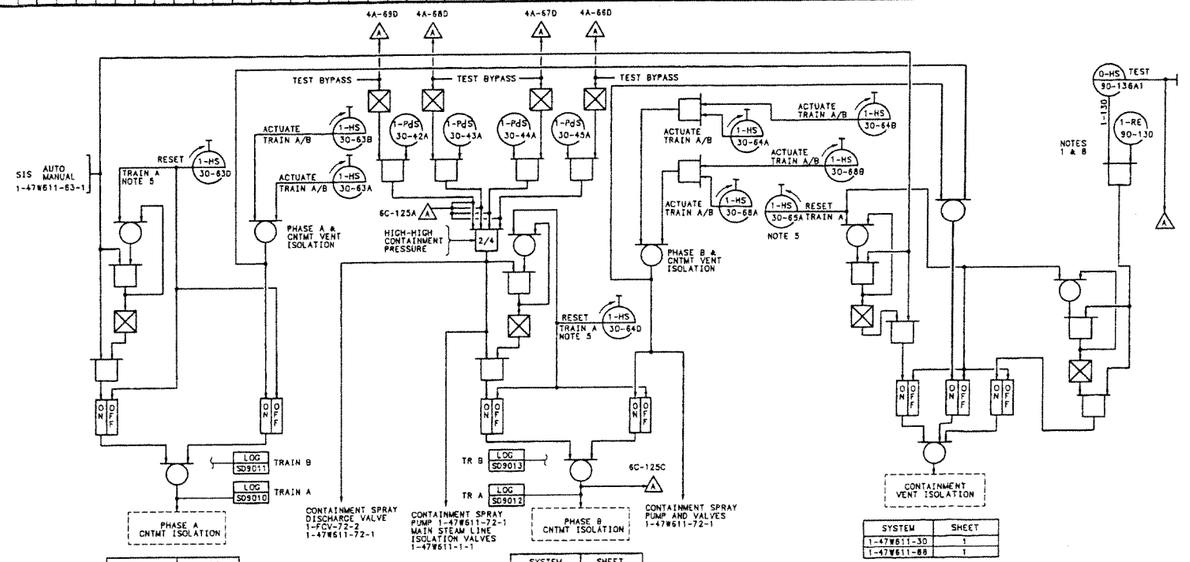
RO NRC WRITTEN EXAMINATION
REFERENCE PACKAGE



SYSTEM	SHEET
1-47W611-30	1, 2, 8
1-47W611-81	2
1-47W611-62	1
1-47W611-63	3, 5, 6, 8
1-47W611-65	1, 2, 3
1-47W611-68	1
1-47W611-70	3
1-47W611-77	1, 5
1-47W611-81	1
1-47W611-1	3
1-47W611-31	7
1-47W611-65	1
1-47W611-26	3

SYSTEM	SHEET
1-47W611-30	3, 4
1-47W611-70	3
1-47W611-32	2
1-47W611-67	3

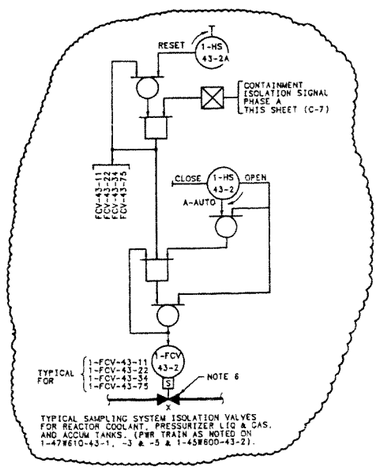
SYSTEM	SHEET
1-47W611-30	1
1-47W611-88	1

NOTES:

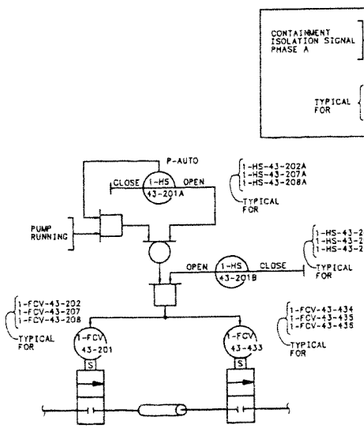
1. FOR TRAIN B, 1-RE-90-131 AND 0-HS-90-136A2 ARE USED. 0-HS-90-136A1 & 136A2 ARE MULTI SELECT SW'S USED TO TEST ONE CHANNEL AT A TIME.
3. ALL ISOLATION SIGNALS AND CIRCUITRY THAT ARE PART OF ENGINEERED SAFEGUARDS ARE REDUNDANT.
4. NOTE DELETED.
5. EACH TRAIN A RESET HAS AN ASSOCIATED TRAIN B RESET. SEE TVA DRAWING 1-47W810-30-1 FOR TRAIN B "RESET" HANDSWITCH NUMBERS.
6. VALVES 1-FCV-43-22 AND 1-FCV-43-23 MAY BE NORMALLY OPEN WITH 1-FSV-43-23 ENERGIZED TO ALLOW CONTINUOUS RCS FLOW DUE TO THERMAL CYCLING CONCERNS (REF. EDC-51134).
8. 1-RE-90-130 & 131, WHICH HOUSE GAS RADIATION DETECTORS, MONITOR THE CONTAINMENT PURGE EXHAUST.
9. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.
11. FOR SYMBOLS SEE INSTRUMENTION &IDENTIFICATION STANDARDS, LATEST ISSUE.

REFERENCE DRAWINGS:

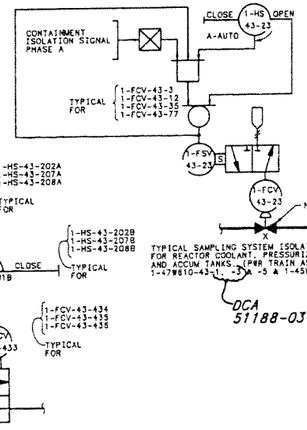
1-47W611-0-1	LOGIC INDEX & SYMBOLS
47B801-SERIES	INSTRUMENT TABULATION
1-45W600-43-2	SAMPLING AND WATER QUALITY SYSTEM SCHEMATIC DIAGRAM
1-45W600-90-1	RADIATION MONITORING SYSTEM SCHEMATIC DIAGRAM
1-45W600-57-8	SEPARATION & WESC AUX RELAYS SCHEMATIC DIAGRAMS
1-47W810-30-1 THRU 6	CONTAINMENT VENTILATION SYSTEM
1-47W810-90-1 THRU 3	RADIATION MONITORING SYSTEM CONTROL DIAGRAM
1-47W810-43-3, -5, -6	SAMPLING & WATER QUALITY SYSTEM CONTROL DIAGRAM
1-47W611-1-1	MAIN STEAM SYSTEM LOGIC DIAGRAM
1-47W611-63-1	SAFETY INJECTION SYSTEM LOGIC DIAGRAM
1-47W611-72-1	CONTAINMENT SPRAY SYSTEM LOGIC DIAGRAM



TYPICAL SAMPLING SYSTEM ISOLATION VALVES FOR REACTOR COOLANT, PRESSURIZER LIQ & GAS, AND ACCUM TANKS. (PWR TRAIN AS NOTED ON 1-47W610-43-1, -3 & -5 & 1-45W600-43-2).

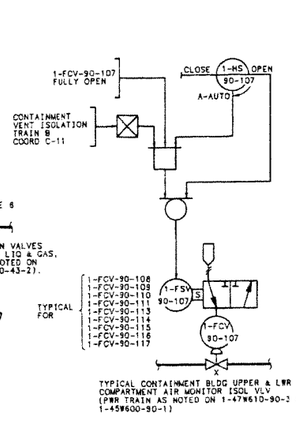


CONTAINMENT H_2 SAMPLE SYSTEM (PWR TRAIN AS NOTED ON 1-47W610-43-6 & 1-45W600-43-2)



TYPICAL SAMPLING SYSTEM ISOLATION VALVES FOR REACTOR COOLANT, PRESSURIZER LIQ & GAS, AND ACCUM TANKS. (PWR TRAIN AS NOTED ON 1-47W610-43-1, -3 & -5 & 1-45W600-43-2).

DCA 51188-03-0



TYPICAL CONTAINMENT BLDG UPPER & LWR COMPARTMENT AIR MONITOR ISOL VLV (PWR TRAIN AS NOTED ON 1-47W610-90-2 & 1-45W600-90-1)

FSAR FIG 6.2.4-21 & FSAR FIG 7.3-3 SH 4

18	51188	JEW	GJB	DLG	5-12-92
REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE

REVISED PER DCA'S 51188-02-0 AND 03-0.

SCALE: NTS — EXCEPT AS NOTED

PROJECT FACILITY
POWERHOUSE
UNITS 1 & 2

TITLE
ELECTRICAL
LOGIC DIAGRAM
CONTAINMENT ISOLATION

1 — WATTS BAR NUCLEAR PLANT, TENNESSEE VALLEY AUTHORITY — Q

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: G.W. JOHNSON	CHECKER: GARY BARNARD	RO ISSUE PER EAI 3.10 & RIMS T28 '92 0227 860	1 C.A. ATKINS
DESIGNER: C.A. ATKINS	REVIEWER: R.L. FORESTER		2 ROBERT D. MURR
			3 C.C. LYKE FOR MCB

ISSUED BY: R.M. JOHNSON — PRINTS REQ'D A

DATE 3/5/92 | 85 | E | 1-47W611-88-1 | R18

PRINT SIZE F — BR OR PROJ AB CE EE ME NE FE HE SE TE BL BF WB SO

PRINT SIZE H — BR OR PROJ AB CE EE ME NE FE HE SE TE BL BF WB SO

CAD MAINTAINED DRAWING

CONFIGURATION CONTROL DRAWING

1-47W611-99-4 | E | 85

CONTAINMENT ISOLATION PHASE A - TRAIN A - UNIT 1 TABLE III (3 MASTER & 7 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-77-19 (9160B) REACTOR COOLANT DRAIN TANK TO VENT HEADER	K502	K605*	1NC, 125V DC
	2. 1-FCV-77-10 (LCV-1003) REACTOR COOLANT DRAIN TANK PUMP DISCHARGE			1NC, 125V DC
	3. 1-FCV-77-128 REACTOR BUILDING SUMP DISCHARGE			1NC, 125V DC
	4. 1-FCV-77-17 (9159B) REACTOR COOLANT DRAIN TANK TO GAS ANALYZER			1NC, 125V DC
	5. 1-FCV-77-20 (9157) REACTOR COOLANT DRAIN TANK N_2 SUPPLY			1NC, 125V DC
	6. TVA RELAY FOR 1-FCV-1-14, 32, 1-FCV-43-23, 55, 58, 61, 64 BLOWDOWN & SAMPLE LINE ISLN VALVE			1NC, 120V AC
	7. 1-FCV-81-12 (8028) PRIMARY MAKEUP WATER PUMP DISCHARGE			1NC, 125V DC
	8. TVA RELAY FOR 1-FCV-1-181 & 183 INBOARD BLOWDOWN ISLN VALVES, SAMPLE VALVES 1-FCV-43-3, 12, 35, 77			1NC, 120V AC
GROUP B TESTABLE LOADS	1. 1-FCV-68-307 (8025) PRESSURIZER RELIEF TANK TO GAS ANALYZER	K522	K606*	1NC., 125V DC
	2. 1-FCV-63-64 (8880) SIS ACCUMULATOR TANK N_2 HEADER INLET			1NC, 125V DC
	3. 1-FCV-68-305 (8033) PRESSURIZER RELIEF TANK N_2 SUPPLY			1NC, 125V DC
	4. 1-FCV-63-71 (8871) SIS TEST LINE ISOLATION VALVE			1NC, 125V DC
	5. AUXILIARY BUILDING ISOLATION			1NO., 120V AC
	6. INCORE INSTRUMENT ROOM COOLER A (1-FCO-31-263, 269)			1NC, 120V AC
	7. 1-FSV-30-135 CNTMT ANNULUS DIFF PRESS ISLN VALVE (UNIT 1 ONLY)			1NC, 125V DC
	8. SHUTDOWN BOARD ROOM A PRESSURIZER FAN A-A			1NC, 120V AC
GROUP C TESTABLE LOADS	1. 1-FCV-62-72-(8149A) REGENERATIVE HEAT EXCHANGER LETDOWN ISOLATION VALVE A	K502	K607*	1NC, 125V DC
	2. 1-FCV-62-73-(8149B) REGENERATIVE HEAT EXCHANGER LETDOWN ISOLATION VALVE B			1NC, 125V DC
	3. 1-FCV-61-191 GLYCOL SUPPLY LINE ISOLATION VALVE			1NC, 125V DC
	4. 1-FCV-61-193 GLYCOL RETURN LINE ISOLATION VALVE			1NC, 125V DC
	5. 1-FCV-63-185 RHR SUPPLY TEST LINE VALVE			1NC, 125V DC
	6. 1-PCV-65-81 SHIELD BUILDING VENT ISOLATION VALVE &			1NO., 120V AC
	1-PCV-65-86 EGTS CNTMT ANNULUS ISLN VALVE			1NO., 120V AC
	7. 1-FCV-62-76 (8036) REGENERATIVE HEAT EXCHANGER LETDOWN ISLN VALVE			1NC, 125V DC
GROUP D NON-TESTABLE LOADS	1. 1-FCV-62-63-(8100) SEAL FLOW ISOLATION VALVE	K522	K614*	1NO., 120V AC
	2. CNTMT ISLN PH-A TR-A (PLANT) COMPUTER POINT SD-9010)			1NO., 48V DC
	3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO., 125V DC
GROUP E TESTABLE LOADS	1. CONTAINMENT ANNULUS VACUUM FAN A & FCO-65-77	K522	K612*	1NO., 120V AC
	2. 1-FCV-65-52 CONTAINMENT ISOLATION DAMPER UNIT 1			1NC, 125V DC
	3. ~~2-FCV-65-5 CONTAINMENT ISOLATION DAMPER UNIT 2~~			1NC, 125V DC
	4. 1-FCV-65-10 EMERGENCY GAS TREATMENT SYSTEM SUCTION UNIT 1			1NO., 125V DC
	5. ~~2-FCO-65-46 SHIELD BUILDING EXHAUST B UNIT 2~~			1NO., 125V DC
	6. 1-PCV-65-81 & PCV-65-86 CONTAINMENT RECIRC ISLN			1NO., 125V DC
	7. 1-FCV-62-74 (8149C) REGENERATIVE HEAT EXCHANGER LETDOWN ISLN VALVE C			1NC, 125V DC
GROUP F TESTABLE LOADS	1. ~~2-FCO-65-9 EMERGENCY GAS TREATMENT SYSTEM TRAIN A UNIT 2 SUCTION~~	K502	K613*	1NO., 125V DC
	2. 1-FCO-65-26 UNIT 1 SHIELD BUILDING EXHAUST A			1NO., 125V DC
	3. EMERGENCY GAS TREATMENT FAN A-A (ISLN DAMPER 0-FCV-65-24 OPERATED BY FAN LOGIC)			1NO., 120V AC
	4. 1-FCV-31-306 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE			1NC, 125V DC
	5. 1-FCV-31-308 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE			1NC, 125V DC
	6. 1-FCV-31-326 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE			1NC, 125V DC
	7. 1-FCV-31-330 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE			1NC, 125V DC
	8. SHUTDOWN BOARD ROOM B PRESSURIZER FAN B-A			1NC, 120V AC

CONT'D COORD C-11 THIS SHEET

CONTAINMENT ISOLATION PHASE B - TRAIN A - UNIT 1 TABLE V (1 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE	1. CONTAINMENT AIR RETURN FAN 1A-A	K506	K625*	1NO., 125V DC
	2. UPPER COMPARTMENT VENTILATION FAN 1A			1NC, 120V AC
	3. UPPER COMPARTMENT VENTILATION FAN 1C			1NC, 120V AC
	4. TVA RELAY FOR CONTROL ROD DRIVE FANS 1A-A & 1C-A LOWER COMPARTMENT COOLING UNITS 1A-A & 1C-A			1NO. 120V AC
	5. TVA RELAY FOR 1-FCV-67-107, 87, 99, 95, 130, 133, 295, & 296 CONTAINMENT VENTILATION COOLERS ISOLATION VALVES			1NO., 120V AC
	6. FCV-67-97 LOWER CNTMT 1C CLRS SUPPLY ISOL VALVE			1NO. 120V AC
GROUP B NON-TESTABLE	1. COMPONENT COOLING SYSTEM BOOSTER PUMP 1A-A	K506	K619*	1NC, 120V AC
	2. 1-FCV-32-80 CONTROL AIR ISLN VALVE ~~2-1-FCV-32-81~~			1NC, 120V AC
	3. 1-FCV-32-110 CONTROL AIR (NON-ESSENTIAL) ISLN VALVE			1NC, 120V AC
	4. COMPONENT COOLING SYSTEM BOOSTER PUMP 1A-A			1NO. 120V AC
	5. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO. 125V DC
GROUP C NON-TESTABLE	1. 1-FCV-70-133 RC BOOSTER PUMP A & B DISCHARGE	K506	K618*	1NO., 120V AC
	2. 1-FCV-70-90 RCP THERMAL BARRIER 1A HT EXCH. ISOL			1NO., 120V AC
	3. 1-FCV-70-100 RCP OIL COOLER SUPPLY CNTMT ISOL VALVE			1NO, 120V AC
	4. 1-FCV-70-92 RCP OIL COOLER DISCHARGE LINE			1NO., 120V AC
GROUP D TESTABLE	1. 1-FCV-67-104 LOWER CNTMT B CLRS DISCH ISLN VALVE	K506	K626*	1NO. 120V AC
	2. 1-FCV-67-112 LOWER CNTMT D CLRS DISCH ISLN VALVE			1NO. 120V AC
	3. 1-FCV-67-139 UPPER CNTMT VENT CLR B DISCH ISLN VALVE			1NO. 120V AC
	4. 1-FCV-67-142 UPPER CNTMT VENT CLR D DISCH ISLN VALVE			1NO. 120V AC
	5. CNTMT ISLN PH-B TR-A (PLANT) COMPUTER POINT SD-9012)			1NO. 48V DC
	6. FCV-67-89 LOWER CNTMT 1A CLRS SUPPLY ISOL VALVE			1NO. 120V AC

CONTAINMENT ISOLATION PHASE B - TRAIN B - UNIT 1 TABLE VI (1 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE	1. CONTAINMENT AIR RETURN FAN 1B-B	K506	K625*	1NO., 125V DC
	2. UPPER COMPARTMENT VENTILATION FAN 1B			1NC, 120V AC
	3. UPPER COMPARTMENT VENTILATION FAN 1D			1NC, 120V AC
	4. TVA RELAY FOR CONTROL ROD DRIVE FANS 1B-B & 1D-B LOWER COMPARTMENT COOLING UNITS 1B-B & 1D-B			1NO. 120V AC
	5. TVA RELAY FOR 1-FCV-67-91, 103, 83, 111, 138, 141, 297, & 298 CONTAINMENT VENTILATION COOLERS ISOLATION VALVES			1NO., 120V AC
GROUP B NON-TESTABLE	1. COMPONENT COOLING SYSTEM BOOSTER PUMP 1B-B	K506	K619*	1NC, 120V AC
	2. 1-FCV-32-102 CONTROL AIR ISLN VALVE ~~2-1-FCV-32-103~~			1NC, 120V AC
	3. ~~2-FCV-32-111 CONTROL AIR (NON-ESSENTIAL) ISLN VALVE~~			1NC, 120V AC
	4. COMPONENT COOLING SYSTEM BOOSTER PUMP 1B-B			1NO, 120V AC
	5. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO, 125V DC
GROUP C NON-TESTABLE	1. 1-FCV-70-134 RC BOOSTER PUMP A & B DISCHARGE	K506	K618*	1NO., 120V AC
	2. 1-FCV-70-87 RCP THERMAL BARRIER 1A HT. EXCH. ISOL			1NO., 120V AC
	3. 1-FCV-70-140 RCP OIL COOLER SUPPLY LINE			1NO., 120V AC
	4. 1-FCV-70-89 RCP OIL COOLER DISCHARGE LINE			1NO., 120V AC
GROUP D TESTABLE	1. 1-FCV-67-88 LOWER CNTMT A CLRS DISCH ISLN VALVE	K506	K626*	1NO., 120V AC
	2. 1-FCV-67-96 LOWER CNTMT C CLRS DISCH ISLN VALVE			1NO., 120V AC
	3. 1-FCV-67-131 UPPER CNTMT VENT CLR A DISCH ISLN VALVE			1NO., 120V AC
	4. 1-FCV-67-134 UPPER CNTMT VENT CLR C DISCH ISLN VALVE			1NO., 120V AC
	5. CNTMT ISLN PH-B TR-B (PLANT) COMPUTER POINT SD-9013)			1NO., 48V DC
	6. FCV-67-113 LOWER CNTMT 1D CLRS SUPPLY ISOL VALVE			1NO., 120V AC
	7. FCV-67-105 LOWER CNTMT 1B CLRS SUPPLY ISOL VALVE			1NO., 120V AC

CONTAINMENT ISOLATION PHASE A - TRAIN B - UNIT 1 TABLE IV (3 MASTER & 7 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-77-18 (9160A) REACTOR COOLANT DRAIN TANK TO VENT HEADER	K502	K605*	1NC, 125V DC
	2. 1-FCV-77-9 (9170) REACTOR COOLANT DRAIN TANK PUMP DISCHARGE			1NC, 125V DC
	3. 1-FCV-77-127 REACTOR BUILDING SUMP DISCHARGE			1NC, 125V DC
	4. 1-FCV-77-16 (9159A) REACTOR COOLANT DRAIN TANK TO GAS ANALYZER			1NC, 125V DC
	5. TVA RELAY FOR 1-FCV-43-22, 75, 2, 11, 34 BLOWDOWN SAMPLE LINE ISLN VALVE			1NC, 120V AC
	6. TVA RELAY FOR 1-FCV-1-182 & 184 INBOARD ISLN VALVES. BLOWDOWN & SAMPLE VALVES 1-FCV-1-7, 25; 1-FCV-43-54D, 56D, 59D, 63D			1NC, 120V AC
GROUP B TESTABLE LOADS	1. 1-FCV-68-308 (8026) PRESSURIZER RELIEF TANK TO GAS ANALYZER	K522	K606*	1NC, 125V DC
	2. 1-FCV-63-84 (8964) SIS TEST LINE ISOLATION VALVE			1NC, 125V DC
	3. AUXILIARY BUILDING ISOLATION			1NO, 120V AC
	4. INCORE INSTRUMENT ROOM COOLER B (1-FCO-31-264, 268)			1NC, 120V AC
	5. 1-FSV-30-134 CNTMT ANNULUS DIFF PRESS. ISLN VALVE (UNIT 1 ONLY)			1NC, 125V DC
	6. SHUTDOWN BOARD ROOM A PRESSURIZER FAN C-B			1NC, 120V AC
GROUP C TESTABLE LOADS	1. 1-FCV-62-77 (8152) REGENERATIVE HEAT EXCHANGER LETDOWN LINE ISLN VALVE	K502	K607*	1NC, 125V DC
	2.			
	3. 1-FCV-61-192 GLYCOL SUPPLY LINE ISOLATION VALVE			1NC, 125V DC
	4. 1-FCV-61-194 GLYCOL RETURN LINE ISOLATION VALVE			1NC, 125V DC
	5. 1-PCV-65-83 SHIELD BUILDING VALVE ISOLATION VALVE &			1NO, 120V AC
	1-PCV-65-87 EGTS CNTMT ANNULUS ISLN VALVE			1NO, 120V AC
GROUP D NON-TESTABLE LOADS	1. 1-FCV-62-61-(8112) SEAL FLOW ISOLATION	K522	K614*	1NO., 120V AC
	2. CNTMT ISLN PH-A TR-B (PLANT) COMPUTER POINT SD-9011)			1NO., 48V DC
	3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO., 125V DC
GROUP E TESTABLE LOADS	1. CONTAINMENT ANNULUS VACUUM FAN B & 1-TCO-65-74	K522	K612*	1NO., 120V AC
	2. 1-FCV-65-53 CONTAINMENT ISOLATION DAMPER UNIT 1			1NC, 125V DC
	3. ~~2-FCV-65-4 CONTAINMENT ISOLATION DAMPER UNIT 2~~			1NC, 125V DC
	4. 1-FCV-65-30 EMERGENCY GAS TREATMENT SYSTEM SUCTION UNIT 1			1NO. 125V DC
	5. ~~2-FCO-65-46 SHIELD BUILDING EXHAUST A UNIT 2~~			1NO. 125V DC
	6. 1-PCV-65-83 & 87 CONTAINMENT RECIRC ISOLATION			1NO. 125V DC
	7. 1-FCV-63-23 (8888) SIS ACCUMULATOR FILL			1NC, 125V DC
GROUP F TESTABLE LOADS	1. ~~2-FCO-65-29 EMERGENCY GAS TREATMENT SYSTEM TRAIN B UNIT 2 SUCTION~~	K502	K613*	1NO., 125V DC
	2. 1-FCO-65-27 UNIT 1 SHIELD BUILDING EXHAUST B			1NO., 125V DC
	3. EMERGENCY GAS TREATMENT FAN B-B (ISLN DAMPER 0-FCV-65-43 OPERATED BY FAN LOGIC)			1NO., 120V AC
	4. 1-FCV-31-305 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE			1NC, 125V DC
	5. 1-FCV-31-309 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE			1NC, 125V DC
	6. 1-FCV-31-327 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE			1NC, 125V DC
	7. 1-FCV-31-329 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE			1NC, 125V DC
	8. SHUTDOWN BOARD ROOM B PRESSURIZER FAN D-B			1NC, 120V AC

CONT'D COORD H-8 THIS SHEET

CONTAINMENT SPRAY ACTUATION - TRAIN A - UNIT 1 TABLE IX (4 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOAD	1. CONTAINMENT SPRAY PUMP 1A-A	K505 & K519	K643*	2NO., 125V DC
	2. K644 TEST INTERLOCK			NC., 120V AC
	3. SPRAY ACTUATION TR-A (PLANT) COMPUTER POINT SD-9002)			1NO., 48V DC
GROUP B TESTABLE LOAD	1. 1-FCV-72-39 CONTAINMENT SPRAY PUMP 1A-A DISCHARGE VALVE	K505 & K519	K644*	1NO., 120V AC
	(1 CONTACT IN TEST CIRCUIT REQUIRED TO CLOSE IN TEST TO BYPASS PUMP INTERLOCK) VIA STC TRAIN A			1NC., 120V AC
	2. K643 TEST INTERLOCK			
	3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO., 125V DC
	1. 1-FCV-72-34 CONTAINMENT SPRAY MINIFLOW	K347	K636	1NO., 120V AC
	1. 1-FCV-72-34 CONTAINMENT SPRAY MINIFLOW	K348	K639	1NC., 120V AC

MAIN STEAM ISOLATION - TRAIN A - UNIT 1 TABLE XI (1 MASTER & 2 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A	1. 1-FCV-1-4 LOOP #1 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)	K504	K616*	2NC, 125V DC
	2. 1-FCV-1-11 LOOP #2 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)			2NC, 125V DC
	3. 1-FCV-1-147 BYPASS VALVE LOOP #1 (TESTABLE)		K617*	1NC, 125V DC
	4. MAIN STEAM ISLN TR-A (PLANT) COMPUTER POINT SD-9004)		K616*	1NO., 48V DC
GROUP B	1. 1-FCV-1-22 LOOP #3 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)	K504	K623*	2NC, 125V DC
	2. 1-FCV-1-29 LOOP #4 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)			2NC, 125V DC
	3. 1-FCV-1-149 BYPASS VALVE LOOP #3 (TESTABLE)		K624*	1NC, 125V DC

TABLE XIII UNIT 1 - TRAIN A (4 MASTER & 7 SLAVE RELAYS) — GROUP A & B FEEDWATER ISOLATION; GROUP C - TURBINE & FEEDWATER PUMP TRIP

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A NON-TESTABLE LOADS	1. 1-FCV-3-35 MAIN FEED WATER CONTROL VALVE	K501, K507 & K520	K601,* K620 & K636*	1NC, 125V DC CONTACT OF EACH RELAY IN SERIES FOR EACH VALVE
	2. 1-FCV-3-48 MAIN FEED WATER CONTROL VALVE			
	3. 1-FCV-3-90 MAIN FEED WATER CONTROL VALVE			
	4. 1-FCV-3-103 MAIN FEED WATER CONTROL VALVE			
GROUP B NON-TESTABLE	1. 1-FCV-3-33 STEAM GENERATOR NO. 1 FEEDWATER ISOLATION VALVE	K501, K507 & K520	K610,* K649 & K637*	1NO., 120V AC CONTACT OF EACH RELAY IN PARALLEL FOR EACH VALVE
	2. 1-FCV-3-87 STEAM GENERATOR NO. 3 FEEDWATER ISOLATION VALVE			
	3. MAIN FEED ISLN TR-A (PLANT) COMPUTER POINT SD-9006)			1NO., 48V DC
	4. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO., 125V DC
	5. SAFETY INJECTION ACTUATION TR A (PLANT) COMPUTER POINT SD-9000)	K501	K610*	1NO., 48V DC
GROUP C NON-TESTABLE LOADS	1. MAIN FEED PUMP TURBINE 1A			1NO., 125V DC
	2. MAIN FEED PUMP TURBINE 1B			1NO., 125V DC
	3. TURBINE TRIP 20/AST		K621	1NO., 250V DC
	4. TURBINE OPC 1 TRIP	K601		1NO., 250V DC
	5. MAIN FEED PUMP TURBINE TRIP (COMPUTER POINT) TESTABLE	K620		1NO., 48V DC
	6. HOTWELL PUMP SEPARATION RELAY	K636		1NO., 120V AC

CONTAINMENT VENT ISOLATION - TRAIN A - UNIT 1 TABLE VII (1 MASTER & 2 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. TVA BUFFER RELAY FOR THE FOLLOWING: CONTAINMENT PURGE AIR SUPPLY FAN A; 1-FCO-30-1A PURGE AIR SUPPLY UNIT A SUCTION DAMPER; 1-FCO-30-1B PURGE AIR SUPPLY UNIT A DISCHARGE DAMPER; CONTAINMENT PURGE AIR EXHAUST FAN A; 1-FCO-30-11A INCORE INSTRUMENT ROOM SUPPLY FAN SUCTION DAMPER; 1-FCO-30-11B INCORE INSTRUMENT ROOM SUPPLY FAN DISCHARGE DAMPER; INCORE INSTRUMENT ROOM EXHAUST FAN & SUPPLY FAN; CONTAINMENT PURGE AIR SUPPLY FAN B; 1-FCO-30-4A PURGE AIR SUPPLY UNIT B SUCTION DAMPER; 1-FCO-30-4B PURGE AIR SUPPLY UNIT B DISCHARGE DAMPER; CONTAINMENT PURGE AIR EXHAUST FAN B	K503	K615*	1NC, 120V AC
	2. 1-FCV-30-2 PURGE AIR UNIT A ISOLATION			1NC, 125V DC
	3. FCV-30-61 PURGE AIR EXHAUST UNIT A SUCTION VALVE			1NC, 125V DC
	4. 1-FCV-30-5 PURGE AIR UNIT B ISOLATION			1NC, 125V DC
	5. 1-FCV-30-12 ANNULUS PURGE ISOLATION			1NC, 125V DC
	6. 1-FCV-30-62 PURGE AIR EXHAUST UNIT B SUCTION VALVE			1NC, 125V DC
	7. 1-FCV-30-54 ANNULUS EXHAUST ISOLATION			1NC, 125V DC
GROUP B TESTABLE LOADS	1. 1-FCV-30-7 UPPER COMPARTMENT PURGE ISOLATION; 1-FCV-30-51 UPPER CONTAINMENT EXHAUST ISOLATION	K503	K622*	1NC, 125V DC
	2. *1-FCV-30-10 UPPER COMPARTMENT PURGE ISOLATION; 1-FCV-30-52 UPPER CONTAINMENT EXHAUST ISOLATION			1NC, 125V DC
	3. 1-FCV-30-14 LOWER COMPARTMENT PURGE ISOLATION; 1-FCV-30-56 LOWER CONTAINMENT EXHAUST ISOLATION			1NC, 125V DC
	4. 1-FCV-30-17 LOWER COMPARTMENT PURGE ISOLATION			1NC, 125V DC
	5. 1-FCV-30-40 LOWER COMPARTMENT EXHAUST ISOLATION			1NC, 125V DC
	6. 1-FCV-30-20 INCORE INSTRUMENT ROOM PURGE ISOLATION; 1-FCV-30-59 INCORE INSTRUMENT ROOM EXHAUST ISOLATION			1NC, 125V DC
	7. 1-FCV-90-107, 111, 113, 117 RAD MON ISLN			1NO. 120V AC
	8. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO. 125V DC

CONTAINMENT SPRAY ACTUATION - TRAIN B - UNIT 1 TABLE X (4 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOAD	1. CONTAINMENT SPRAY PUMP 1B-B	K505 & K519	K643*	2NO., 125V DC
	2. K644 TEST INTERLOCK			1NC. 120V AC
	3. SPRAY ACTUATION (PLANT) COMPUTER POINT SD-9003)			1NO., 48V DC
GROUP B TESTABLE LOAD	1. 1-FCV-72-2 CONTAINMENT SPRAY PUMP 1B-B DISCHARGE VALVE (1 CONTACT IN TEST CIRCUIT REQUIRED TO CLOSE IN TEST TO BYPASS PUMP INTERLOCK) VIA STC TRAIN B	K505 & K519	K644*	1NO., 120V AC
	2. K643 TEST INTERLOCK			1NC., 120V AC
	3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO., 125V DC
	1. 1-FCV-72-13 CONTAINMENT SPRAY MINIFLOW	K443	K638	1NO., 120V AC
	1. 1-FCV-72-13 CONTAINMENT SPRAY MINIFLOW	K444	K639	1NC., 120V AC

MAIN STEAM ISOLATION - TRAIN B - UNIT 1 TABLE XII (1 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A	1. 1-FCV-1-4 LOOP #1 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)	K504	K616*	2NC, 125V DC
	2. 1-FCV-1-11 LOOP #2 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)			2NC, 125V DC
	3. 1-FCV-1-148 LOOP #2 BYPASS VALVE		K617	1NC, 125V DC
	4. MAIN STEAM ISLN TR-B (PLANT) COMPUTER POINT SD-9005)		K616*	1NO., 48V DC
GROUP B	1. 1-FCV-1-22 LOOP #3 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)	K504	K623*	2NC, 125V DC
	2. 1-FCV-1-29 LOOP #4 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE)			2NC, 125V DC
	3. 1-FCV-1-150 BYPASS VALVE LOOP #4		K624	1NC, 125V DC

TABLE XIV UNIT 1 - TRAIN B (4 MASTER & 7 SLAVE RELAYS) — GROUP A & B FEEDWATER ISOLATION; GROUP C - TURBINE & FEEDWATER PUMP TRIP

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A NON-TESTABLE LOADS	1. 1-FCV-3-35 MAIN FEED WATER CONTROL VALVE	K501, K507 & K520	K601,* K620 & K636*	1NC, 125V DC CONTACT OF EACH RELAY IN SERIES FOR EACH VALVE
	2. 1-FCV-3-48 MAIN FEED WATER CONTROL VALVE			
	3. 1-FCV-3-90 MAIN FEED WATER CONTROL VALVE			
	4. 1-FCV-3-103 MAIN FEED WATER CONTROL VALVE			
GROUP B NON-TESTABLE	1. 1-FCV-3-47 STEAM GENERATOR NO. 2 FEEDWATER ISOLATION VALVE	K501, K507 & K520	K610,* K649 K637*	1NO., 120V AC CONTACT OF EACH RELAY IN PARALLEL FOR EACH VALVE
	2. 1-FCV-3-100 STEAM GENERATOR NO. 4 FEEDWATER ISOLATION VALVE			
	3. MAIN FEED ISLN TR-B (PLANT) COMPUTER POINT SD-9007)			1NO., 48V DC
	4. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO., 125V DC
	5. SAFETY INJECTION ACTUATION TR B (PLANT) COMPUTER POINT SD-9001)	K501	K610*	1NO., 48V DC
GROUP C NON-TESTABLE LOADS	1. MAIN FEED PUMP TURBINE 1A			1NO., 125V DC
	2. MAIN FEED PUMP TURBINE 1B			1NO., 125V DC
	3. TURBINE TRIP 20/ET		K621	1NO., 250V DC
	4. TURBINE OPC2 TRIP	K601		1NO., 250V DC
	5. MAIN FEED PUMP TURBINE TRIP (COMPUTER POINT) TESTABLE	K620		1NO., 48V DC
	6. HOTWELL PUMP SEPARATION RELAY	K636		1NO., 120V AC

CONTAINMENT ISOLATION PHASE A - TRAIN B - UNIT 1 TABLE IV (CONT'D)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP C TESTABLE LOADS	1.	K522	K630	
	2.			
	3.			
	4. 1-FCV-61-122 FLOOR COOLANT GLYCOL ISLN VALVE (9833)			1NC, 125V DC
	5. 1-FCV-61-97 FLOOR COOLANT GLYCOL ISLN VALVE (9835)			1NC, 125V DC
	6.			
	7.			
	8. 1-FCV-70-85 COMPONENT COOLING EXCESS LETDOWN HEAT EXCHANGER DISCHARGE			1NC, 125V DC

CONTAINMENT VENT ISOLATION - TRAIN B - UNIT 1 TABLE VIII (1 MASTER & 2 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. TVA BUFFER RELAY FOR THE SAME LOADS AS LISTED IN TABLE VII ON RELAY K615, ITEM 1	K503	K615*	1NC, 120V AC
	2. 1-FCV-30-2 PURGE AIR UNIT A ISOLATION			1NC, 125V DC
	1-FCV-30-61 PURGE AIR EXHAUST UNIT A SUCTION VALVE			1NC, 125V DC
	1-FCV-30-5 PURGE AIR UNIT B ISOLATION			1NC, 125V DC
	1-FCV-30-12 ANNULUS PURGE ISOLATION			1NC, 125V DC
	1-FCV-30-62 PURGE AIR EXHAUST UNIT B SUCTION VALVE			1NC, 125V DC
	1-FCV-30-54 ANNULUS EXHAUST ISOLATION			1NC, 125V DC
GROUP B TESTABLE LOADS	1. 1-FCV-30-8 UPR. COMPT. PURGE ISLN, 1-FCV-30-50 UPR. CNTMT. EXH. ISLN.	K503	K622*	1NC, 125V DC
	2. 1-FCV-30-9 UPPER COMPARTMENT PURGE ISOLATION; 1-FCV-30-53 UPPER CONTAINMENT EXHAUST ISOLATION			1NC, 125V DC
	3. 1-FCV-30-15 LOWER COMPARTMENT PURGE ISOLATION; 1-FCV-30-57 LOWER CONTAINMENT EXHAUST ISOLATION			1NC, 125V DC
	4. 1-FCV-30-16 LOWER COMPARTMENT PURGE ISOLATION			1NC, 125V DC
	5. 1-FCV-30-37 LOWER COMPARTMENT EXHAUST ISOLATION			1NC, 125V DC
	6. 1-FCV-30-19 INCORE INSTRUMENT ROOM PURGE ISOLATION; 1-FCV-30-58 INCORE INSTRUMENT ROOM EXHAUST ISOLATION			1NC, 125V DC
	7. 1-FCV-90-108, 109, 110, 114, 115, 116 RAD MON ISLN			1NO., 120V AC
	8. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)			1NO., 125V DC

CONTAINMENT ISOLATION PHASE A - TRAIN A - UNIT 1 TABLE III (CONT'D)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP C TESTABLE LOADS	1.	K522	K630*	
	2.			
	3. 1-FCV-61-110 FLOOR COOLANT GLYCOL ISLN VALVE (9832)			1NC, 125V DC
	4. 1-FCV-61-96 FLOOR COOLANT GLYCOL ISLN VALVE (9834)			1NC, 125V DC
	5. 1-FCV-26-240 CNTMT STANDPIPE ISLN VALVE			1NO., 120V AC
	6.			
	7. 1-FCV-26-243 RCP SPRAY ISLN VLV			1NO., 120V AC
	8. 1-FCV-70-143 ISLN VALVE TO EXCESS LETDOWN HEAT EXCHANGER			1NO. 120V AC

PRESSURIZER RELIEF BLOCK - TRAIN A - UNIT 1 TABLE XV (1 MASTER & 1 SLAVE)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-63-80 (8808C)-SIS ACCUMULATOR TK 3 OUTLET ISLN VALVE	K510	K628	1NC, 120V AC
	2. 1-FCV-63-118 (8808A)-SIS ACCUMULATOR TK 1 OUTLET ISLN VALVE			1NC, 120V AC

PRESSURIZER RELIEF BLOCK - TRAIN B - UNIT TABLE XV (1 MASTER & 1 SLAVE)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-63-67 (8808D)-SIS ACCUMULATOR TK 4 OUTLET ISLN VALVE	K510	K628	1NC., 120V AC
	2. 1-FCV-63-98 (8808B)-SIS ACCUMULATOR TK 2 OUTLET ISLN VALVE			1NC., 120V AC

NOTES:

1. SEE 1-47W611-99-3 FOR TYPICAL LOGIC & NOTES.

REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE
11	M-39911-A	ESJ	PDH	DLO	4-2-99
REVISED PER DCA M39911-335-0.					

SCALE: NTS — EXCEPT AS NOTED

PROJECT FACILITY: POWERHOUSE UNITS 1 & 2

TITLE: ELECTRICAL LOGIC DIAGRAM REACTOR PROTECTION SYSTEM

1 — WATTS BAR NUCLEAR PLANT, TENNESSEE VALLEY AUTHORITY — Q

DESIGN: DRAFTER J.A. TALLEY; CHECKER GARY BARNARD; DESIGNER S. LIN; REVIEWER R.L. FORESTER

INITIAL ISSUE: R0 ISSUE PER EAI-3.10 & RIMS T28 '92 0227 860

ENGINEERING APPROVAL: 1 S. LIN; 2 C.A. ATKINS; 3 C.C. LYKE FOR MCB

ISSUED BY: R.M. JOHNSON

DATE 3/5/92 | 85 | E | 1-47W611-99-4 | R11

PRINTS REQ'D R — PRINT SIZE F — BR OR PROJ AB CE EE ME NE FE HE SE TE BL BF #8 SQ — PRINT SIZE H — BR OR PROJ AB CE EE ME NE FE HE SE TE BL BF #8 SQ

CONFIGURATION CONTROL DRAWING

3.6 CONTAINMENT SYSTEMS

3.6.11 Ice Bed

LCO 3.6.11 The ice bed shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Ice bed inoperable.	A.1 Restore ice bed to OPERABLE status.	48 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.11.1	Verify maximum ice bed temperature is ≤ 27°F.	12 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.6.11.2	Verify total weight of stored ice is ≥ 2,158,000 lb by: a. Weighing a representative sample of ≥ 144 ice baskets and verifying each basket contains ≥ 1110 lb of ice; and b. Calculating total weight of stored ice, at a 95% confidence level, using all ice basket weights determined in SR 3.6.11.2.a.	18 months
SR 3.6.11.3	Verify azimuthal distribution of ice at a 95% confidence level by subdividing weights, as determined by SR 3.6.11.2.a, into the following groups: a. Group 1-bays 1 through 8; b. Group 2-bays 9 through 16; and c. Group 3-bays 17 through 24. The average ice weight of the sample baskets in each group from radial rows 1, 2, 4, 6, 8, and 9 shall be ≥ 1110 lb.	18 months
SR 3.6.11.4	Verify, by visual inspection, accumulation of ice on structural members comprising flow channels through the ice bed is ≤ 15 percent blockage of the total flow area for each safety analysis section.	18 months

(continued)

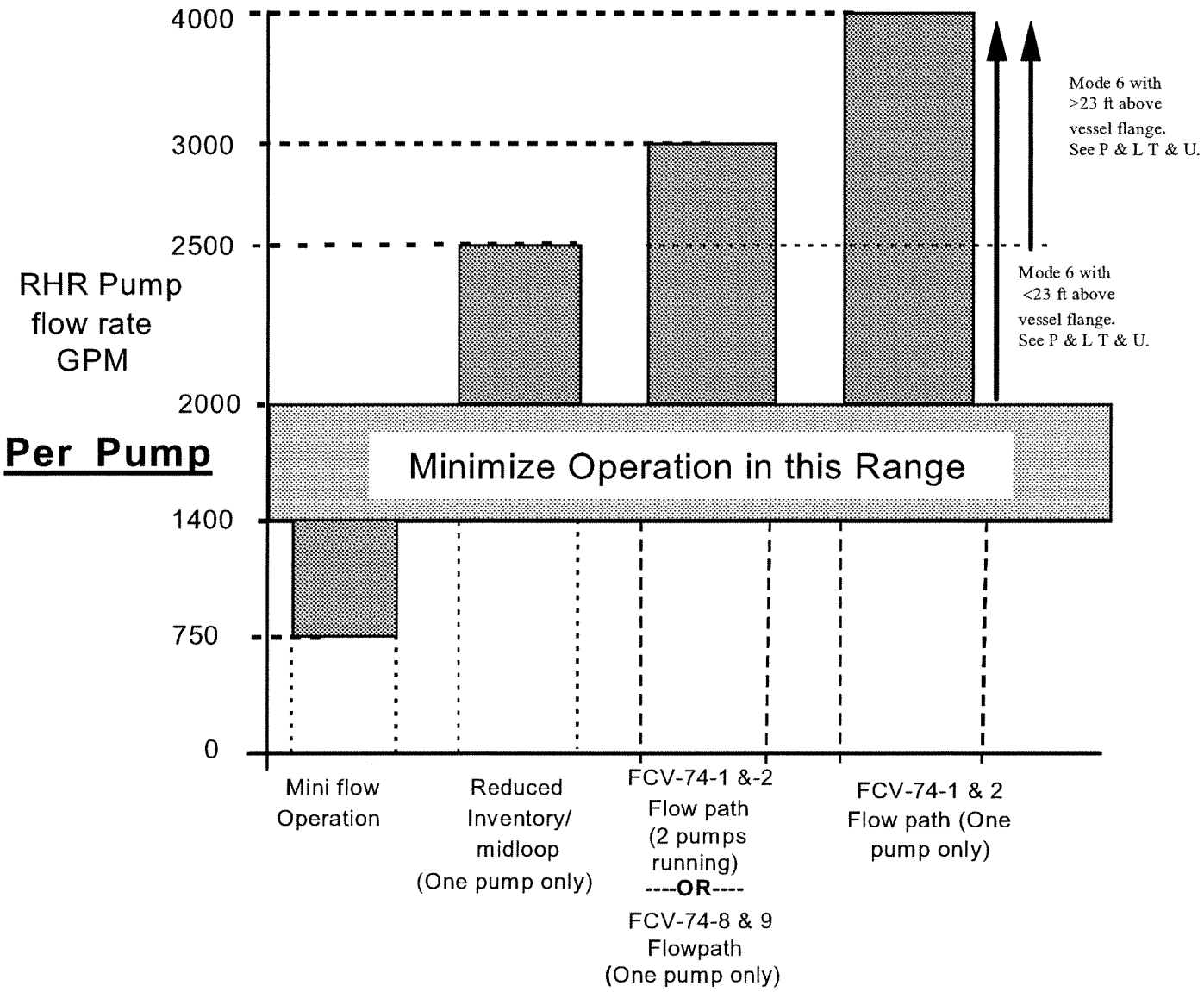
SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.11.5	----------NOTE---------- The requirements of this SR are satisfied if the boron concentration and pH values obtained from averaging the individual sample results are within the limits specified below. ---------- Verify, by chemical analysis of the stored ice in at least one randomly selected ice basket from each ice condenser bay, that ice bed: a. Boron concentration is ≥ 1800 ppm and ≤ 2000 ppm; and b. pH is ≥ 9.0 and ≤ 9.5.	54 months
SR 3.6.11.6	Visually inspect, for detrimental structural wear, cracks, corrosion, or other damage, two ice baskets from each azimuthal group of bays. See SR 3.6.11.3.	40 months
SR 3.6.11.7	----------NOTE---------- The chemical analysis may be performed on either the liquid solution or on the resulting ice. ---------- Verify, by chemical analysis, that ice added to the ice condenser meets the boron concentration and pH requirements of SR 3.6.11.5.	Each ice addition

APPENDIX A

Page 1 of 1

RHR PUMP OPERATING FLOW LIMITS



APPENDIX A

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TIME TO CORE BOIL

DAYS AFTER SHUTDOWN	POWER (MW)	T–BOIL–1 (MIN)	T–BOIL–2 (MIN)
0.5	20.46	4.28	5.19
1	16.70	5.25	6.36
2	13.69	6.40	7.76
3	12.22	7.17	8.69
4	11.24	7.79	9.45
6	9.96	8.80	10.66
8	9.06	9.67	11.72
10	8.37	10.47	12.69
15	7.04	12.44	15.09
20	6.14	14.27	17.30
25	5.48	15.99	19.38
30	4.92	17.80	21.59

T–BOIL–1 = Time to boil at midloop with starting temp of 140°F.

T–BOIL–2 = Time to boil for all elevations above 720.75 with starting temp of 140°F.

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT

ABNORMAL OPERATING INSTRUCTION

AOI-16

LOSS OF NORMAL FEEDWATER

Revision 29

Unit 1

QUALITY RELATED

REQUESTED BY: J. M. Earles

SPONSORING ORGANIZATION: Operations

APPROVED BY: Patrick Salkeld

Effective Date: 12/19/05

LEVEL OF USE: CONTINUOUS

REVISION LOG

REVISION OR CHANGE NUMBER	EFFECTIVE DATE	AFFECTED PAGES	DESCRIPTION OF REVISION/CHANGE
25	3/17/03	2, 9, 10, 12, 17	Non-intent. Corrected typos. Revised section 3.4 step 5.d RNO because iterative load changes may be required. Corrected section 3.3 steps 7-10 for proper procedure flow without reliance upon double-negative statements. These changes are due to operator/operator training feedback.
UIC-1	7/21/03	2, 20	Intent. Section 3.6, Step 2, add NOTE to allow use of bypass reg. valve to dampen oscillations caused by main reg. valve malfunctions.
26	12/5/03	2, 12, 20-23	Non-intent. Incorporated UIC-1 which added a page to Section 3.6, moved step 4 to page 21,moved steps 6,7& 8 to page 22 and renumbered pages. Reworded Sect. 3.4, Step 5 RNO to clarify flowpath. Moved Sect. 3.6, Step 3 prior to Step 2 to allow evaluation of bypass valve usage and added steps in RNO to isolate any failed open bypass reg. valve. These changes are due to operator training feedback.
27	03/15/04	2, 9, 10, 18, 19	Non-intent. Change step sequence per license training feedback to place removing unit from influence of valve position limiter later in Sections 3.3 & 3.5.
28	06/09/04	2, 9, 10	Non-intent. Add step to section 3.3 to reset C-7 if necessary after runback. Training feedback.
29	12/19/05	2, all, 6, 10, 19, 17, 22	Replaced the word VERIFY with CHECK or ENSURE where appropriate. Added caution to address excessive rod insertion. Clarified existing steps for removing turbine from valve position limiter. Added step to refer to Tech Specs. Enhanced 3.6 [7] RNO to ensure the effect of a failed steam flow channel on the MFPs is evaluated.

1.0 PURPOSE

This Instruction provides actions to respond to a loss of normal FW due to MFW pump trip, a malfunctioning MFW reg valve or a loss of pump automatic speed control.

2.0 SYMPTOMS

2.1 Alarms

A. MFPT 1A ABNORMAL [50-A]

B. MFPT 1B ABNORMAL [50-B]

C. TRIPPED [51-A]

D. MFP 1A FLOW LO [57-A]

E. MFP 1B FLOW LO [58-A]

F. SG FEEDWATER FLOW HI [58-B]

G. SG 1 LEVEL HI [60-B]

H. SG 2 LEVEL HI [61-B]

I. SG 3 LEVEL HI [62-B]

J. SG 4 LEVEL HI [63-B]

K. SG LEVEL DEVIATION [63-F]

2.2 Automatic Actions

NOTE: Pressure equivalent load is indicated on ICS point P0300A. Runback circuitry may be verified at 1-PIS-47-13, HP TURBINE IMPULSE STEAM PRESSURE [1-L-262, 729, T3J]. Standby Main Feedwater Pump Auto-Start at 67% load is armed when relay number 1 is illuminated on the PIS. Turbine runback at 85% load is armed when relay number 3 is illuminated on the PIS.

A. MFW pump trip, with runback armed:

1. Turbine runback to less than 85%.
2. Standby feedwater pump starts.
3. Affected MFW pump turbine condenser isolates.

B. Loss of one MFW pump, with runback NOT armed:

1. Standby FW pump starts (if turbine load greater than 67%).
2. MFW pump turbine condenser isolates if FW flow greater than 40%.

C. If MFW reg vlv fails OPEN, turbine trip will occur at 82.4% steam generator level.

3.0 OPERATOR ACTIONS

3.1 Diagnostics

IF	GO TO Subsection
Standby MFWP TRIP without Main Turbine in service	3.2
Standby MFWP TRIP with Main Turbine in service	3.3
MFWP TRIP less than 800 MWe (67% Turbine Load)	3.4
MFWP TRIP greater than or equal to 800 MWe (67% Turbine Load)	3.5
MFW reg or bypass reg valve control failure	3.6
MFW pump speed control circuit failure	3.7

3.2 Loss of Standby MFWP Without Main Turbine In Service

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** at least one MFW pump in service.	** **GO TO** Step 5.
3.	**ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	Manually **CONTROL** MFWPT speed.
4.	** **GO TO** Step 10.	
5.	**START** AFW pumps: • Both MD AFW pumps. • TD AFW pump.	

CAUTION **Care should be taken to avoid excessive rod insertion. If resulting Reactor power is less than desired, rods SHALL NOT be withdrawn in an attempt to recover Reactor power.**

6.	**INSERT** control rods to reduce reactor power to within AFW capabilities (less than 4%).	
7.	**MAINTAIN** zero startup rate.	

3.2 Loss of Standby MFWP Without Main Turbine In Service (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8.	**CHECK** AFW pumps LCVs controlling S/G levels to 38%.	Manually **CONTROL** AFW LCVs to maintain S/G levels at 38%.
9.	**STABILIZE** RCS Tave greater than or equal to 557°F.	**ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues, **THEN** **CONTROL** AFW flow to minimize cooldown.
10.	**WHEN** S/G levels controlled, **THEN** **CONSULT** plant staff for recovery actions.	
11.	**REFER TO** appropriate instruction: • SPP-3.5, Regulatory Reporting Requirements. • GO-3, Unit Startup From Less Than 4% Reactor Power To Less Than 30% Reactor Power. • GO-5, Unit Shutdown From Less Than 30% Reactor Power To Hot Standby.	

- END OF SUBSECTION -

3.3 Loss of Standby MFWP With Main Turbine In Service

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**IF** both MFWPs in service, **THEN:** a. **INITIATE** repairs on Standby MFWP. b. **RETURN TO** Instruction in effect.	
3.	**CHECK** one MFWP in service.	**TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip.
4.	**CHECK** turbine load less than 800 MWe (67%).	**REDUCE** turbine load to within MFWP capability with valve position limiter.
5.	**MONITOR** reactor power controlled to match turbine power.	**INSERT** control rods to match reactor power with turbine load.

3.3 Loss of Standby MFWP With Main Turbine In Service (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. **ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	Manually **CONTROL** MFWPT speed. **REDUCE** turbine load, if necessary: a. **SET** LOAD RATE at 5%/min. b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL ∇ (lower). c. **PUSH** GO button. d. **WHEN** desired load reached, **THEN** **PUSH** HOLD button, and **REPEAT** Step 6.
7. **IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	
8. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. b. **RESET** loss-of-load interlock with steam dump mode switch.	

3.3 Loss of Standby MFWP With Main Turbine In Service (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	**CHECK** VALVE POS LIMIT LIGHT LIT.	** **GO TO** Step 11.
10.	**REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, **THEN** **SET** valve position limiter to 95%.	
11.	**RETURN TO** Instruction in effect.	

- END OF SUBSECTION -

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** at least one MFWP in service.	**IF** reactor power greater than 50% (P-9), **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection. **IF** 1-HS-3-45 in NORMAL, **THEN** **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip. ** **GO TO** Step 9.
3.	**PLACE** tripped MFP recirc valve controller in MANUAL, and **CLOSE** recirc valve.	
4.	**ENSURE** MFWP speed rising to control S/G Δ-P and levels on program.	Manually **CONTROL** MFWPT speed.

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5.	**ENSURE** adequate feed flow for existing conditions:
	• Feed flow greater than or equal to steam flow.
	• S/G levels returning to program.
		START Standby MFWP.
		
		REDUCE turbine load, if necessary:
		a. **SET** LOAD RATE at 5%/min.
		b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL▽ (lower).
		c. **PUSH** GO button.
		d. **IF** adequate feed flow established, **THEN**
		PUSH HOLD button and
		** **GO TO** Step 6.
		e. **IF** continued load reduction may establish adequate feed flow, **THEN**
		REPEAT Step 5 RNO.
		
		IF reactor power greater than 50% (P-9) **AND** adequate feed flow can **NOT** be established, **THEN**
		TRIP reactor, and
		** **GO TO** E-0, Reactor Trip or Safety Injection.
		
		IF adequate feed flow can **NOT** be established (less than P-9), **THEN**
		TRIP turbine, and
		** **GO TO** AOI-17, Turbine Trip.

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6.	**MONITOR** reactor power controlled to match turbine load.	**INSERT** control rods to match reactor power with turbine load.
7.	**INITIATE** repairs on failed pump.	
8.	**RETURN TO** Instruction in effect.	
9.	**START** Standby MFWP, and **ESTABLISH** feed flow.	**IF** Standby MFWP flow can **NOT** be established, **THEN** **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip.
10.	**REDUCE** turbine load to between 150 and 200 MWe (12 and 16%): a. **SET** LOAD RATE at 5%/min. b. **SET** 10% in SETTER with REFERENCE CONTROL▽ (lower). c. **PUSH** GO button. d. **WHEN** Unit between 150 and 200 MWe, **THEN** **PUSH** HOLD button.	

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
NOTE AUTO rod withdrawal will be blocked below 15% reactor power (C-5).	
11. **INSERT** control rods to match reactor power with turbine load (between 12 and 16%), then **MAINTAIN** zero startup rate.	
12. **MAINTAIN** Tave-Tref on program: • **ADJUST** turbine load. • **CONTROL** feed flow. • **MONITOR** steam dumps and S/G PORV operation.	
13. **MONITOR** #1 FW heater inlet pressure less than 1363 psig.	**STOP** Condensate Booster Pumps, as necessary.
NOTE Manual level control may be required due to the slow response characteristics of the bypass reg valves.	
14. **MONITOR** bypass reg valves controlling S/G levels on program.	**CONTROL** bypass reg valves in MANUAL. **IF** S/G levels can **NOT** be maintained, **THEN** **TRIP** Reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. b. **RESET** loss-of-load interlock with steam dump mode switch.	
16. **IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	
17. **EVALUATE** MFWP status to determine recovery action plan.	
18. **REFER TO** GO-5, Unit Shutdown From 30% Reactor Power to Hot Standby, to complete alignments for 15% power level.	

-END OF SUBSECTION -

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** turbine load less than or equal to 1000 MWe (85%).	**ENSURE** Standby MFWP running. **REDUCE** turbine load to less than 1000 MWe with valve position limiter.
3.	**PLACE** tripped MFP recirc valve controller in MANUAL, and **CLOSE** recirc valve.	
4.	**CHECK** turbine load less than 800 MWe (67%),	**ENSURE** Standby MFWP running. **IF** Standby MFWP **NOT** available, **THEN** **REDUCE** turbine load to less than 800 MWe with valve position limiter.
5.	**ENSURE** MFWP speed rising to control S/G Δ-P and levels on program.	Manually **CONTROL** MFWPT speed.

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
CAUTION **Continued load reductions below 800 MWe should be done using normal turbine controls at less than or equal to 5% min.**	
6. **ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	**ENSURE** Standby MFWP running. **REDUCE** turbine load, if necessary: a. **SET** LOAD RATE at 5%/min. b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL∇ (lower). c. **PUSH** GO button. d. **WHEN** desired load reached, **THEN** **PUSH** HOLD button, and **REPEAT** Step 6.
7. **ENSURE** T-avg and T-ref within 3°.	**INSERT** control rods to match reactor power with turbine load.
8. **REFER TO** Tech Specs: • 3.2.3 AFD	

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	**IF** feed flow greater than 40%, **THEN** **ENSURE** tripped MFWP turbine condenser valves CLOSED: • Pump A, 1-FCV-2-205 and -210, OR • Pump B, 1-FCV-2-211 and -216.	
10.	**MONITOR** reg valves controlling S/G levels on program.	**CONTROL** reg valves in MANUAL. **IF** S/G levels can **NOT** be maintained, **THEN** **TRIP** Reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
11.	**IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. b. **RESET** loss-of-load interlock with steam dump mode switch.	
12.	**ENSURE** Condensate System Pumps in service as necessary: • **REFER TO** GO-4, Normal Power Operation.	

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13.	**IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	
14.	**CHECK** VALVE POS LIMIT LIT.	** **GO TO** Step 15.
15.	**REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, **THEN** **SET** valve position limiter to 95%.	
16,	**INITIATE** repairs on failed pump.	
17.	**RETURN TO** Instruction in effect.	

-END OF SUBSECTION -

3.6 Main FW Reg or Bypass Reg Valve Control Failure

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**CONTROL** failed MFW reg or bypass reg valve in MANUAL.	

NOTE If the main reg. valve is malfunctioning, the bypass reg. valve for the affected loop may be manually positioned as necessary up to 0.85 x 10^6 lb/hr flow to dampen oscillations in feedwater flow. A power tilt in the affected core quadrant may occur due to a rise in bypass flow. Flows above 84,500 lbm/hr in the bypass line will invalidate the value of computer point U1118.

2.	**CHECK** SG levels on bypass reg valve control.	** **GO TO** Step 4.
3.	**IF** any bypass reg valve failed, **THEN**	
	a. **ENSURE** turbine tripped.	
	b. **ENSURE** AFW pumps running.	
	c. **INSERT** control rods to reduce reactor power to within AFW capabilities (less than 4%) , then **MAINTAIN** zero startup rate.	
	d. **CHECK** AFW LCVs controlling S/G levels to 38%.	d. Manually **CONTROL** AFW LCVs to maintain S/G levels at 38%.
	e. **CHECK** bypass reg valves closed.	e. **ISOLATE** bypass reg valves as required.
	f. **CHECK** S/G levels returning to PROGRAM.	f. **IF** S/G level RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ****GO TO** E-0, Reactor Trip or Safety Injection.
	g. ** **GO TO** Step 6.	

3.6 Main FW Reg or Bypass Reg Valve Control Failure (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4.	**CHECK** S/G levels returning to PROGRAM.	**IF** S/G level RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ****GO TO** E-0, Reactor Trip or Safety Injection.

NOTE A LO FW FLOW WTR HAMMER annunciation [59-C] will be received when any main feedwater flow drops to less than 0.75 x 10^6 lb/hr.

5.	**WHEN** any S/G MFW flow drops to less than 0.55 x 10^6 lb/hr, **THEN** **INITIATE** manual anti-water hammer actions:	
	a. **CLOSE** affected loop(s) MFW reg valve and FW isolation valve.	
	b. **MAINTAIN** affected S/G levels on program with bypass reg valves.	
	c. **REDUCE** turbine load to within capability of bypass reg valves.	c. **IF** S/G level loss IMMINENT, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
	d. **TRANSFER** S/G level control to bypass reg valves: • **REFER TO** SOI-2 & 3.01, Condensate and Feedwater System.	

3.6 Main FW Reg or Bypass Reg Valve Control Failure (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
CAUTION **Power range N41 controls S/G 1 and S/G 4 MFW reg valves. N42 controls S/G 2 and S/G 3 MFW reg valves.**	
NOTE All power range monitors input to auctioneered high anticipatory circuit for bypass FW reg valves.	
6. **CHECK** power range N41 through N44 NORMAL.	** **GO TO** AOI-4, Nuclear Instrumentation Malfunctions.
NOTE Steps 7 & 8 should end up having the same channel (A or B) selected for steam flow and feed flow on each S/G to ensure a loss of voltage to any one channel will have minimal effect on the affected S/G level.	
7. **CHECK** controlling steam flow channels NORMAL.	**SELECT** operable channel, and **EVALUATE** effect of the failed channel on the MFPs, while continuing with this section.
8. **CHECK** controlling FW flow channels NORMAL.	**SELECT** operable channel.

3.6 Main FW Reg or Bypass Reg Valve Control Failure (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	**CHECK** press compensation channel(s) NORMAL.	**REFER TO** Tech Specs: • 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation. • 3.3.3, Post Accident Monitoring (PAM) Instrumentation. • 3.3.4, Remote Shutdown System.
10.	**IF** affected S/G controlling channel and level NORMAL, **THEN** **RETURN** MFW reg valve to AUTO.	
11.	**INITIATE** repairs to failed equipment.	
12.	**RETURN TO** Instruction in effect.	

- END OF SUBSECTION -

3.7 Failure Of MFW Pump Control

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**CHECK** MFWPT speed controller(s) NORMAL.	**CONTROL** MFP speed using MANUAL control of master controller or individual controller(s) as required. **IF** MANUAL control of individual MFWPT controller is ineffective, **THEN** **TRIP** affected MFWPT, and ** **GO TO** Section 3.4 or 3.5 as applicable.
2.	**PLACE** control rods in MANUAL.	
3.	**ENSURE** T-avg and T-ref within 3°.	
4.	**MAINTAIN** MFWP discharge press on PROGRAM.	
5.	**ENSURE** S/G levels return to PROGRAM.	**IF** S/G levels RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.

3.7 Failure Of MFW Pump Control (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6.	**CHECK** steam dump mode in T-AVG position.	**IF** 1-PT-1-33 failed **AND** steam dumps in PRESS mode, **THEN:** a. **TURN** steam dumps OFF. b. **PLACE** steam dump press controller to MANUAL, and **ZERO** output. c. **TURN** steam dumps ON. d. **STABILIZE** S/G press.
7.	**INITIATE** repairs to failed equipment.	
8.	**IF** desired to place control rods in auto, **THEN** **ENSURE** T-avg and T-ref within 1° and **PLACE** control rods in auto.	
9.	**RETURN TO** Instruction in effect.	

- END OF SUBSECTION -

4.0 DISCUSSION

This AOI addresses loss of normal feedwater to any or all S/Gs as a result of pump failures or valve malfunctions.

A. Loss of reg valve control can result in the valve failing open or closed. This failure requires the operator to place the valve control in manual and return the S/G level to program. A low FW flow water hammer annunciation will be received when any main feedwater flow drops to less than 0.75×10^6 lb/hr (20%) [window 59-C]. Actions must be taken to restore flow. If any S/G MFW flow drops to less than 0.55×10^6 lb/hr then manual closure of the affected MFW reg valve, FW isol valve and level control by the bypass reg valve is required to prevent water hammer conditions in the affected S/G.

B. The unit can maintain 85% load with one MFWP and start of the standby MFWP. The standby MFWP auto starts on loss of one MFWP with turbine load greater than or equal to 67% (1-PIS-47-13, HP TURBINE IMPULSE STEAM PRESSURE). Without the standby MFWP, the turbine must be manually run-back to less than 67%.

C. If PT-1-33 fails high, the feed pump speed program circuit will see a small ΔP signal, causing the MFWPs to raise speed. If PT-1-33 fails low, the feed pump speed program circuit will see a large ΔP signal, causing the FW pumps to drop speed.

D. If PT-1-33 fails high and the steam dumps are selected to the pressure mode, the steam dump valves should open proportionally to the error signal generated by the difference in the PIC-1-33 setpoint and the failed high signal.

E. If PT-3-1 fails high, the feed pump speed control circuit will see a large ΔP signal. This will cause the MFWPs to drop speed. If PT-3-1 fails low, this causes the feed pump speed control circuit to see a small ΔP and raise speed.

F. If SG controlling channel inputs fail, the affected reg valve can be returned to auto by selecting a operable flow channel.

5.0 REFERENCES

5.1 Performance

A. AOI-4, Nuclear Instrumentation Malfunction.

B. AOI-17, Turbine Trip.

C. E-0, Reactor Trip or Safety Injection.

D. GO-3, Unit Startup from less than 4% Reactor Power to less than 30% Reactor Power.

E. GO-4, Normal Power Operation.

F. GO-5, Unit Shutdown from less than 30% Reactor Power to Hot Standby

G. SOI-2 & 3.01, Condensate and Feedwater System.

H. SPP-3.5, Regulatory Reporting Requirements.

5.2 Technical Specification

A. 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation.

B. 3.3.3, Post Accident Monitoring (PAM) Instrumentation.

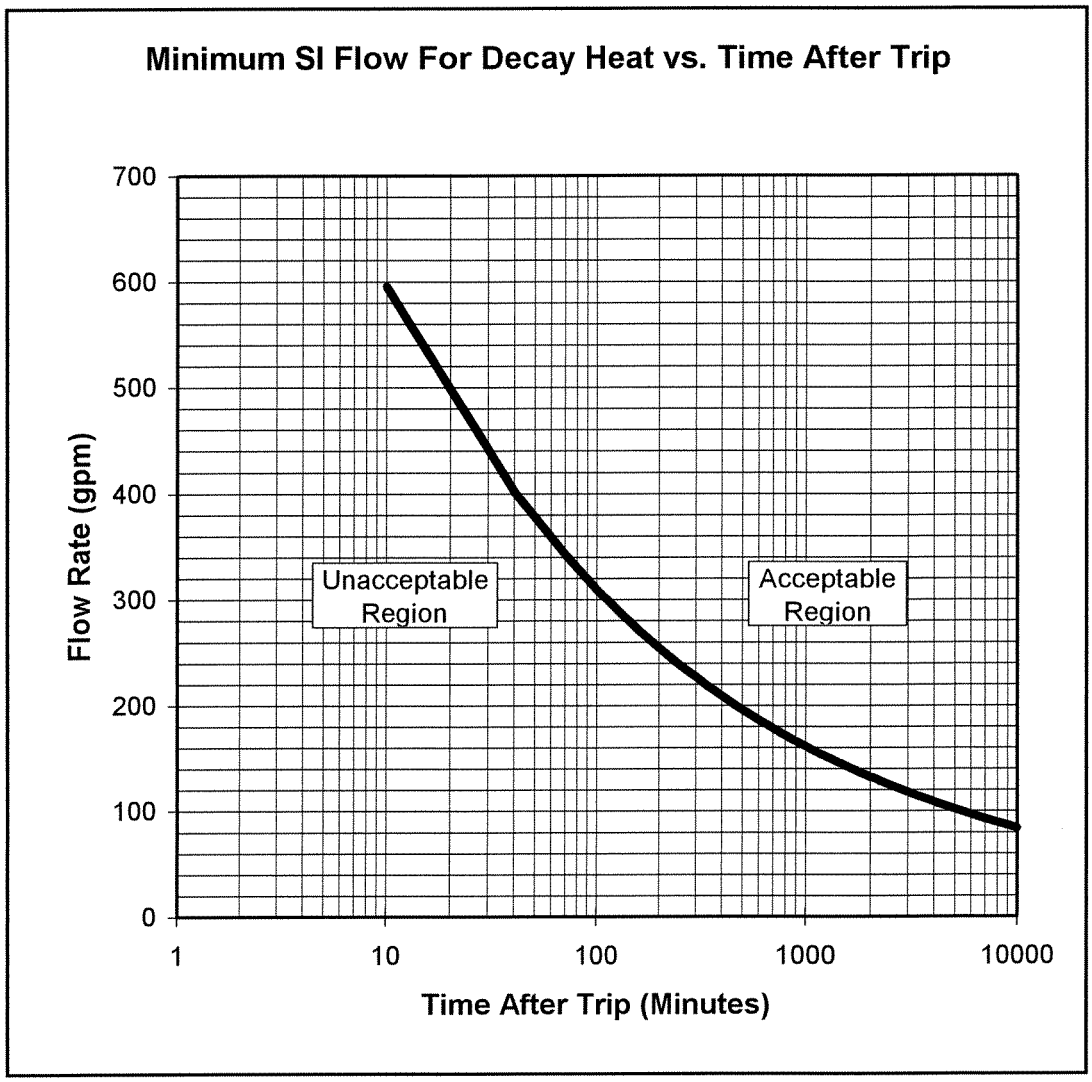
C. 3.3.4, Remote Shutdown System.

5.3 Plant Drawings

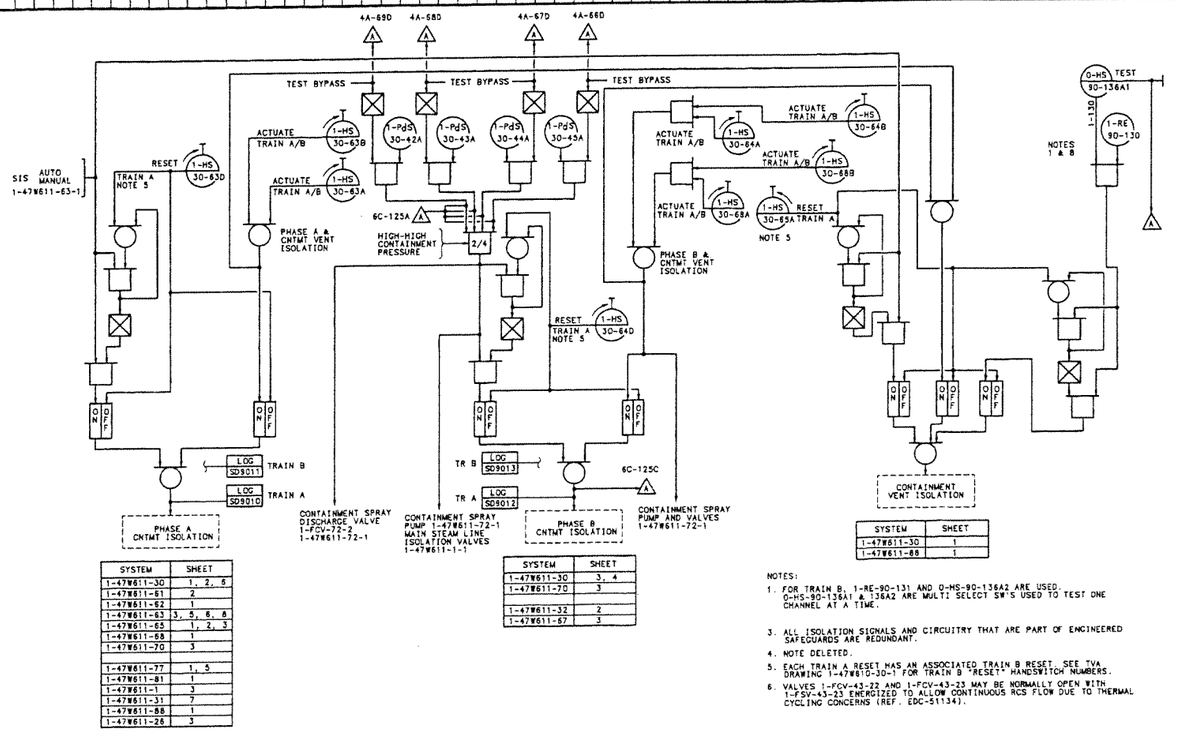
A. 1-47W803-1

B. 1-47W611-3-1, -2, & -6

Figure 1


Minimum SI Flow For Decay Heat vs. Time After Trip
Flow Rate (gpm)
700
600
500
400
300
200
100
0
Unacceptable Region
Acceptable Region
1
10
100
1000
10000
Time After Trip (Minutes)

SRO NRC WRITTEN EXAMINATION
REFERENCE PACKAGE



SYSTEM	SHEET
1-47W611-30	1, 2, 5
1-47W611-61	2
1-47W611-62	1
1-47W611-63	3, 5, 6, 8
1-47W611-65	1, 2, 3
1-47W611-68	1
1-47W611-70	3
1-47W611-77	1, 5
1-47W611-81	1
1-47W611-1	3
1-47W611-31	7
1-47W611-88	1
1-47W611-26	3

SYSTEM	SHEET
1-47W611-30	3, 4
1-47W611-70	3
1-47W611-32	2
1-47W611-67	3

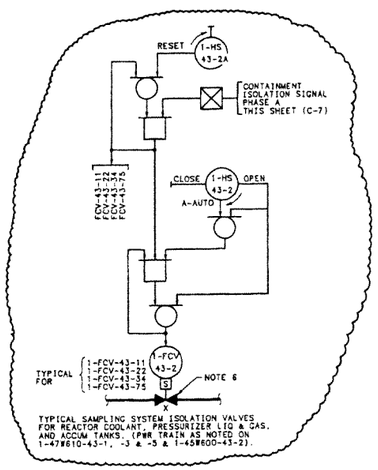
SYSTEM	SHEET
1-47W611-30	1
1-47W611-88	1

NOTES:

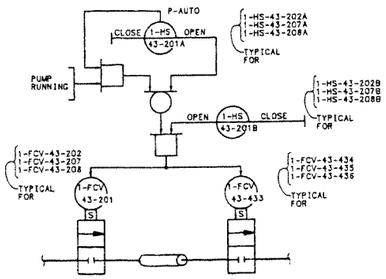
1. FOR TRAIN B, 1-RE-90-131 AND O-MS-90-136A2 ARE USED. O-MS-90-136A1 & 136A2 ARE MULTI SELECT SW'S USED TO TEST ONE CHANNEL AT A TIME.
3. ALL ISOLATION SIGNALS AND CIRCUITRY THAT ARE PART OF ENGINEERED SAFEGUARDS ARE REDUNDANT.
4. NOTE DELETED.
5. EACH TRAIN A RESET HAS AN ASSOCIATED TRAIN B RESET. SEE TVA DRAWING 1-47W610-30-1 FOR TRAIN B "RESET" HANDSWITCH NUMBERS.
6. VALVES 1-FCV-43-22 AND 1-FCV-43-23 MAY BE NORMALLY OPEN WITH 1-FSY-43-23 ENERGIZED TO ALLOW CONTINUOUS RCS FLOW DUE TO THERMAL CYCLING CONCERNS (REF. EDC-51134).
8. 1-RE-90-130 & 131, WHICH HOUSE GAS RADIATION DETECTORS, MONITOR THE CONTAINMENT PURGE EXHAUST.
9. DIGITAL AND ANALOG LOGIC SYMBOLS ARE USED ON LOGIC DIAGRAMS TO FUNCTIONALLY DESCRIBE THE PROCESS CONTROL. REFER TO THE ASSOCIATED WIRING SCHEMATIC FOR THE ELECTRICAL COMPONENTS USED TO IMPLEMENT THE CONTROL SCHEME.
11. FOR SYMBOLS SEE INSTRUMENTION &IDENTIFICATION STANDARDS, LATEST ISSUE.

REFERENCE DRAWINGS:

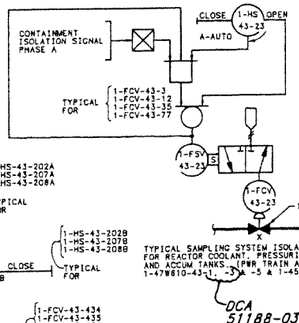
1-47W611-0-1	LOGIC INDEX & SYMBOLS
47B9D1-SERIES	INSTRUMENT TABULATION
1-45W600-43-2	SAMPLING AND WATER QUALITY SYSTEM SCHEMATIC DIAGRAM
1-45W600-90-1	RADIATION MONITORING SYSTEM SCHEMATIC DIAGRAM
1-45W600-57-8	SEPARATION & MISC AUX RELAYS SCHEMATIC DIAGRAMS
1-47W610-30-1 THRU 6	CONTAINMENT VENTILATION SYSTEM
1-47W610-90-1 THRU 3	RADIATION MONITORING SYSTEM CONTROL DIAGRAM
1-47W610-43-3, -5, -6	SAMPLING & WATER QUALITY SYSTEM CONTROL DIAGRAM
1-47W611-1-1	MAIN STEAM SYSTEM LOGIC DIAGRAM
1-47W611-63-1	SAFETY INJECTION SYSTEM LOGIC DIAGRAM
1-47W611-72-1	CONTAINMENT SPRAY SYSTEM LOGIC DIAGRAM



TYPICAL SAMPLING SYSTEM ISOLATION VALVES FOR REACTOR COOLANT, PRESSURIZER LIQ & GAS, AND ACCUM TANKS. (PWR TRAIN AS NOTED ON 1-47W610-43-1, -3 & -5 & 1-45W600-43-2).

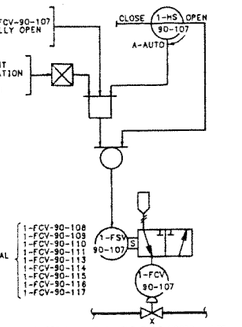


CONTAINMENT H_2 SAMPLE SYSTEM (PWR TRAIN AS NOTED ON 1-47W610-43-6 & 1-45W600-43-2)



TYPICAL SAMPLING SYSTEM ISOLATION VALVES FOR REACTOR COOLANT, PRESSURIZER LIQ & GAS, AND ACCUM TANKS. (PWR TRAIN AS NOTED ON 1-47W610-43-1, -3 & -5 & 1-45W600-43-2).

OCA 51188-03-0



TYPICAL CONTAINMENT BLDG UPPER & LWR COMPARTMENT AIR MONITOR ISOL VLV (PWR TRAIN AS NOTED ON 1-47W610-90-2 & 1-45W600-90-1)

FSAR FIG 6.2.4-21 & FSAR FIG 7.3-3 SH 4

18	51188	JEW	GJB	DLO	4-12-92
REVISED PER DCA'S 51188-02-0 AND 03-0.					
REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE

SCALE: NTS — EXCEPT AS NOTED

PROJECT FACILITY
POWERHOUSE
UNITS 1 & 2

TITLE
ELECTRICAL
LOGIC DIAGRAM
CONTAINMENT ISOLATION

1	WATTS BAR NUCLEAR PLANT TENNESSEE VALLEY AUTHORITY	Q

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER C.W. JOHNSON	CHECKER GARY BARNARD	RO ISSUE PER EAI 3.10 & RIMS T28 '92 0227 860	1 C.A. ATKINS
DESIGNER C.A. ATKINS	REVIEWER R.L. FORESTER		2 ROBERT D. MURR
			3 C.C. LYKE FOR MCB

ISSUED BY: R.M. JOHNSON — DATE 3/5/92 — 85 — E — 1-47W611-88-1 — R18

PRINTS REQ'D R ____ — PRINT SIZE F — BR OR PROJ AB CE EE ME NE FE HE SE TE BL BF WB SQ — PRINT SIZE H — BR OR PROJ AB CE EE ME NE FE HE SE TE BL BF WB SQ

CAD MAINTAINED DRAWING

CONFIGURATION CONTROL DRAWING

1-47W611-99-4 | 3 | 85

CONTAINMENT ISOLATION PHASE A - TRAIN A - UNIT 1 TABLE III
(3 MASTER & 7 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-77-19 (9160B) REACTOR COOLANT DRAIN TANK TO VENT HEADER 2. 1-FCV-77-10 (LCV-1003) REACTOR COOLANT DRAIN TANK PUMP DISCHARGE 3. 1-FCV-77-128 REACTOR BUILDING SUMP DISCHARGE 4. 1-FCV-77-17 (9159B) REACTOR COOLANT DRAIN TANK TO GAS ANALYZER 5. 1-FCV-77-20 (9157) REACTOR COOLANT DRAIN TANK N_2 SUPPLY 6. TVA RELAY FOR 1-FCV-1-14, 32, 1-FCV-43-23, 55, 56, 61, 64 BLOWDOWN & SAMPLE LINE ISLN VALVE 7. 1-FCV-81-12 (8026) PRIMARY MAKEUP WATER PUMP DISCHARGE 8. TVA RELAY FOR 1-FCV-1-161 & 163 INBOARD BLOWDOWN ISLN VALVES, SAMPLE VALVES 1-FCV-43-3, 12, 35, 77	K502	K605•	1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 120V AC 1NC, 125V DC 1NC, 120V AC
GROUP B TESTABLE LOADS	1. 1-FCV-68-307 (8025) PRESSURIZER RELIEF TANK TO GAS ANALYZER 2. 1-FCV-63-64 (8860) SIS ACCUMULATOR TANK N_2 HEADER INLET 3. 1-FCV-68-305 (8033) PRESSURIZER RELIEF TANK N_2 SUPPLY 4. 1-FCV-63-71 (8871) SIS TEST LINE ISOLATION VALVE 5. AUXILIARY BUILDING ISOLATION 6. INCORE INSTRUMENT ROOM COOLER A (1-FCO-31-263, 269) 7. 1-FSV-30-135 CNTMT ANNULUS DIFF PRESS ISLN VALVE (UNIT 1 ONLY) 8. SHUTDOWN BOARD ROOM A PRESSURIZER FAN A-A	K522	K606•	1NC., 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NO., 120V AC 1NC, 120V AC 1NC, 125V DC 1NC, 120V AC
GROUP C TESTABLE LOADS	1. 1-FCV-62-72-(8149A) REGENERATIVE HEAT EXCHANGER LETDOWN ISOLATION VALVE A 2. 1-FCV-62-73-(8149B) REGENERATIVE HEAT EXCHANGER LETDOWN ISOLATION VALVE B 3. 1-FCV-61-191 GLYCOL SUPPLY LINE ISOLATION VALVE 4. 1-FCV-61-193 GLYCOL RETURN LINE ISOLATION VALVE 5. 1-FCV-63-185 RHR SUPPLY TEST LINE VALVE 6. 1-PCV-65-81 SHIELD BUILDING VENT ISOLATION VALVE & 1-PCV-65-86 EGTS CNTMT ANNULUS ISLN VALVE 7. 1-FCV-62-76 (8036) REGENERATIVE HEAT EXCHANGER LETDOWN ISLN VALVE	K502	K607•	1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NO., 120V AC 1NO., 120V AC 1NC, 125V DC
GROUP D NON-TESTABLE LOADS	1. 1-FCV-62-63-(8100) SEAL FLOW ISOLATION VALVE 2. CNTMT ISLN PH-A TR-A (1PLANT) COMPUTER POINT SD-9010) 3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K522	K614•	1NO., 120V AC 1NO., 48V DC 1NO., 125V DC
GROUP E TESTABLE LOADS	1. CONTAINMENT ANNULUS VACUUM FAN A & FCO-65-77 2. 1-FCV-65-52 CONTAINMENT ISOLATION DAMPER UNIT 1 3. 2-FCV-65-5 CONTAINMENT ISOLATION DAMPER UNIT 2 4. 1-FCV-65-10 EMERGENCY GAS TREATMENT SYSTEM SUCTION UNIT 1 5. 2-FCO-65-46 SHIELD BUILDING EXHAUST A UNIT 2 6. 1-PCV-65-83 & 87 CONTAINMENT RECIRC ISOLATION 7. 1-FCV-62-74 (8149C) REGENERATIVE HEAT EXCHANGER LETDOWN ISLN VALVE C	K522	K612•	1NO., 120V AC 1NC, 125V DC 1NC, 125V DC 1NO., 125V DC 1NO., 125V DC 1NO., 125V DC 1NC, 125V DC
GROUP F TESTABLE LOADS	1. 2-FCO-65-5 EMERGENT GAS TREATMENT SYSTEM TRAIN B UNIT 2 SUCTION 2. 1-FCO-65-26 UNIT 1 SHIELD BUILDING EXHAUST A 3. EMERGENCY GAS TREATMENT FAN A-A (ISLN DAMPER O-FCV-65-24 OPERATED BY FAN LOGIC) 4. 1-FCV-31-306 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE 5. 1-FCV-31-308 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE 6. 1-FCV-31-326 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE 7. 1-FCV-31-330 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE 8. SHUTDOWN BOARD ROOM B PRESSURIZER FAN B-A	K502	K613•	1NO., 125V DC 1NO., 125V DC 1NO., 120V AC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 120V AC

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CONTAINMENT ISOLATION PHASE B - TRAIN A - UNIT 1 TABLE V
(1 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE	1. CONTAINMENT AIR RETURN FAN 1A-A 2. UPPER COMPARTMENT VENTILATION FAN 1A 3. UPPER COMPARTMENT VENTILATION FAN 1C 4. TVA RELAY FOR CONTROL ROD DRIVE FANS 1A-A & 1C-A LOWER COMPARTMENT COOLING UNITS 1A-A & 1C-A 5. TVA RELAY FOR 1-FCV-67-107, 67, 99, 95, 130, 133, 295, & 296 CONTAINMENT VENTILATION COOLERS ISOLATION VALVES 6. FCV-67-97 LOWER CNTMT 1C CLRS SUPPLY ISOL VALVE	K506	K625•	1NO., 125V DC 1NC, 120V AC 1NC, 120V AC 1NO., 120V AC 1NO., 120V AC 1NO., 120V AC
GROUP B NON-TESTABLE	1. COMPONENT COOLING SYSTEM BOOSTER PUMP 1A-A 2. 1-FCV-32-80 CONTROL AIR ISLN VALVE (1-FCV-32-81) 3. 1-FCV-32-110 CONTROL AIR (NON-ESSENTIAL) ISLN VALVE 4. COMPONENT COOLING SYSTEM BOOSTER PUMP 1A-A 5. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K506	K618•	1NC, 120V AC 1NC, 120V AC 1NC, 120V AC 1NO, 120V AC 1NO, 125V DC
GROUP C NON-TESTABLE	1. 1-FCV-70-133 RC BOOSTER PUMP A & B DISCHARGE 2. 1-FCV-70-90 RCP THERMAL BARRIER 1A HT. EXCH. ISOL 3. 1-FCV-70-100 RCP OIL COOLER SUPPLY CNTMT ISOL VALVE 4. 1-FCV-70-92 RCP OIL COOLER DISCHARGE LINE	K506	K618•	1NO., 120V AC 1NC, 120V AC 1NO., 120V AC 1NO., 120V AC
GROUP D TESTABLE	1. 1-FCV-67-104 LOWER CNTMT B CLRS DISCH ISLN VALVE 2. 1-FCV-67-112 LOWER CNTMT D CLRS DISCH ISLN VALVE 3. 1-FCV-67-139 UPPER CNTMT VENT CLR B DISCH ISLN VALVE 4. 1-FCV-67-142 UPPER CNTMT VENT CLR D DISCH ISLN VALVE 5. CNTMT ISLN PH-B TR-A (1PLANT) COMPUTER POINT SD-9012) 6. FCV-67-89 LOWER CNTMT 1A CLRS SUPPLY ISOL VALVE	K506	K626•	1NO. 120V AC 1NO. 120V AC 1NO. 120V AC 1NO. 120V AC 1NO. 48V DC 1NO. 120V AC

CONTAINMENT ISOLATION PHASE B - TRAIN B - UNIT 1 TABLE VI
(1 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE	1. CONTAINMENT AIR RETURN FAN 1B-B 2. UPPER COMPARTMENT VENTILATION FAN 1B 3. UPPER COMPARTMENT VENTILATION FAN 1D 4. TVA RELAY FOR CONTROL ROD DRIVE FANS 1B-B & 1D-B LOWER COMPARTMENT COOLING UNITS 1B-B & 1D-B 5. TVA RELAY FOR 1-FCV-67-91, 103, 83, 111, 138, 141, 297, & 298 CONTAINMENT VENTILATION COOLERS ISOLATION VALVES	K506	K625•	1NO., 125V DC 1NC, 120V AC 1NC, 120V AC 1NO., 120V AC 1NO., 120V AC
GROUP B NON-TESTABLE	1. COMPONENT COOLING SYSTEM BOOSTER PUMP 1B-B 2. 1-FCV-32-102 CONTROL AIR ISLN VALVE (1-FCV-32-103) 3. 2-FCV-32-14 CONTROL AIR (NON-ESSENTIAL) ISLN VALVE 4. COMPONENT COOLING SYSTEM BOOSTER PUMP 1B-B 5. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K506	K619•	1NC, 120V AC 1NC, 120V AC 1NC, 120V AC 1NO, 120V AC 1NO, 125V DC
GROUP C NON-TESTABLE	1. 1-FCV-70-134 RC BOOSTER PUMP A & B DISCHARGE 2. 1-FCV-70-87 RCP THERMAL BARRIER 1A HT. EXCH. ISOL 3. 1-FCV-70-140 RCP OIL COOLER SUPPLY LINE 4. 1-FCV-70-89 RCP OIL COOLER DISCHARGE LINE	K506	K618•	1NO., 120V AC 1NC, 120V AC 1NO., 120V AC 1NO., 120V AC
GROUP D TESTABLE	1. 1-FCV-67-86 LOWER CNTMT A CLRS DISCH ISLN VALVE 2. 1-FCV-67-96 LOWER CNTMT C CLRS DISCH ISLN VALVE 3. 1-FCV-67-131 UPPER CNTMT VENT CLR A DISCH ISLN VALVE 4. 1-FCV-67-134 UPPER CNTMT VENT CLR C DISCH ISLN VALVE 5. CNTMT ISLN PH-B TR-B (1PLANT) COMPUTER POINT SD-9013) 6. FCV-67-113 LOWER CNTMT 1D CLRS SUPPLY ISOL VALVE 7. FCV-67-105 LOWER CNTMT 1B CLRS SUPPLY ISOL VALVE	K506	K626•	1NO., 120V AC 1NO., 120V AC 1NO., 120V AC 1NO., 120V AC 1NO., 48V DC 1NO., 120V AC

CONTAINMENT ISOLATION PHASE A - TRAIN B - UNIT 1 TABLE IV
(3 MASTER & 7 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-77-18 (9160A) REACTOR COOLANT DRAIN TANK TO VENT HEADER 2. 1-FCV-77-9 (9170) REACTOR COOLANT DRAIN TANK PUMP DISCHARGE 3. 1-FCV-77-127 REACTOR BUILDING SUMP DISCHARGE 4. 1-FCV-77-16 (9159A) REACTOR COOLANT DRAIN TANK TO GAS ANALYZER 5. TVA RELAY FOR 1-FCV-43-22, 75, 2, 11, 34 BLOWDOWN SAMPLE LINE ISLN VALVE 6. TVA RELAY FOR 1-FCV-1-182 & 184 INBOARD ISLN VALVES, BLOWDOWN & SAMPLE VALVES 1-FCV-1-7, 25; 1-FCV-43-54D, 56D, 58D, 63D	K502	K605•	1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 120V AC 1NC, 120V AC
GROUP B TESTABLE LOADS	1. 1-FCV-68-308 (8026) PRESSURIZER RELIEF TANK TO GAS ANALYZER 2. 1-FCV-63-84 (8964) SIS TEST LINE ISOLATION VALVE 3. AUXILIARY BUILDING ISOLATION 4. INCORE INSTRUMENT ROOM COOLER B (1-FCO-31-264, 268) 5. 1-FSV-30-134 CNTMT ANNULUS DIFF PRESS. ISLN VALVE (UNIT 1 ONLY) 6. SHUTDOWN BOARD ROOM A PRESSURIZER FAN C-B	K522	K606•	1NC, 125V DC 1NC, 125V DC 1NO, 120V AC 1NO, 120V AC 1NC, 125V DC 1NC, 120V AC
GROUP C TESTABLE LOADS	1. 1-FCV-82-77 (8152) REGENERATIVE HEAT EXCHANGER LETDOWN LINE ISLN VALVE 2. 3. 1-FCV-61-192 GLYCOL SUPPLY LINE ISOLATION VALVE 4. 1-FCV-61-194 GLYCOL RETURN LINE ISOLATION VALVE 5. 1-PCV-65-83 SHIELD BUILDING VALVE ISOLATION VALVE & 1-PCV-65-87 EGTS CNTMT ANNULUS ISLN VALVE	K502	K607•	1NC, 125V DC 1NC, 125V DC 1NO, 120V AC 1NO, 125V DC
GROUP D NON-TESTABLE LOADS	1. 1-FCV-62-61-(8112) SEAL FLOW ISOLATION 2. CNTMT ISLN PH-A TR-B (1PLANT) COMPUTER POINT SD-9011) 3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K522	K614•	1NO., 120V AC 1NO., 48V DC 1NO., 125V DC
GROUP E TESTABLE LOADS	1. CONTAINMENT ANNULUS VACUUM FAN B & 1-FCO-65-74 2. 1-FCV-65-53 CONTAINMENT ISOLATION DAMPER UNIT 1 3. 2-FCV-65-6 CONTAINMENT ISOLATION DAMPER UNIT 2 4. 1-FCV-65-30 EMERGENCY GAS TREATMENT SYSTEM SUCTION UNIT 1 5. 2-FCO-65-45 SHIELD BUILDING EXHAUST A UNIT 2 6. 1-PCV-65-85 & 89 CONTAINMENT RECIRC ISOLATION 7. 1-FCV-63-23 (8888) SIS ACCUMULATOR FILL	K522	K612•	1NO., 120V AC 1NC, 125V DC 1NC, 125V DC 1NO, 125V DC 1NO, 125V DC 1NO, 125V DC 1NC, 125V DC
GROUP F TESTABLE LOADS	1. 2-FCO-65-6 EMERGENT GAS TREATMENT SYSTEM TRAIN B UNIT 2 SUCTION 2. 1-FCO-65-27 UNIT 1 SHIELD BUILDING EXHAUST B 3. EMERGENCY GAS TREATMENT FAN B-B (ISLN DAMPER O-FCV-65-43 OPERATED BY FAN LOGIC) 4. 1-FCV-31-305 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE 5. 1-FCV-31-308 INCORE INSTRUMENT ROOM CHILLER A ISOLATION VALVE 6. 1-FCV-31-327 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE 7. 1-FCV-31-329 INCORE INSTRUMENT ROOM CHILLER B ISOLATION VALVE 8. SHUTDOWN BOARD ROOM B PRESSURIZER FAN D-B	K502	K613•	1NO., 125V DC 1NO., 125V DC 1NO., 120V AC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 120V AC

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CONTAINMENT SPRAY ACTUATION - TRAIN A - UNIT 1 TABLE IX
(4 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOAD	1. CONTAINMENT SPRAY PUMP 1A-A 2. K644 TEST INTERLOCK 3. SPRAY ACTUATION TR-A (1PLANT) COMPUTER POINT SD-9002)	K505 & K519	K643•	2NO., 125V DC NC., 120V AC 1NO., 48V DC
GROUP B TESTABLE LOAD	1. 1-FCV-72-39 CONTAINMENT SPRAY PUMP 1A-A DISCHARGE VALVE (1 CONTACT IN TEST CIRCUIT REQUIRED TO CLOSE IN TEST TO BYPASS PUMP INTERLOCK) VIA STC TRAIN A 2. K643 TEST INTERLOCK 3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K505 & K519	K644•	1NO., 120V AC 1NC., 120V AC 1NO., 125V DC
	1. 1-FCV-72-34 CONTAINMENT SPRAY MINIFLOW	K347	K636	1NO., 120V AC
	1. 1-FCV-72-34 CONTAINMENT SPRAY MINIFLOW	K348	K639	1NC., 120V AC

MAIN STEAM ISOLATION - TRAIN A - UNIT 1 TABLE XI
(1 MASTER & 2 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A	1. 1-FCV-1-4 LOOP #1 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 2. 1-FCV-1-11 LOOP #2 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 3. 1-FCV-1-147 BYPASS VALVE LOOP #1 (TESTABLE) 4. MAIN STEAM ISLN TR-A (1PLANT) COMPUTER POINT SD-9004)	K504	K616• K617• K616•	2NC, 125V DC 2NC, 125V DC 1NC, 125V DC 1NO., 48V DC
GROUP B	1. 1-FCV-1-22 LOOP #3 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 2. 1-FCV-1-29 LOOP #4 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 3. 1-FCV-1-149 BYPASS VALVE LOOP #3 (TESTABLE)	K504	K623• K624•	2NC, 125V DC 2NC, 125V DC 1NC, 125V DC

TABLE XIII UNIT 1 - TRAIN A
(4 MASTER & 7 SLAVE RELAYS)

GROUP A & B FEEDWATER ISOLATION
GROUP C - TURBINE & FEEDWATER PUMP TRIP

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A NON-TESTABLE LOADS	1. 1-FCV-3-35 MAIN FEED WATER CONTROL VALVE 2. 1-FCV-3-46 MAIN FEED WATER CONTROL VALVE 3. 1-FCV-3-90 MAIN FEED WATER CONTROL VALVE 4. 1-FCV-3-103 MAIN FEED WATER CONTROL VALVE	K501, K507 & K520	K601, K620 & K636•	1NC, 125V DC CONTACT OF EACH RELAY IN SERIES FOR EACH VALVE
GROUP B NON-TESTABLE	1. 1-FCV-3-33 STEAM GENERATOR NO. 1 FEEDWATER ISOLATION VALVE 2. 1-FCV-3-87 STEAM GENERATOR NO. 3 FEEDWATER ISOLATION VALVE 3. MAIN FEED ISLN TR-A (1PLANT) COMPUTER POINT SD-9005) 4. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K501, K507 & K520	K610,• K649 & K637•	1NO., 120V AC CONTACT OF EACH RELAY IN PARALLEL FOR EACH VALVE 1NO., 48V DC 1NO., 125V DC
	5. SAFETY INJECTION ACTUATION TR A (1PLANT) COMPUTER POINT SD-9000)	K501	K610•	1NO., 48V DC
GROUP C NON-TESTABLE LOADS	1. MAIN FEED PUMP TURBINE 1A 2. MAIN FEED PUMP TURBINE 1B 3. TURBINE TRIP 20/AST 4. TURBINE OPC 1 TRIP 5. MAIN FEED PUMP TURBINE TRIP (COMPUTER POINT) TESTABLE 6. HOTWELL PUMP SEPARATION RELAY	K601 K620 K636	K621	1NO., 125V DC 1NO., 125V DC 1NO., 250V DC 1NO., 250V DC 1NO., 48V DC 1NO., 120V AC

CONTAINMENT VENT ISOLATION - TRAIN A - UNIT 1 TABLE VII
(1 MASTER & 2 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. TVA BUFFER RELAY FOR THE FOLLOWING CONTAINMENT PURGE AIR SUPPLY FAN A 1-FCO-30-1A PURGE AIR SUPPLY UNIT A SUCTION DAMPER 1-FCO-30-11B PURGE AIR SUPPLY UNIT A DISCHARGE DAMPER CONTAINMENT PURGE AIR EXHAUST FAN A 1-FCO-30-11A INCORE INSTRUMENT ROOM SUPPLY FAN SUCTION DAMPER 1-FCO-30-11B INCORE INSTRUMENT ROOM A SUPPLY FAN DISCHARGE DAMPER INCORE INSTRUMENT ROOM EXHAUST FAN A SUPPLY FAN CONTAINMENT PURGE AIR SUPPLY FAN B 1-FCO-30-4A PURGE AIR SUPPLY UNIT B SUCTION DAMPER 1-FCO-30-4B PURGE AIR SUPPLY UNIT B DISCHARGE DAMPER CONTAINMENT PURGE AIR EXHAUST FAN B	K503	K615•	1NC, 120V AC
	2. 1-FCV-30-2 PURGE AIR UNIT A ISOLATION 3. FCV-30-61 PURCE AIR EXHAUST UNIT A SUCTION VALVE 4. 1-FCV-30-5 PURGE AIR UNIT B ISOLATION 5. 1-FCV-30-12 ANNULUS PURGE ISOLATION 6. 1-FCV-30-62 PURGE AIR EXHAUST UNIT B SUCTION VALVE 7. 1-FCV-30-54 ANNULUS EXHAUST ISOLATION			1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC
GROUP B TESTABLE LOADS	1. 1-FCV-30-7 UPPER COMPARTMENT PURGE ISOLATION 1-FCV-30-51 UPPER CONTAINMENT EXHAUST ISOLATION 2. 1-FCV-30-10 UPPER COMPARTMENT PURGE ISOLATION 1-FCV-30-52 UPPER CONTAINMENT EXHAUST ISOLATION 3. 1-FCV-30-14 LOWER COMPARTMENT PURGE ISOLATION 1-FCV-30-56 LOWER CONTAINMENT EXHAUST ISOLATION 4. 1-FCV-30-17 LOWER COMPARTMENT PURGE ISOLATION 5. 1-FCV-30-40 LOWER COMPARTMENT EXHAUST ISOLATION 6. 1-FCV-30-20 INCORE INSTRUMENT ROOM PURGE ISOLATION 1-FCV-30-59 INCORE INSTRUMENT ROOM EXHAUST ISOLATION 7. 1-FCV-90-107, 111, 113, 117 RAD MON ISLN 8. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K503	K622•	1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NO, 120V AC 1NO, 125V DC

CONTAINMENT SPRAY ACTUATION - TRAIN B - UNIT 1 TABLE X
(4 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOAD	1. CONTAINMENT SPRAY PUMP 1B-B 2. K644 TEST INTERLOCK 3. SPRAY ACTUATION (1PLANT) COMPUTER POINT SD-9003)	K505 & K519	K643•	2NO., 125V DC 1NC 120V AC 1NO., 48V DC
GROUP B TESTABLE LOAD	1. 1-FCV-72-2 CONTAINMENT SPRAY PUMP 1B-B DISCHARGE VALVE (1 CONTACT IN TEST CIRCUIT REQUIRED TO CLOSE IN TEST TO BYPASS PUMP INTERLOCK) VIA STC TRAIN B 2. K643 TEST INTERLOCK 3. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K505 & K519	K644•	1NO., 120V AC 1NC., 120V AC 1NO., 125V DC
	1. 1-FCV-72-13 CONTAINMENT SPRAY MINIFLOW	K443	K638	1NO., 120V AC
	1. 1-FCV-72-13 CONTAINMENT SPRAY MINIFLOW	K444	K639	1NC., 120V AC

MAIN STEAM ISOLATION - TRAIN B - UNIT 1 TABLE XII
(1 MASTER & 4 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A	1. 1-FCV-1-4 LOOP #1 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 2. 1-FCV-1-11 LOOP #2 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 3. 1-FCV-1-148 LOOP #2 BYPASS VALVE 4. MAIN STEAM ISLN TR-B (1PLANT) COMPUTER POINT SD-9005)	K504	K616• K617 K616•	2NC, 125V DC 2NC, 125V DC 1NC, 125V DC 1NO., 48V DC
GROUP B	1. 1-FCV-1-22 LOOP #3 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 2. 1-FCV-1-29 LOOP #4 MAIN STEAM HEADER ISOLATION VALVE (NON-TESTABLE) 3. 1-FCV-1-150 BYPASS VALVE LOOP #4	K504	K623• K624	2NC, 125V DC 2NC, 125V DC 1NC, 125V DC

CONTAINMENT ISOLATION PHASE A - TRAIN B - UNIT 1 TABLE IV (CONT'D)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP C TESTABLE LOADS	1. 2. 3. 4. 1-FCV-61-122 FLOOR COOLANT GLYCOL ISLN VALVE (8833) 5. 1-FCV-61-97 FLOOR COOLANT GLYCOL ISLN VALVE (8835) 6. 7. 8. 1-FCV-70-85 COMPONENT COOLING EXCESS LETDOWN HEAT EXCHANGER DISCHARGE	K522	K630	1NC, 125V DC 1NC, 125V DC 1NC, 125V DC

CONTAINMENT ISOLATION PHASE A - TRAIN A - UNIT 1
TABLE III (CONT'D)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP C TESTABLE LOADS	1. 2. 3. 1-FCV-61-110 FLOOR COOLANT GLYCOL ISLN VALVE (8832) 4. 1-FCV-61-98 FLOOR COOLANT GLYCOL ISLN VALVE (8834) 5. 1-FCV-26-240 CNTMT STANDPIPE ISLN VALVE 6. 7. 1-FCV-26-243 RCP SPRAY ISLN VLV 8. 1-FCV-70-143 ISLN VALVE TO EXCESS LETDOWN HEAT EXCHANGER	K522	K630•	1NC, 125V DC 1NC, 125V DC 1NO., 120V AC 1NO., 120V AC 1NO. 120V AC

CONTAINMENT VENT ISOLATION - TRAIN B - UNIT 1
TABLE VIII (1 MASTER & 2 SLAVE RELAYS)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. TVA BUFFER RELAY FOR THE SAME LOADS AS LISTED IN TABLE XIII ON RELAY K615, ITEM 1	K503	K615•	1NC, 120V AC
	2. 1-FCV-30-2 PURGE AIR UNIT A ISOLATION 1-FCV-30-61 PURGE AIR EXHAUST UNIT A SUCTION VALVE 1-FCV-30-5 PURGE AIR UNIT B ISOLATION 1-FCV-30-12 ANNULUS PURGE ISOLATION 1-FCV-30-62 PURGE AIR EXHAUST UNIT B SUCTION VALVE 1-FCV-30-54 ANNULUS EXHAUST ISOLATION			1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC
GROUP B TESTABLE LOADS	1. 1-FCV-30-8 UPR COMPT. PURGE ISLN, 1-FCV-30-50 UPR. CNTMT. EXH. ISLN 2. 1-FCV-30-9 UPPER COMPARTMENT PURGE ISOLATION 1-FCV-30-53 UPPER CONTAINMENT EXHAUST ISOLATION 3. 1-FCV-30-15 LOWER COMPARTMENT PURGE ISOLATION 1-FCV-30-57 LOWER CONTAINMENT EXHAUST ISOLATION 4. 1-FCV-30-16 LOWER COMPARTMENT PURGE ISOLATION 5. 1-FCV-30-37 LOWER COMPARTMENT EXHAUST ISOLATION 6. 1-FCV-30-19 INCORE INSTRUMENT ROOM PURGE ISOLATION 1-FCV-30-58 INCORE INSTRUMENT ROOM EXHAUST ISOLATION 7. 1-FCV-90-108, 109, 110, 114, 115, 116 RAD MON ISLN 8. MASTER ISOL SIGNAL STATUS PANEL (1-M-6)	K503	K622•	1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NC, 125V DC 1NO., 120V AC 1NO., 125V DC

PRESSURIZER RELIEF BLOCK - TRAIN A - UNIT 1
TABLE XV (1 MASTER & 1 SLAVE)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-63-60 (8808C)-SIS ACCUMULATOR TK 3 OUTLET ISLN VALVE 2. 1-FCV-63-118 (8808A)-SIS ACCUMULATOR TK 1 OUTLET ISLN VALVE	K510	K628	1NC, 120V AC 1NC, 120V AC

PRESSURIZER RELIEF BLOCK - TRAIN B - UNIT
TABLE XV (1 MASTER & 1 SLAVE)

GROUPING		MASTER RELAY	SLAVE RELAY	CONTACTS REQUIRED
GROUP A TESTABLE LOADS	1. 1-FCV-63-67 (8808D)-SIS ACCUMULATOR TK 4 OUTLET ISLN VALVE 2. 1-FCV-63-98 (8808B)-SIS ACCUMULATOR TK 2 OUTLET ISLN VALVE	K510	K628	1NC , 120V AC 1NC., 120V AC

NOTES:

1. SEE 1-47W611-99-3 FOR TYPICAL LOGIC & NOTES.

11	M-39911-A	ESJ	PDH	DLO	4-2-99
REVISED PER DCA M39911-335-0.					
REV	CHANGE REF	PREPARER	CHECKER	APPROVED	DATE

SCALE: NTS — EXCEPT AS NOTED

PROJECT FACILITY
POWERHOUSE
UNITS 1 & 2

TITLE
ELECTRICAL LOGIC DIAGRAM REACTOR PROTECTION SYSTEM

1 — WATTS BAR NUCLEAR PLANT, TENNESSEE VALLEY AUTHORITY — Q

DESIGN		INITIAL ISSUE	ENGINEERING APPROVAL
DRAFTER: J.A. TALLEY	CHECKER: CART BARNARD	RO ISSUE PER EAI-3.10 & RIMS T28 '92 0227 860	1 S. LIN
DESIGNER: S. LIN	REVIEWER: M.L. FORESTER		2 C.A. ATKINS
			3 C.C. LYKE FOR MCB

ISSUED BY: R.M. JOHNSON

DATE 3/5/92 | 85 | E | 1-47W611-99-4 | R11

PRINTS REQ'D R ___ PRINT SIZE E — BR OR PROJ AB CS EE ME NE FE HT SE TE BL BT RB SQ

PRINT SIZE H — BR OR PROJ AB CS EE ME NE FE HT SE TE BL BT RB SQ

PROCADAM MAINTAINED DRAWING
THIS CONFIGURATION CONTROL DRAWING IS MAINTAINED BY THE RBN CAD UNIT AND IS NOT PART OF THE TVA PROCADAM DATABASE
DO NOT REPRODUCE DRAWINGS

CONFIGURATION CONTROL DRAWING

3.6 CONTAINMENT SYSTEMS

3.6.11 Ice Bed

LCO 3.6.11 The ice bed shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Ice bed inoperable.	A.1 Restore ice bed to OPERABLE status.	48 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.11.1	Verify maximum ice bed temperature is ≤ 27°F.	12 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.11.2	Verify total weight of stored ice is ≥ 2,158,000 lb by: a. Weighing a representative sample of ≥ 144 ice baskets and verifying each basket contains ≥ 1110 lb of ice; and b. Calculating total weight of stored ice, at a 95% confidence level, using all ice basket weights determined in SR 3.6.11.2.a.	18 months
SR 3.6.11.3	Verify azimuthal distribution of ice at a 95% confidence level by subdividing weights, as determined by SR 3.6.11.2.a, into the following groups: a. Group 1-bays 1 through 8; b. Group 2-bays 9 through 16; and c. Group 3-bays 17 through 24. The average ice weight of the sample baskets in each group from radial rows 1, 2, 4, 6, 8, and 9 shall be ≥ 1110 lb.	18 months
SR 3.6.11.4	Verify, by visual inspection, accumulation of ice on structural members comprising flow channels through the ice bed is ≤ 15 percent blockage of the total flow area for each safety analysis section.	18 months

(continued)

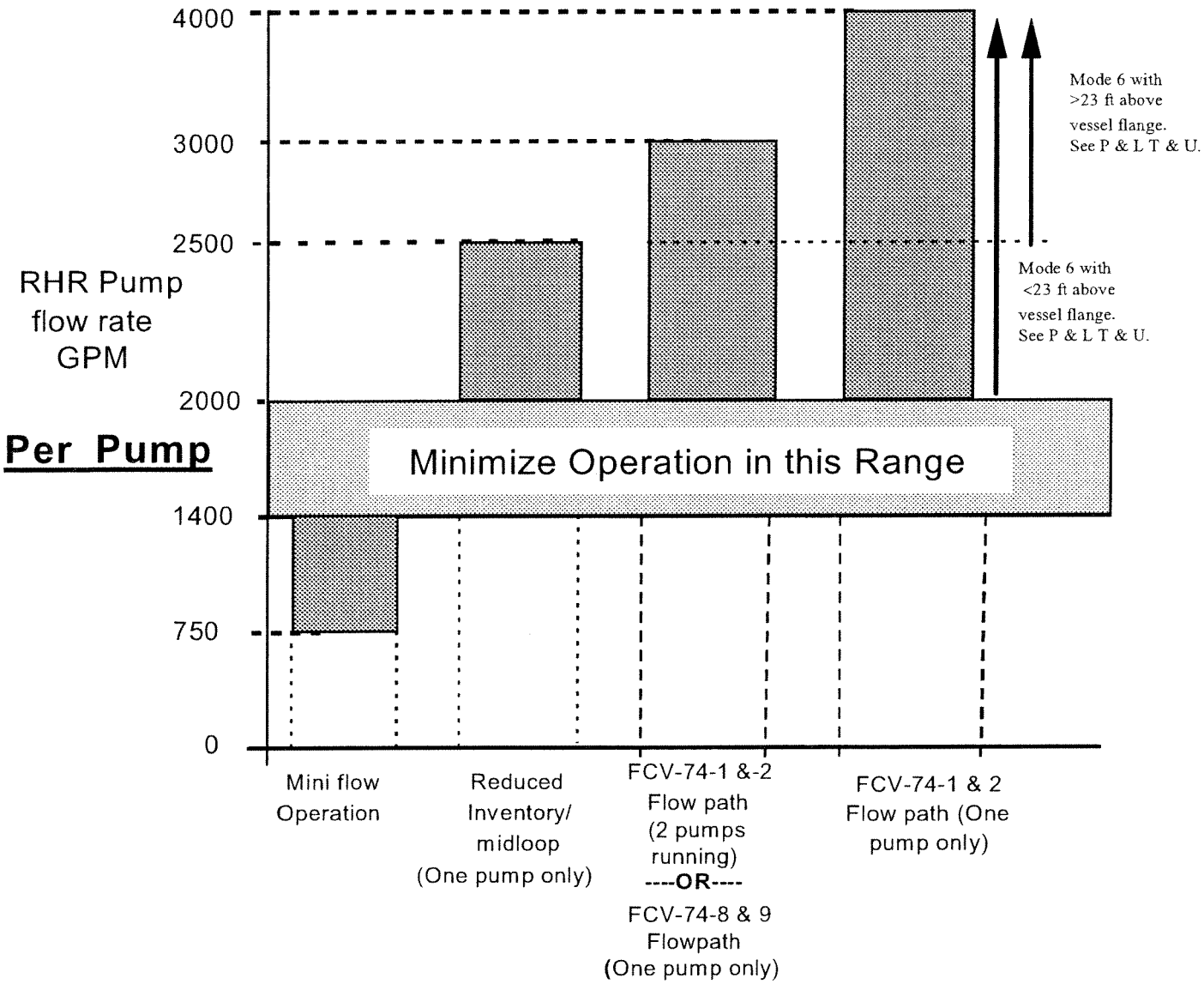
SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.11.5	----------NOTE---------- The requirements of this SR are satisfied if the boron concentration and pH values obtained from averaging the individual sample results are within the limits specified below. ---------- Verify, by chemical analysis of the stored ice in at least one randomly selected ice basket from each ice condenser bay, that ice bed: a. Boron concentration is ≥ 1800 ppm and ≤ 2000 ppm; and b. pH is ≥ 9.0 and ≤ 9.5.	54 months
SR 3.6.11.6	Visually inspect, for detrimental structural wear, cracks, corrosion, or other damage, two ice baskets from each azimuthal group of bays. See SR 3.6.11.3.	40 months
SR 3.6.11.7	----------NOTE---------- The chemical analysis may be performed on either the liquid solution or on the resulting ice. ---------- Verify, by chemical analysis, that ice added to the ice condenser meets the boron concentration and pH requirements of SR 3.6.11.5.	Each ice addition

APPENDIX A

Page 1 of 1

RHR PUMP OPERATING FLOW LIMITS



APPENDIX A

Page 1 of 1

TIME TO CORE BOIL

DAYS AFTER SHUTDOWN	POWER (MW)	T–BOIL–1 (MIN)	T–BOIL–2 (MIN)
0.5	20.46	4.28	5.19
1	16.70	5.25	6.36
2	13.69	6.40	7.76
3	12.22	7.17	8.69
4	11.24	7.79	9.45
6	9.96	8.80	10.66
8	9.06	9.67	11.72
10	8.37	10.47	12.69
15	7.04	12.44	15.09
20	6.14	14.27	17.30
25	5.48	15.99	19.38
30	4.92	17.80	21.59

T–BOIL–1 = Time to boil at midloop with starting temp of 140°F.

T–BOIL–2 = Time to boil for all elevations above 720.75 with starting temp of 140°F.

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT

ABNORMAL OPERATING INSTRUCTION

AOI-16

LOSS OF NORMAL FEEDWATER

Revision 29

Unit 1

QUALITY RELATED

REQUESTED BY: J. M. Earles

SPONSORING ORGANIZATION: Operations

APPROVED BY: Patrick Salkeld

Effective Date: 12/19/05

LEVEL OF USE: CONTINUOUS

REVISION LOG

REVISION OR CHANGE NUMBER	EFFECTIVE DATE	AFFECTED PAGES	DESCRIPTION OF REVISION/CHANGE
25	3/17/03	2, 9, 10, 12, 17	Non-intent. Corrected typos. Revised section 3.4 step 5.d RNO because iterative load changes may be required. Corrected section 3.3 steps 7-10 for proper procedure flow without reliance upon double-negative statements. These changes are due to operator/operator training feedback.
UIC-1	7/21/03	2, 20	Intent. Section 3.6, Step 2, add NOTE to allow use of bypass reg. valve to dampen oscillations caused by main reg. valve malfunctions.
26	12/5/03	2, 12, 20-23	Non-intent. Incorporated UIC-1 which added a page to Section 3.6, moved step 4 to page 21,moved steps 6,7& 8 to page 22 and renumbered pages. Reworded Sect. 3.4, Step 5 RNO to clarify flowpath. Moved Sect. 3.6, Step 3 prior to Step 2 to allow evaluation of bypass valve usage and added steps in RNO to isolate any failed open bypass reg. valve. These changes are due to operator training feedback.
27	03/15/04	2, 9, 10, 18, 19	Non-intent. Change step sequence per license training feedback to place removing unit from influence of valve position limiter later in Sections 3.3 & 3.5.
28	06/09/04	2, 9, 10	Non-intent. Add step to section 3.3 to reset C-7 if necessary after runback. Training feedback.
29	12/19/05	2, all, 6, 10, 19, 17, 22	Replaced the word VERIFY with CHECK or ENSURE where appropriate. Added caution to address excessive rod insertion. Clarified existing steps for removing turbine from valve position limiter. Added step to refer to Tech Specs. Enhanced 3.6 [7] RNO to ensure the effect of a failed steam flow channel on the MFPs is evaluated.

1.0 PURPOSE

This Instruction provides actions to respond to a loss of normal FW due to MFW pump trip, a malfunctioning MFW reg valve or a loss of pump automatic speed control.

2.0 SYMPTOMS

2.1 Alarms

A. MFPT 1A ABNORMAL [50-A]

B. MFPT 1B ABNORMAL [50-B]

C. TRIPPED [51-A]

D. MFP 1A FLOW LO [57-A]

E. MFP 1B FLOW LO [58-A]

F. SG FEEDWATER FLOW HI [58-B]

G. SG 1 LEVEL HI [60-B]

H. SG 2 LEVEL HI [61-B]

I. SG 3 LEVEL HI [62-B]

J. SG 4 LEVEL HI [63-B]

K. SG LEVEL DEVIATION [63-F]

2.2 Automatic Actions

NOTE: Pressure equivalent load is indicated on ICS point P0300A. Runback circuitry may be verified at 1-PIS-47-13, HP TURBINE IMPULSE STEAM PRESSURE [1-L-262, 729, T3J]. Standby Main Feedwater Pump Auto-Start at 67% load is armed when relay number 1 is illuminated on the PIS. Turbine runback at 85% load is armed when relay number 3 is illuminated on the PIS.

A. MFW pump trip, with runback armed:

1. Turbine runback to less than 85%.
2. Standby feedwater pump starts.
3. Affected MFW pump turbine condenser isolates.

B. Loss of one MFW pump, with runback NOT armed:

1. Standby FW pump starts (if turbine load greater than 67%).
2. MFW pump turbine condenser isolates if FW flow greater than 40%.

C. If MFW reg vlv fails OPEN, turbine trip will occur at 82.4% steam generator level.

3.0 OPERATOR ACTIONS

3.1 Diagnostics

IF	GO TO Subsection
Standby MFWP TRIP without Main Turbine in service	3.2
Standby MFWP TRIP with Main Turbine in service	3.3
MFWP TRIP less than 800 MWe (67% Turbine Load)	3.4
MFWP TRIP greater than or equal to 800 MWe (67% Turbine Load)	3.5
MFW reg or bypass reg valve control failure	3.6
MFW pump speed control circuit failure	3.7

3.2 Loss of Standby MFWP Without Main Turbine In Service

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** at least one MFW pump in service.	** **GO TO** Step 5.
3.	**ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	Manually **CONTROL** MFWPT speed.
4.	** **GO TO** Step 10.	
5.	**START** AFW pumps: • Both MD AFW pumps. • TD AFW pump.	

CAUTION **Care should be taken to avoid excessive rod insertion. If resulting Reactor power is less than desired, rods SHALL NOT be withdrawn in an attempt to recover Reactor power.**

6.	**INSERT** control rods to reduce reactor power to within AFW capabilities (less than 4%).	
7.	**MAINTAIN** zero startup rate.	

3.2 Loss of Standby MFWP Without Main Turbine In Service (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8.	**CHECK** AFW pumps LCVs controlling S/G levels to 38%.	Manually **CONTROL** AFW LCVs to maintain S/G levels at 38%.
9.	**STABILIZE** RCS Tave greater than or equal to 557°F.	**ENSURE** steam dumps and S/G PORVs CLOSED. **IF** cooldown continues, **THEN** **CONTROL** AFW flow to minimize cooldown.
10.	**WHEN** S/G levels controlled, **THEN** **CONSULT** plant staff for recovery actions.	
11.	**REFER TO** appropriate instruction: • SPP-3.5, Regulatory Reporting Requirements. • GO-3, Unit Startup From Less Than 4% Reactor Power To Less Than 30% Reactor Power. • GO-5, Unit Shutdown From Less Than 30% Reactor Power To Hot Standby.	

- END OF SUBSECTION -

3.3 Loss of Standby MFWP With Main Turbine In Service

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**IF** both MFWPs in service, **THEN:** a. **INITIATE** repairs on Standby MFWP. b. **RETURN TO** Instruction in effect.	
3.	**CHECK** one MFWP in service.	**TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip.
4.	**CHECK** turbine load less than 800 MWe (67%).	**REDUCE** turbine load to within MFWP capability with valve position limiter.
5.	**MONITOR** reactor power controlled to match turbine power.	**INSERT** control rods to match reactor power with turbine load.

3.3 Loss of Standby MFWP With Main Turbine In Service (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. **ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	Manually **CONTROL** MFWPT speed. **REDUCE** turbine load, if necessary: a. **SET** LOAD RATE at 5%/min. b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL ∇ (lower). c. **PUSH** GO button. d. **WHEN** desired load reached, **THEN** **PUSH** HOLD button, and **REPEAT** Step 6.
7. **IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	
8. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. b. **RESET** loss-of-load interlock with steam dump mode switch.	

3.3 Loss of Standby MFWP With Main Turbine In Service (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	**CHECK** VALVE POS LIMIT LIGHT LIT.	** **GO TO** Step 11.
10.	**REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, **THEN** **SET** valve position limiter to 95%.	
11.	**RETURN TO** Instruction in effect.	

- END OF SUBSECTION -

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** at least one MFWP in service.	**IF** reactor power greater than 50% (P-9), **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection. **IF** 1-HS-3-45 in NORMAL, **THEN** **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip. ** **GO TO** Step 9.
3.	**PLACE** tripped MFP recirc valve controller in MANUAL, and **CLOSE** recirc valve.	
4.	**ENSURE** MFWP speed rising to control S/G Δ-P and levels on program.	Manually **CONTROL** MFWPT speed.

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5. **ENSURE** adequate feed flow for existing conditions:
• Feed flow greater than or equal to steam flow.
• S/G levels returning to program.
	START Standby MFWP.
	
	REDUCE turbine load, if necessary:
	a. **SET** LOAD RATE at 5%/min.
	b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL▽ (lower).
	c. **PUSH** GO button.
	d. **IF** adequate feed flow established, **THEN**
	PUSH HOLD button and
	** **GO TO** Step 6.
	e. **IF** continued load reduction may establish adequate feed flow, **THEN**
	REPEAT Step 5 RNO.
	
	IF reactor power greater than 50% (P-9) **AND** adequate feed flow can **NOT** be established, **THEN**
	TRIP reactor, and
	** **GO TO** E-0, Reactor Trip or Safety Injection.
	
	IF adequate feed flow can **NOT** be established (less than P-9), **THEN**
	TRIP turbine, and
	** **GO TO** AOI-17, Turbine Trip.

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6.	**MONITOR** reactor power controlled to match turbine load.	**INSERT** control rods to match reactor power with turbine load.
7.	**INITIATE** repairs on failed pump.	
8.	**RETURN TO** Instruction in effect.	
9.	**START** Standby MFWP, and **ESTABLISH** feed flow.	**IF** Standby MFWP flow can **NOT** be established, **THEN** **TRIP** turbine, and ** **GO TO** AOI-17, Turbine Trip.
10.	**REDUCE** turbine load to between 150 and 200 MWe (12 and 16%): a. **SET** LOAD RATE at 5%/min. b. **SET** 10% in SETTER with REFERENCE CONTROL▽ (lower). c. **PUSH** GO button. d. **WHEN** Unit between 150 and 200 MWe, **THEN** **PUSH** HOLD button.	

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
NOTE AUTO rod withdrawal will be blocked below 15% reactor power (C-5).	
11. **INSERT** control rods to match reactor power with turbine load (between 12 and 16%), then **MAINTAIN** zero startup rate.	
12. **MAINTAIN** Tave-Tref on program: • **ADJUST** turbine load. • **CONTROL** feed flow. • **MONITOR** steam dumps and S/G PORV operation.	
13. **MONITOR** #1 FW heater inlet pressure less than 1363 psig.	**STOP** Condensate Booster Pumps, as necessary.
NOTE Manual level control may be required due to the slow response characteristics of the bypass reg valves.	
14. **MONITOR** bypass reg valves controlling S/G levels on program.	**CONTROL** bypass reg valves in MANUAL. **IF** S/G levels can **NOT** be maintained, **THEN** **TRIP** Reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.

3.4 Loss of MFWP Less Than 800 MWe (67% Turbine Load) (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15. **IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. b. **RESET** loss-of-load interlock with steam dump mode switch.	
16. **IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	
17. **EVALUATE** MFWP status to determine recovery action plan.	
18. **REFER TO** GO-5, Unit Shutdown From 30% Reactor Power to Hot Standby, to complete alignments for 15% power level.	

-END OF SUBSECTION -

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**IF** loss of S/G level is imminent, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.	
2.	**CHECK** turbine load less than or equal to 1000 MWe (85%).	**ENSURE** Standby MFWP running. **REDUCE** turbine load to less than 1000 MWe with valve position limiter.
3.	**PLACE** tripped MFP recirc valve controller in MANUAL, and **CLOSE** recirc valve.	
4.	**CHECK** turbine load less than 800 MWe (67%),	**ENSURE** Standby MFWP running. **IF** Standby MFWP **NOT** available, **THEN** **REDUCE** turbine load to less than 800 MWe with valve position limiter.
5.	**ENSURE** MFWP speed rising to control S/G Δ-P and levels on program.	Manually **CONTROL** MFWPT speed.

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
CAUTION **Continued load reductions below 800 MWe should be done using normal turbine controls at less than or equal to 5% min.**	
6. **ENSURE** adequate feed flow for existing conditions: • Feed flow greater than or equal to steam flow. • S/G levels returning to program.	**ENSURE** Standby MFWP running. **REDUCE** turbine load, if necessary: a. **SET** LOAD RATE at 5%/min. b. **SET** target (10% drop) in SETTER with REFERENCE CONTROL▽ (lower). c. **PUSH** GO button. d. **WHEN** desired load reached, **THEN** **PUSH** HOLD button, and **REPEAT** Step 6.
7. **ENSURE** T-avg and T-ref within 3°.	**INSERT** control rods to match reactor power with turbine load.
8. **REFER TO** Tech Specs: • 3.2.3 AFD	

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	**IF** feed flow greater than 40%, **THEN** **ENSURE** tripped MFWP turbine condenser valves CLOSED: • Pump A, 1-FCV-2-205 and -210, OR • Pump B, 1-FCV-2-211 and -216.	
10.	**MONITOR** reg valves controlling S/G levels on program.	**CONTROL** reg valves in MANUAL. **IF** S/G levels can **NOT** be maintained, **THEN** **TRIP** Reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
11.	**IF** C-7 LOSS OF LOAD STM DUMP INTERLOCK annunciator LIT [66E], **THEN** a. **ENSURE** steam dump valves have zero demand. b. **RESET** loss-of-load interlock with steam dump mode switch.	
12.	**ENSURE** Condensate System Pumps in service as necessary: • **REFER TO** GO-4, Normal Power Operation.	

3.5 Loss of MFWP Greater Than or Equal To 800 MWe (67% Turbine Load) (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13.	**IF** reactor power dropped by greater than or equal to 15% in one hour, **THEN** **NOTIFY** Chemistry to initiate power change sampling requirements.	
14.	**CHECK** VALVE POS LIMIT LIT.	** **GO TO** Step 15.
15.	**REDUCE** turbine load setpoint using REFERENCE CONTROL ∇ (lower) AND GO button until VALVE POS LIMIT LIGHT not LIT, **THEN** **SET** valve position limiter to 95%.	
16,	**INITIATE** repairs on failed pump.	
17.	**RETURN TO** Instruction in effect.	

-END OF SUBSECTION -

3.6 Main FW Reg or Bypass Reg Valve Control Failure

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **CONTROL** failed MFW reg or bypass reg valve in MANUAL.	
NOTE If the main reg. valve is malfunctioning, the bypass reg. valve for the affected loop may be manually positioned as necessary up to 0.85 x 10^6 lb/hr flow to dampen oscillations in feedwater flow. A power tilt in the affected core quadrant may occur due to a rise in bypass flow. Flows above 84,500 lbm/hr in the bypass line will invalidate the value of computer point U1118.	
2. **CHECK** SG levels on bypass reg valve control.	** **GO TO** Step 4.
3. **IF** any bypass reg valve failed, **THEN**	
a. **ENSURE** turbine tripped.	
b. **ENSURE** AFW pumps running.	
c. **INSERT** control rods to reduce reactor power to within AFW capabilities (less than 4%) , then **MAINTAIN** zero startup rate.	
d. **CHECK** AFW LCVs controlling S/G levels to 38%.	d. Manually **CONTROL** AFW LCVs to maintain S/G levels at 38%.
e. **CHECK** bypass reg valves closed.	e. **ISOLATE** bypass reg valves as required.
f. **CHECK** S/G levels returning to PROGRAM.	f. **IF** S/G level RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ****GO TO** E-0, Reactor Trip or Safety Injection.
g. ** **GO TO** Step 6.	

3.6 Main FW Reg or Bypass Reg Valve Control Failure (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4.	**CHECK** S/G levels returning to PROGRAM.	**IF** S/G level RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ****GO TO** E-0, Reactor Trip or Safety Injection.

NOTE A LO FW FLOW WTR HAMMER annunciation [59-C] will be received when any main feedwater flow drops to less than 0.75 x 10^6 lb/hr.

5.	**WHEN** any S/G MFW flow drops to less than 0.55 x 10^6 lb/hr, **THEN** **INITIATE** manual anti-water hammer actions:	
	a. **CLOSE** affected loop(s) MFW reg valve and FW isolation valve.	
	b. **MAINTAIN** affected S/G levels on program with bypass reg valves.	
	c. **REDUCE** turbine load to within capability of bypass reg valves.	c. **IF** S/G level loss IMMINENT, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.
	d. **TRANSFER** S/G level control to bypass reg valves: • **REFER TO** SOI-2 & 3.01, Condensate and Feedwater System.	

3.6 **Main FW Reg or Bypass Reg Valve Control Failure** (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
CAUTION **Power range N41 controls S/G 1 and S/G 4 MFW reg valves. N42 controls S/G 2 and S/G 3 MFW reg valves.**	
NOTE All power range monitors input to auctioneered high anticipatory circuit for bypass FW reg valves.	
6. **CHECK** power range N41 through N44 NORMAL.	** **GO TO** AOI-4, Nuclear Instrumentation Malfunctions.
NOTE Steps 7 & 8 should end up having the same channel (A or B) selected for steam flow and feed flow on each S/G to ensure a loss of voltage to any one channel will have minimal effect on the affected S/G level.	
7. **CHECK** controlling steam flow channels NORMAL.	**SELECT** operable channel, and **EVALUATE** effect of the failed channel on the MFPs, while continuing with this section.
8. **CHECK** controlling FW flow channels NORMAL.	**SELECT** operable channel.

3.6 Main FW Reg or Bypass Reg Valve Control Failure (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	**CHECK** press compensation channel(s) NORMAL.	**REFER TO** Tech Specs: • 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation. • 3.3.3, Post Accident Monitoring (PAM) Instrumentation. • 3.3.4, Remote Shutdown System.
10.	**IF** affected S/G controlling channel and level NORMAL, **THEN** **RETURN** MFW reg valve to AUTO.	
11.	**INITIATE** repairs to failed equipment.	
12.	**RETURN TO** Instruction in effect.	

- END OF SUBSECTION -

3.7 Failure Of MFW Pump Control

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.	**CHECK** MFWPT speed controller(s) NORMAL.	**CONTROL** MFP speed using MANUAL control of master controller or individual controller(s) as required. **IF** MANUAL control of individual MFWPT controller is ineffective, **THEN** **TRIP** affected MFWPT, and ** **GO TO** Section 3.4 or 3.5 as applicable.
2.	**PLACE** control rods in MANUAL.	
3.	**ENSURE** T-avg and T-ref within 3°.	
4.	**MAINTAIN** MFWP discharge press on PROGRAM.	
5.	**ENSURE** S/G levels return to PROGRAM.	**IF** S/G levels RISING **OR** DROPPING uncontrolled, **THEN** **TRIP** reactor, and ** **GO TO** E-0, Reactor Trip or Safety Injection.

3.7 Failure Of MFW Pump Control (Continued)

	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6.	**CHECK** steam dump mode in T-AVG position.	**IF** 1-PT-1-33 failed **AND** steam dumps in PRESS mode, **THEN:** a. **TURN** steam dumps OFF. b. **PLACE** steam dump press controller to MANUAL, and **ZERO** output. c. **TURN** steam dumps ON. d. **STABILIZE** S/G press.
7.	**INITIATE** repairs to failed equipment.	
8.	**IF** desired to place control rods in auto, **THEN** **ENSURE** T-avg and T-ref within 1° and **PLACE** control rods in auto.	
9.	**RETURN TO** Instruction in effect.	

- END OF SUBSECTION -

4.0 DISCUSSION

This AOI addresses loss of normal feedwater to any or all S/Gs as a result of pump failures or valve malfunctions.

A. Loss of reg valve control can result in the valve failing open or closed. This failure requires the operator to place the valve control in manual and return the S/G level to program. A low FW flow water hammer annunciation will be received when any main feedwater flow drops to less than 0.75×10^6 lb/hr (20%) [window 59-C]. Actions must be taken to restore flow. If any S/G MFW flow drops to less than 0.55×10^6 lb/hr then manual closure of the affected MFW reg valve, FW isol valve and level control by the bypass reg valve is required to prevent water hammer conditions in the affected S/G.

B. The unit can maintain 85% load with one MFWP and start of the standby MFWP. The standby MFWP auto starts on loss of one MFWP with turbine load greater than or equal to 67% (1-PIS-47-13, HP TURBINE IMPULSE STEAM PRESSURE). Without the standby MFWP, the turbine must be manually run-back to less than 67%.

C. If PT-1-33 fails high, the feed pump speed program circuit will see a small ΔP signal, causing the MFWPs to raise speed. If PT-1-33 fails low, the feed pump speed program circuit will see a large ΔP signal, causing the FW pumps to drop speed.

D. If PT-1-33 fails high and the steam dumps are selected to the pressure mode, the steam dump valves should open proportionally to the error signal generated by the difference in the PIC-1-33 setpoint and the failed high signal.

E. If PT-3-1 fails high, the feed pump speed control circuit will see a large ΔP signal. This will cause the MFWPs to drop speed. If PT-3-1 fails low, this causes the feed pump speed control circuit to see a small ΔP and raise speed.

F. If SG controlling channel inputs fail, the affected reg valve can be returned to auto by selecting a operable flow channel.

5.0 REFERENCES

5.1 Performance

A. AOI-4, Nuclear Instrumentation Malfunction.

B. AOI-17, Turbine Trip.

C. E-0, Reactor Trip or Safety Injection.

D. GO-3, Unit Startup from less than 4% Reactor Power to less than 30% Reactor Power.

E. GO-4, Normal Power Operation.

F. GO-5, Unit Shutdown from less than 30% Reactor Power to Hot Standby

G. SOI-2 & 3.01, Condensate and Feedwater System.

H. SPP-3.5, Regulatory Reporting Requirements.

5.2 Technical Specification

A. 3.3.2, Engineered Safety Feature Actuation System (ESFAS) Instrumentation.

B. 3.3.3, Post Accident Monitoring (PAM) Instrumentation.

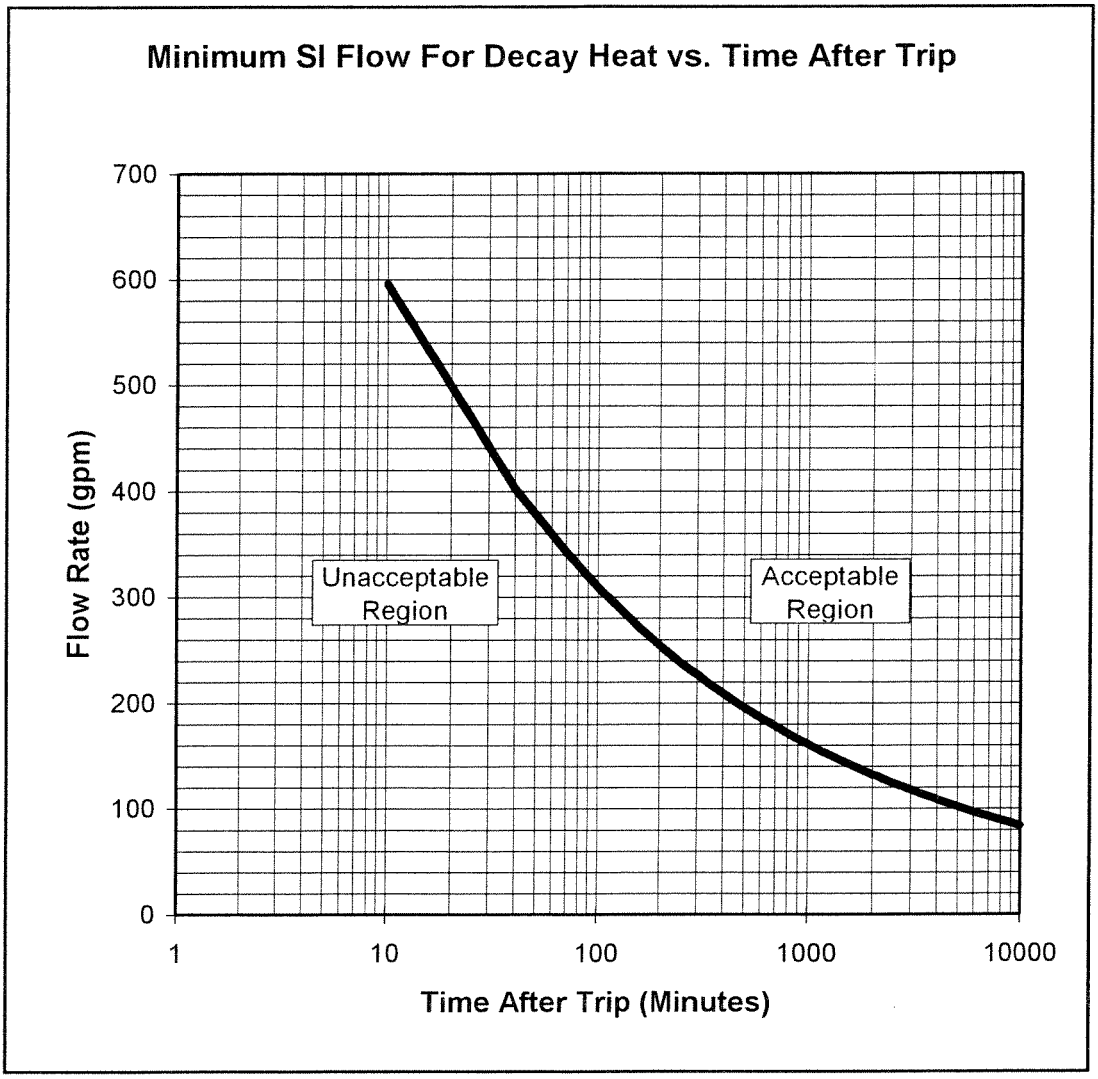
C. 3.3.4, Remote Shutdown System.

5.3 Plant Drawings

A. 1-47W803-1

B. 1-47W611-3-1, -2, & -6

Figure 1

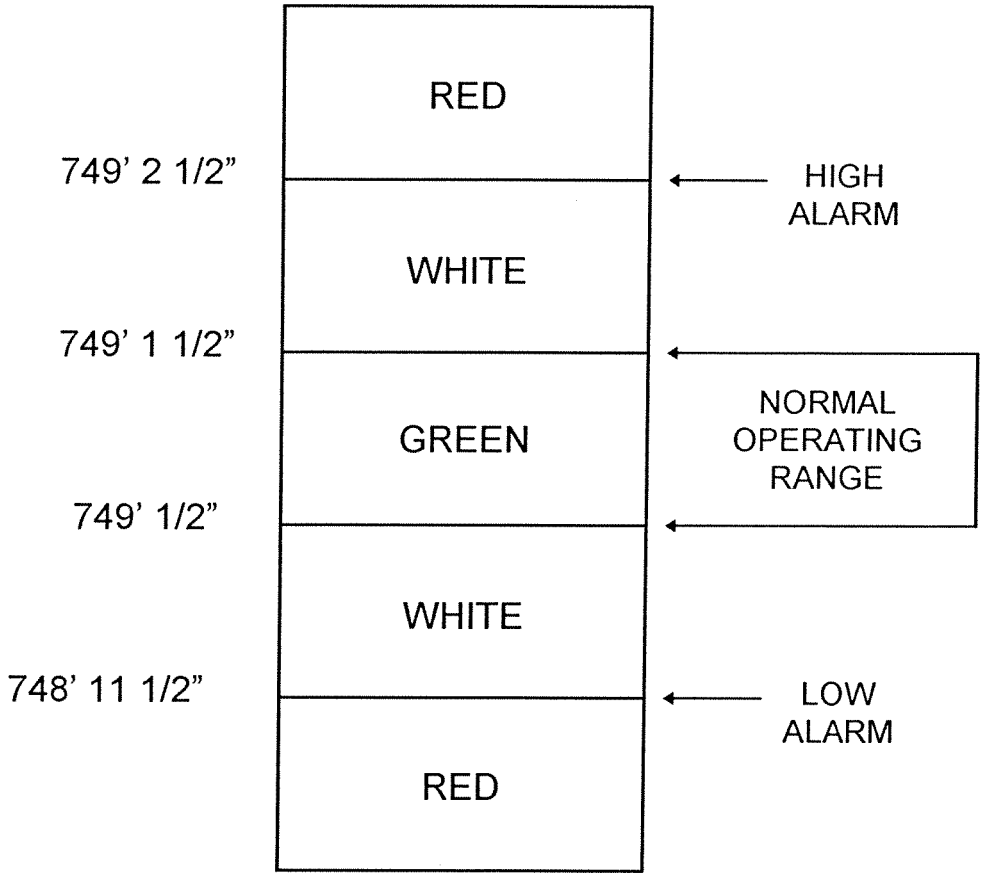

Minimum SI Flow For Decay Heat vs. Time After Trip
Flow Rate (gpm)
700
600
500
400
300
200
100
0
Unacceptable Region
Acceptable Region
1
10
100
1000
10000
Time After Trip (Minutes)

Appendix E

Page 1 of 1

COLOR BANDED SFP LEVEL GUAGE

(Not to scale - actual size 5" tall by 14" wide)



A color banded SFP level gauge has been added to the existing level gauge on the SFP return header. This is a 5 inch tall by 14 inch wide placard with 5 color bands. The top and bottom 1" band is red (in alarm range <748' 11 ½" or >749' 2 ½"). Center green normal operating band is between 749' ½" to 749' 1 ½". White 1" bands are cushion zones between normal operating band and alarm points.

3.1 Loss of AC (Power Ops)

	Mode	Initiating/Condition
GENERAL	1,2, 3,4	**Prolonged loss of Offsite and Onsite AC power** *(1 and 2)* 1. 1A and 1B 6.9KV Shutdown Bds de-energized for >15 minutes 2. *(a or b)* a. Core Cooling Red or Orange b. Restoration of Either 1A or 1B 6.9KV Shutdown Bds is not likely within 4 hours of loss.
SITE	1,2, 3,4	**Loss of Offsite and Onsite AC Power > 15 minutes** 1. 1A and 1B 6.9KV Shutdown Bds de-energized for >15 minutes
ALERT	1,2, 3,4	**Loss of Offsite Power for >15 minutes** *(1 and 2)* 1. C and D CSSTs not available for >15 minutes 2. 1A or 1B Diesel Generator not available
UNUSUAL EVENT	1,2 3,4	**Loss of Offsite Power for >15 minutes** *(1 and 2)* 1. C and D CSSTs not available for >15 minutes 2. Each Diesel Generator is supplying power to its respective Shutdown Board

3.2 Loss of AC (Shutdown)

Mode	Initiating/Condition
	Not Applicable
	Not Applicable
5,6, or De-fuel	**UNPLANNED loss of Offsite and Onsite AC power for >15 minutes** 1. 1A and 1B 6.9KV Shutdown Bds de-energized for >15 minutes *Also Refer to "Loss of Shutdown Systems" (6.1)*
5,6, or De-fuel	**UNPLANNED loss of Offsite Power for >15 minutes** *(1 and 2)* 1. C and D CSSTs not available for >15 minutes 2. Either Diesel Generator is supplying power to its respective Shutdown Board

3.3 Loss of DC Power

	Mode	Initiating/Condition
GENERAL		*Refer to "Fission Product Barrier Matrix" and "Loss of Function" (2.2)*
SITE	1,2, 3,4	**Loss of All Vital DC Power for >15 minutes** 1. Voltage <105V DC on 125V DC Vital Battery Buses 1-I and 1-II and 1-III and 1-IV for >15 minutes *Also Refer to "Fission Product Barrier Matrix", "Loss of Function" (2.2), and "Loss of Instrumentation" (2.1)*
ALERT		*Also Refer to "Fission Product Barrier Matrix", "Loss of Function" (2.2), and "Loss of Instrumentation" (2.1)*
UNUSUAL EVENT	5,6, or De-fuel	**UNPLANNED Loss of the Required Train of DC power for >15 minutes** *(1 or 2)* 1. Voltage <105V DC on 125V DC Vital Battery Buses 1-I and 1-III for >15 minutes 2. Voltage <105V DC on 125V DC Vital Battery Buses 1-II and 1-IV for >15 minutes

6.1 Loss of Shutdown Systems

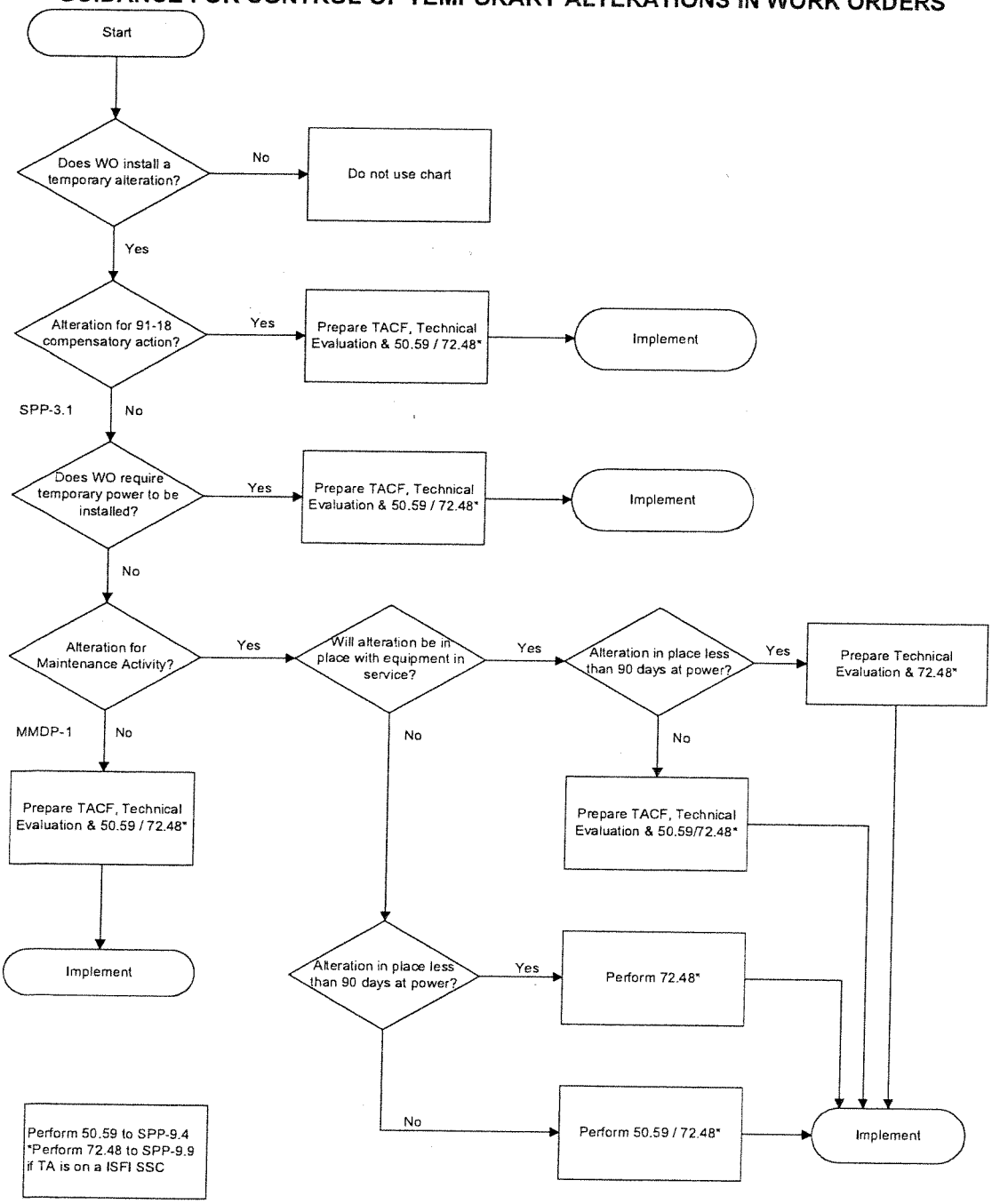
	Mode	Initiating/Condition
GENERAL	5,6	Note: Additional information will be provided later pending NRC Guidance on Shutdown EALs *Refer to "Gaseous Effluents" (7.1)*
SITE	5,6	**Loss of water level in the Rx vessel that has or will uncover fuel in the Rx vessel** *(1 and 2 and 3 and 4)* 1. Loss of RHR capability 2. Rx vessel water level < el. 718' 3. Incore TCs (if available) indicate RCS temp. >200° F 4. RCS is vented/open to CNTMT *Note: If CNTMT open, refer to "Gaseous Effluents" (7.1)*
ALERT	5,6	**Inability to maintain Unit in Cold Shutdown** *(1 and 2)* 1 RHR capability is not available for RCS Cooling 2. Incore TCs (if available) indicate RCS temp >200° F *Note: If CNTMT open, refer to "Gaseous Effluents" (7.1)*
UNUSUAL EVENT	5,6	Note: Additional information will be provided later pending NRC Guidance on Shutdown EALs

6.2 Loss of AC (Shutdown)

Mode	Initiating/Condition
	Not Applicable
	Not Applicable
5,6 or De-Fuel	**UNPLANNED loss of Offsite and Onsite AC Power for >15 minutes** 1. 1A and 1B 6.9 KV Shutdown Bds de-energized for >15 minutes
5,6 or De-Fuel	**UNPLANNED loss of All Offsite Power for >15 minutes** *(1 and 2)* 1. C and D CSSTS not available For >15 minutes. 2. Either Diesel Generator is supplying power to its respective Shutdown Board

APPENDIX D
Page 1 of 1

GUIDANCE FOR CONTROL OF TEMPORARY ALTERATIONS IN WORK ORDERS



1.1 Fuel Clad Barrier

1. Critical Safety Function Status

LOSS	Potential LOSS
Core Cooling Red	Core Cooling Orange OR Heat Sink Red (RHR Not in Service)

-OR-

2. Primary Coolant Activity Level

LOSS	Potential LOSS
RCS sample activity is Greater Than 300 µCi/gm dose equivalent iodine-131	Not applicable

-OR-

3. Incore TCs Hi Quad Average

LOSS	Potential LOSS
Greater Than 1200°F	Greater Than 727°F

-OR-

4. Reactor Vessel Water Level

LOSS	Potential LOSS
Not Applicable	VALID RVLIS level <33% (No RCP running)

-OR-

5. Containment Radiation Monitors

LOSS	Potential LOSS
VALID reading increase of Greater Than: 74 R/hr On 1-RE-90-271 and 272 OR 59 R/hr On 1-RE-90-273 and 274	Not Applicable

-OR-

6. Site Emergency Director Judgment

Any condition that, in the Judgment of the SM/SED, Indicates Loss or Potential Loss of the Fuel Clad Barrier Comparable to the Conditions Listed Above.

1.2 RCS Barrier

1. Critical Safety Function Status

LOSS	Potential LOSS
Not Applicable	Pressurized Thermal Shock Red OR Heat Sink Red (RHR Not in Service)

-OR-

2. RCS Leakage/LOCA

LOSS	Potential LOSS
RCS Leak results in Loss of subcooling (<65°F Indicated), [85°F ADV]	Non Isolatable RCS Leak Exceeding The Capacity of One Charging Pump (CCP) In the Normal Charging Alignment. OR RCS Leakage Results In Entry Into E-1

-OR-

3. Steam Generator Tube Rupture

LOSS	Potential LOSS
SGTR that results in a safety injection actuation OR Entry into E-3	Not Applicable

-OR-

4. Reactor Vessel Water Level

LOSS	Potential LOSS
VALID RVLIS level <33% (No RCP Running)	Not Applicable

-OR-

5. Site Emergency Director Judgment

Any condition that, in the Judgment of the SM/SED, Indicates Loss or Potential Loss of the RCS Barrier Comparable to the Conditions Listed Above.

1.3 CNTMT Barrier

1. Critical Safety Function Status

LOSS	Potential LOSS
Not Applicable	Containment (FR-Z.1) Red OR Actions of FR-C.1 (Red Path) are INEFFECTIVE

-OR-

2. Containment Pressure/Hydrogen

LOSS	Potential LOSS
Rapid unexplained decrease following initial increase OR Containment pressure or Sump level Not increasing (with LOCA in progress)	Containment Hydrogen Increases to >4% by volume OR Pressure >2.8 PSIG (Phase B) with < One full train of Containment spray

-OR-

3. Containment Isolation Status

LOSS	Potential LOSS
Containment Isolation is Incomplete (when required) AND a Release Path to the Environment Exists	Not Applicable

-OR-

4. Containment Bypass

LOSS	Potential LOSS
RUPTURED S/G is also FAULTED outside CNTMT OR Prolonged (>4 Hours) Secondary Side release outside CNTMT from a S/G with a SGTL > T/S Limits	Unexplained VALID increase in area or ventilation RAD monitors in areas adjacent to CNTMT (with LOCA in progress)

-OR-

5. Significant Radioactivity in Containment

LOSS	Potential LOSS
Not Applicable	VALID Reading increase of Greater Than: 108 R/hr on 1-RE-90-271 and 1-RE-90-272 OR 86 R/hr on 1-RE-90-273 and 1-RE-90-274

-OR-

6. Site Emergency Director Judgment

Any condition that, in the Judgment of the SM/SED, Indicates Loss or Potential Loss of the CNTMT Barrier Comparable to the Conditions Listed Above.

Modes: 1, 2, 3, 4

INSTRUCTIONS

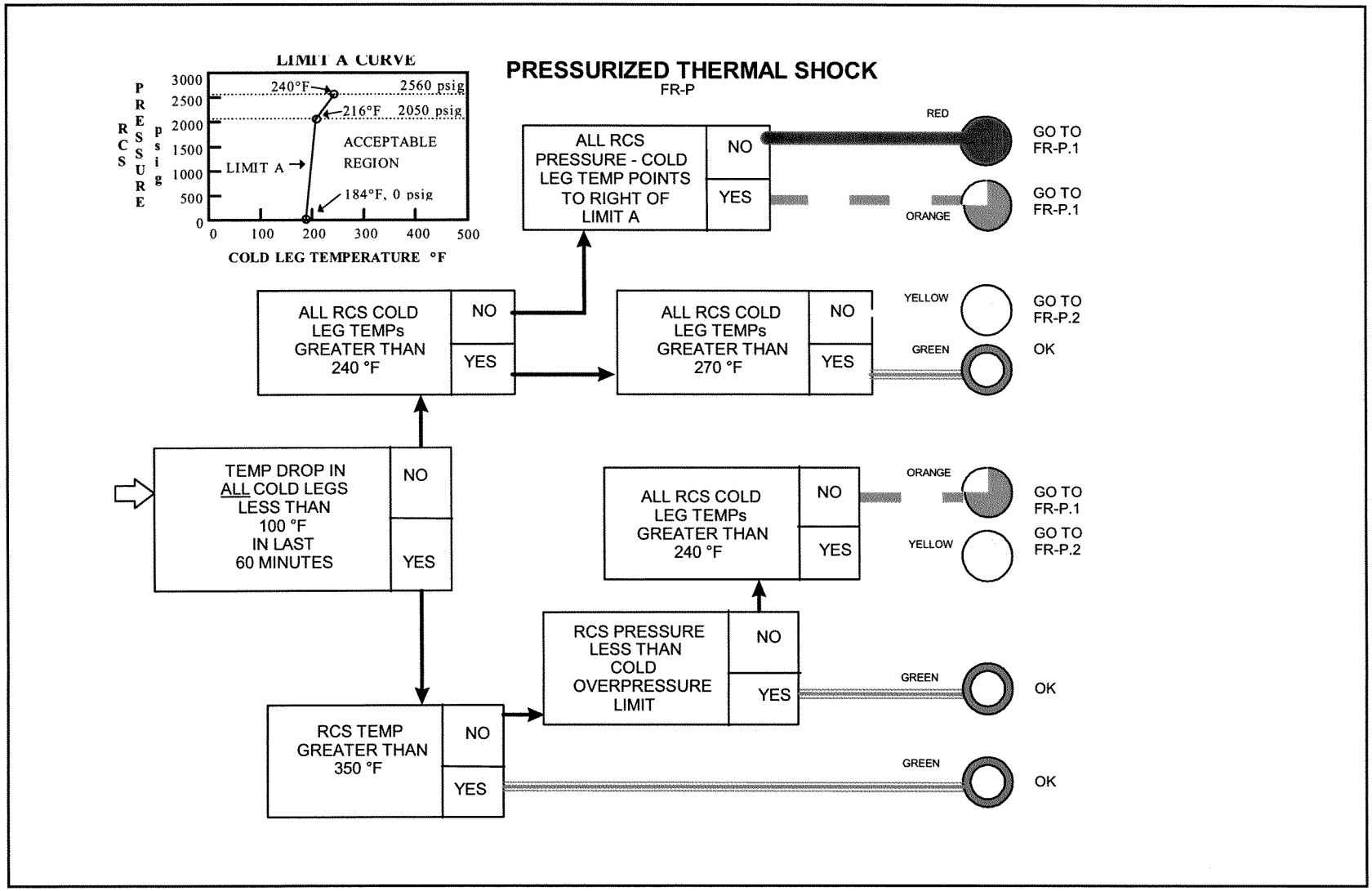
NOTE: A condition is considered to be MET if, in the judgment of the Site Emergency Director, the condition will be MET imminently (i.e., within 1 to 2 hours, in the absence of a viable success path). The classification shall be made a soon as this determination is made.

1. In the matrix to the left, review the **INITIATING CONDITIONS** in all columns and identify which, if any, **INITIATING CONDITIONS** are MET. Circle these **CONDITIONS**.
2. For each of the three barriers, identify if any **LOSS** or Potential **LOSS INITIATING CONDITIONS** have been MET.
3. If a CSF is listed as an **INITIATING CONDITION**; the respective status tree criteria will be monitored and used to determine the **EVENT** classification for the Modes listed on the classification flowchart.
4. Compare the barrier losses and potential losses to the **EVENTS** below and make the appropriate declaration.

FISSION PRODUCT BARRIER MATRIX U1

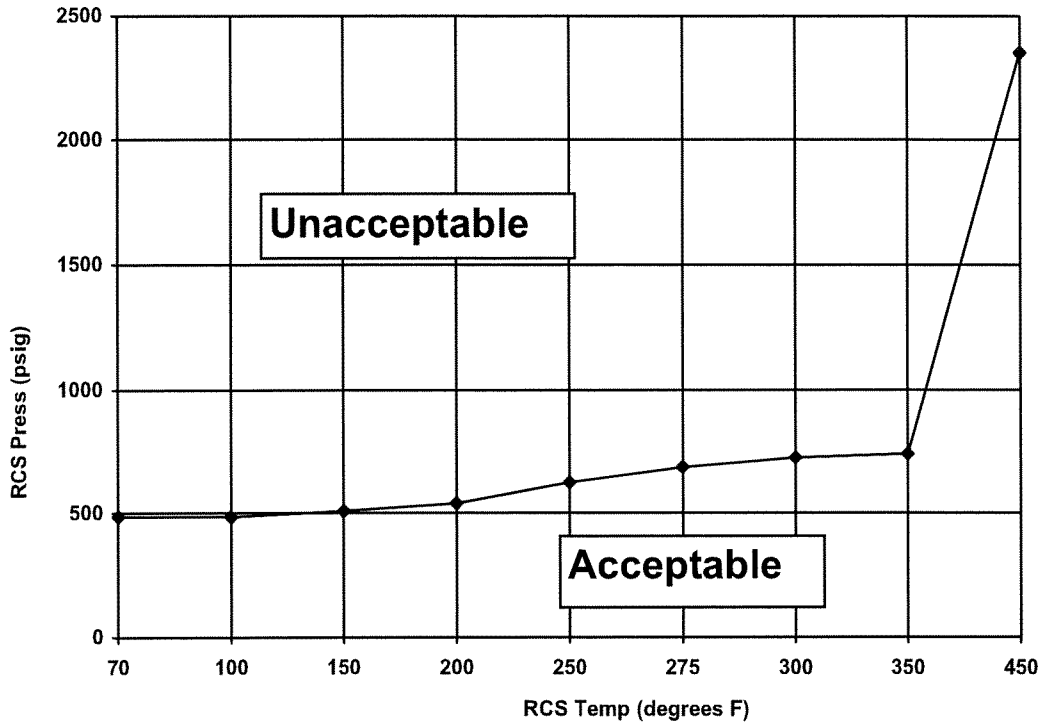
EVENTS

UNUSUAL EVENT	ALERT
Loss or Potential LOSS of Containment Barrier	Any LOSS or Potential LOSS of Fuel Clad barrier OR Any LOSS or Potential LOSS of RCS barrier
SITE AREA EMERGENCY	**GENERAL EMERGENCY**
LOSS or Potential LOSS of any two barriers	LOSS of any two barriers and Potential LOSS of third barrier


LIMIT A CURVE
RCS PRESSURE psig
3000
2500
2000
1500
1000
500
0
240°F
2560 psig
216°F
2050 psig
ACCEPTABLE REGION
LIMIT A
184°F, 0 psig
0
100
200
300
400
500
COLD LEG TEMPERATURE °F
PRESSURIZED THERMAL SHOCK
FR-P
ALL RCS PRESSURE - COLD LEG TEMP POINTS TO RIGHT OF LIMIT A
NO
YES
RED
GO TO FR-P.1
ORANGE
GO TO FR-P.1
ALL RCS COLD LEG TEMPs GREATER THAN 240 °F
NO
YES
ALL RCS COLD LEG TEMPs GREATER THAN 270 °F
NO
YES
YELLOW
GO TO FR-P.2
GREEN
OK
TEMP DROP IN ALL COLD LEGS LESS THAN 100 °F IN LAST 60 MINUTES
NO
YES
ALL RCS COLD LEG TEMPs GREATER THAN 240 °F
NO
YES
ORANGE
GO TO FR-P.1
YELLOW
GO TO FR-P.2
RCS PRESSURE LESS THAN COLD OVERPRESSURE LIMIT
NO
YES
GREEN
OK
RCS TEMP GREATER THAN 350 °F
NO
YES
GREEN
OK

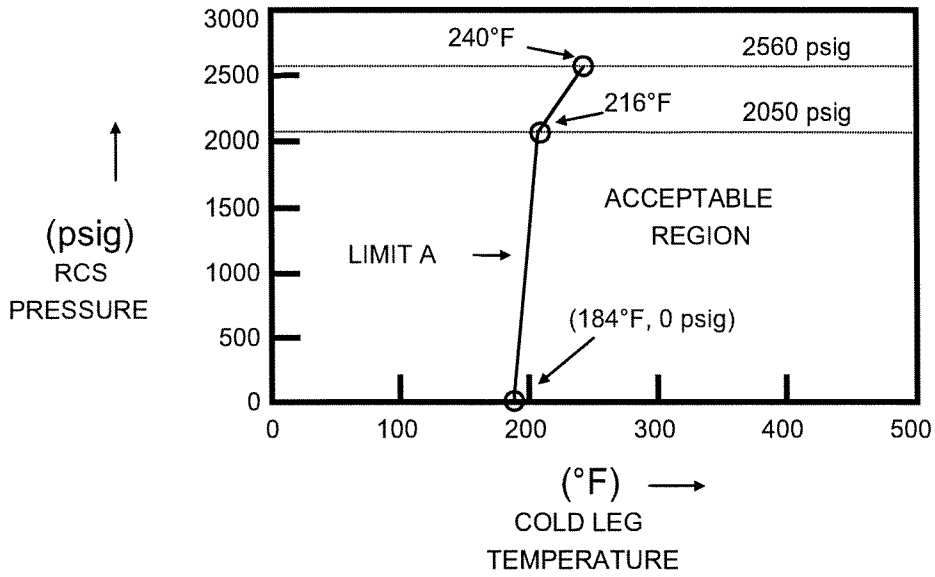
COLD OVERPRESSURE LIMIT CURVE

FIGURE 1



LIMIT A CURVE

FIGURE 2



CONTAINMENT

FR-Z