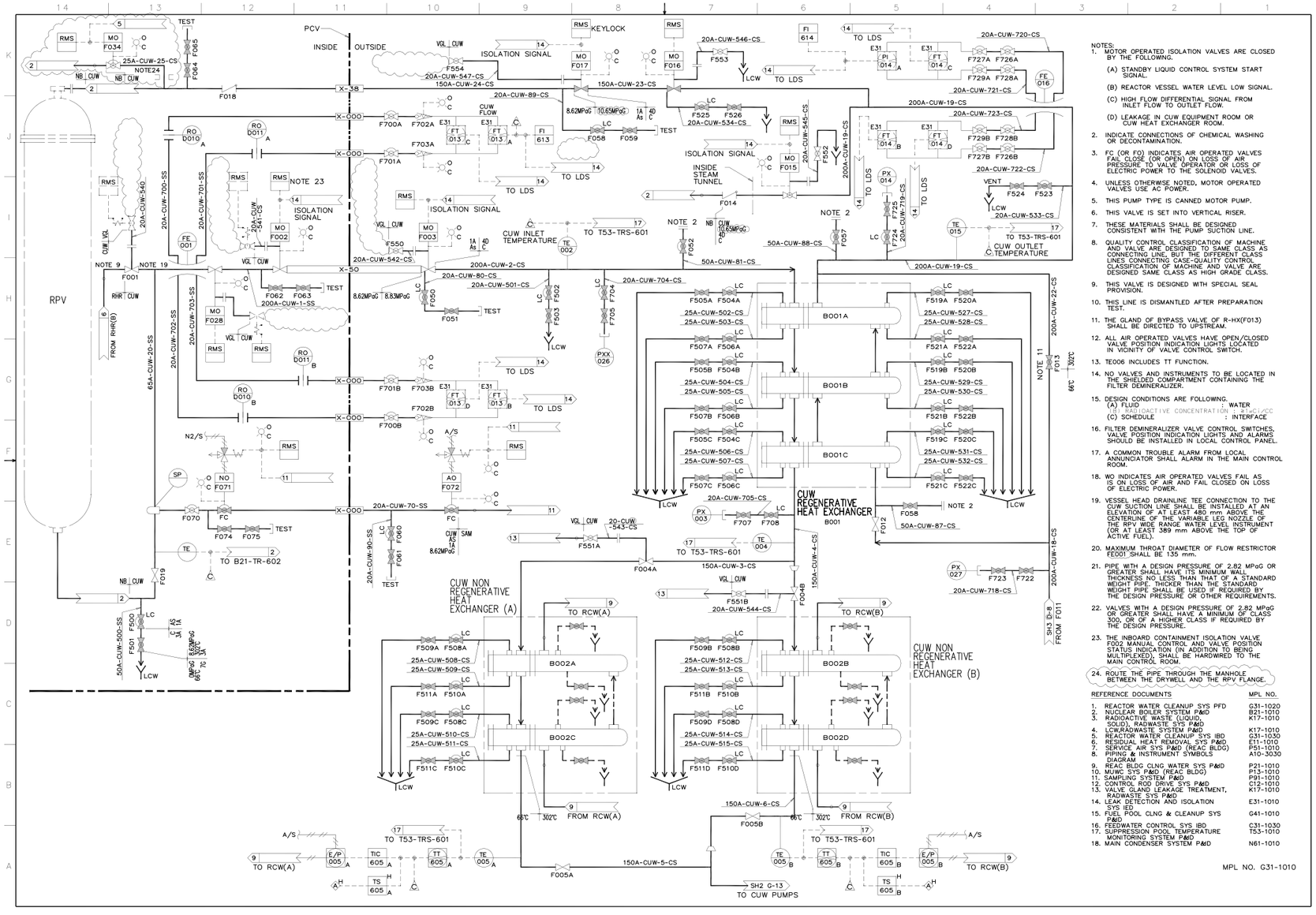


Figure 5.4-12 Reactor Water Cleanup System P&ID (Sheet 1 of 4)

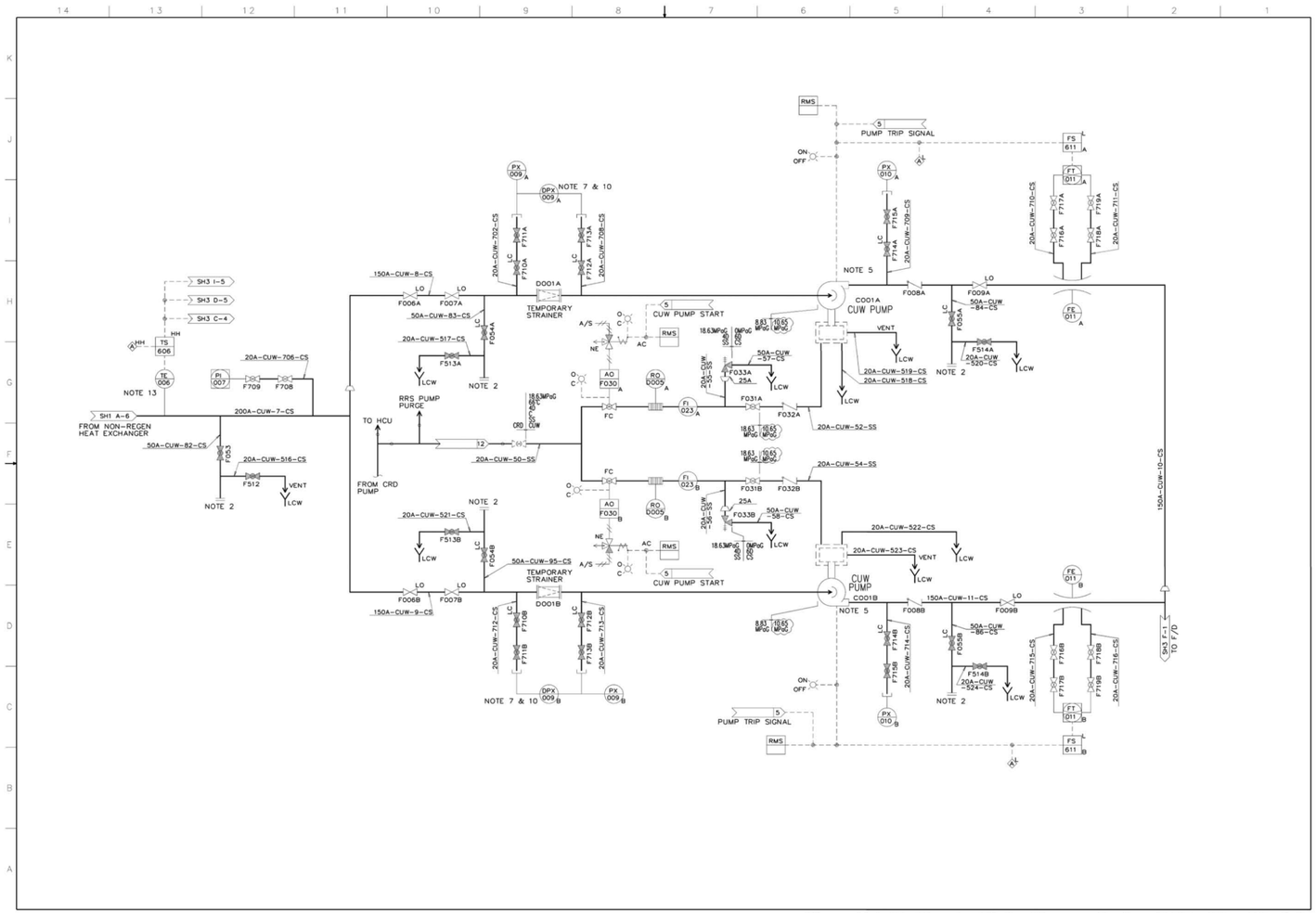


Figure 5.4-12 Reactor Water Cleanup System P&ID (Sheet 2 of 4)

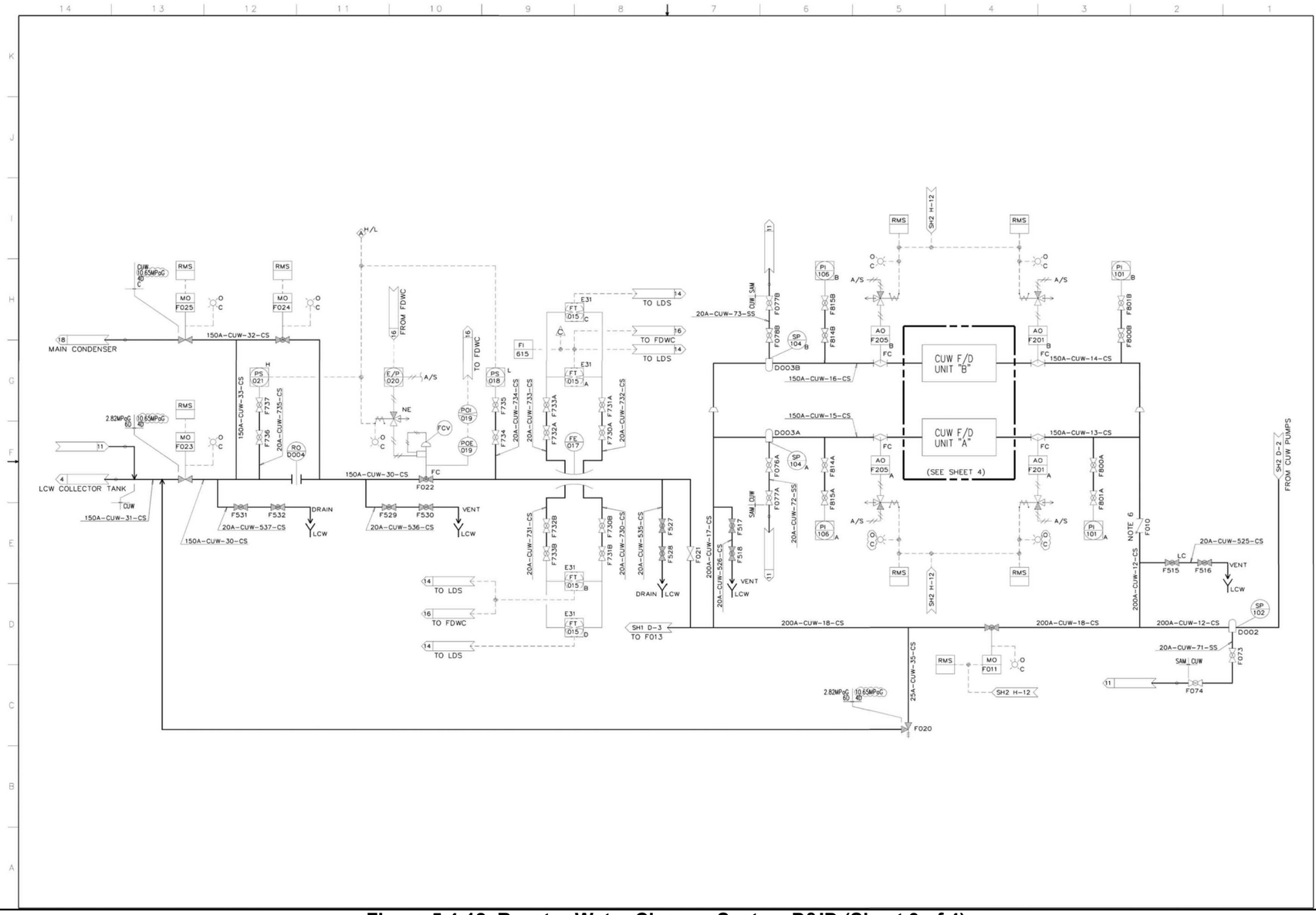


Figure 5.4-12 Reactor Water Cleanup System P&ID (Sheet 3 of 4)

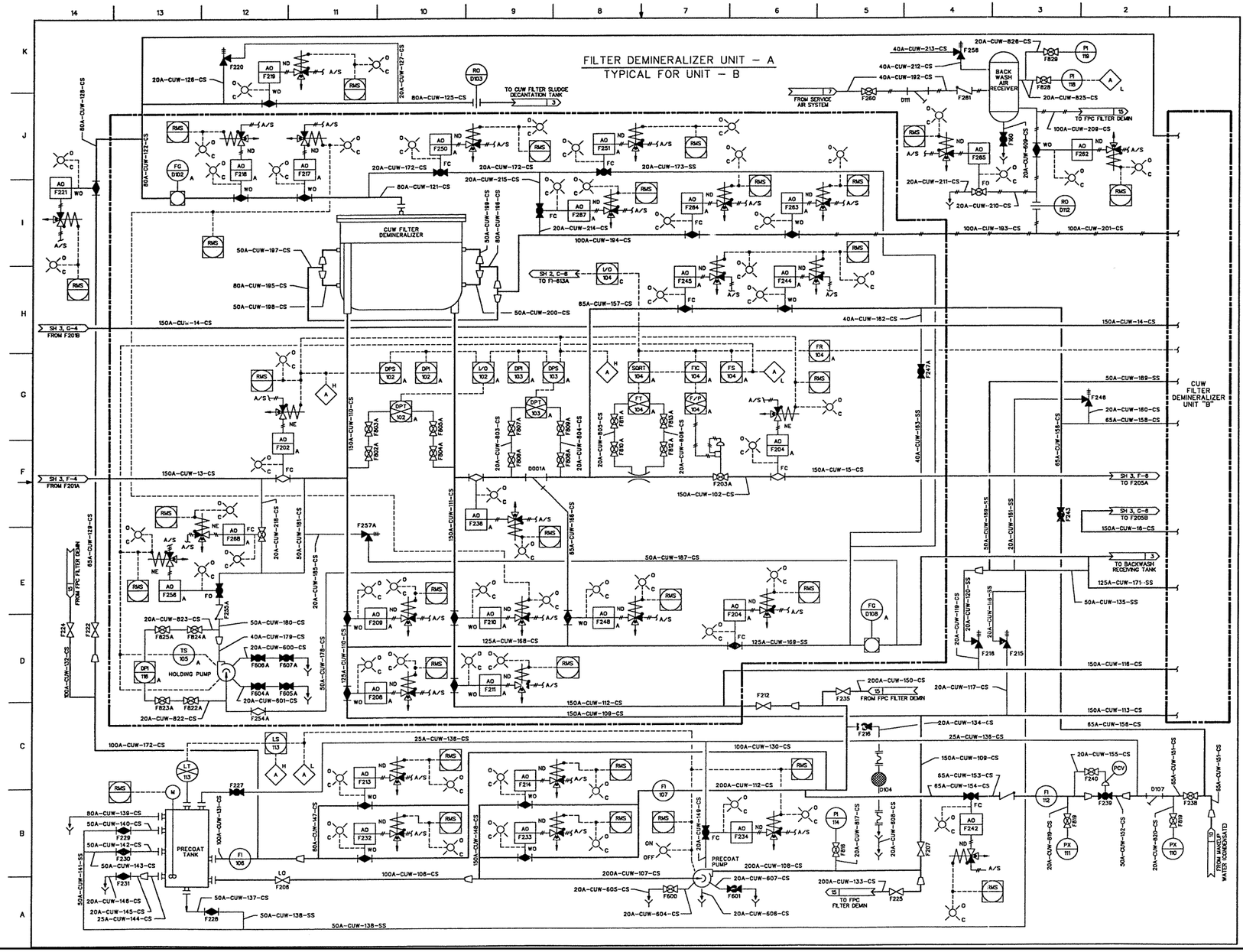


Figure 5.4-12 Reactor Water Cleanup System P&ID (Sheet 4 of 4)

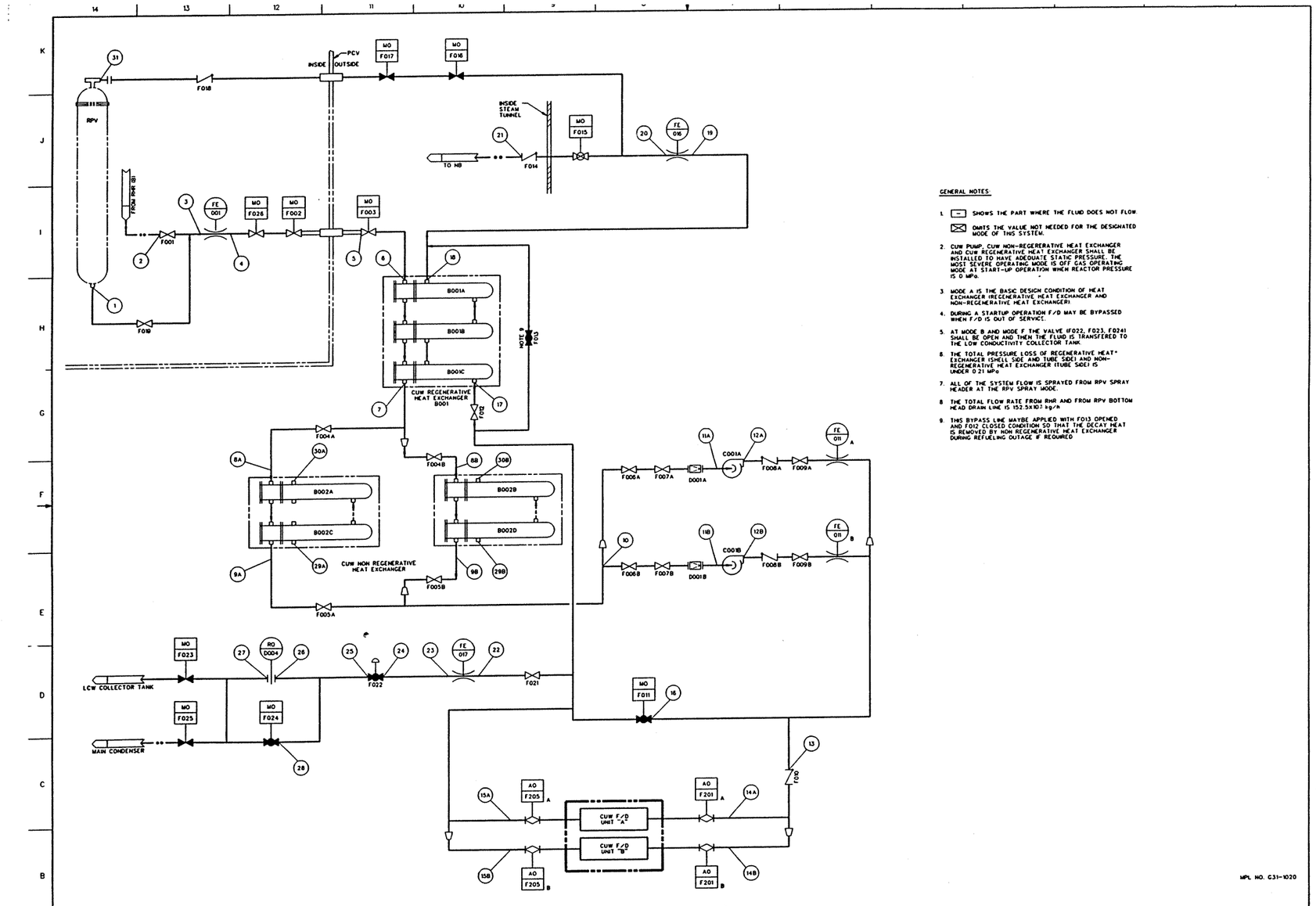


Figure 5.4-13 Reactor Water Cleanup System PFD (Sheet 1 of 2)

MODE A: NORMAL OPERATION (REACTOR PRESS 7.17MPa A)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11A(B)	12A(B)	13	14A(B)	15A(B)	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3/h)	30	172	202	←	→	202	160	80	77	154	154	154	154	154	154	–	154	183	←	→	183	–	–	–	–	–	–	–	140	140	–
PRESS (MPa A)	7.50	✕	✕	✕	✕	7.28	7.21	7.28	7.21	✕	7.18	8.36	✕	8.35	7.93	–	7.98	7.91	✕	✕	✕	–	–	–	–	–	–	–	✕	✕	–
TEMP (℃)	278	←	→	→	→	278	112	112	49	✕	49	49.5	→	49.5	–	49	225	→	→	→	225	–	–	–	–	–	–	–	Max 35	✕	–
Max ALLOWABLE PRESS LOSS (m)			ΔP = 3	←	→	NOTE 6	←	→			TDH = 120	←	→	ΔP = 36	←	→	NOTE 6	←	→	ΔP = 3	←	→							ΔP = 10	←	→

MODE B: START-UP OPERATION (REACTOR PRESS 1.08MPa A) NOTE 5

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11A(B)	12A(B)	13	14A(B)	15A(B)	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3/h)	NOTE 8	←	172	←	→	172	155	155	77	154	154	154	154	154	154	–	116	–	←	→	127	41	←	→	→	→	41	–	140	140	–
PRESS (MPa A)	1.10	1.01	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	–	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	–
TEMP (℃)	179	←	→	→	→	179	102	102	Max 54	✕	✕	✕	✕	Max 54	✕	–	Max 54	156	156	156	156	Max 54	←	→	→	→	Max 54	–	Max 35	✕	–
Max ALLOWABLE PRESS LOSS (m)			ΔP = 3	←	→	NOTE 6	←	→			TDH = 120	←	→	ΔP = 36	←	→	NOTE 6	←	→	ΔP = 3	←	→									

MODE C: HOT STANDBY OPERATION (MAIN CONDENSER AVAILABLE) (REACTOR PRESS 7.17MPa A)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11A(B)	12A(B)	13	14 A/B	15 A/B	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3/h)	NOTE 8	←	207	←	→	207	161	81	77	154	154	154	–	–	–	154	154	186	←	→	186	–	–	–	–	–	–	–	140	140	–
PRESS (MPa A)	7.31	✕	✕	✕	✕	7.27	7.20	7.28	7.21	✕	7.18	8.36	–	–	–	8.35	7.98	7.91	✕	✕	✕	–	–	–	–	–	–	–	✕	✕	–
TEMP (℃)	278	←	→	→	→	278	118	118	Max 54	←	→	Max 54	–	–	–	Max 54	Max 54	236	←	→	236	–	–	–	–	–	–	–	Max 35	✕	–
Max ALLOWABLE PRESS LOSS (m)			ΔP = 3	←	→	NOTE 6	←	→			TDH = 120	←	→			ΔP = 36	NOTE 6	←	→	ΔP = 3	←	→									

MODE D: HOT STANDBY OPERATION (MAIN CONDENSER ISOLATION) (REACTOR PRESS 7.61MPa A)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11A(B)	12A(B)	13	14A(B)	15A(B)	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3/h)	NOTE 8	←	209	←	→	209	162	81	77	154	154	154	–	154	154	154	154	187	←	→	187	–	–	–	–	–	–	–	140	140	–
PRESS (MPa A)	7.72	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	–	–	–	✕	✕	✕	✕	✕	✕	–	–	–	–	–	–	–	–	–	–
TEMP (℃)	292	←	→	→	→	292	119	119	Max 54	←	→	Max 54	–	–	–	Max 54	Max 54	240	←	→	240	–	–	–	–	–	–	–	Max 35	✕	–
Max ALLOWABLE PRESS LOSS (m)			ΔP = 3	←	→	NOTE 6	←	→			TDH = 120	←	→			ΔP = 36	NOTE 6	←	→	ΔP = 3	←	→									

MODE E: REFUELING (RECIRCULATING) (REACTOR PRESS: ATMOSPHERIC PRESS)

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11A(B)	12A(B)	13	14A(B)	15A(B)	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3/h)	NOTE 8	←	154	←	→	→	154	77	77	154	154	154	154	154	154	–	154	←	→	→	154	–	–	–	–	–	–	–	140	140	–
PRESS (MPa A)	STP	←	→	→	→	→	→	→	→	STP	✕	✕	✕	✕	✕	–	✕	✕	✕	✕	✕	–	–	–	–	–	–	–	✕	✕	–
TEMP (℃)	Max 52	←	→	→	→	→	Max 52	Max 49	→	Max 49	Max 49.5	→	→	Max 49.5	–	Max 49.5	Max 52	→	→	Max 52	–	–	–	–	–	–	–	–	Max 35	✕	–
Max ALLOWABLE PRESS LOSS (m)			ΔP = 3	←	→	NOTE 6	←	→			TDH = 120	←	→	ΔP = 36	←	→	NOTE 6	←	→	ΔP = 3	←	→									

MODE F: AFTER REFUELING (REACTOR PRESS: ATMOSPHERIC PRESS) NOTE 5

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11A(B)	12A(B)	13	14A(B)	15A(B)	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3/h)	NOTE 8	←	154	←	→	154	77	77	154	154	154	154	154	154	154	–	–	–	–	–	–	154	←	→	→	→	154	140	140	–
PRESS (MPa A)	STP	←	→	→	→	→	→	→	→	STP	✕	✕	✕	✕	✕	–	–	–	–	–	–	✕	✕	✕	✕	✕	✕	✕	✕	✕	–
TEMP (℃)	Max 52	←	→	→	→	→	→	→	→	→	→	→	→	Max 52	→	–	–	–	–	–	–	Max 52	←	→	→	→	Max 52	Max 35	–	–	–
Max ALLOWABLE PRESS LOSS (m)			ΔP = 3	←	→	NOTE 6	←	→			TDH = 120	←	→	ΔP = 36	←	→																

MODE G: RPV SPRAY (REACTOR PRESS 1.03 MPa A) NOTE 7

	1	2	3	4	5	6	7	8 A/B	9 A/B	10	11A(B)	12A(B)	13	14A(B)	15A(B)	16	17	18	19	20	21	22	23	24	25	26	27	28	29 A/B	30 A/B	31
FLOW (m^3/h)	NOTE 8	←	172	←	→	172	Max 172	Max 172	76	152	152	152	152	152	152	–	152	Max 172	←	Max 172	–	–	–	–	–	–	–	–	140	140	Max 172
PRESS (MPa A)	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕	–	✕	✕	✕	✕	✕	–	–	–	–	–	–	–	✕	✕	1.03
TEMP (℃)	183	←	→	→	→	183	✕	✕	Max 49	←	Max 49	Max 49.5	→	→	Max 49.5	–	Max 49.5	148	✕	148	–	–	–	–	–	–	–	–	Max 35	✕	✕
Max ALLOWABLE PRESS LOSS (m)			ΔP = 3	←	→	NOTE 6	←	→			TDH = 120	←	→	ΔP = 36	←	→	NOTE 6	←	→	ΔP = 3	←	→									

TABLE 1 VALVE OPENING/CLOSING CONDITION

MODE \ VALVE NO	F002	F003	F011	F015	F016	F022	F023	F024	F201	F205
A	O	O	C	O	C	C	C	C	O	O
B	O	O	C	O	C	T	O	C	O	O
C	O	O	O	O	C	C	C	C	C	C
D	O	O	O	O	C	C	C	C	C	C
E	O	O	C	O	C	C	C	C	O	O
F	O	O	C	C	C	O	O	O	O	O
G	O	O	C	C	O	C	C	C	O	O

O OPENING C CLOSING T THROTTLED

Figure 5.4-13 Reactor Water Cleanup System PFD (Sheet 2 of 2)

NOTES:

1. ALL EQUIPMENT IS PREFIXED BY SYSTEM MPL NO. G31 UNLESS OTHERWISE NOTED.
2. ALL EQUIPMENT IS NON IE EXCEPT PRIMARY CONTAINMENT ISOLATION VALVES AND CUW INJECTION VALVE.
3. CUW CONTAINMENT ISOLATION VALVE F002 MANUAL CONTROL AND STATUS LIGHTS (IN ADDITION TO BEING MULTIPLEXED) SHALL BE HARDWIRED TO THE MAIN CONTROL ROOM.

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

	REFERENCE DESIGNATOR
1. CUW SYSTEM P&ID	G31–1010
2. CUW SYSTEM PFD	G31–1020
3. LEAK DETECTION AND ISOLATION SYSTEM IBD	E31–1030
4. FEEDWATER CONTROL SYSTEM IBD	C31–1030

SUPPORTING DOCUMENTS:

1. 23A5791 – INTERLOCK BLOCK DIAGRAM (IBD) STANDARDS

TABLE OF CONTENTS

MPL NO. G31–1030

TITLE, NOTES AND REFERENCE DOCUMENTS

Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 1 of 11)

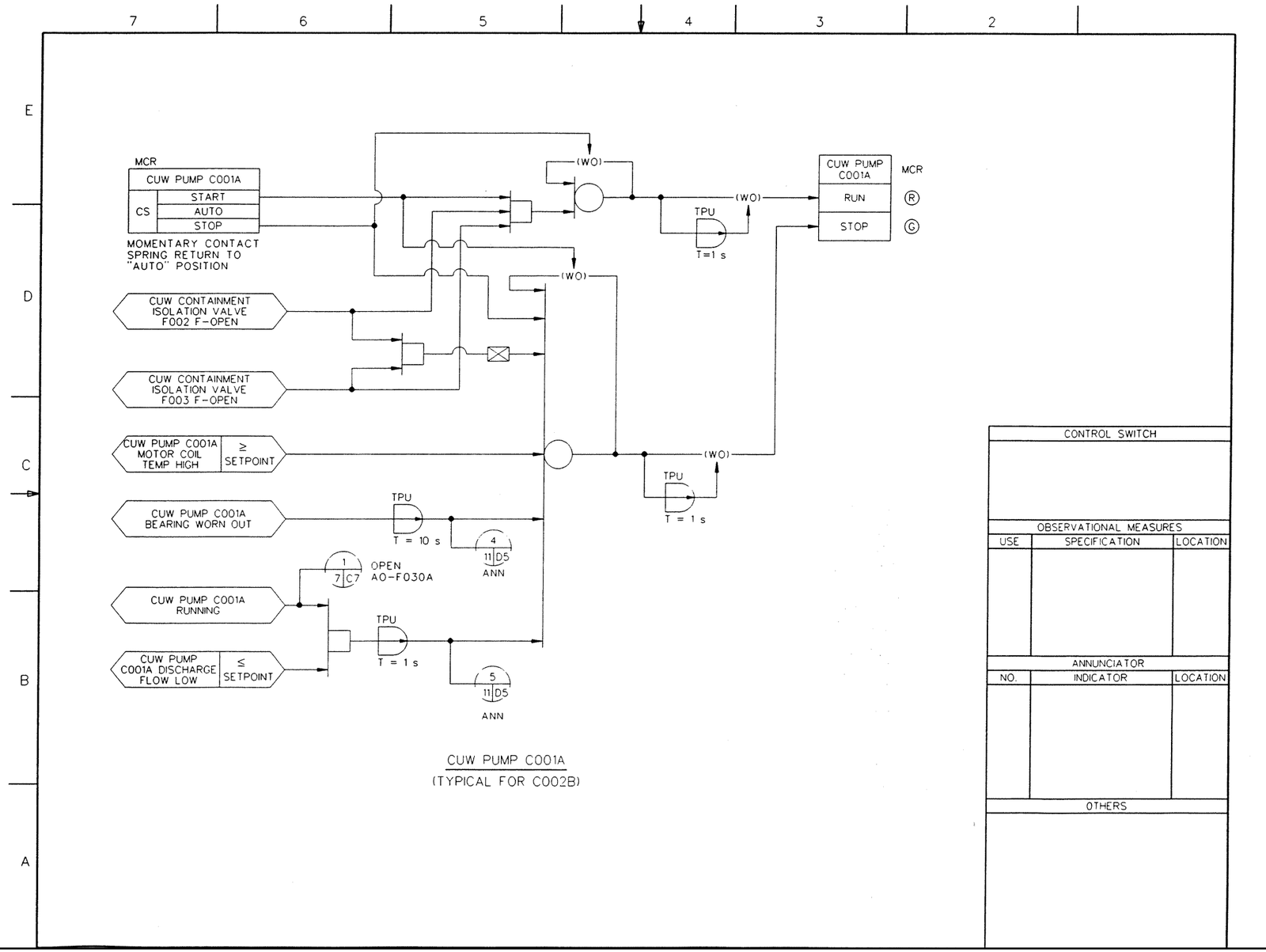


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 2 of 11)

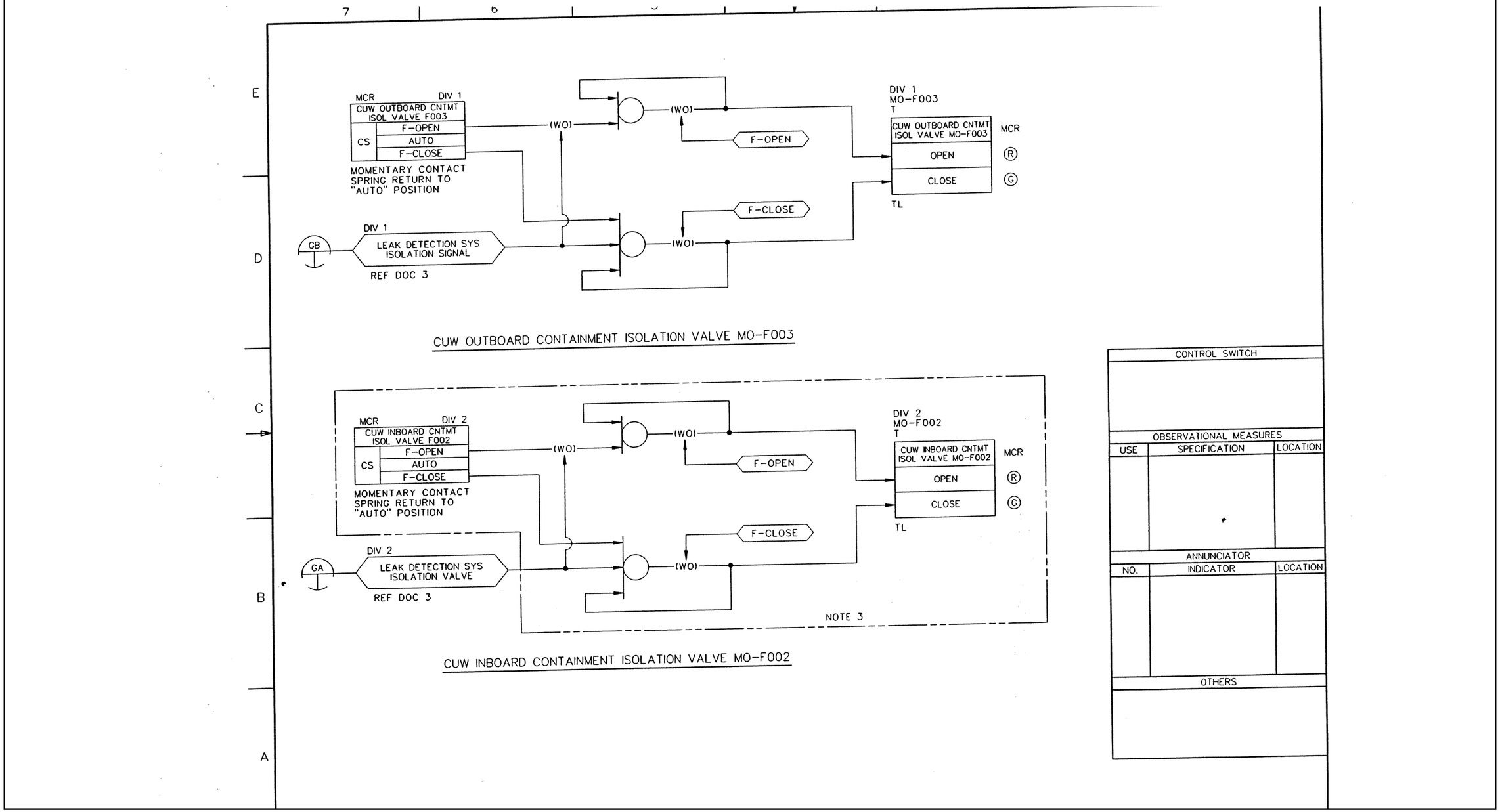


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 3 of 11)

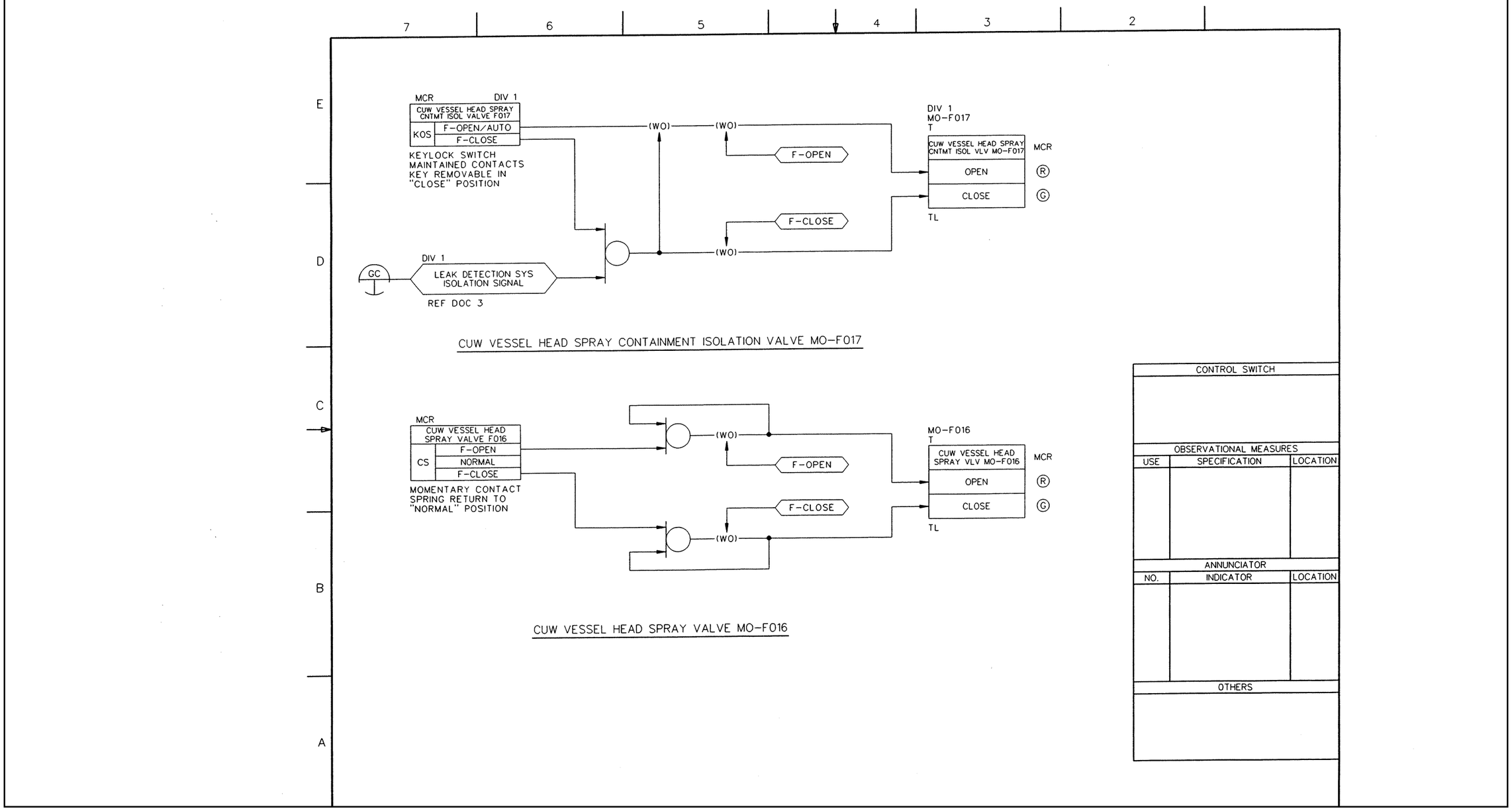


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 4 of 11)

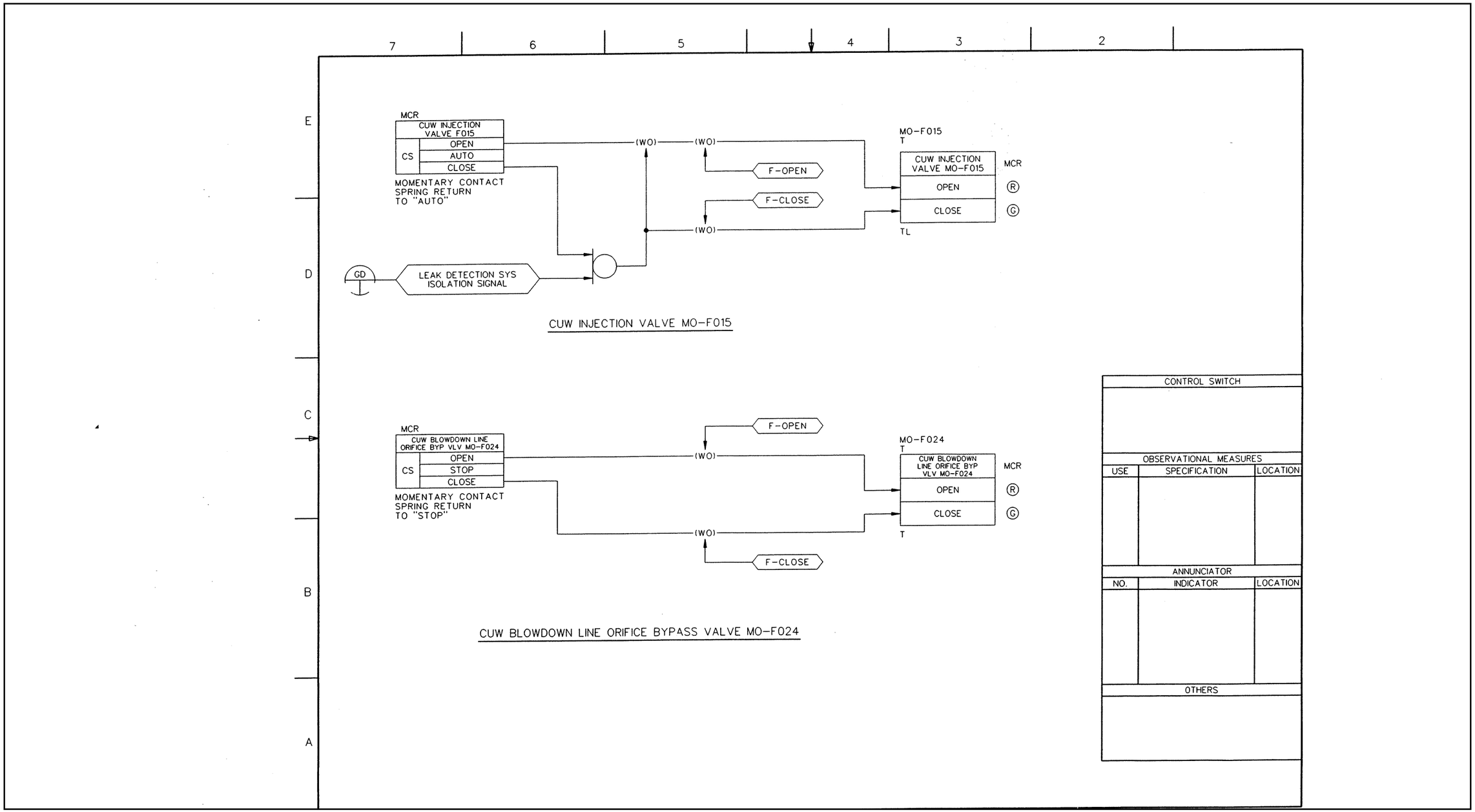
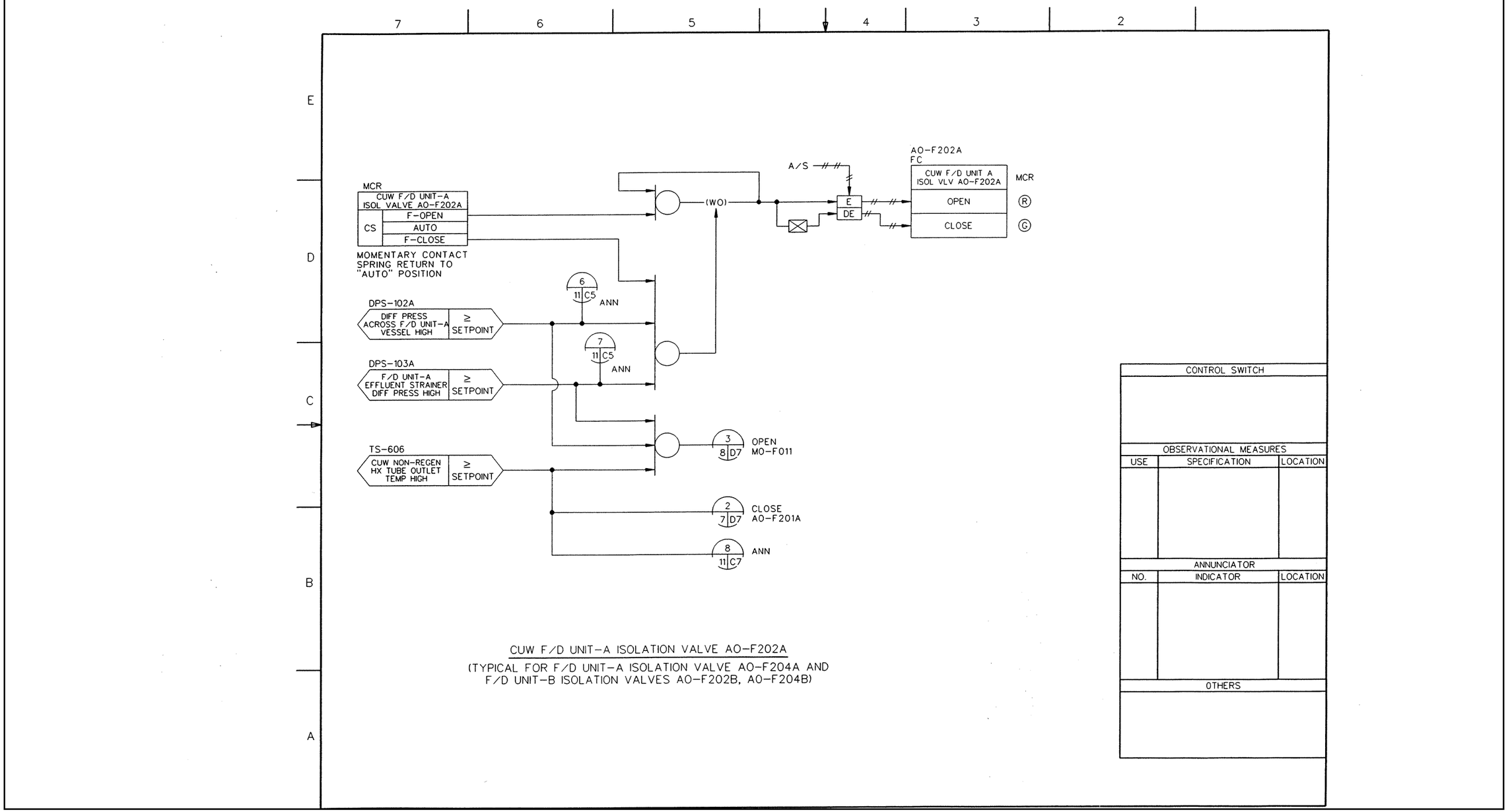


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 5 of 11)



CUW F/D UNIT-A ISOLATION VALVE AO-F202A

(TYPICAL FOR F/D UNIT-A ISOLATION VALVE AO-F204A AND F/D UNIT-B ISOLATION VALVES AO-F202B, AO-F204B)

Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 6 of 11)

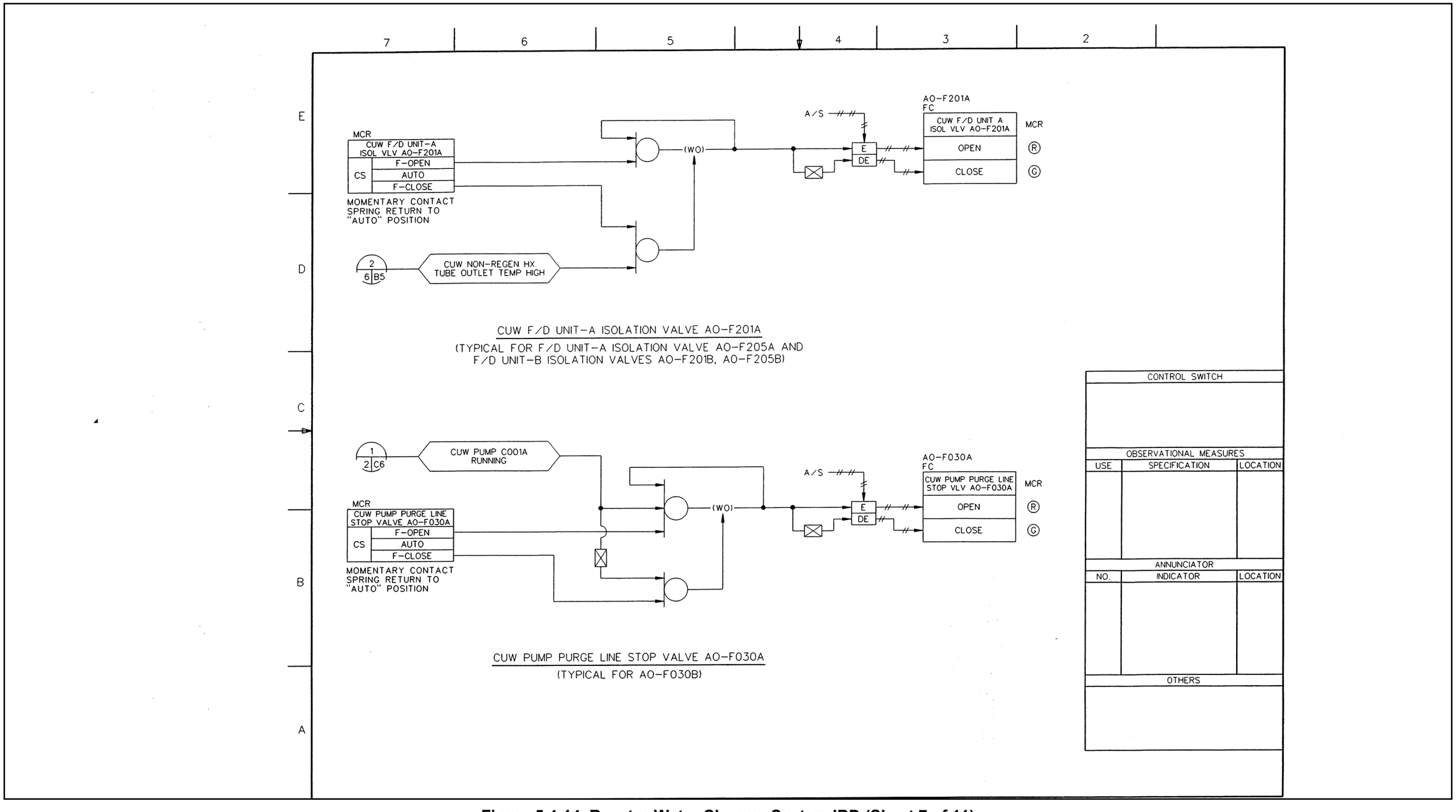


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 7 of 11)

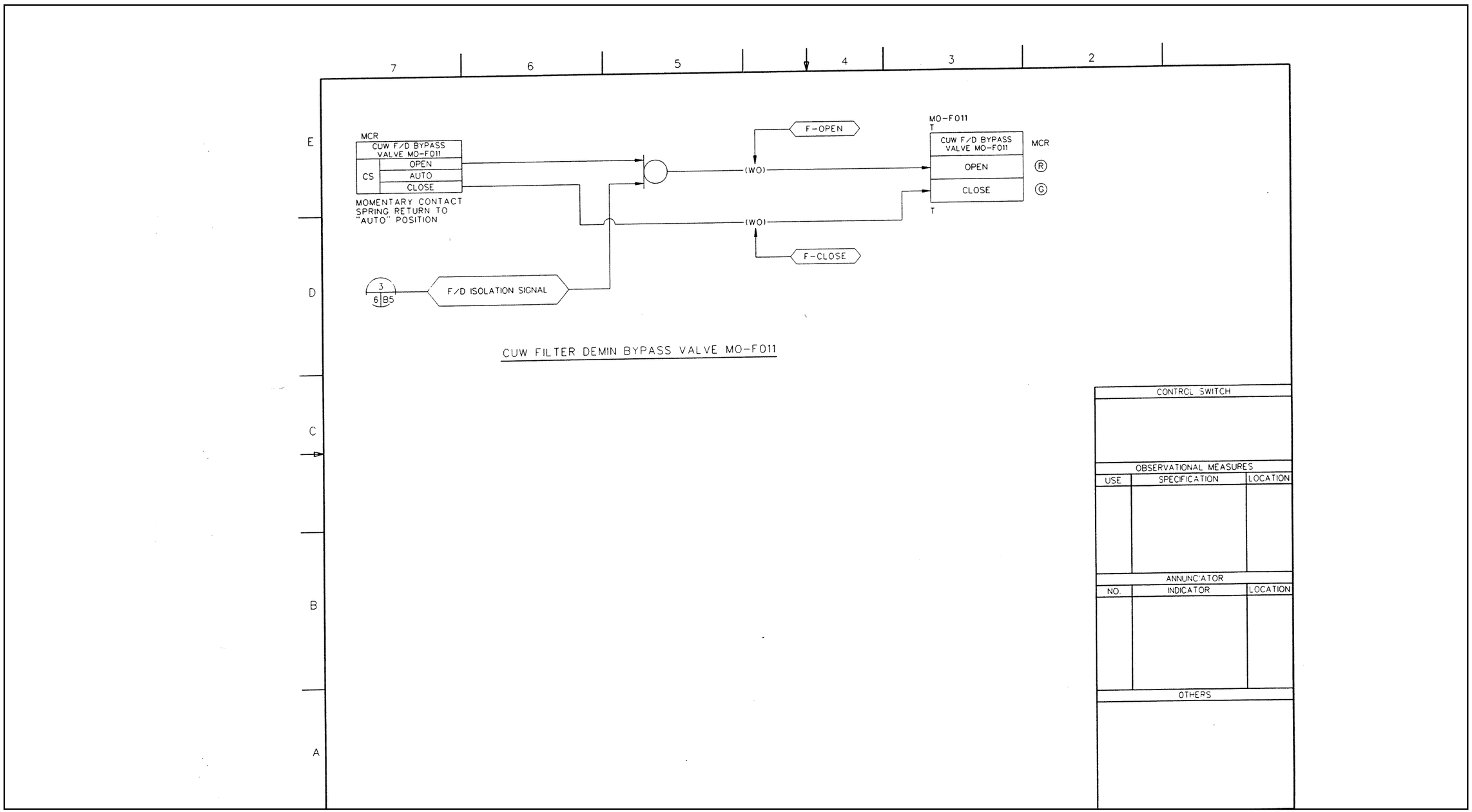


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 8 of 11)

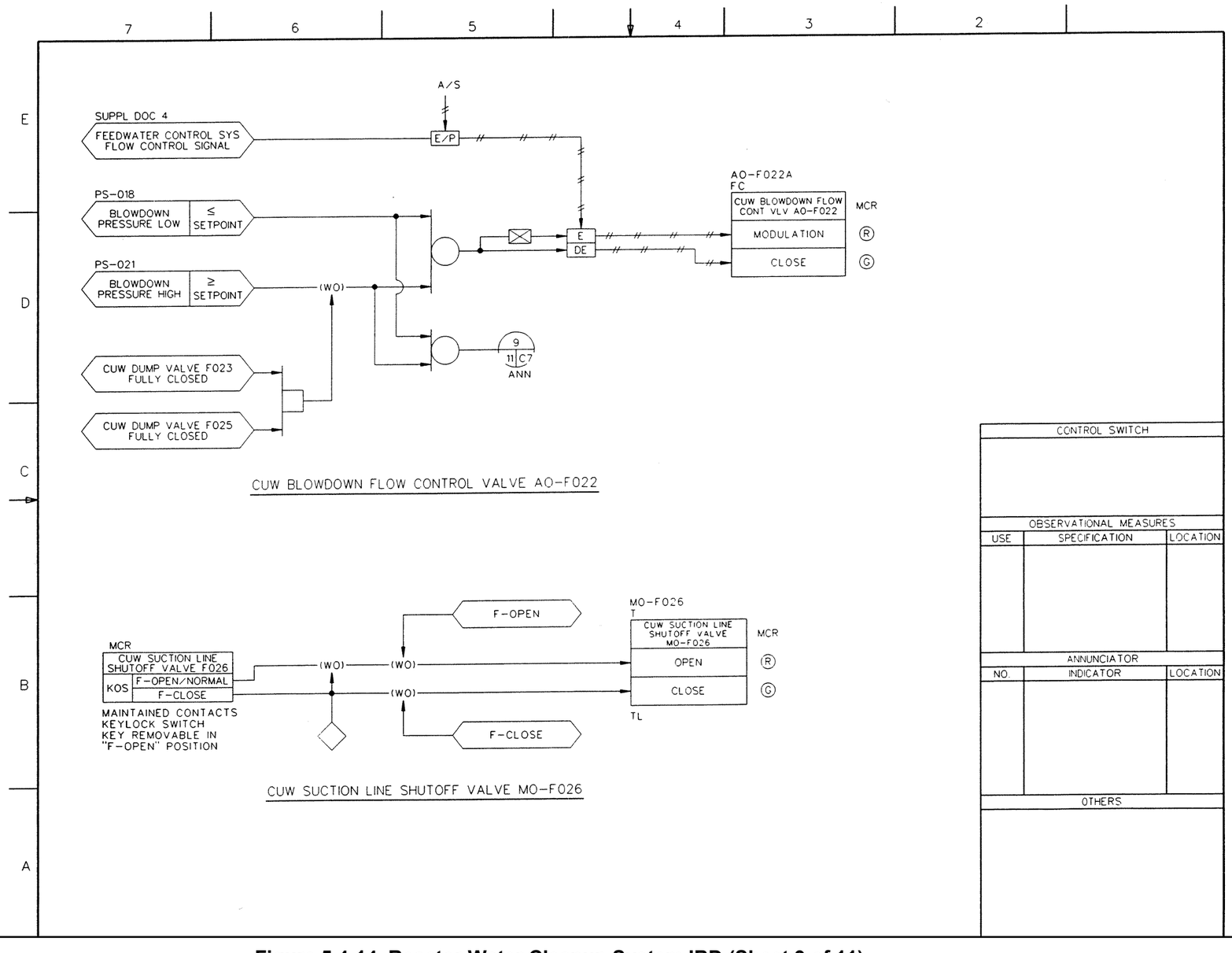


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 9 of 11)

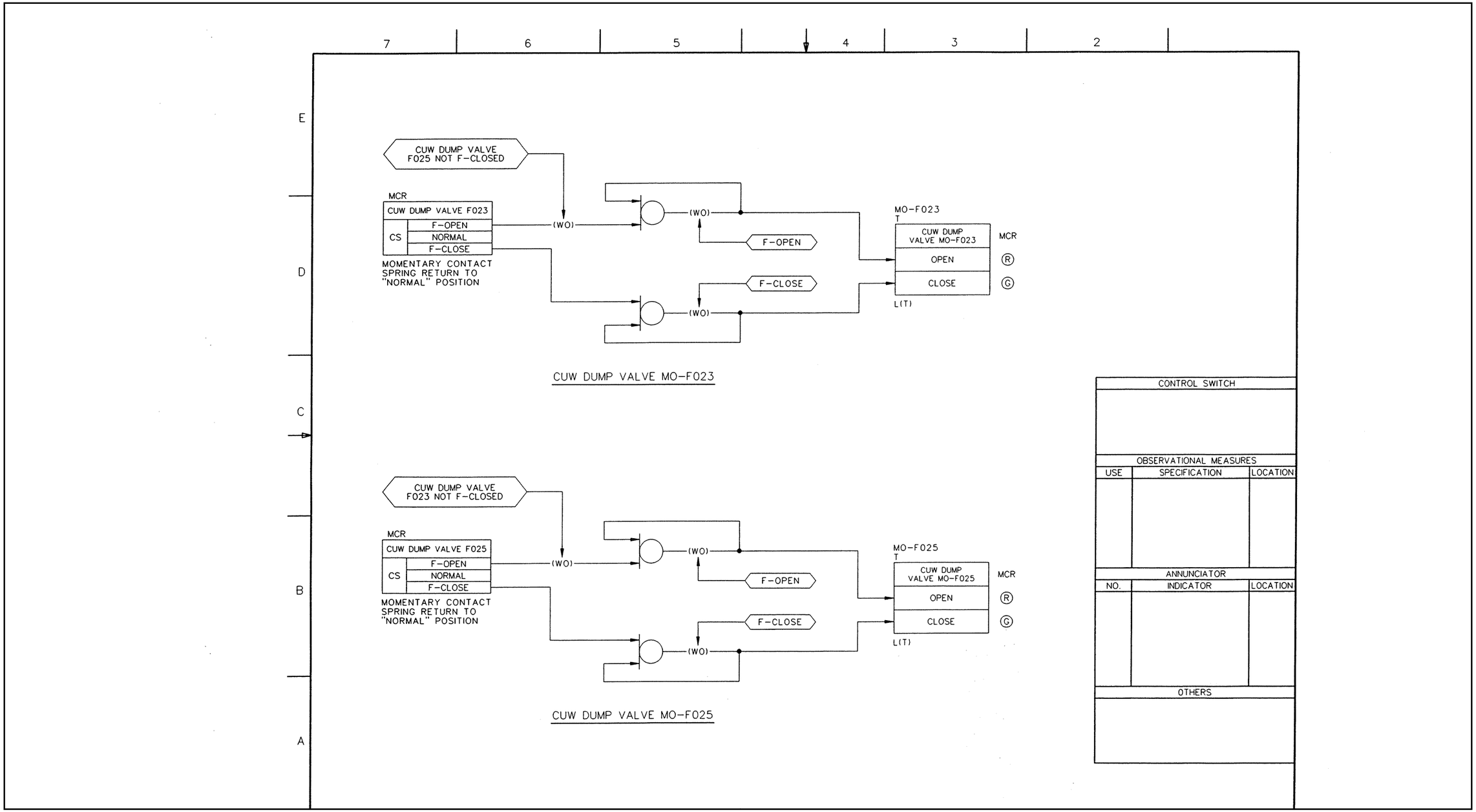


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 10 of 11)

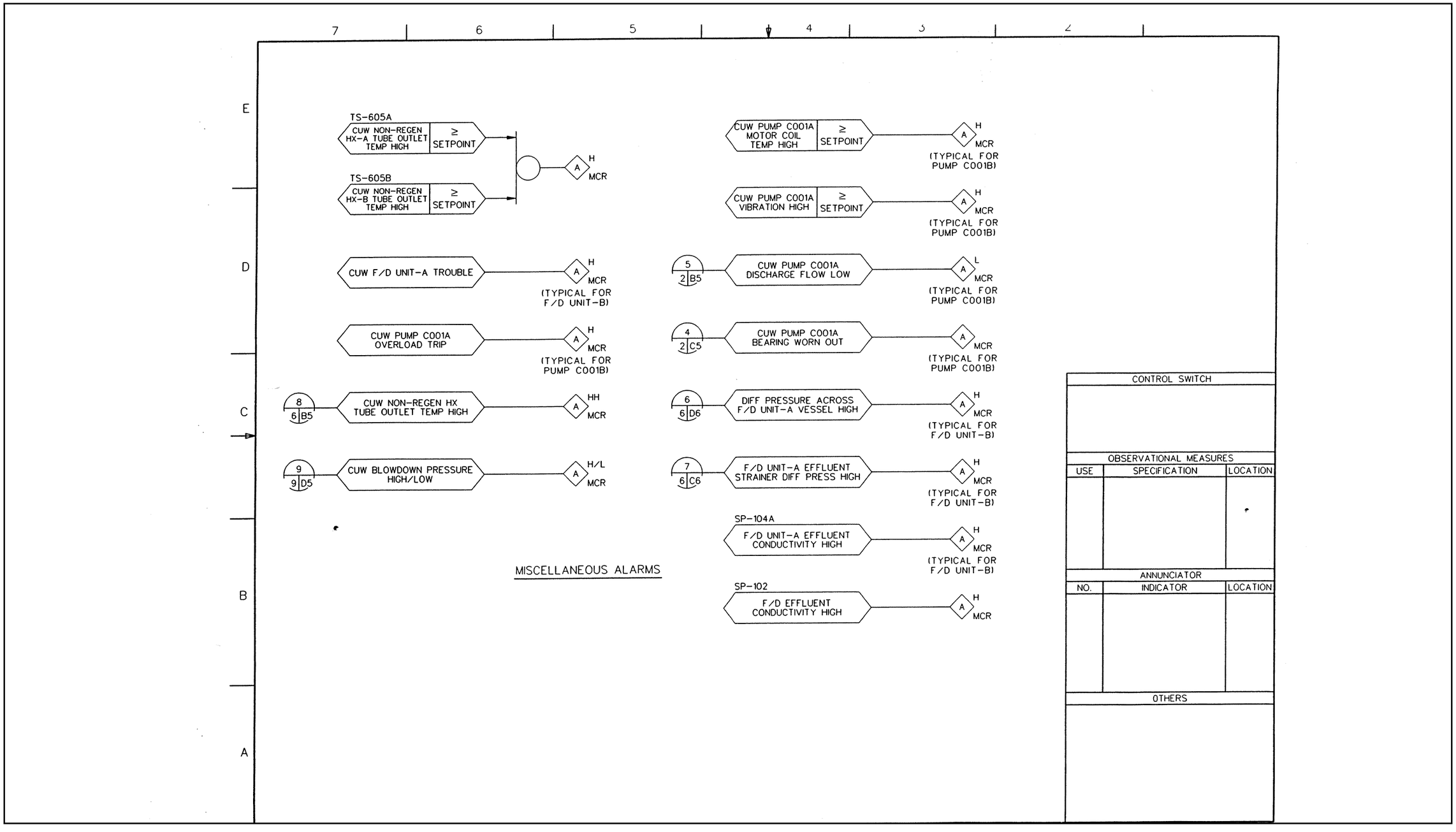


Figure 5.4-14 Reactor Water Cleanup System IBD (Sheet 11 of 11)