INDEPENDENT DESIGN REVIEW

of the

PALO VERDE NUCLEAR GENERATING STATION

INSTRUMENTATION AND CONTROL SYSTEMS

Before the

INSTRUMENTATION & CONTROL SYSTEMS REVIEW BOARD

VOLUME III of III

A P P E N D I X

Phoenix, Arizona

June 17-18, 1981

GRUMLEY REPORTERS
PHOENIX, ARIZONA

PALO VERDE NUCLEAR GENERATING STATION
BALANCE OF PLANT
INSTRUMENTATION AND CONTROL SYSTEMS
REVIEW BOARD

PHOENIX, AZ

JUNE 17-18, 1981

INSTRUMENTATION AND CONTROLS INDEPENDENT DESIGN REVIEW

6/17 & 18/81	BOARD CONVENES FOR BECHTEL PRESENTATION (MEETING NO. 1)
6/25/81	APS LICENSING REVIEWS TRANSCRIPT
7/02/81	FINAL TRANSCRIPT SENT TO NRC, REVIEW BOARD AND BECHTEL
7/16/81	BECHTEL'S DRAFT RESPONSE SENT TO APS FOR INFORMAL REVIEW
7/23/81	APS COMMENTS ON DRAFT RESPONSE SENT TO BECHTEL
WEEK OF 7/27/81	FOLLOW-UP MEETING WITH NRC (MEETING NO. 2)
8/06/81	BECHTEL SUBMITS RESPONSES TO OPEN ITEMS FROM REVIEW MEETING NO. 1
8/17/81	APS SENDS BOARD'S COMMENTS ON RESPONSES TO BECHTEL
8/26/81	THOSE BOARD MEMBERS WITH COMMENTS WILL RECONVENE TO MEET WITH BECHTEL*
9/04/81	LETTER TO NRC CLOSING OUT REVIEW
WEEK OF 9/07/81	NRC I&C DRAWING REVIEW AND SITE VISIT

*RECONVENING MAY BE FULFILLED WITH CONFERENCE CALL

SCHEDULE 1

REVIEW BOARD AGENDA

BOP INSTRUMENTATION & CONTROL SYSTEMS

1. INTRODUCTION
   A. NSSS INTERFACES
2. SYSTEM OVERVIEW
   A. ENGINEERED SAFETY FEATURE SYSTEMS
      1. BOP ESFAS
         A. DESIGN CRITERIA
         B. SYSTEM DESCRIPTION
      2. ESF ACTUATED DEVICE LOGIC - TYPICALS
      3. ESF LOAD SEQUENCER
         A. DESIGN CRITERIA
         B. SYSTEM DESCRIPTION
   B. SYSTEMS REQUIRED FOR SAFE SHUTDOWN
      1. REMOTE SHUTDOWN PANEL AND COLD SHUTDOWN CAPABILITY
         A. DESIGN CRITERIA
         B. SYSTEM DESCRIPTION
         C. LAYOUT

EXHIBIT i

REVIEW BOARD AGENDA

BOP INSTRUMENTATION & CONTROL SYSTEMS

2. SYSTEM OVERVIEW (CONT'D)
   - C. SAFETY-RELATED DISPLAY INSTRUMENTATION
     - 1. PROCESS INSTRUMENTATION
       - A. DESIGN CRITERIA
       - B. SYSTEM DESCRIPTION
     - 2. SAFETY EQUIPMENT STATUS SYSTEM (SESS)
       - A. DESIGN CRITERIA
       - B. SYSTEM DESCRIPTION
       - C. LAYOUT
     - 3. POST ACCIDENT MONITORING (REG GUIDE 1.97, REV. 2)
       - A. DESIGN CRITERIA
       - B. SYSTEM DESCRIPTION
   - D. ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY
     - 1. CLASS IE ALARM SYSTEM
       - A. DESIGN CRITERIA
       - B. SYSTEM DESCRIPTION
     - 2. SAFETY PARAMETER DISPLAY SYSTEM (SPDS)
       - A. DESIGN CRITERIA
       - B. SYSTEM DESCRIPTION
   - E. CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
     - 1. DESIGN CRITERIA
     - 2. SYSTEM DESCRIPTION

REVIEW BOARD AGENDA

BOP INSTRUMENTATION & CONTROL SYSTEMS

3. COMPLIANCE WITH REGULATORY REQUIREMENTS
    - A. SRP'S
    - B. GDC'S
    - C. REGULATORY GUIDES
    - D. IEEE STANDARDS
    - E. BTP'S
    - F. IE BULLETINS
    - G. NUREG-0737
4. ADDITIONAL ITEMS OF CONCERN
    - A. INSTRUMENTATION AND CONTROL SYSTEMS BRANCH CONCERNS (NRC LETTER DATED APRIL 16, 1981)
5. BACKGROUND INFORMATION

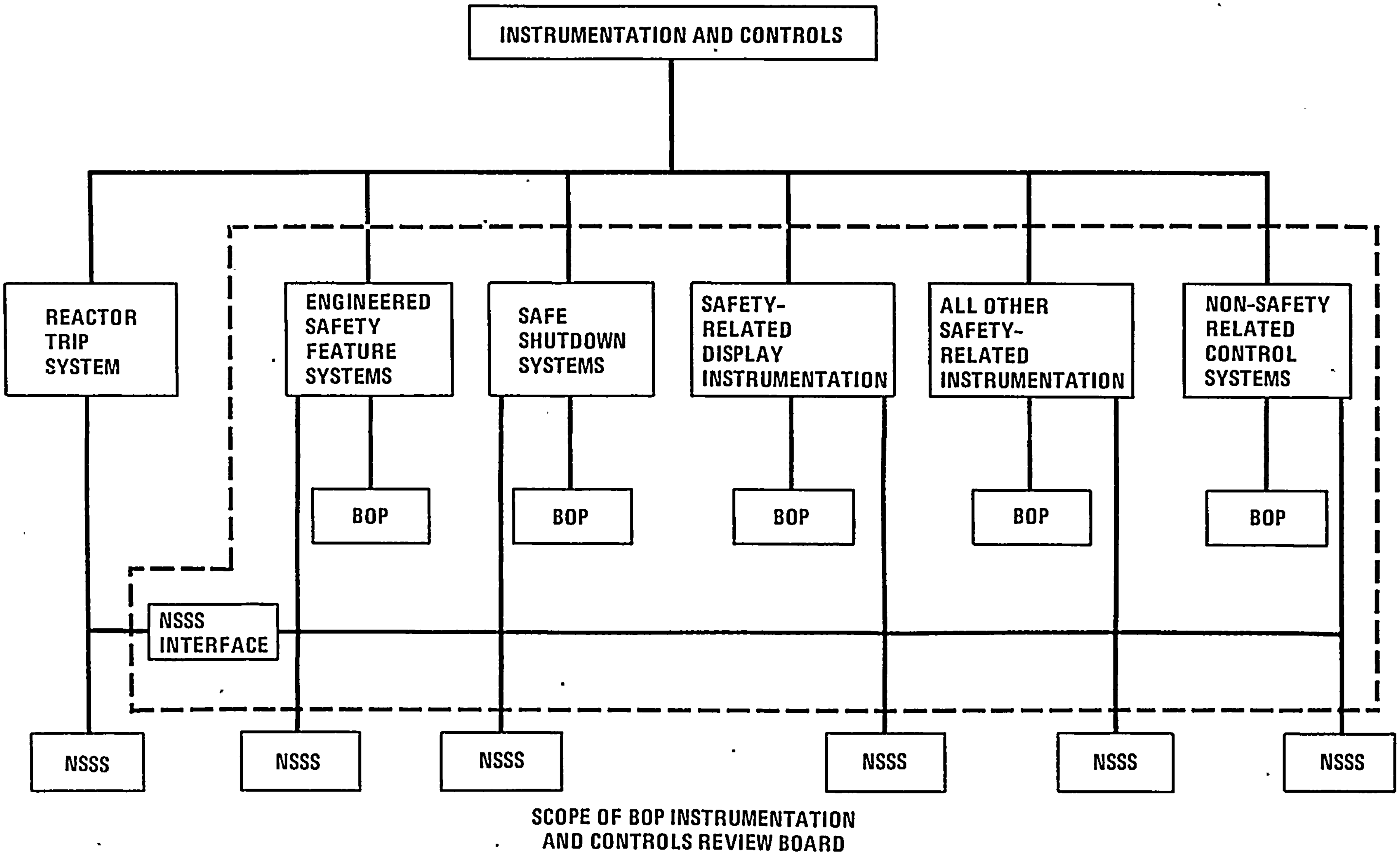

INSTRUMENTATION AND CONTROLS
REACTOR TRIP SYSTEM
ENGINEERED SAFETY FEATURE SYSTEMS
SAFE SHUTDOWN SYSTEMS
SAFETY-RELATED DISPLAY INSTRUMENTATION
ALL OTHER SAFETY-RELATED INSTRUMENTATION
NON-SAFETY RELATED CONTROL SYSTEMS
BOP
BOP
BOP
BOP
BOP
NSSS INTERFACE
NSSS
NSSS
NSSS
NSSS
NSSS
NSSS
SCOPE OF BOP INSTRUMENTATION AND CONTROLS REVIEW BOARD

FIGURE 1-1

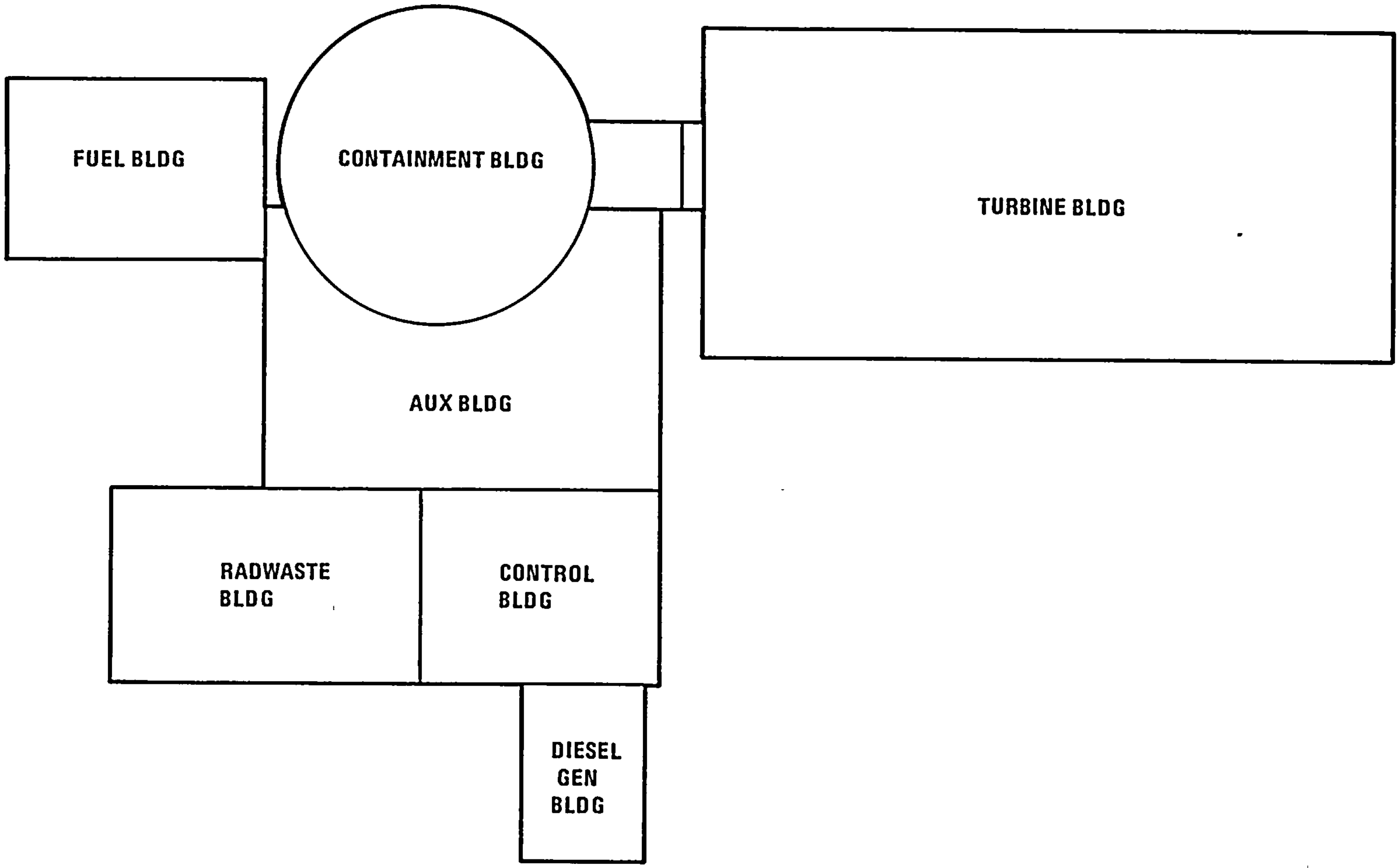


FIGURE 1-2
PVNGS GENERAL PLANT ARRANGEMENT

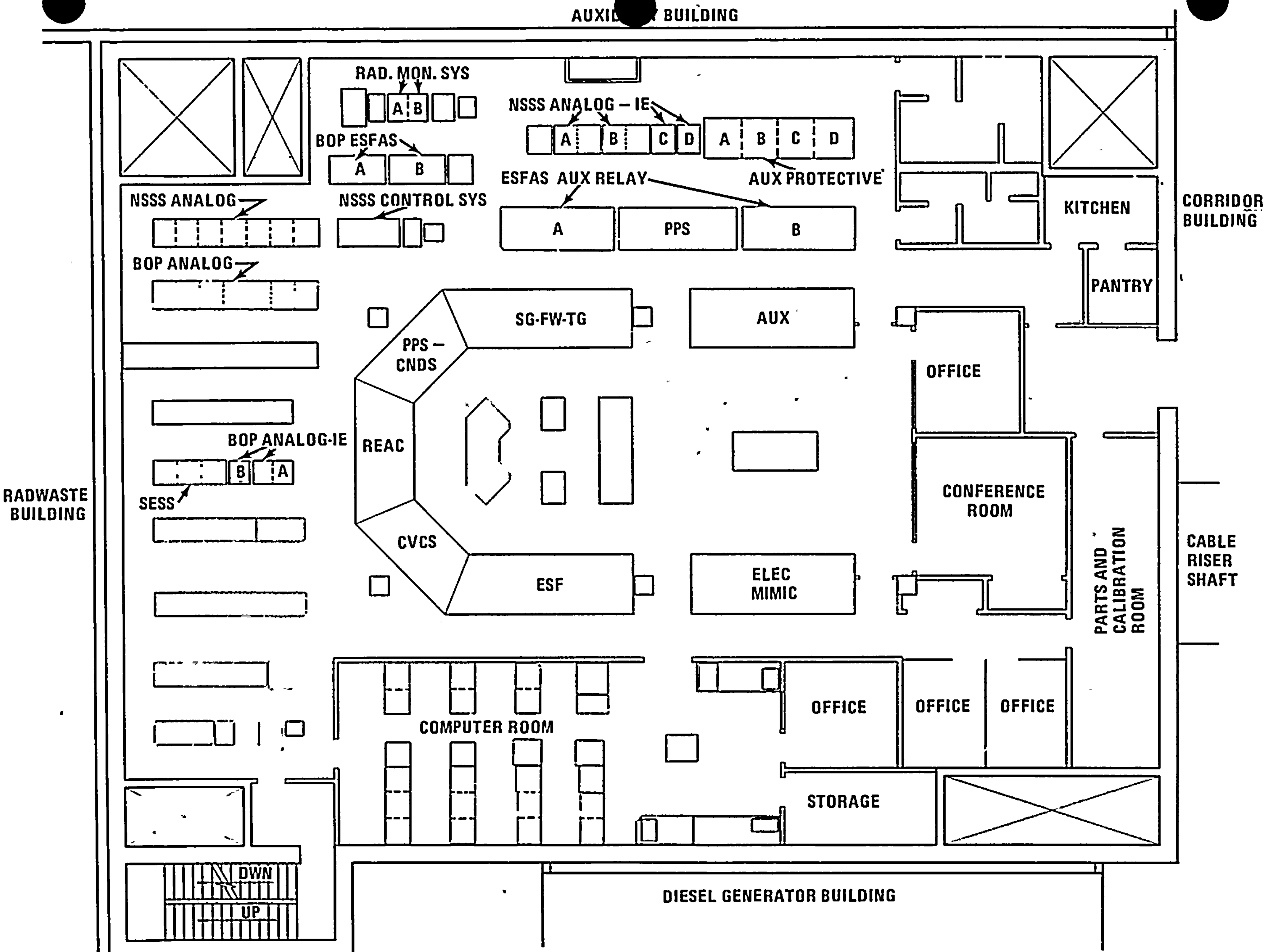


FIGURE 1-3
MAIN CONTROL ROOM ARRANGEMENT

PVNGS CLASSIFICATIONS

A. QUALITY CLASS "Q"

- FULL COMPLIANCE WITH 10CFR50, APPENDIX B, PER ANSI N45.2-1971. (ALL ENGINEERED SAFETY FEATURES [ESF] COMPONENTS ARE "Q")

B. QUALITY CLASS "R"

- SIMILAR TO 10CFR50, APPENDIX B, BUT REQUIRES LESS EXTENSIVE DOCUMENTATION

C. QUALITY CLASS "S"

- INDUSTRY STANDARD EQUIPMENT

D. SEISMIC CATEGORY I

- REMAIN FUNCTIONAL FOR SSE AND OBE

  QF_1 - REMAIN FUNCTIONAL BEFORE, DURING, AND AFTER SSE

  QF_2 - REMAIN FUNCTIONAL BEFORE AND AFTER SSE

E. SEISMIC CATEGORY II

- COMPONENTS ESSENTIAL TO POWER GENERATION DESIGNED TO NOT MALFUNCTION FOR AN EQUIVALENT STATIC LOAD OF 0.13G HORIZONTAL AND 0.09G VERTICAL

F. SEISMIC CATEGORY III

- DESIGNED FOR AN EQUIVALENT STATIC LOAD OF 0.05G OR TO MEET UNIFORM BUILDING CODE FOR SEISMIC ZONE 2

G. SEISMIC CATEGORY IX

- DESIGN ANALYZED FOR NON-COLLAPSE FOR SSE

EXHIBIT 1-1

INSTRUMENTATION AND CONTROLS

CESSAR GENERAL INTERFACE REQUIREMENTS

REFERENCE: CESSAR SECTION 7.1.3

REQUIREMENT	DESIGN FEATURE
1) POWER VITAL INSTRUMENT POWER REQUIREMENTS FOR THE SAFETY-RELATED SYSTEMS ARE DISCUSSED IN CESSAR SECTION 8.3.1.	IN COMPLIANCE
2) PROTECTION FROM NATURAL PHENOMENA CESSAR DESIGN SCOPE CLASS 1E EQUIPMENT SHALL BE LOCATED WITHIN THE PLANT SO AS TO ENSURE THE VARIOUS NATURAL PHENOMENA SPECIFIED IN GDC 2 WHICH ARE APPLICABLE TO THE APPLICANT'S SITE WILL NOT RESULT IN DEGRADATION OF THAT EQUIPMENT BELOW THE LEVEL REQUIRED TO ALLOW IT TO PERFORM REQUIRED PROTECTIVE ACTION ASSUMING A SINGLE FAILURE.	IN COMPLIANCE
3) PROTECTION FROM PIPE FAILURE THE LOCATION OF SAFETY-RELATED INSTRUMENTATION AND CONTROL COMPONENTS SHALL TAKE INTO ACCOUNT THEIR POTENTIAL DAMAGE DUE TO PIPING FAILURES, SUCH AS PIPE WHIP, JET IMPINGEMENT, ETC., FROM HIGH OR MEDIUM ENERGY FLUID SYSTEMS.	IN COMPLIANCE

REQUIREMENT	DESIGN FEATURE
THE LOCATION OF THESE COMPONENTS AND THE ROUTING OF 1E AND ASSOCIATED CABLES AND SENSING LINES SHOULD AVOID SUCH HAZARDS OR SHALL BE PROVIDED WITH ADEQUATE PROTECTION SUCH THAT REQUIRED PROTECTIVE ACTION CAN BE PERFORMED ASSUMING A SINGLE PIPING FAILURE, ITS ASSOCIATED EFFECTS, AND A SINGLE FAILURE.	
4) MISSILES	
THE SAFETY-RELATED EQUIPMENT SHALL BE PROTECTED FROM POTENTIAL MISSILE SOURCES. THE 1E AND ASSOCIATED CABLING AND SENSING LINES SHALL BE HANDLED IN A SIMILAR FASHION.	IN COMPLIANCE
5) SEPARATION	
THE ROUTING OF 1E AND ASSOCIATED CABLING AND SENSING LINES FROM SENSORS BE ARRANGED TO MINIMIZE THE POSSIBILITY OF COMMON MODE FAILURE. THIS REQUIRES THAT THE CABLING FOR THE FOUR SAFETY CHANNELS BE ROUTED SEPARATELY, HOWEVER, THE CABLES OF DIFFERENT SAFETY FUNCTIONS WITHIN ONE CHANNEL, MAY BE ROUTED TOGETHER. LOW ENERGY SIGNAL CABLES SHALL BE ROUTED SEPARATELY FROM ALL POWER CABLES. SAFETY-RELATED SENSORS SHALL BE SEPARATED. THE SEPARATION	IN COMPLIANCE

REQUIREMENT	DESIGN FEATURE
OF THEIR SAFETY-RELATED CABLES REQUIRES THAT THE CABLES BE ROUTED IN SEPARATE CABLE TRAYS. ASSOCIATED CIRCUIT CABLING FROM REDUNDANT CHANNELS SHALL BE SEPARATED, PROVIDED WITH ISOLATION, ANALYZED, OR TESTED TO DEMONSTRATE THAT NO SINGLE CREDIBLE FAILURE CAN ADVERSELY AFFECT MORE THAN ONE REDUNDANT CHANNEL.	
NON-CLASS 1E INSTRUMENTATION CIRCUITS AND CABLES (LOW LEVEL) WHICH MAY BE IN PROXIMITY TO ASSOCIATED CIRCUITS AND CABLES, ARE TO BE TREATED AS ASSOCIATED CIRCUITS IF ANALYSES OR TESTS DEMONSTRATE THAT CREDIBLE FAILURES THEREIN COULD ADVERSELY AFFECT CLASS 1E CIRCUITS.	
6) INDEPENDENCE	
CABLING ASSOCIATED WITH REDUNDANT CHANNELS OF SAFETY-RELATED CIRCUITS SHALL BE INSTALLED SUCH THAT A SINGLE CREDIBLE EVENT CANNOT CAUSE MULTIPLE CHANNEL MALFUNCTIONS OR INTERACTIONS BETWEEN CHANNELS.	IN COMPLIANCE

CESSAR GENERAL INTERFACE REQUIREMENTS

REFERENCE: CESSAR SECTION 7.1.3

REQUIREMENT	DESIGN FEATURE
7) THERMAL LIMITATIONS	
THE SAFETY-RELATED EQUIPMENT SHALL BE LOCATED SO AS NOT TO VIOLATE THE TEMPERATURE AND HUMIDITY LIMITS OF CESSAR SECTION 3.11.	IN COMPLIANCE
8) MONITORING	
AUXILIARY AND SUPPORTING SYSTEMS FOR THE SAFETY-RELATED INSTRUMENTATION AND CONTROLS SHALL BE DESIGNED TO CAUSE A SYSTEMS LEVEL BYPASS INDICATION, WHEN THEY ARE BYPASSED OR DELIBERATELY MADE INOPERABLE, FOR THE SAFETY-RELATED SYSTEM WHICH WOULD BE AFFECTED BY THE BYPASSING OR DELIBERATE INOPERABILITY OF THE AUXILIARY OR SUPPORTING SYSTEM.	IN COMPLIANCE
THE RPS AND ESFAS ALARMS AND THE REMOTE PPS AND DNBR/LPD CALCULATOR OPERATOR'S MODULES SHALL BE LOCATED IN THE MAIN CONTROL ROOM.	

CESSAR GENERAL INTERFACE REQUIREMENTS

REFERENCE: CESSAR SECTION 7.1.3

REQUIREMENT	DESIGN FEATURE
9) OPERATIONAL CONTROLS	
THE RPS AND ESFAS MANUAL ACTUATION DEVICES SHALL BE LOCATED IN THE CONTROL ROOM. THE INSTRUMENTATION AND CONTROL COMPONENTS OF THE SAFE SHUTDOWN SYSTEMS ON THE REMOTE SHUTDOWN PANEL OR AT LOCAL LOCATIONS SHALL BE MANUALLY OPERABLE.	IN COMPLIANCE
10) INSPECTION AND TESTING	
THE PPS, INCLUDING SENSORS, SHALL BE CAPABLE OF BEING PERIODICALLY TESTED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS OF CHAPTER 16. THOSE PORTIONS WHICH COULD ADVERSELY AFFECT REACTOR OPERATIONS SHALL BE CAPABLE OF BEING TESTED WHEN THE REACTOR IS SHUT DOWN. ALL OTHER SAFETY-RELATED INSTRUMENTATION SHALL BE CAPABLE OF BEING TESTED DURING NORMAL OPERATION.	IN COMPLIANCE
11) CHEMISTRY/SAMPLING	
THE COMPONENTS OF THE SAFETY-RELATED EQUIPMENT SHALL BE LOCATED SO AS NOT TO EXCEED THE CHEMISTRY LIMITS SPECIFIED IN SECTION 3.11.	IN COMPLIANCE

INSTRUMENTATION AND CONTROLS

CESSAR GENERAL INTERFACE REQUIREMENTS

REFERENCE: CESSAR SECTION 7.1.3

REQUIREMENT	DESIGN FEATURE
12) MATERIALS NOT APPLICABLE TO THE SAFETY-RELATED INSTRUMENT AND CONTROLS EQUIPMENT.	IN COMPLIANCE
13) SYSTEM COMPONENT ARRANGEMENT SAFETY-RELATED COMPONENTS SHALL BE LOCATED SO AS TO CONFORM TO THE SEPARATION, INDEPENDENCE, AND OTHER CRITERIA SPECIFIED IN THIS SECTION. THE SAFETY-RELATED COMPONENTS SHALL BE LOCATED TO PROVIDE ACCESS FOR MAINTENANCE, TESTING AND OPERATION AS REQUIRED. ANALOG AND DIGITAL SIGNALS PROVIDED TO THE SAFETY-RELATED COMPONENTS SHALL NOT SHARE THE SAME MULTICONDUCTOR CABLE, UNLESS SPECIFICALLY CALLED FOR OR APPROVED BY COMBUSTION ENGINEERING.	IN COMPLIANCE
14) RADIOLOGICAL WASTE RADIOLOGICAL WASTE DISCHARGE LINES OR COMPONENTS SHALL NOT BE ROUTED OR LOCATED NEXT TO PROTECTION SYSTEM ELECTRONIC COMPONENTS IN A MANNER THAT WILL RESULT IN EXCEEDING THE RADIATION LIMITS SPECIFIED IN SECTION 3.11.	IN COMPLIANCE

REQUIREMENT	DESIGN FEATURE
15) Overpressure Protection	
The components of the safety-related equipment shall be located so as not to exceed the pressure limits specified in Section 3.11.	IN COMPLIANCE
16) Related Services	
• A fire protection system shall be provided to protect the safety-related equipment, including sensors, consistent with GDC 3. This shall include facilities for detection, alarming, and extinguishing of fires. Facilities and methods for minimizing the probability and effects of fires, including fire barriers, fire resistant and non-combustible materials, and other such items, shall be employed whenever possible. Adequate drainage shall be provided if water is used to extinguish fires.	IN COMPLIANCE
Inadvertent operation or rupture of fire protection systems shall not result in the reduction of the functional capability of safety-related systems or components below that required to perform their safety function.	

CESSAR GENERAL INTERFACE REQUIREMENTS

REFERENCE: CESSAR SECTION 7.1.3

REQUIREMENT	DESIGN FEATURE
PHYSICAL IDENTIFICATION SHALL BE PROVIDED TO ENABLE PLANT PERSONNEL TO RECOGNIZE THAT PPS, ESFAS AUXILIARY RELAY CABINETS, RTSS, AND THEIR CABLING ARE SAFETY-RELATED. THE CABINETS SHALL BE IDENTIFIED BY NAMEPLATES. A COLOR CODING SCHEME SHALL BE USED TO IDENTIFY THE PHYSICALLY SEPARATED CHANNEL CABLING FROM SENSOR TO THE PPS (REFER TO CESSAR SECTION 7.1.3.5); THE SAME COLOR CODE SHALL BE USED FOR INTERBAY OR INTERCABINET IDENTIFICATION. CABLING OR WIRING WITHIN A BAY AT THE CABINET WHICH IS IN THE CHANNEL OF ITS CIRCUIT CLASSIFICATION SHALL NOT BE COLOR CODED. THE CABINET NAMEPLATES AND CABLING SHALL BE COLOR CODED AS FOLLOWS:	IN COMPLIANCE PER FSAR SECTION 8.3.1.3 (ASSOCIATED CIRCUITS TREATED AS CLASS 1E IDENTIFIED BY THE SEPARATION GROUP COLOR CODE.)

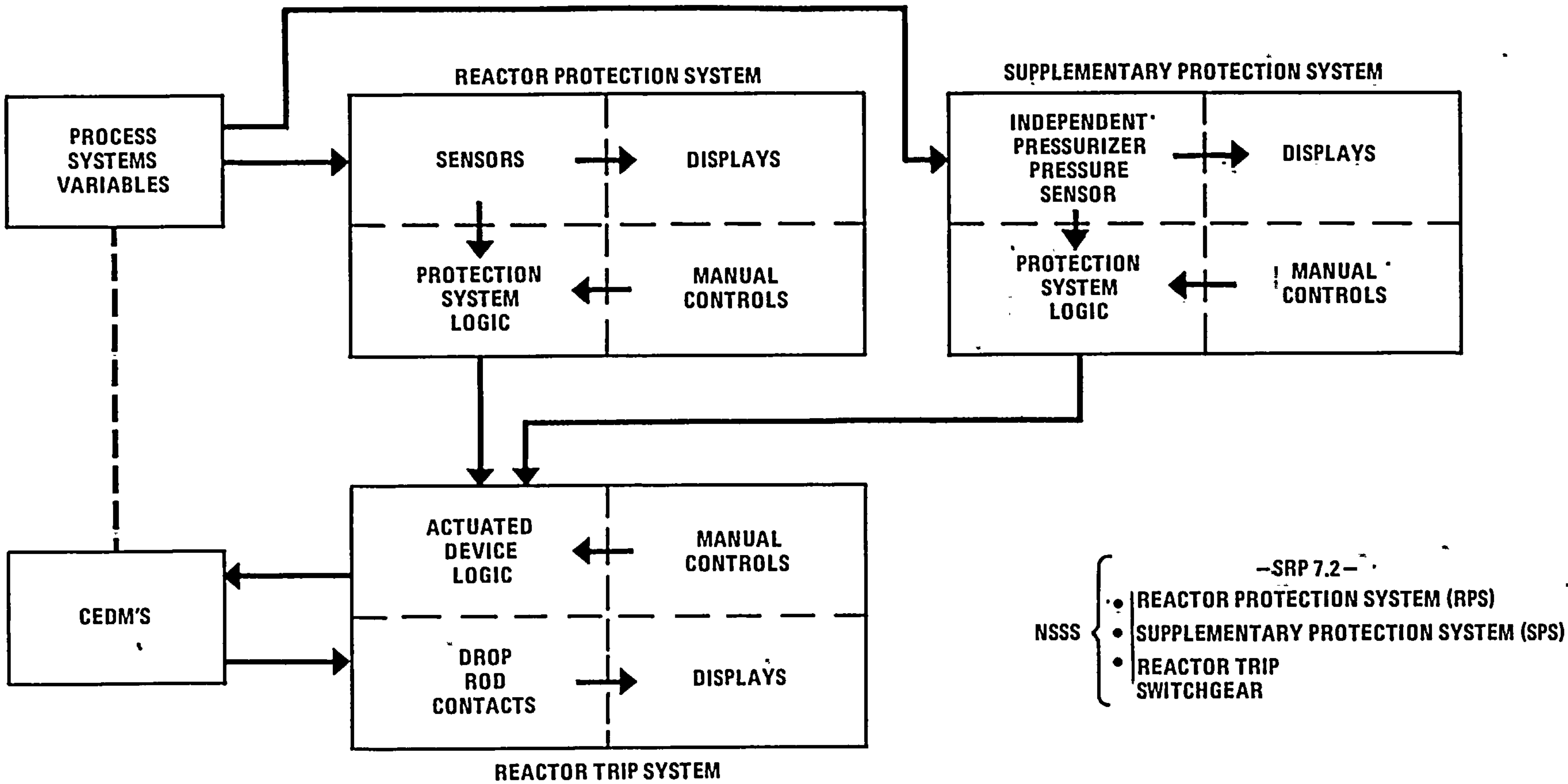
PROTECTIVE	ESF TRAINS	ASSOCIATED
CHANNEL A: RED	A: RED	CHANNEL J: WHITE/RED STRIPE
CHANNEL B: GREEN	B: GREEN	CHANNEL K: WHITE/GREEN STRIPE
CHANNEL C: YELLOW		CHANNEL L: WHITE/YELLOW STRIPE
CHANNEL D: BLUE		CHANNEL M: WHITE/BLUE STRIPE

REQUIREMENT	DESIGN FEATURE
ALL NON-PANEL MOUNTED PROTECTION SYSTEM INSTRUMENTATION AND CONTROL COMPONENTS ARE IDENTIFIED WITH A NAME TAG WHICH PROVIDES THE CHANNEL NUMBER AND THE SUFFIX A, B, C, OR D TO SPECIFICALLY IDENTIFY THE PROTECTION CHANNEL WITH WHICH THE COMPONENT IS IDENTIFIED.	
17) ENVIRONMENTAL	
ENVIRONMENTAL SUPPORT SYSTEMS SHALL BE PROVIDED TO ENSURE THAT THE ENVIRONMENTAL CONDITIONS OF THE SAFETY-RELATED SYSTEMS DO NOT EXCEED THE REQUIREMENTS FOR 1E EQUIPMENT AS DEFINED IN SECTION 3.11.	IN COMPLIANCE
18) MECHANICAL INTERACTION	
SEISMIC REQUIREMENTS FOR SAFETY-RELATED EQUIPMENT ARE SPECIFIED IN SECTION 3.10.	IN COMPLIANCE

CESSAR GENERAL INTERFACE REQUIREMENTS

REFERENCE: CESSAR SECTION 7.1.3

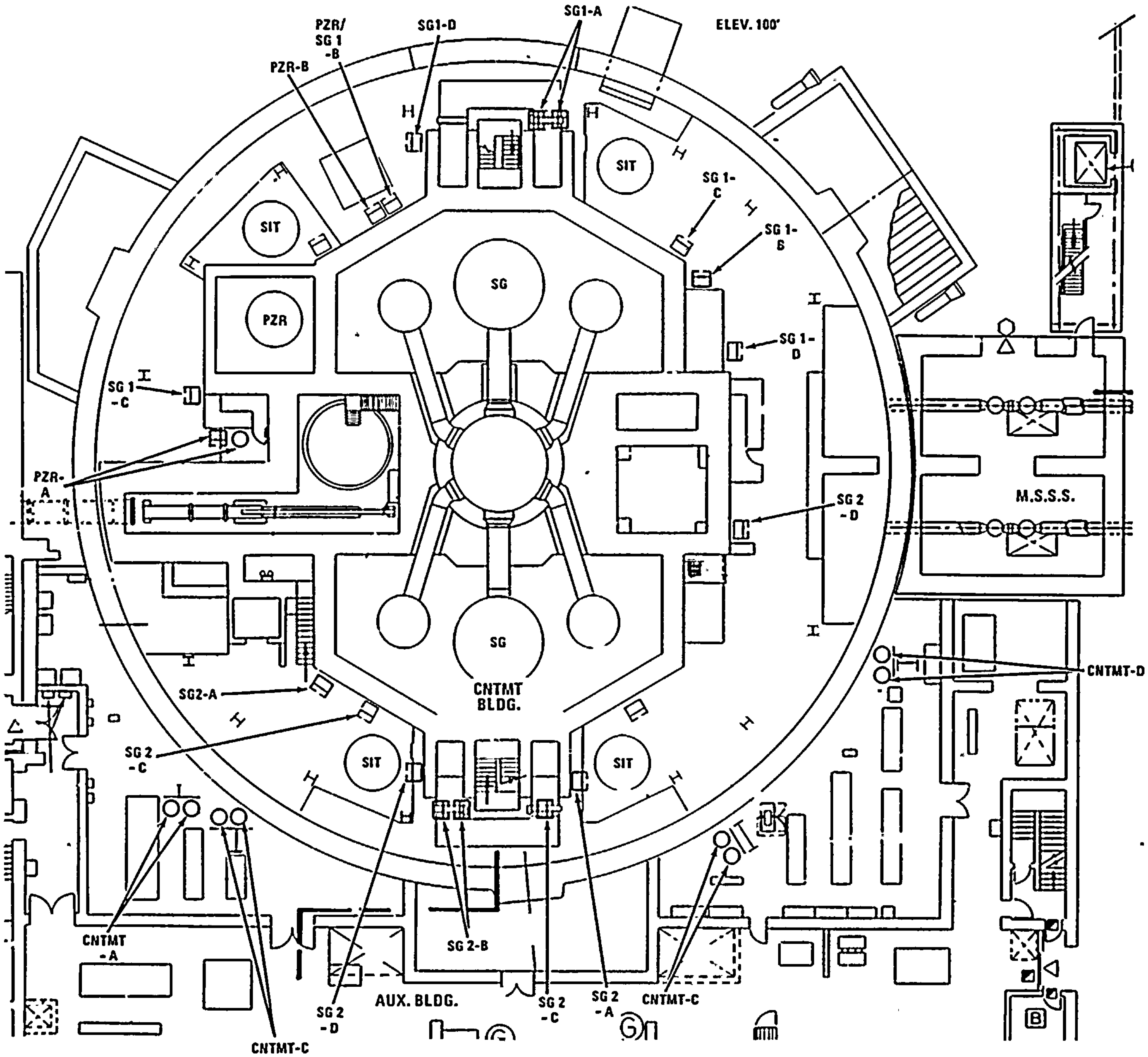
REQUIREMENT	DESIGN FEATURE
19) PLANT MONITORING SYSTEM INPUTS THE INPUTS TO THE RPS AND ESFAS CAN BE SENT TO THE PMS FOR TRENDING, DATA LOGGING AND OTHER HISTORICAL FUNCTIONS BUT ARE NOT USED FOR OTHER CONTROL FUNCTIONS. THESE INPUTS SHALL HAVE PROPER ISOLATION TO PREVENT ANY FAILURE IN THE PMS FROM ADVERSELY AFFECTING THE RPS OR ESFAS.	IN COMPLIANCE



REACTOR TRIP SYSTEM

ELECTRICAL AND MECHANICAL DEVICES AND CIRCUITRY (FROM SENSORS THROUGH ACTUATION DEVICES) REQUIRED TO INITIATE REACTOR SHUTDOWN

FIGURE 1A-1



RPS — ESFAS
SENSOR LOCATIONS
FIGURE 1A-2

REACTOR TRIP SYSTEM

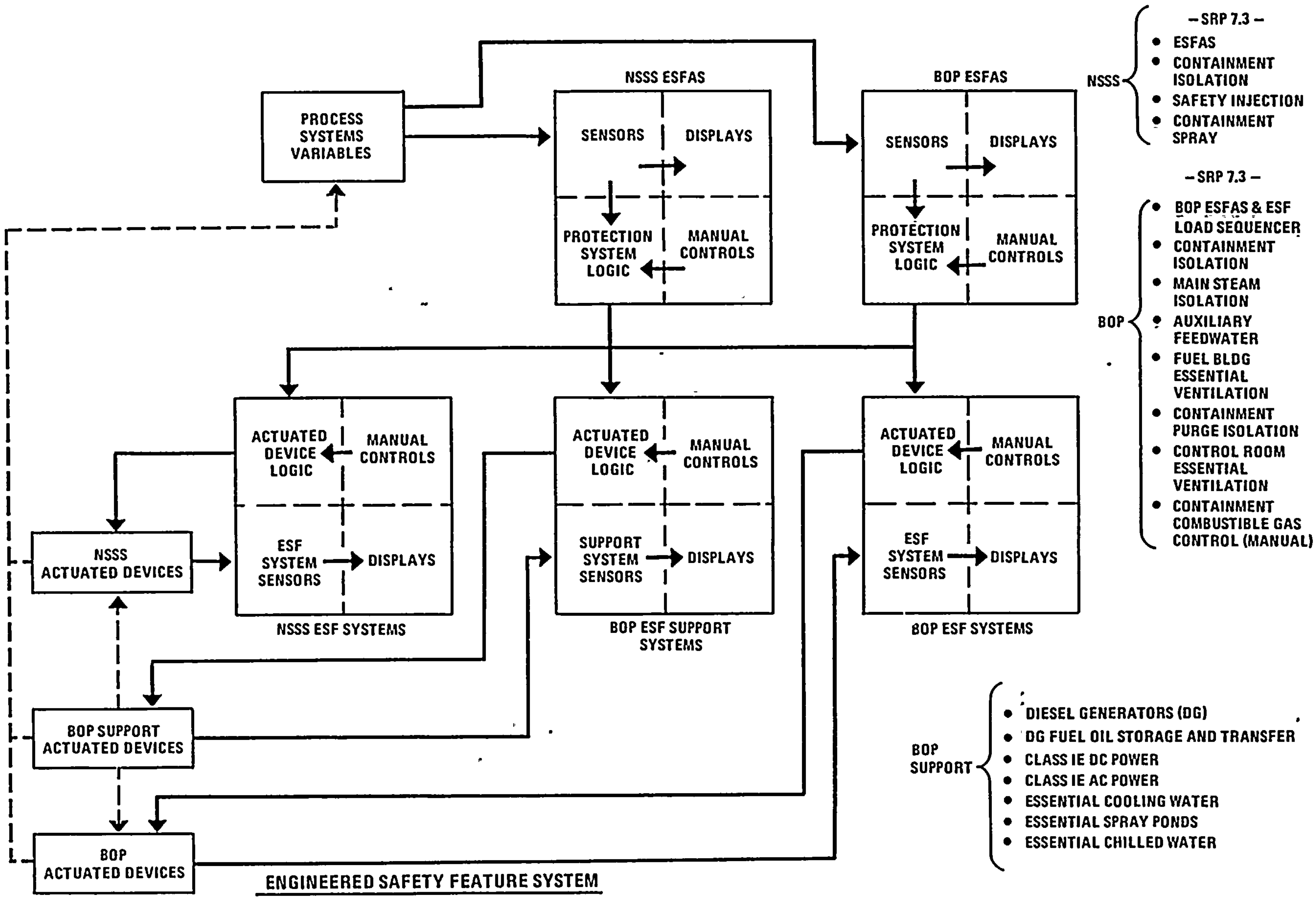
ADDITIONAL CESSAR INTERFACE REQUIREMENTS

REFERENCE: CESSAR SECTION 7.2.3

REQUIREMENT	DESIGN FEATURE
1) SEPARATION	
PREAMPLIFIERS FOR THE FISSION CHAMBERS SHALL BE MOUNTED OUTSIDE THE BIOLOGICAL SHIELD BUT INSIDE THE CONTAINMENT BUILDING. THE PREAMPLIFIERS AND CABLING SHALL BE PROVIDED WITH PHYSICAL AND ELECTRICAL SEPARATION.	IN COMPLIANCE
2) OPERATIONAL/CONTROLS	
ADMINISTRATIVE PROCEDURES OR OTHER SUITABLE MEANS SHALL BE USED TO CONTROL CHANGES TO CPC CONSTANTS, ADJUSTMENTS TO VARIABLE SETPOINTS, AND THE BYPASSING OF CHANNELS WHICH COULD AFFECT OPERATION.	IN COMPLIANCE

EXHIBIT 1A-11

2. SYSTEM OVERVIEW



ENGINEERED SAFETY FEATURE SYSTEM

ELECTRICAL AND MECHANICAL DEVICES AND CIRCUITRY (FROM SENSORS THROUGH ACTUATION DEVICES) REQUIRED TO INITIATE PROTECTIVE ACTION.

FIGURE 2A-1

2.A.1.A. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

DESIGN CRITERIA

1) THE BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM (BOP ESFAS) SHALL PROVIDE INITIATING SIGNALS FOR BALANCE OF PLANT ENGINEERED SAFETY FEATURE (BOP ESF) SYSTEM COMPONENTS WHICH REQUIRE AUTOMATIC INITIATION FOLLOWING A DESIGN BASIS EVENT.

THE BOP ESFAS ACTUATION SIGNALS ARE:

FUEL BUILDING ESSENTIAL VENTILATION ACTUATION SIGNAL (FBEVAS)
CONTAINMENT PURGE ISOLATION ACTUATION SIGNAL (CPIAS)
CONTROL ROOM VENTILATION ISOLATION ACTUATION SIGNAL (CRVIAS)
CONTROL ROOM ESSENTIAL FILTRATION ACTUATION SIGNAL (CREFAS)

THE AUTOMATICALLY ACTUATED BOP ESF SYSTEMS ARE:

FUEL BUILDING ESSENTIAL VENTILATION SYSTEM
CONTAINMENT PURGE ISOLATION SYSTEM
CONTROL ROOM ESSENTIAL VENTILATION SYSTEM
AND THEIR SUPPORT SYSTEMS

THE ONE MANUALLY ACTUATED ESF SYSTEM IS:

CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM

EXHIBIT 2A1-1

2.A.1.A. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

DESIGN CRITERIA

2) SPECIFIC DESIGN CRITERIA FOR THE BOP ESFAS ARE DETAILED IN IEEE 279-1971 "CRITERIA FOR PROTECTION SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS," SECTION 3, DETAILED AS FOLLOWS:

BOP ESFAS DESIGN BASES

1) DESIGN BASIS EVENTS
2) MONITORED VARIABLES
3) NUMBER AND LOCATION OF SENSORS
4) NORMAL OPERATION NOMINAL VARIABLE VALUES
5) NORMAL OPERATION VARIABLE LIMITS
6) ACTUATION SETPOINTS
7) MARGIN TO ACTUATION
8) QUALIFICATION, REDUNDANCY, FAILURE MODES
9) MINIMUM PERFORMANCE REQUIREMENTS

BASIS (1): THE DESIGN BASIS EVENTS REQUIRING BOP ESF ACTION ARE:

DESIGN BASIS EVENTS / SYSTEMS	FUEL BUILDING ESSENTIAL VENTILATION SYSTEM	CONTAINMENT PURGE ISOLATION SYSTEM	CONTROL ROOM ESSENTIAL VENTILATION SYSTEM	CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM
LOSS OF REACTOR COOLANT – LARGE BREAK	C,E	B,E	E	A
LOSS OF REACTOR COOLANT – SMALL BREAK	C,E	B,E	E	A
FUEL HANDLING ACCIDENT – CONTAINMENT BUILDING		B	B	
FUEL HANDLING ACCIDENT – SPENT FUEL POOL	F		F	
CHLORINE GAS RELEASE			D	
FIRE/SMOKE-PLANT VICINITY			A	

A. MANUAL ACTUATION
B. ACTUATED BY INITIATION OF CPIAS OR CIAS
C. ON SIAS THE FUEL BUILDING ESSENTIAL VENTILATION SYSTEM STARTS AND IS ALIGNED TO EXHAUST FROM THE AUXILIARY BUILDING
D. CONTROL ROOM ISOLATION AND RECIRCULATION
E. ACTUATED BY SIAS OR CIAS: SIAS AND CIAS LOGIC IS PART OF NSSS SCOPE.
F. ACTUATED BY FBEVAS.

2.A.1.A BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM DESIGN CRITERIA

EXHIBIT 2A1-3

BASIS (2): MONITORED VARIABLES INITIATING PROTECTIVE SIGNALS

VARIABLE \ SIGNAL	SIAS	CIAS	CPIAS	CREFAS	CRVIAS	FBEVAS	MANUAL
FUEL BUILDING AIRBORNE ACTIVITY						X	
CONTROL ROOM VENTILATION INTAKE ACTIVITY				X			
CONTROL ROOM VENTILATION INTAKE CHLORINE					X		
CONTROL ROOM VENTILATION INTAKE SMOKE[(A)]							X
CONTAINMENT HYDROGEN							X
PRESSURIZER PRESSURE[(B)]	X	X					
CONTAINMENT PRESSURE[(B)]	X	X					
CONTAINMENT AIRBORNE ACTIVITY			X				

(A) NON SAFETY RELATED SENSOR

(B) PART OF NSSS ESFAS

PROTECTIVE SIGNALS INITIATING PROTECTIVE ACTIONS

SIGNAL \ PROTECTIVE ACTION	FUEL BLDG ESS VENT SYSTEM			CONTROL ROOM ESS VENT SYSTEM		
	SI/RECIRC AREA FILTRATION	FUEL BLDG FILTRATION	CONTAINMENT PURGE ISOLATION	PRESSURIZED FILTERED RECIRCULATION	ISOLATED FILTERED RECIRCULATION	CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM
SIAS	X			X		
CIAS			X			
CPIAS			X	X		
CREFAS				X		
CRVIAS					X	
FBEVAS		X		X		
MANUAL					X	X

EXHIBIT 2A1-4

BASIS (3): THE NUMBER AND LOCATION OF THE SENSORS REQUIRED TO MONITOR THE VARIABLES ARE:

MONITORED VARIABLE	TYPE	NUMBER OF SENSORS	LOCATION
POWER ACCESS PURGE EXHAUST AREA RADIATION LEVEL	GEIGER-MUELLER	2	OUTSIDE CONTAINMENT BETWEEN POWER ACCESS PURGE EXHAUST DUCT AND REFUELING PURGE EXHAUST DUCT
FUEL BUILDING EXHAUST DUCT RADIATION LEVEL	β-SCINTILLATION	1	FUEL BUILDING EXHAUST DUCT
FUEL POOL AREA RADIATION LEVEL	GEIGER-MUELLER	1	OVERLOOKING SPENT FUEL POOL
CONTROL ROOM AIR INTAKE ACTIVITY LEVEL	β-SCINTILLATION	2	CONTROL ROOM OUTSIDE AIR INTAKE DUCT
CONTROL ROOM AIR INTAKE CHLORINE LEVEL	CHEMICALLY IMPREG-NATED PAPER TAPE, (COLOR REACTION)	2	CONTROL ROOM OUTSIDE AIR INTAKE DUCT
CONTROL ROOM AIR INTAKE SMOKE DETECTOR	IONIZATION (PRODUCTS OF COMBUSTION	2	CONTROL ROOM OUTSIDE AIR INTAKE DUCT
CONTAINMENT HYDROGEN ANALYZER	THERMAL CONDUCTIVITY	2	OUTSIDE CONTAINMENT PERMANENTLY INSTALLED WITH NORMALLY CLOSED INLET AND RETURN VALVES AVAILABLE FOR MANUAL STARTUP FROM CONTROL ROOM

BASES (4), (5), (6), AND (7): THE NORMAL OPERATION LIMITS FOR EACH VARIABLE, THE ACTUATION SETPOINTS AND THE MARGIN BETWEEN THE OPERATION LIMITS AND ACTUATION SETPOINTS ARE:

ACTUATION SIGNAL	(FULL POWER) NOMINAL	NORMAL OPERATION LIMIT	ACTUATION SETPOINT	MARGIN TO ACTUATION
FBEVAS				
FUEL BUILDING EXHAUST DUCT HIGH ACTIVITY	LESS THAN SENSITIVITY $\left(<10^{-6}\frac{\mu Ci}{CM^3}\text{ (XE-133)}\right)$	LESS THAN SENSITIVITY $\left(<10^{-6}\frac{\mu Ci}{CM^3}\text{ (XE-133)}\right)$	$2 \times 10^{-6}\frac{\mu Ci}{CM^3}$ (XE-133)	$1 \times 10^{-6}\frac{\mu Ci}{CM^3}$ (XE-133)
FUEL POOL HIGH RADIATION LEVEL	$0.5\frac{MR}{H}$	$0.5\frac{MR}{H}$	$2.5\frac{MR}{H}$	$2.0\frac{MR}{H}$
CPIAS				
POWER ACCESS PURGE EXHAUST RADIATION LEVEL	$<2.5\frac{MR}{H}$	$<2.5\frac{MR}{H}$	$2.5\frac{MR}{H}$	NEGLIGIBLE
CREFAS				
CONTROL ROOM AIR INTAKE HIGH ACTIVITY LEVEL	LESS THAN SENSITIVITY $\left(<10^{-6}\frac{\mu Ci}{CM^3}\text{ (XE-133)}\right)$	LESS THAN SENSITIVITY $\left(<10^{-6}\frac{\mu Ci}{CM^3}\text{ (XE-133)}\right)$	$2 \times 10^{-6}\frac{\mu Ci}{CM^3}$ (XE-133)	$1 \times 10^{-6}\frac{\mu Ci}{CM^3}$ (XE-133)
CRVIAS				
CONTROL ROOM AIR INTAKE HIGH CHLORINE LEVEL	LESS THAN SENSITIVITY	LESS THAN SENSITIVITY	4 PPM (BY VOL)	4 PPM (BY VOL)
CONTROL ROOM AIR INTAKE HIGH SMOKE LEVEL (MANUAL INITIATION OF CRVIAS UPON DETECTION OF SMOKE)	LESS THAN SENSITIVITY	LESS THAN SENSITIVITY	1.25% OBSCURATION	1.25% OBSCURATION

EXHIBIT 2A1-6

2.A.1.A. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

DESIGN CRITERIA

BASIS (8): THE QUALIFICATION, REDUNDANCY AND FAILURE MODE REQUIREMENTS OF THE BOP ESFAS SHALL BE AS FOLLOWS:

BOP ESFAS COMPONENTS SHALL BE QUALIFIED TO WITHSTAND, AND REMAIN OPERABLE DURING THE ENVIRONMENTAL CONDITIONS MAINTAINED AT THE EQUIPMENT LOCATIONS BEFORE, DURING, AND AFTER THE SPECIFIED DESIGN BASIS EVENTS.

BOP ESFAS COMPONENTS SHALL WITHSTAND, AND REMAIN OPERABLE, DURING AND AFTER A SAFE SHUTDOWN EARTHQUAKE (SSE).

A SINGLE FAILURE WITHIN THE BOP ESFAS SHALL NOT PREVENT PROPER PROTECTIVE ACTION AT THE SYSTEM LEVEL.

A LOSS OF POWER TO THE BOP ESFAS MEASUREMENT CHANNELS AND/OR TO THE LOGIC SYSTEM CAUSES SYSTEM ACTUATION.

BASIS (9): THE MINIMUM PERFORMANCE REQUIREMENTS OF THE BOP ESFAS SHALL BE AS FOLLOWS:

THE REQUIRED BOP ESFAS RESPONSE TIMES AND ACCURANCIES OF MEASUREMENT CHANNELS ARE PROVIDED BELOW. THE TOTAL BOP ESFAS RESPONSE TIMES REPRESENT THE SUM OF THE MEASUREMENT CHANNEL RESPONSE TIME PLUS THE BOP ESFAS LOGIC RESPONSE TIME.

	MEASUREMENT CHANNEL RESPONSE TIME		BOP ESFAS LOGIC RESPONSE TIME	MEASUREMENT CHANNEL ACCURACY
1) CONTAINMENT POWER ACCESS PURGE EXHAUST AREA RADIATION	0.75S (POWER) 1.25S REFUELING)	+	1.278S	±20%
2) FUEL POOL AREA RADIATION	0.5S	+	1.278S	±20%
3) FUEL BUILDING EXHAUST AIR-BORNE ACTIVITY	0.5S	+	1.278S	±25%
4) CONTROL ROOM AIR INTAKE AIRBORNE ACTIVITY	0.5S	+	1.278S	±25%
5) CONTROL ROOM AIR INTAKE CHLORINE	8S	+	1.278S	±20% OF THE CHLORINE CON-CENTRATION IN THE MEASURE-MENT POINT
6) CONTROL ROOM AIR INTAKE SMOKE	50S		N.A. (MANUAL INITIATION)	±10%

EXHIBIT 2A1-8

DESIGN CRITERIA

3) ONLY THOSE ESF SYSTEMS THAT, WHEN ACTUATED, DO NOT CAUSE A PLANT CONDITION REQUIRING PROTECTIVE ACTION, OR DISTURB REACTOR OPERATIONS, SHALL BE CONTROLLED BY THE BOP ESFAS.

4) THE AUTOMATICALLY ACTUATED BOP ESF SYSTEMS SHALL USE ONE-OUT-OF-TWO INPUT SIGNAL LOGIC.

5) THE BOP ESFAS LOGIC SHALL BE CONTAINED IN SEPARATE ENCLOSURES ISOLATED FROM THE NSSS TWO-OUT-OF-FOUR ESFAS AND REACTOR PROTECTIVE SYSTEM (RPS) LOGIC.

6) THE ACTUATION SYSTEM CONSISTS OF THE SENSORS, BISTABLES, INITIATION LOGIC, AND ACTUATION LOGIC THAT MONITOR SELECTED PLANT PARAMETERS AND PROVIDE AN ACTUATION SIGNAL TO EACH INDIVIDUAL ACTUATED COMPONENT IN THE ESF SYSTEM IF THE PLANT PARAMETERS REACH PRESELECTED SETPOINTS.

7) THE BOP ESFAS SHALL PROVIDE THE LOGIC TO AUTOMATICALLY START AND SEQUENTIALLY LOAD THE DIESEL GENERATORS AND TO SHED ALL 4.16 kV CLASS IE LOADS ON A LOSS OF POWER.

2.A.1.A. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

DESIGN CRITERIA

8) THE FOLLOWING CODES AND STANDARDS SHALL BE USED IN THE DESIGN OF THE BOP ESFAS:

- 10CFR50, LICENSING OF PRODUCTION AND UTILIZATION FACILITIES, APPENDIX A, GENERAL DESIGN CRITERIA FOR NUCLEAR POWER PLANTS, JULY 15, 1971.
- INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) STD 279-1971, CRITERIA FOR PROTECTION SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS.
- IEEE STD 323-1974, STANDARD FOR QUALIFYING CLASS IE EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS.
- IEEE STD 338-1971, TRIAL-USE CRITERIA FOR THE PERIODIC TESTING OF NUCLEAR POWER GENERATING STATION PROTECTION SYSTEMS.
- IEEE STD 344-1975, RECOMMENDED PRACTICES FOR SEISMIC QUALIFICATION OF CLASS IE EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS.
- IEEE STD 379-1972, TRIAL-USE GUIDE FOR THE APPLICATION OF THE SINGLE-FAILURE CRITERION TO NUCLEAR POWER GENERATING STATION PROTECTION SYSTEMS.
- IEEE STD 384-1974, TRIAL-USE STANDARD CRITERIA FOR SEPARATION OF CLASS IE EQUIPMENT AND CIRCUITS, AS MODIFIED BY NRC REGULATORY GUIDE 1.75.
- IEEE STD 420-1973, TRIAL-USE GUIDE FOR CLASS IE CONTROL SWITCHBOARDS FOR NUCLEAR POWER GENERATING STATIONS.

DESIGN CRITERIA

9) THE INITIATING CIRCUITS SHALL CONTINUOUSLY MONITOR KEY PROCESS VARIABLES INDICATING ACCIDENT CONDITIONS AND TRANSMITTING DIGITAL (ON-OFF) SIGNALS TO THE BOP ESFAS INITIATING LOGIC.

10) THE BOP ESFAS INITIATING LOGIC SHALL PROVIDE TWO ESFAS INITIATION SIGNALS FOR THE ACTUATION LOGIC.

11) THE SYSTEM SHALL MONITOR THE UNDERVOLTAGE RELAYS ON THE 4.16 kV CLASS IE BUS AND INITIATE A LOGIC SIGNAL ON A TWO-OUT-OF-FOUR COINCIDENCE OF BUS UNDERVOLTAGE. THIS LOGIC SIGNAL WILL BE USED TO SHED ALL CLASS 1E 4.16 kV LOADS EXCEPT THE LOAD CENTER TRANSFORMERS, SHED CERTAIN 480V LOADS, START THE DIESEL GENERATOR, START EQUIPMENT REQUIRED AFTER A LOSS OF OFFSITE POWER, AND TRIP THE 4.16 kV CLASS IE BUS PREFERRED POWER SUPPLY BREAKERS.

DESIGN CRITERIA

12) THE SYSTEM SHALL PROVIDE SEQUENCING LOGIC FOR SEQUENTIAL LOADING OF ESF AND FORCED SHUTDOWN LOADS ONTO THE ESF BUS UPON CLOSING OF THE DIESEL GENERATOR BREAKER, A SAFETY INJECTION ACTUATION SIGNAL (SIAS), OR AN AUXILIARY FEEDWATER ACTUATION SIGNAL (AFAS).

13) THE BOP ESFAS SHALL BE DESIGNED TO THE REQUIREMENTS FOR NUCLEAR SAFETY-RELATED SYSTEMS SUCH THAT THE DEVICES MUST MAINTAIN THEIR SAFETY-RELATED FUNCTIONAL CAPABILITY UNDER ALL NORMAL AND ABNORMAL PLANT OPERATING CONDITIONS.

14) THE TWO REDUNDANT INITIATING LOGIC SYSTEMS AND THE TWO REDUNDANT ACTUATION LOGIC SYSTEMS SHALL BE SEPARATED AND IDENTIFIED BY APPROPRIATE COLORED NAMEPLATE AND WIRING SEPARATION IDENTIFICATION.

15) POWER FOR EACH INDEPENDENT AND REDUNDANT LOGIC SUBSYSTEM SHALL BE SUPPLIED FROM A SEPARATE CLASS IE 120V-AC VITAL INSTRUMENT AND CLASS IE 125V-DC DISTRIBUTION BUS.

16) THE SYSTEM SHALL ACCEPT POWER INPUT LINE VARIATIONS AND TRANSIENTS WITHOUT PRODUCING FALSE PROTECTIVE ACTUATIONS OR PREVENTING REQUIRED RESPONSE TO ACCIDENT CONDITIONS.

DESIGN CRITERIA

17) PROVISIONS FOR TESTING SHALL BE IN ACCORDANCE WITH REGULATORY GUIDE (RG) 1.22 AND IEEE 338-1971.

18) INTERLOCKS SHALL PREVENT THE OPERATOR FROM BYPASSING MORE THAN ONE SENSOR CHANNEL AT A TIME FOR ANY ONE TYPE OF TRIP. THIS INTERLOCK SHALL NOT COMPROMISE THE REDUNDANCE AND INDEPENDENCE OF THE CHANNELS.

19) SHOULD ANOTHER ACCIDENT CONDITION OCCUR AFTER THE LOAD SEQUENCER HAS STARTED, THE SEQUENCER SHALL RESET TO ZERO. EQUIPMENT IN OPERATION AT THIS TIME SHALL REMAIN IN OPERATION. IF A LOSS OF OFFSITE POWER (LOP) SIGNAL IS INITIATED AFTER THE LOAD SEQUENCER HAS STARTED, ALL LOADS WILL BE SHED AND RESEQUENCED ON THE DIESEL GENERATOR BREAKER CLOSURE.

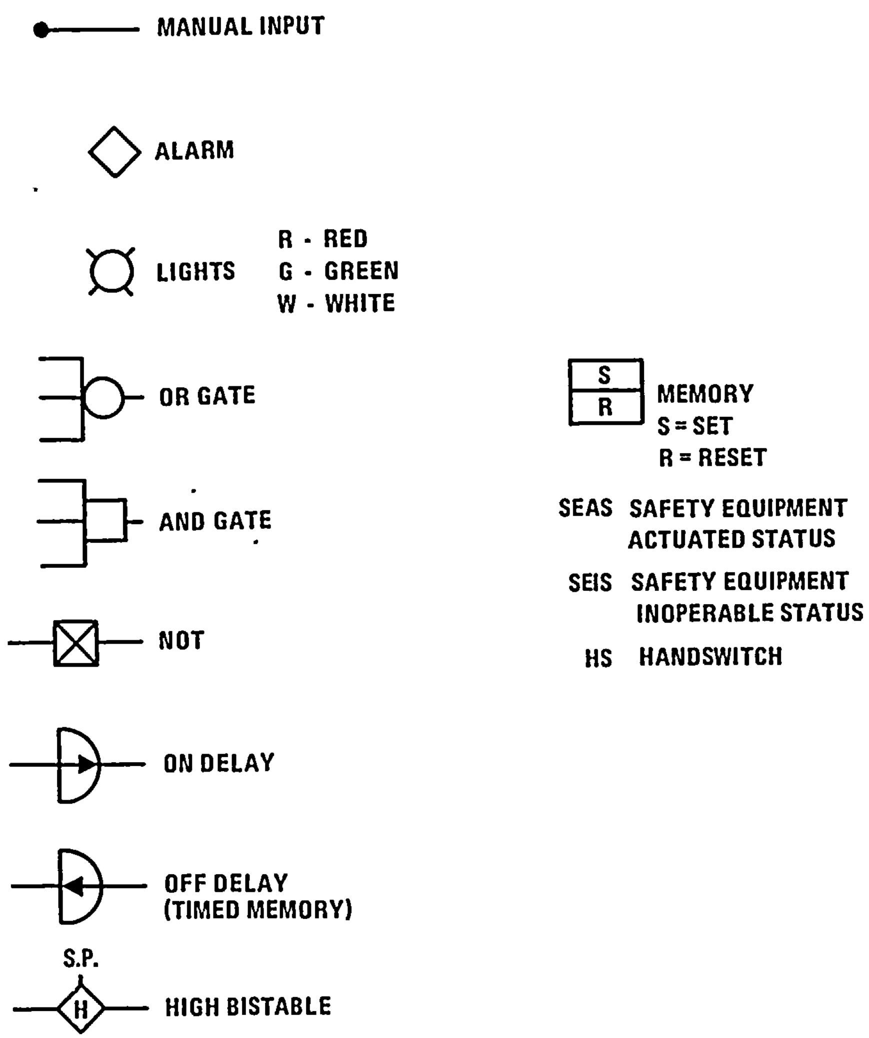


FIGURE 2A1-1
LOGIC SYMBOLS

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

1) BOP ESFAS MEASUREMENT CHANNELS

A. PROCESS MEASUREMENT CHANNELS ARE USED TO PERFORM THE FOLLOWING FUNCTIONS:

CONTINUOUSLY MONITOR EACH SELECTED GENERATING STATION VARIABLE

PROVIDE INDICATION OF OPERATIONAL AVAILABILITY OF EACH SENSOR TO THE OPERATOR

TRANSMIT SIGNALS TO BISTABLES WITHIN THE ESFAS INITIATING LOGIC

B. PROTECTIVE PARAMETERS ARE MEASURED WITH TWO INDEPENDENT PROCESS MEASUREMENT CHANNELS

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

1) BOP ESFAS MEASUREMENT CHANNELS (CONT'D)

C. A MEASUREMENT CHANNEL CONSISTS OF INSTRUMENT SENSING LINES, SENSOR, TRANSMITTER, POWER SUPPLY, ISOLATION DEVICE, INDICATOR, AND INTERCONNECTING WIRING. SIGNAL ISOLATION IS PROVIDED FOR COMPUTER INPUTS AND ANNUNCIATION.

D. EACH REDUNDANT MEASUREMENT CHANNEL IS SUPPLIED FROM A SEPARATE 120V VITAL AC DISTRIBUTION BUS

2) BOP ESFAS BISTABLE AND INITIATING LOGIC

A. THE BOP ESFAS INITIATING LOGICS PERFORM THE FOLLOWING FUNCTIONS:

COMPARES THE SIGNAL RECEIVED FROM THE SENSOR WITH A PREDETERMINED INITIATION SETPOINT IN THE BISTABLE CIRCUIT.

PROVIDES CHANNEL AND SIGNAL STATUS INFORMATION TO THE OPERATOR.

PROVIDES TWO ESFAS INITIATION SIGNALS FOR THE ACTUATING LOGIC.

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

2) BOP ESFAS BISTABLE AND INITIATING LOGIC (CONT'D)

B. THE BOP ESFAS INITIATING LOGIC CONSISTS OF BISTABLES, BISTABLE OUTPUT RELAYS, TRIP OUTPUT SIGNALS, INDICATING LIGHTS, AND INTERCONNECTING WIRING.

C. SIGNALS FROM THE PROTECTIVE MEASUREMENT CHANNELS ARE SENT TO COMPARATOR CIRCUITS (BISTABLES) WHERE THE INPUT SIGNALS ARE COMPARED TO PREDETERMINED SETPOINTS. WHENEVER A CHANNEL PARAMETER REACHES THE PREDETERMINED SETPOINT, THE CHANNEL BISTABLE DEENERGIZES AN OUTPUT RELAY.

D. EACH REDUNDANT CHANNEL BISTABLE RELAY IS SUPPLIED FROM A SEPARATE 120V VITAL AC DISTRIBUTION BUS.

E. THE BISTABLE SETPOINTS ARE ADJUSTABLE FROM THE FRONT OF THE CABINET. ACCESS IS LIMITED, HOWEVER, BY MEANS OF A KEY-OPERATED SWITCH. BISTABLE SETPOINTS ARE CAPABLE OF BEING READ OUT ON A DISPLAY LOCATED ON THE CABINET.

F. THE ESFAS INITIATION SIGNALS ARE GENERATED IN TWO CHANNELS DESIGNATED A AND B. A SIGNAL FROM THE BISTABLE OUTPUT RELAY IN EITHER OR BOTH PROTECTIVE MEASUREMENT CHANNELS GENERATES ESFAS INITIATING SIGNALS TO BOTH ACTUATION CHANNELS.

3) BOP ESFAS ACTUATING LOGIC

A. THE BOP ESFAS ACTUATING LOGICS PERFORM THE FOLLOWING FUNCTIONS:

- RECEIVE ESFAS SIGNALS FROM THE ESFAS INITIATING LOGIC
- FORM ONE-OUT-OF-TWO INCIDENCE OF LIKE ESFAS SIGNALS
- PROVIDE A MEANS FOR REMOTE MANUAL INITIATION
- PROVIDE STATUS INFORMATION TO THE OPERATOR

B. THE ESFAS ACTUATING LOGIC IS PHYSICALLY LOCATED IN TWO ESFAS CABINETS. ONE CABINET CONTAINS THE LOGIC FOR ESF LOAD GROUP 1 EQUIPMENT, WHILE THE OTHER CABINET CONTAINS THE LOGIC FOR ESF LOAD GROUP 2 EQUIPMENT.

SYSTEM DESCRIPTION

C. THE TWO INITIATING SIGNALS (ONE FROM EACH BISTABLE AND INITIATING LOGIC) ARE ARRANGED IN A ONE-OUT-OF-TWO LOGIC IN EACH ACTUATION CHANNEL. ACTUATION OF EITHER SIGNAL DEENERGIZES THE GROUP RELAY ASSOCIATED WITH THAT CHANNEL, AND RESULTS IN AN ACTUATION SIGNAL.

D. EACH ACTUATION CHANNEL IS SUPPLIED FROM A SEPARATE 120V AC DISTRIBUTION BUS AND A SEPARATE CLASS IE 125V DC DISTRIBUTION BUS.

4) BOP ESF SYSTEM ACTUATION

A. COMPONENTS IN EACH BOP ESF SYSTEM ARE ACTUATED BY GROUP RELAYS. THE GROUP RELAY CONTACTS ARE IN THE POWER CONTROL CIRCUIT FOR THE ACTUATED COMPONENTS OF EACH ESF SYSTEM.

B. THE INITIATING AND ACTUATING LOGIC CAUSES DEENERGIZATION OF THE ACTUATION RELAY WHENEVER THE BISTABLE OUTPUT RELAY IS DEENERGIZED.

C. DEENERGIZATION OF THE GROUP RELAY ACTUATES THE ESF SYSTEM COMPONENTS.

5) CHANNEL BYPASSES

A. INITIATING LOGIC BYPASSES ARE PROVIDED IN THE BOP ESFAS AND ARE EMPLOYED TO REMOVE THE INITIATING LOGIC FROM SERVICE FOR MAINTENANCE.

B. THE ACTUATING LOGIC IS CONVERTED TO A SINGLE ACTIVE CHANNEL FOR THE ESFAS-MONITORED VARIABLE BYPASSED. THE BYPASS TIME INTERVAL FOR MAINTENANCE IS SO SHORT THAT THE PROBABILITY OF FAILURE OF THE REMAINING MEASUREMENT CHANNEL AND INITIATING LOGIC IS ACCEPTABLY LOW DURING MAINTENANCE BYPASS PERIODS.

C. OTHER ESFAS-MONITORED VARIABLE INITATING LOGICS THAT HAVE NOT BEEN BYPASSED IN EITHER OF THEIR TWO CHANNELS REMAIN IN A ONE-OUT-OF-TWO ACTUATING LOGIC.

D. THE BYPASS IS MANUALLY INITIATED AND MANUALLY REMOVED.

E. AN ELECTRICAL INTERLOCK ALLOWS ONLY ONE INITIATING LOGIC FOR ANY ONE ESFAS-MONITORED VARIABLE TO BE BYPASSED AT ONE TIME.

F. BYPASSES ARE ANNUNCIATED VISUALLY AND AUDIBLY TO THE OPERATOR.

SYSTEM DESCRIPTION

6) OPERATING BYPASSES

THE BOP ESFAS HAS NO OPERATING BYPASSES.

7) INTERLOCKS

ELECTRICAL INTERLOCKS IN THE BOP ESFAS PREVENT THE OPERATOR FROM BYPASSING MORE THAN ONE INITIATING LOGIC FOR A PARTICULAR ESFAS-MONITORED VARIABLE AT A TIME. DIFFERENT ESFAS-MONITORED VARIABLE INITIATING LOGICS MAY BE BYPASSED SIMULTANEOUSLY, EITHER IN THE SAME CHANNEL OR IN DIFFERENT CHANNELS.

8) REDUNDANCY

REDUNDANT FEATURES OF THE BOP ESFAS INCLUDE:

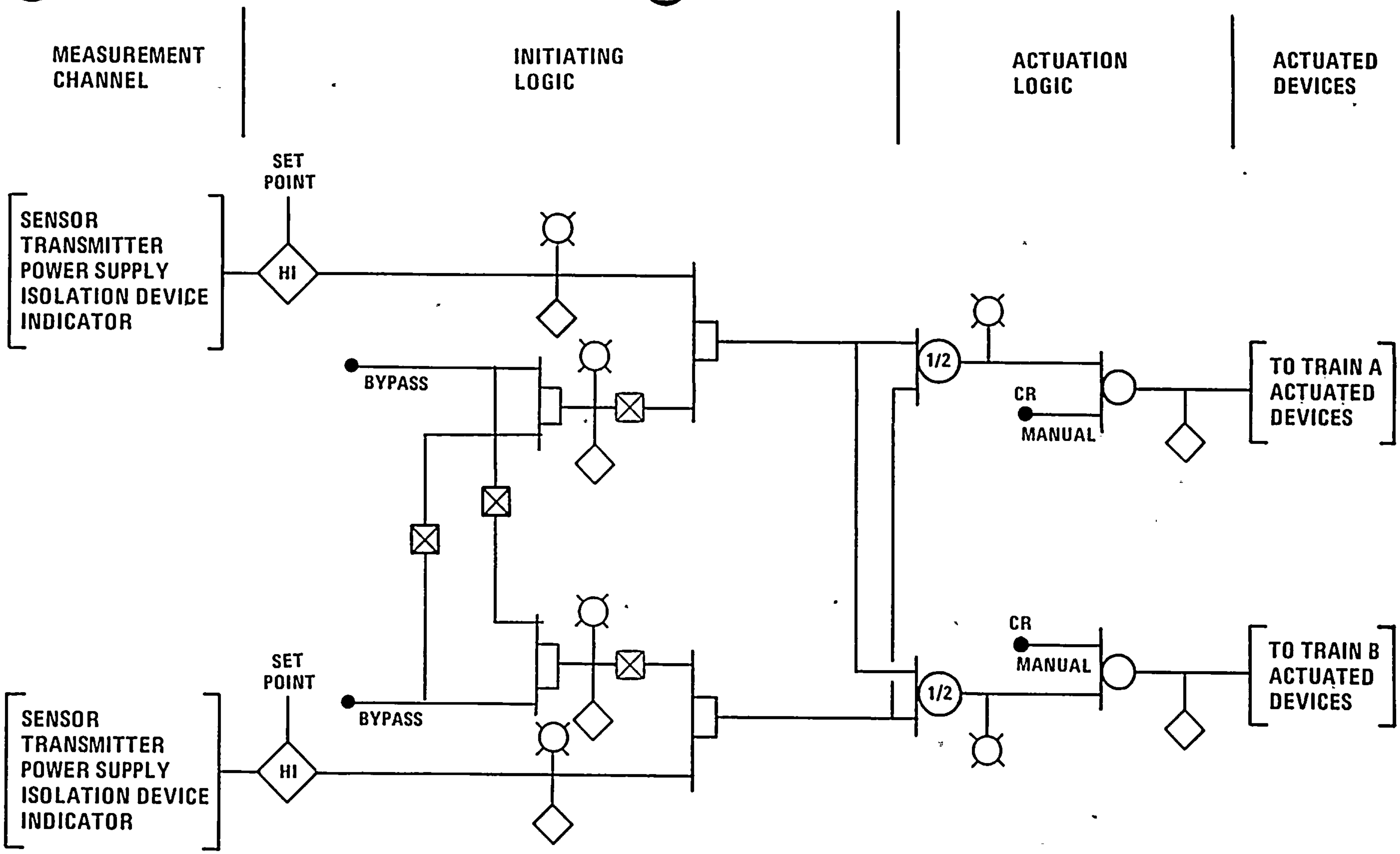
A. TWO INDEPENDENT CHANNELS, FROM PROCESS SENSOR/TRANSMITTER THROUGH AND INCLUDING BISTABLE OUTPUT RELAYS

B. TWO INITIATING LOGIC PATHS ARE PRESENT FOR EACH ACTUATION SIGNAL

C. EACH ACTUATION SIGNAL ACTUATES TWO OUTPUT TRAINS SO THAT REDUNDANT SYSTEM COMPONENTS MAY BE ACTUATED FROM SEPARATE TRAINS

D. POWER FOR THE SYSTEM PROVIDED FROM TWO SEPARATE BUSES (POWER FOR CONTROL AND OPERATION OF REDUNDANT ACTUATED COMPONENTS COMES FROM SEPARATE BUSES. LOAD GROUP 1 COMPONENTS AND SYSTEMS ARE ENERGIZED ONLY BY THE LOAD GROUP 1 BUS AND LOAD GROUP 2 COMPONENTS AND SYSTEMS ARE ENERGIZED ONLY BY THE LOAD GROUP 2 BUS.)

THE RESULT OF THE REDUNDANT FEATURES IS A SYSTEM THAT MEETS THE SINGLE FAILURE CRITERION.

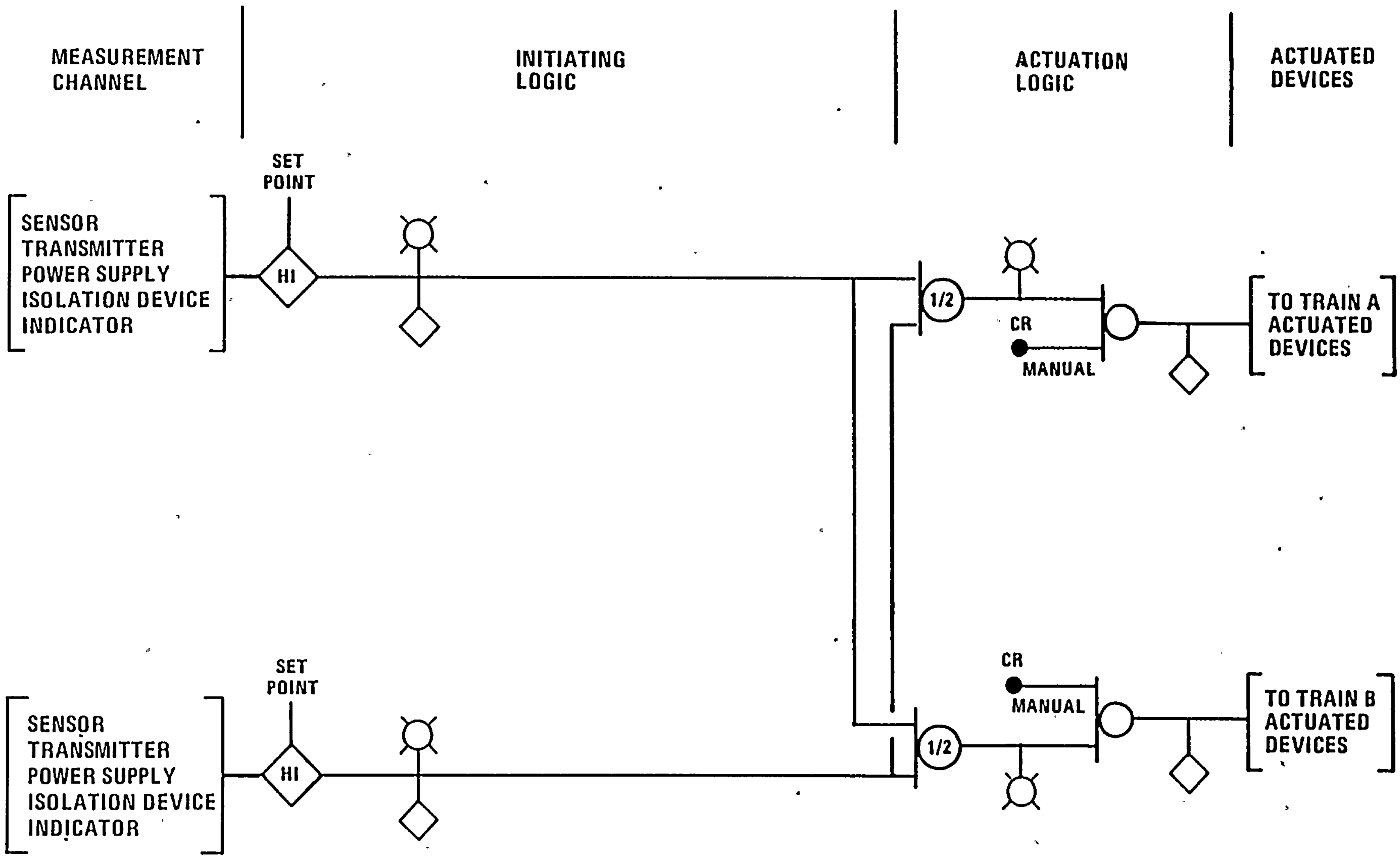


NOTE:

SIGNALS BETWEEN REDUNDANT CHANNELS ARE ELECTRICALLY ISOLATED AND PHYSICALLY SEPARATED.

TYPICAL BOP ESFAS LOGIC

FIGURE 2A1-2



NOTE:

SIGNALS BETWEEN REDUNDANT CHANNELS ARE ELECTRICALLY ISOLATED AND PHYSICALLY SEPARATED.

TYPICAL BOP ESFAS LOGIC

FIGURE 2A1- 2A

9) DIVERSITY

THE BOP ESFAS IS DESIGNED TO ELIMINATE CREDIBLE DUAL CHANNEL FAILURES ORIGINATING FROM A COMMON CAUSE. THE FAILURE MODES OF REDUNDANT CHANNELS AND THE CONDITIONS OF OPERATION THAT ARE COMMON TO THEM ARE ANALYZED TO ASSURE THAT:

A. THE MONITORED VARIABLES PROVIDE ADEQUATE INFORMATION DURING THE ACCIDENTS

B. THE EQUIPMENT CAN PERFORM AS REQUIRED

C. THE INTERACTIONS OF PROTECTIVE ACTIONS, CONTROL ACTIONS, AND THE ENVIRONMENTAL CHANGES THAT CAUSE, OR ARE CAUSED BY, THE DESIGN BASIS EVENTS DO NOT PREVENT THE MITIGATION OF THE CONSEQUENCES OF THE EVENT.

SYSTEM DESCRIPTION

9) DIVERSITY (CONT'D)

D. THE SYSTEM CANNOT BE MADE INOPERABLE BY THE INADVERTENT ACTIONS OF OPERATING AND MAINTENANCE PERSONNEL

IN ADDITION, THE DESIGN IS NOT ENCUMBERED WITH ADDITIONAL COMPONENTS OR CHANNELS WITHOUT REASONABLE ASSURANCE THAT SUCH ADDITIONS ARE BENEFICIAL.

10) TESTING

PROVISIONS ARE MADE TO PERMIT PERIODIC TESTING OF THE BOP ESFAS.

TESTS COVER THE TRIP ACTIONS FROM SENSOR INPUT THROUGH THE PROTECTION SYSTEM AND THE ACTUATION DEVICES.

SYSTEM TEST DOES NOT INTERFERE WITH THE PROTECTIVE FUNCTION OF THE SYSTEM.

THE TESTING SYSTEM MEETS THE CRITERIA OF IEEE STANDARD 338-1971 AND OF REGULATORY GUIDE 1.22.

10) TESTING (CONT'D)

ACTUATION OF THE ESF SYSTEMS CONTROLLED BY THE ONE-OUT-OF-TWO ESFAS DOES NOT DISTURB NORMAL PLANT OPERATING CONDITIONS, THE ONE-OUT-OF-TWO ESFAS IS TESTED BY COMPLETE ACTUATION AS FOLLOWS:

A. SENSOR CHECKS. DURING REACTOR OPERATION, THE MEASUREMENT CHANNELS PROVIDING AN INPUT TO THE ESFAS ARE CHECKED BY COMPARING THE OUTPUTS OF SIMILAR CHANNELS, AND BY CROSS-CHECKING WITH RELATED MEASUREMENTS.

   DURING EXTENDED SHUTDOWN PERIODS OR REFUELING, THESE MEASUREMENT CHANNELS ARE CHECKED AND CALIBRATED AGAINST KNOWN STANDARDS.

B. TRIP BISTABLE TEST. TESTING OF THE SYSTEM IS ACCOMPLISHED BY MANUALLY VARYING THE INPUT SIGNAL TO THE TRIP SETPOINT LEVEL ON ONE BISTABLE AT A TIME AND OBSERVING THE TRIP ACTION.

10) TESTING (CONT'D)

WHEN THE BISTABLE OF A PROTECTIVE CHANNEL IS IN A TRIPPED CONDITION, THE FOLLOWING CONDITIONS SHOULD EXIST.

THE BISTABLE OUTPUT RELAY IS DEENERGIZED.

THE GROUP RELAY IN EACH ACTUATION CHANNEL IS DEENERGIZED.

THE ESF COMPONENTS ARE IN THE ESFAS ACTUATION POSITION.

ACTUATION IS ANNUNCIATED ON THE CONTROL ROOM ANNUNCIATOR PANEL.

10) TESTING (CONT'D)

PROPER OPERATION MAY BE VERIFIED BY THE FOLLOWING:

CHECKING THE POSITION OF EACH ESF COMPONENT

CHECKING THE ACTUATION ANNUNCIATION

CHECKING THE ESF COMPONENT STATUS INDICATION

THE TEST IS REPEATED FOR THE OTHER BISTABLE.

C. RESPONSE TIME TESTS. RESPONSE TIME TESTING WILL BE PERFORMED AT REFUELING INTERVALS. THESE TESTS INCLUDE THE SENSORS FOR EACH ESFAS CHANNEL AND ARE BASED ON THE PREVIOUSLY DEFINED SYSTEM RESPONSE TIME CRITERIA.

11) ACTUATED SYSTEMS

A. FUEL BUILDING ESSENTIAL VENTILATION SYSTEM

- IN THE EVENT OF A FUEL HANDLING ACCIDENT IN THE SPENT FUEL AREA, SENSORS IN THE FUEL BUILDING WILL DETECT THE FISSION PRODUCTS RELEASED FROM THE FUEL.

- THE FUEL BUILDING ESSENTIAL VENTILATION ACTUATION SIGNAL (FBEVAS) IS INITIATED BY ONE-OUT-OF-TWO HIGH AIRBORNE ACTIVITY SIGNALS FROM RADIATION MONITORS, ONE OF WHICH IS A GASEOUS MONITOR IN THE FUEL BUILDING NORMAL EXHAUST DUCT, AND THE OTHER OF WHICH IS AN AREA RADIATION MONITOR ON A WALL OVERLOOKING THE FUEL POOL.

- THE FUEL BUILDING ESSENTIAL VENTILATION SYSTEM IS AUTOMATICALLY ACTUATED BY A FBEVAS FROM THE BOP ESFAS TO REDUCE THE RELEASE OF FISSION PRODUCTS INTO THE ENVIRONMENT.

2.A.1.B. BALANCE-OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

- THE SYSTEM IS DESIGNED SO THAT LOSS OF ELECTRIC POWER TO ONE-OUT-OF-TWO LIKE CHANNELS IN THE MEASUREMENT CHANNELS, INITIATING LOGIC, OR TO THE ACTUATING LOGIC ACTUATES THE FUEL BUILDING ESSENTIAL VENTILATION SYSTEM.

- MANUAL INITIATION OF THE FUEL BUILDING ESSENTIAL VENTILATION SYSTEM IS PROVIDED IN THE CONTROL ROOM.

- THE FUEL BUILDING ESSENTIAL VENTILATION SYSTEM IS COMPOSED OF COMPONENTS IN REDUNDANT LOAD GROUPS, LOAD GROUP 1 AND LOAD GROUP 2. THE INSTRUMENTATION AND CONTROLS OF THE COMPONENTS AND EQUIPMENT IN LOAD GROUP 1 ARE PHYSICALLY AND ELECTRICALLY SEPARATE AND INDEPENDENT OF THE INSTRUMENTATION AND CONTROLS OF THE COMPONENTS AND EQUIPMENT IN LOAD GROUP 2. INDEPENDENCE IS ADEQUATE TO RETAIN THE REDUNDANCY REQUIRED TO MAINTAIN EQUIPMENT FUNCTIONAL CAPABILITY FOLLOWING THOSE DESIGN BASIS EVENTS THAT REQUIRE FUEL BUILDING VENTILATION ISOLATION.

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

- THE FBEVAS IS COMBINED WITH THE SIAS IN THE DEVICE CONTROL CIRCUITS SO THAT ANY ONE OF THE SIGNALS (LOGICAL OR) ACTIVATE THE REQUIRED DEVICES. DURING SIAS OPERATION, THE FUEL BUILDING/AUXILIARY BUILDING ESSENTIAL VENTILATION SYSTEM IS ALIGNED TO EXHAUST FROM THE AUXILIARY BUILDING. THE SIAS TAKES PRECEDENCE OVER FBEVAS SHOULD BOTH SIGNALS BE PRESENT AT THE SAME TIME.

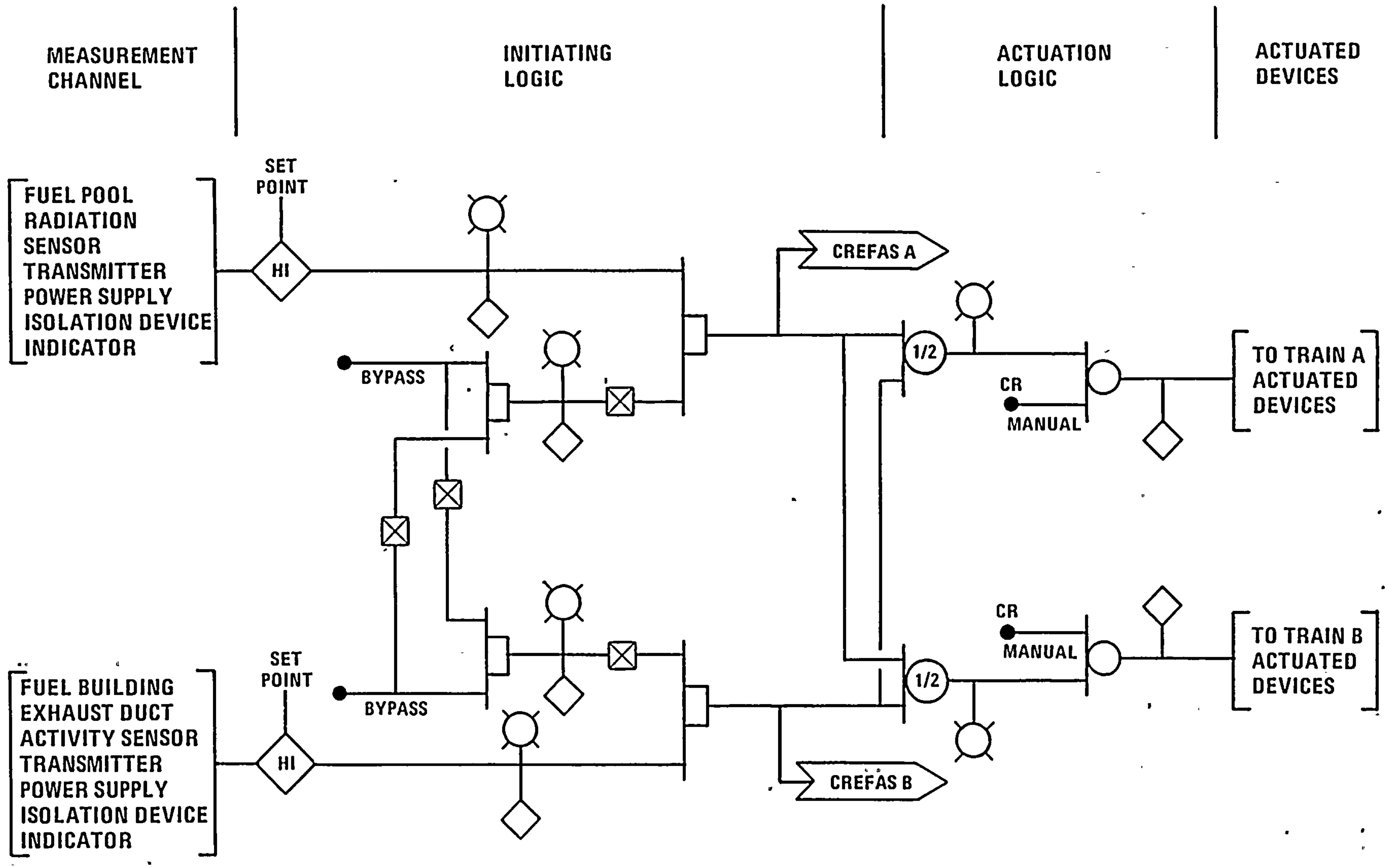
SYSTEM DESCRIPTION

B. CONTAINMENT PURGE ISOLATION SYSTEM

- IN THE EVENT OF A FUEL HANDLING ACCIDENT INSIDE THE CONTAINMENT, SENSORS WILL DETECT THE FISSION PRODUCTS RELEASED FROM THE FUEL.

- THE CONTAINMENT PURGE ISOLATION ACTUATION SIGNAL (CPIAS) IS INITIATED BY ONE-OUT-OF-TWO HIGH AIRBORNE ACTIVITY SIGNALS FROM REDUNDANT RADIATION MONITORS LOCATED IN CLOSE PROXIMITY WITH THE POWER ACCESS PURGE EXHAUST DUCT AND THE REFUELING PURGE EXHAUST DUCT.

- THE CONTAINMENT PURGE ISOLATION SYSTEM IS AUTOMATICALLY ACTUATED BY THE CPIAS FROM THE BOP ESFAS TO PROHIBIT RELEASE OF RADIOACTIVE MATERIAL INTO THE ENVIRONMENT.



NOTE:

SIGNALS BETWEEN REDUNDANT CHANNELS ARE ELECTRICALLY ISOLATED AND PHYSICALLY SEPARATED.

FBEVAS LOGIC

FIGURE 2A1-3

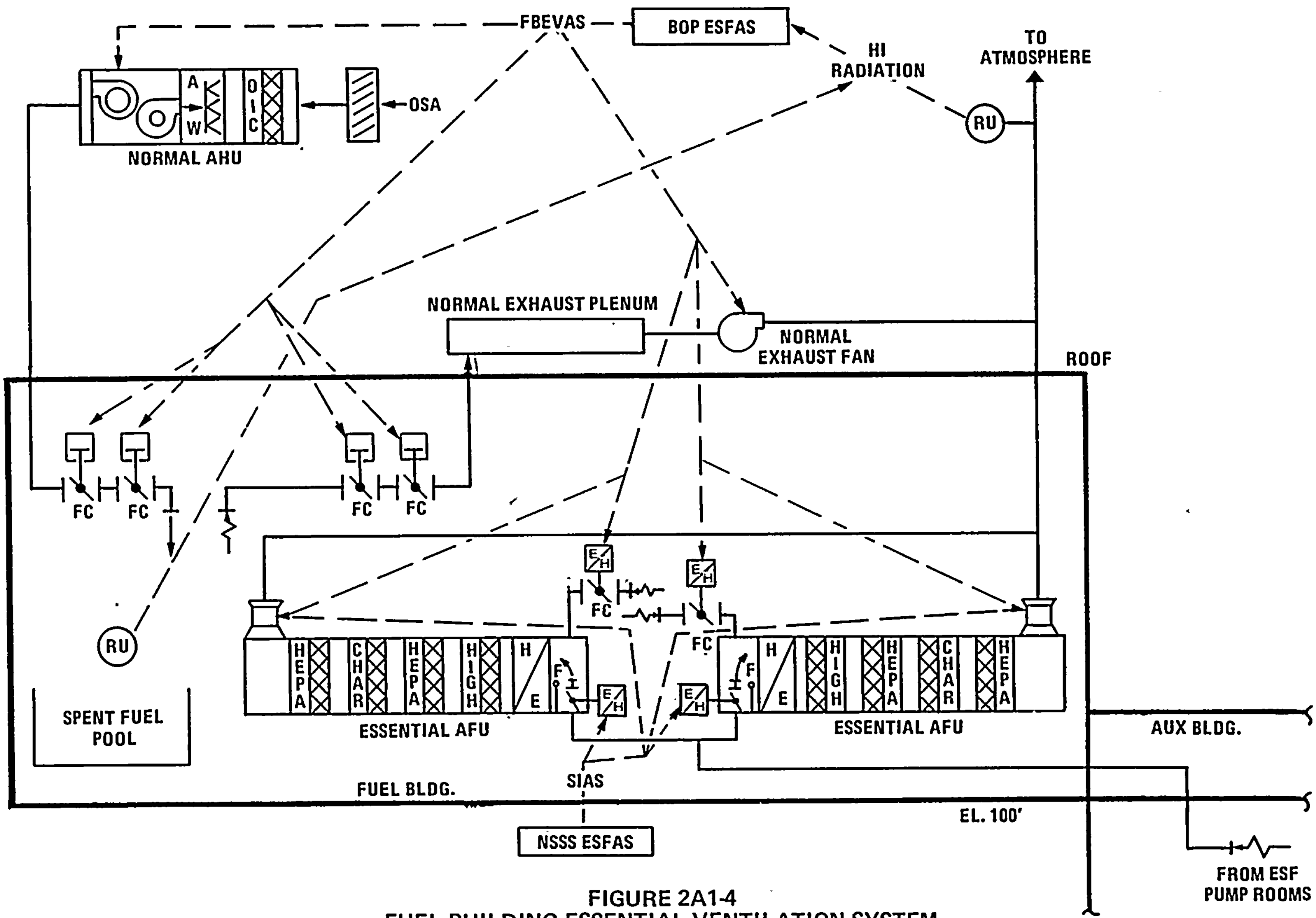


FIGURE 2A1-4
FUEL BUILDING ESSENTIAL VENTILATION SYSTEM
SIMPLIFIED DIAGRAM

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

- THE SYSTEM IS DESIGNED SO THAT LOSS OF ELECTRIC POWER TO ONE-OUT-OF-TWO LIKE CHANNELS IN THE MEASUREMENT CHANNELS, INITIATING LOGIC, OR TO THE ACTUATING LOGIC ACTUATES THE CONTAINMENT PURGE ISOLATION SYSTEM.

- MANUAL INITIATION OF THE CONTAINMENT PURGE ISOLATION SYSTEM IS PROVIDED IN THE CONTROL ROOM.

- THE CONTAINMENT PURGE ISOLATION SYSTEM IS COMPOSED OF COMPONENTS IN REDUNDANT LOAD GROUPS, LOAD GROUP 1 AND LOAD GROUP 2. INSTRUMENTATION AND CONTROLS OF THE COMPONENTS AND EQUIPMENT IN LOAD GROUP 1 ARE PHYSICALLY AND ELECTRICALLY SEPARATE AND INDEPENDENT OF INSTRUMENTATION AND CONTROLS OF THE COMPONENTS AND EQUIPMENT IN LOAD GROUP 2. INDEPENDENCE IS ADEQUATE TO RETAIN THE REDUNDANCY REQUIRED TO MAINTAIN EQUIPMENT FUNCTIONAL CAPABILITY FOLLOWING THOSE DESIGN BASIS EVENTS THAT ARE MITIGATED BY THE CONTAINMENT PURGE ISOLATION SYSTEM.

- THE CPIAS IS COMBINED WITH THE CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS) IN THE CONTROL CIRCUITS OF THE ISOLATION VALVES SO THAT EITHER SIGNAL (LOGICAL OR) CAN ACTUATE THESE VALVES.

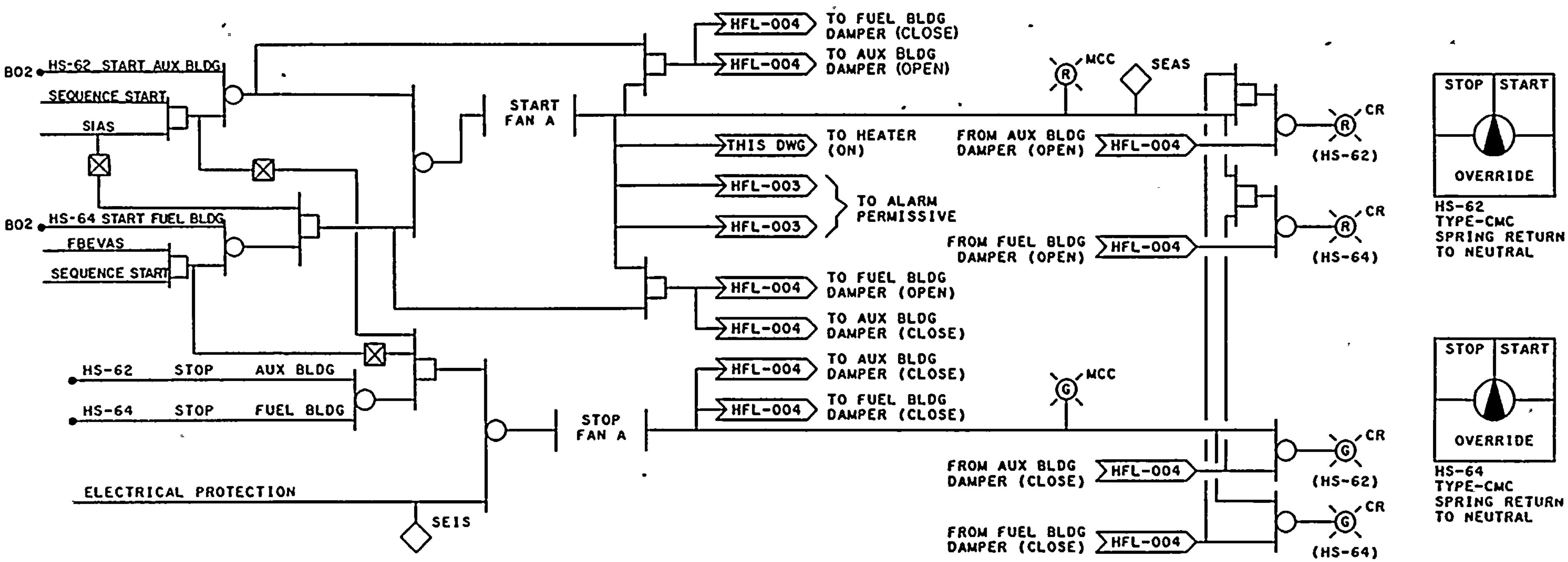
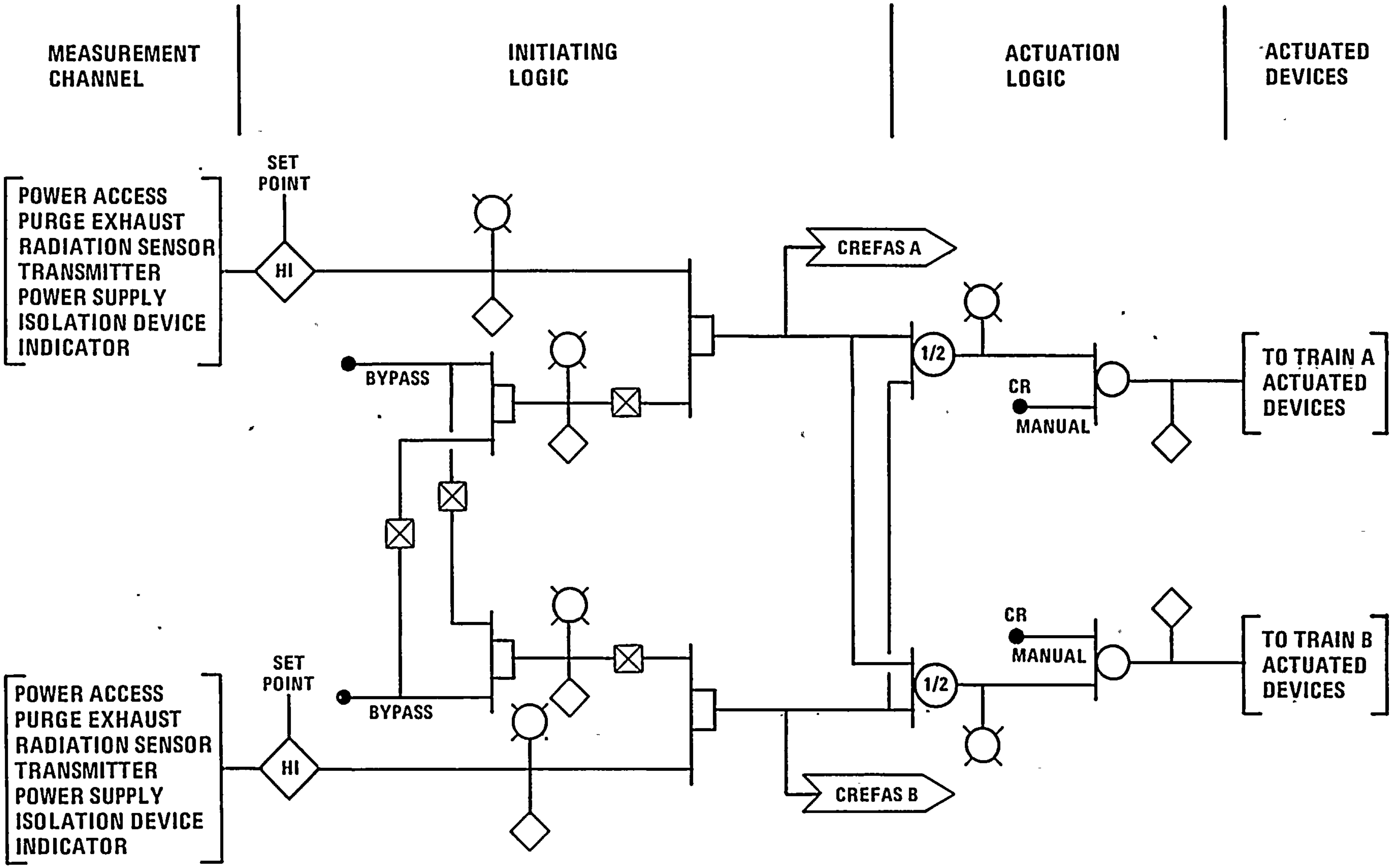


FIGURE 2A1-5
FUEL BUILDING ESSENTIAL VENTILATION ACTUATION SYSTEM
TYPICAL ACTUATED DEVICE LOGIC



NOTE:

SIGNALS BETWEEN REDUNDANT CHANNELS ARE ELECTRICALLY ISOLATED AND PHYSICALLY SEPARATED.

CPIAS LOGIC

FIGURE 2A1-6

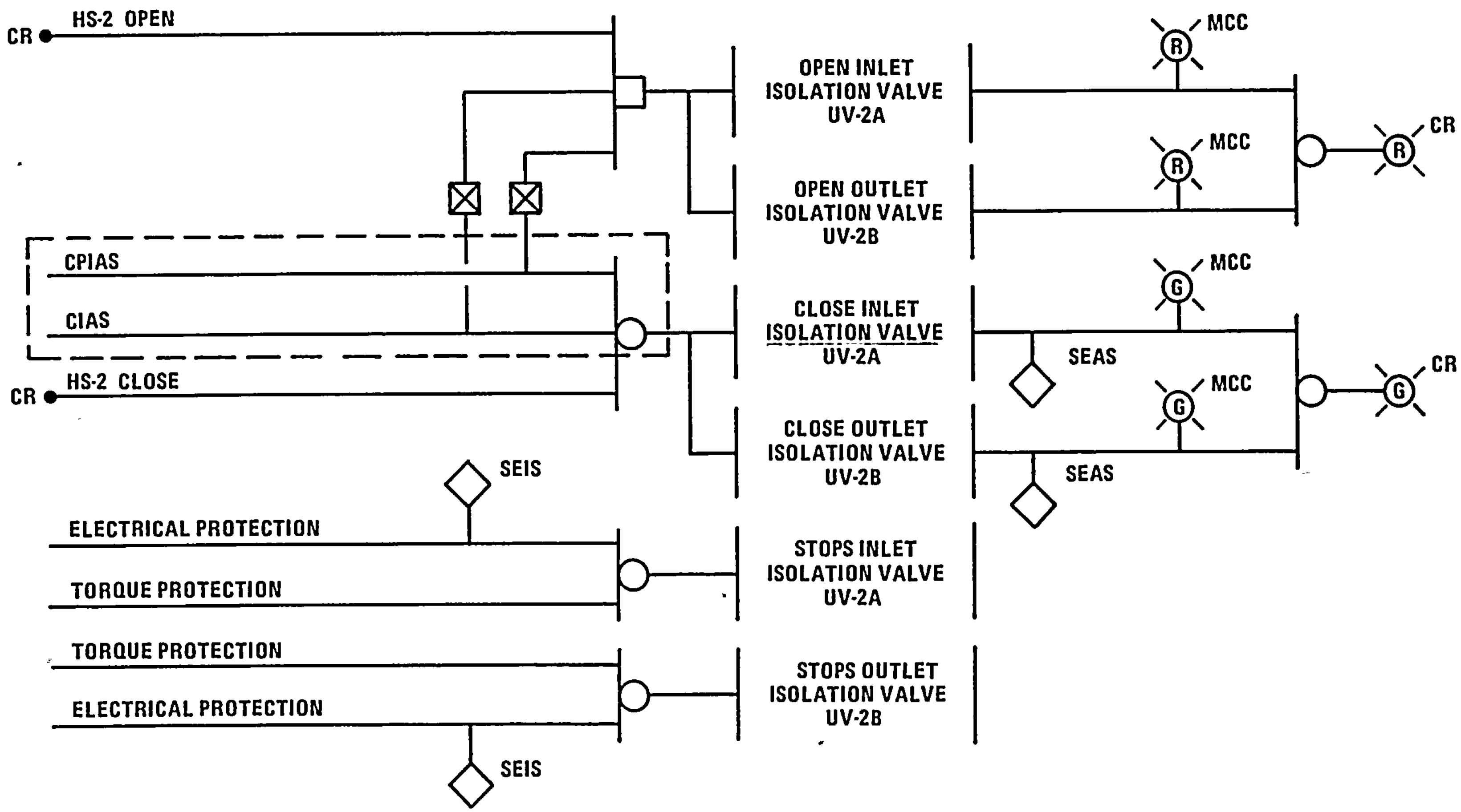


FIGURE 2A1-7
CONTAINMENT PURGE ISOLATION ACTUATION SYSTEM
TYPICAL ACTUATED DEVICE LOGIC

SYSTEM DESCRIPTION

C. CONTROL ROOM ESSENTIAL VENTILATION SYSTEMS

- THE CONTROL ROOM ESSENTIAL VENTILATION SYSTEMS ARE THE CONTROL ROOM VENTILATION ISOLATION SYSTEM AND THE CONTROL ROOM ESSENTIAL FILTRATION SYSTEM.

- THE CONTROL ROOM VENTILATION ISOLATION ACTUATION SIGNAL (CRVIAS) IS INITIATED BY ONE-OUT-OF-TWO CONTROL ROOM OUTSIDE AIR INTAKE HIGH CHLORINE SIGNALS.

- THE CONTROL ROOM VENTILATION ISOLATION SYSTEM IS AUTOMATICALLY ACTUATED BY A CRVIAS FROM THE BOP ESFAS TO ACTIVATE THE CONTROL ROOM ESSENTIAL AHU'S AND ISOLATE THE CONTROL ROOM FROM OUTSIDE AIR.

- THE CONTROL ROOM ESSENTIAL FILTRATION ACTUATION SIGNAL (CREFAS) IS INITIATED BY ONE-OUT-OF-TWO CONTROL ROOM OUTSIDE AIR INTAKE HIGH AIRBORNE ACTIVITY SIGNALS, A FBEVAS, OR A CPIAS.

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

- THE CONTROL ROOM ESSENTIAL FILTRATION SYSTEM IS AUTOMATICALLY ACTUATED BY A CREFAS FROM THE BOP ESFAS TO ACTIVATE THE CONTROL ROOM ESSENTIAL AHU'S AND ROUTE OUTSIDE AIR THROUGH THE ESSENTIAL FILTRATION UNITS TO PRESSURIZE THE CONTROL ROOM AND PREVENT INFILTRATION OF UNTREATED AIR.

- THE SYSTEM IS DESIGNED SO THAT LOSS OF ELECTRIC POWER TO ONE OF THE TWO LIKE CHANNELS IN THE MEASUREMENT CHANNELS, INITIATING LOGIC, OR TO THE ACTUATING LOGIC ACTUATES THE CONTROL ROOM VENTILATION ISOLATION SYSTEM.

- THE SYSTEM IS DESIGNED SO THAT LOSS OF ELECTRICAL POWER TO ONE OF THE TWO LIKE CHANNELS IN THE MEASUREMENT CHANNELS, INITIATING LOGIC, OR TO THE ACTUATING LOGIC ACTUATES THE CONTROL ROOM ESSENTIAL FILTRATION SYSTEM.

- MANUAL INITIATION OF THE CONTROL ROOM VENTILATION ISOLATION SYSTEM AND THE CONTROL ROOM ESSENTIAL FILTRATION SYSTEM IS PROVIDED IN THE CONTROL ROOM.

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

- BOTH CONTROL ROOM ESSENTIAL VENTILATION SYSTEMS ARE COMPOSED OF COMPONENTS IN REDUNDANT LOAD GROUPS, LOAD GROUP 1 AND LOAD GROUP 2. INSTRUMENTATION AND CONTROLS OF THE COMPONENTS AND EQUIPMENT IN LOAD GROUP 1 ARE PHYSICALLY AND ELECTRICALLY SEPARATE AND INDEPENDENT OF INSTRUMENTATION AND CONTROLS OF THE COMPONENTS AND EQUIPMENT IN LOAD GROUP 2. INDEPENDENCE IS ADEQUATE TO RETAIN THE REDUNDANCY REQUIRED TO MAINTAIN CONTROL ROOM HABITABILITY FOLLOWING THOSE DESIGN BASIS EVENTS THAT REQUIRE THE CONTROL ROOM ESSENTIAL VENTILATION SYSTEMS.

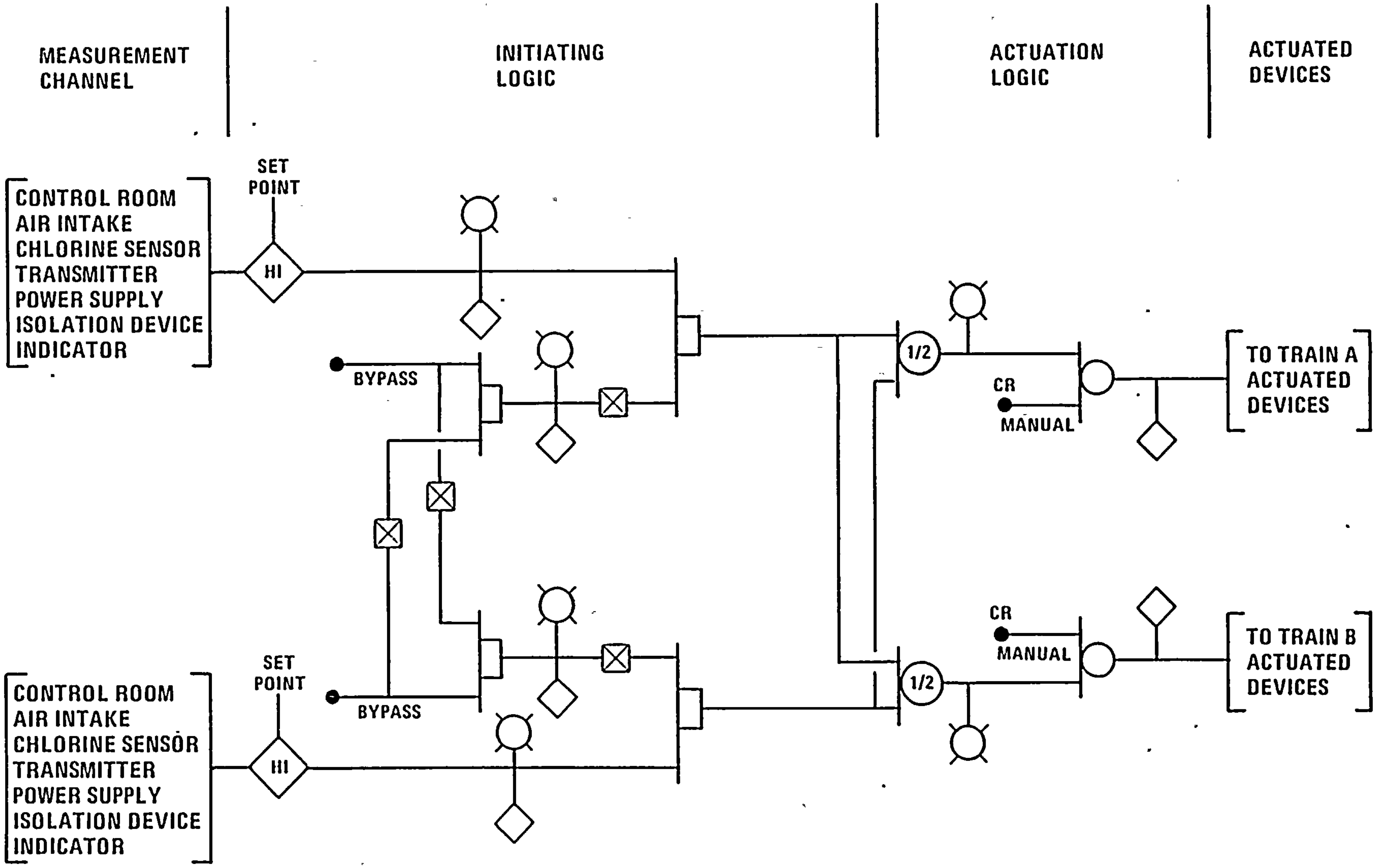
- THE CREFAS IS COMBINED WITH THE SIAS IN THE DEVICE CONTROL CIRCUITS SO THAT ANY ONE OF THE SIGNALS (LOGICAL OR) ACTUATES THE REQUIRED DEVICES.

- THE CRVIAS IS COMBINED WITH THE SIGNALS THAT ACTUATE THE CONTROL ROOM ESSENTIAL FILTRATION SYSTEM IN THE DEVICE CONTROL CIRCUITS SO THAT ANY OF THESE SIGNALS (LOGICAL OR) CAN ACTUATE THE ISOLATION VALVING COMMON TO BOTH OF THE CONTROL ROOM ESSENTIAL VENTILATION SYSTEMS. THE CRVIAS TAKES PRECEDENCE OVER CREFAS TO ISOLATE THE CONTROL ROOM SHOULD BOTH SIGNALS BE PRESENT AT THE SAME TIME.

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

- IN ADDITION TO THE AUTOMATIC INITIATING SIGNALS, TWO INDEPENDENT SMOKE DETECTORS ARE PROVIDED IN THE OUTSIDE AIR INTAKE PLENUM. UPON DETECTION OF SMOKE, AN AUDIBLE AND VISIBLE ALARM WILL ALERT THE OPERATOR TO MANUALLY INITIATE THE CONTROL ROOM VENTILATION ISOLATION SYSTEM.

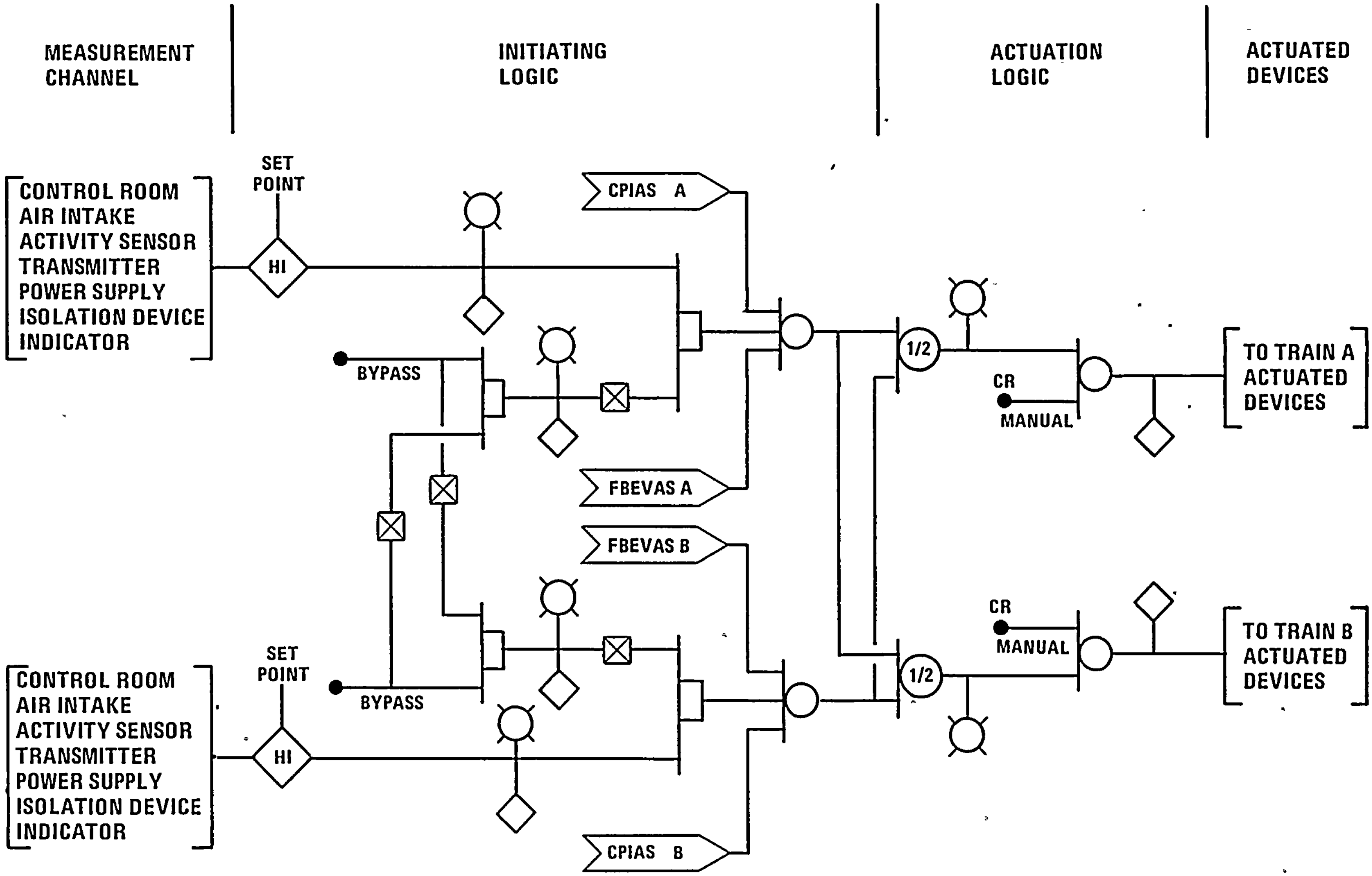


NOTE:

SIGNALS BETWEEN REDUNDANT CHANNELS ARE ELECTRICALLY ISOLATED AND PHYSICALLY SEPARATED.

CRVIAS LOGIC

FIGURE 2A1-8



NOTE:

SIGNALS BETWEEN REDUNDANT CHANNELS ARE ELECTRICALLY ISOLATED AND PHYSICALLY SEPARATED.

CREFAS LOGIC

FIGURE 2A1-9

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

D. CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM

- THE CONTAINMENT HYDROGEN GAS CONCENTRATION MAY INCREASE TO A COMBUSTIBLE CONCENTRATION FOLLOWING A LOCA. IN THE UNLIKELY EVENT THAT A LOCA DOES OCCUR, THE CONTAINMENT HYDROGEN GAS CONCENTRATION IS MAINTAINED LESS THAN THE LOWER COMBUSTIBLE LIMIT BY OPERATION OF THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM.

- THE PRINCIPAL PARAMETER MONITORED FOR DETERMINING WHEN THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM IS TO BE PLACED IN SERVICE IS HYDROGEN CONCENTRATION. THE CONTAINMENT HYDROGEN ANALYZER IS NORMALLY ON STANDBY. FOLLOWING A DESIGN BASIS ACCIDENT (DBA), THE HYDROGEN ANALYZER IS PLACED IN SERVICE WITH CONTROLS MOUNTED IN THE MAIN CONTROL ROOM.

- THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM COMPONENTS ARE CONTROLLED MANUALLY FROM CONTROL SWITCHES LOCATED AT LOCAL PANELS. THE LOCAL PANEL(S) WILL BE ACCESSIBLE AFTER A DBA.

2.A.1.B. BALANCE OF PLANT ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

SYSTEM DESCRIPTION

- A CONTROL SWITCH WITH AN OVERRIDE FEATURE IS PROVIDED FOR EACH OF THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM ISOLATION VALVES. THIS CONTROL SWITCH OVERRIDE FEATURE IS FUNCTIONAL ONLY AFTER RECEIPT OF THE CIAS, AND PERMITS CONTROL OF EACH VALVE INDEPENDENT OF THE CIAS. THE OPEN AND CLOSED POSITIONS OF THESE VALVES, IN ADDITION TO THE OVERRIDE STATUS, ARE INDICATED IN THE CONTROL ROOM.

- THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM IS COMPOSED OF COMPONENTS IN REDUNDANT LOAD GROUPS, LOAD GROUP 1 AND LOAD GROUP 2. INSTRUMENTATION AND CONTROLS OF COMPONENTS AND EQUIPMENT IN LOAD GROUP 1 ARE PHYSICALLY AND ELECTRICALLY SEPARATE AND INDEPENDENT OF INSTRUMENTATION AND CONTROLS OF COMPONENTS AND EQUIPMENT IN LOAD GROUP 2. INDEPENDENCE IS ADEQUATE TO RETAIN THE REDUNDANCY REQUIRED TO MAINTAIN EQUIPMENT FUNCTIONAL CAPABILITY FOLLOWING THOSE DESIGN BASIS EVENTS THAT ARE MITIGATED BY THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM.

- THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM TEST PRESSURE IS GREATER THAN THE PEAK CONTAINMENT DESIGN PRESSURE. THIS PRECLUDES SYSTEM OVER-PRESSURIZATION BY THE INADVERTENT OPENING OF THE ISOLATION VALVES.

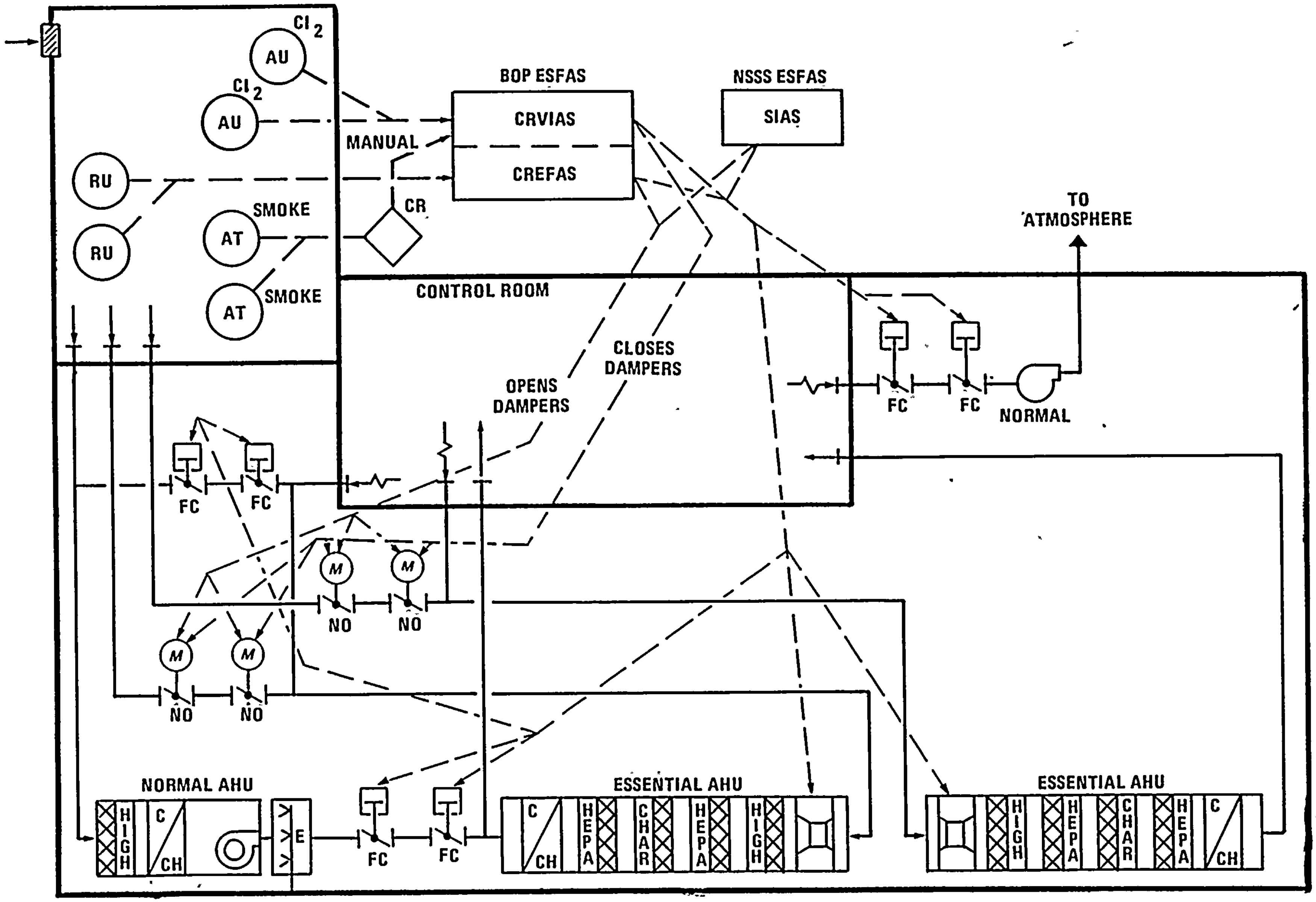
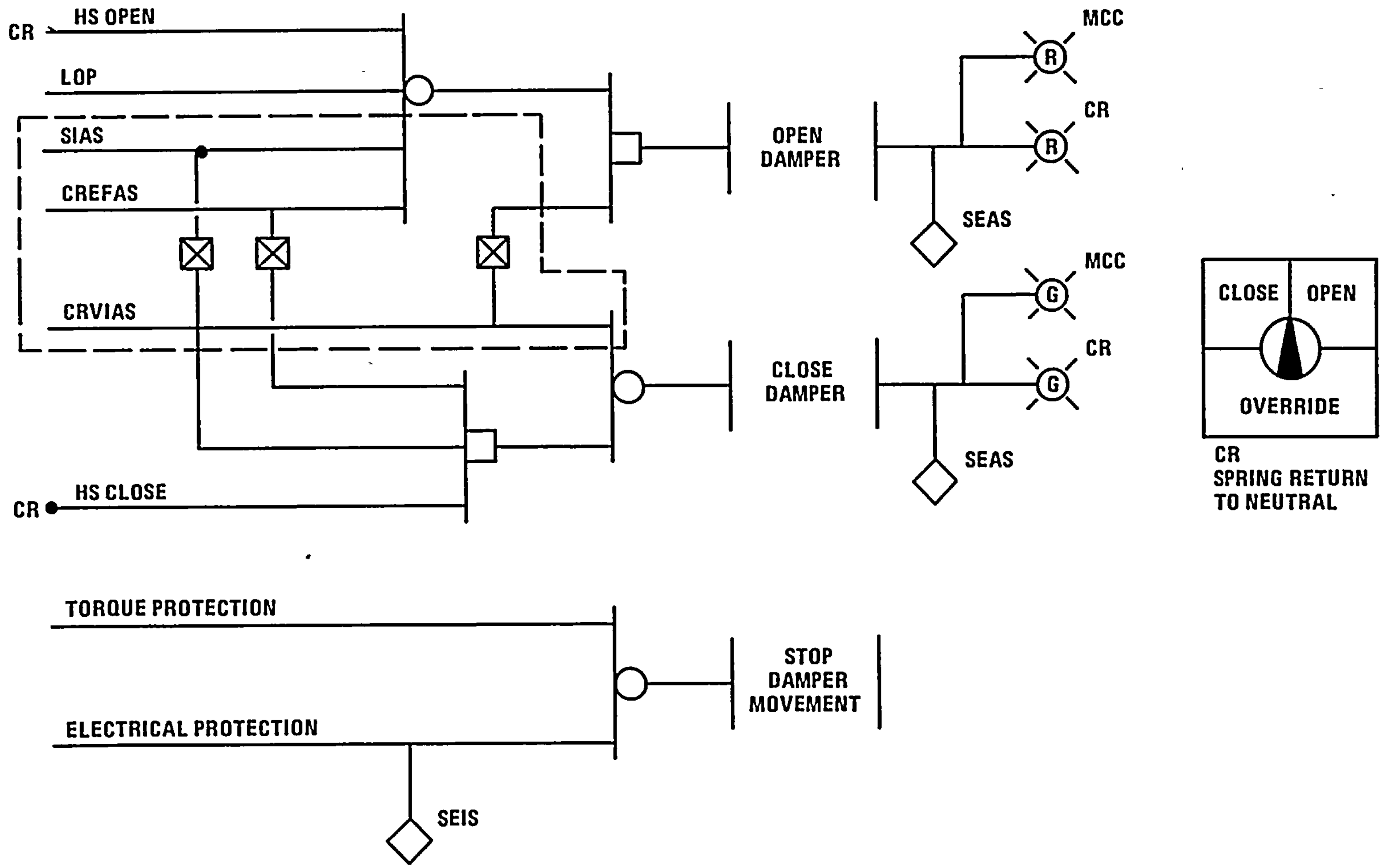
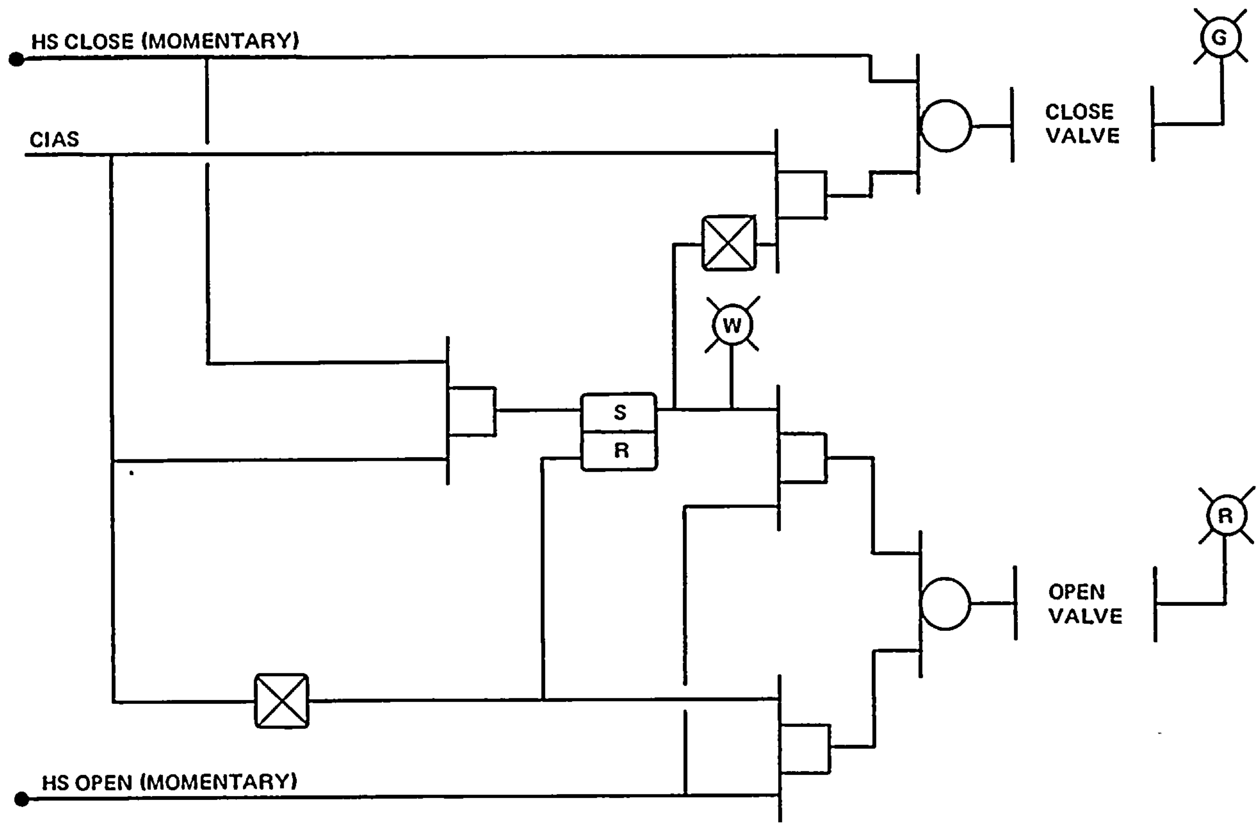


FIGURE 2A1-10
CONTROL ROOM ESSENTIAL VENTILATION SYSTEM
SIMPLIFIED DIAGRAM



CONTROL ROOM ESSENTIAL VENTILATION SYSTEMS
TYPICAL ACTUATED DEVICE LOGIC

FIGURE 2A1-11



CONTAINMENT COMBUSTIBLE GAS CONTROL
SYSTEM DEVICE CONTROL LOGIC

FIGURE 2A1-12

2.A.2. ENGINEERED SAFETY FEATURES SYSTEM ACTUATED DEVICE TYPICAL LOGIC

EACH ESF SYSTEM-ACTUATED DEVICE RECEIVES AN ESFAS SIGNAL OR COMBINATION OF ESFAS SIGNALS

TO AUTOMATICALLY ACTUATE THE DEVICE TO ITS "SAFE" POSITION AS REQUIRED TO PERFORM THE ESF SYSTEM FUNCTION, AND

TO BLOCK INADVERTENT OPERATOR INTERVENTION.

RESET OF THE ESFAS SIGNAL DOES NOT AFFECT THE STATUS OF THE ACTUATED DEVICE: THE DEVICE REMAINS IN ITS "SAFE" MODE OF OPERATION ON RESET OF THE ESFAS SIGNAL. (RESET OF AN ESFAS SIGNAL CAN OCCUR ONLY AFTER THE INITIATING CONDITIONS HAVE CLEARED, AND THE OPERATOR HAS MANUALLY RESET THE ESFAS SIGNAL LOGIC)

EACH ESF SYSTEM-ACTUATED DEVICE IS PROVIDED WITH MANUAL CONTROL TO ENABLE THE OPERATOR TO ACTUATE THE DEVICES AS NECESSARY FOR OPERATION AND TESTING.

FEEDBACK TO THE OPERATOR IS PROVIDED IN THE FORM OF RED AND GREEN LIGHTS IDENTIFYING THE OPERATIONAL STATUS OF THE DEVICE.

ELECTRICAL PROTECTION CIRCUITS ARE PROVIDED TO PRECLUDE PHYSICAL DAMAGE UNDER OVERLOADED CONDITIONS. IN THE CASE OF MOTOR-OPERATED VALVES, THE THERMAL OVERLOAD PROTECTION IS BYPASSED BY THE ESFAS SIGNAL. ANNUNCIATION OF ELECTRICAL PROTECTION IS PROVIDED.

EXHIBIT 2A2-1

2.A.2. ENGINEERED SAFETY FEATURES SYSTEM ACTUATED DEVICE TYPICAL LOGIC

AN ESF SYSTEM-ACTUATED DEVICE IS PROVIDED WITH THE CAPABILITY TO OVERRIDE THE ESFAS SIGNAL TO ALLOW MANUAL CONTROL OF THE ESF SYSTEM. IN GENERAL, OVERRIDE OF THE ESFAS IS PERFORMED AS FOLLOWS:

WITH THE ESFAS SIGNAL PRESENT, THE OVERRIDE MODE IS ENABLED BY PLACING THE CONTROL SWITCH IN THE "SAFE" POSITION.

FEEDBACK TO THE OPERATOR IS PROVIDED IN THE FORM OF A WHITE LIGHT INDICATING THAT THE OVERRIDE MODE IS ENABLED.

THE OVERRIDE MODE IS AUTOMATICALLY RESET WHEN THE ESFAS SIGNAL IS RESET AND NO LONGER PRESENT.

THE OVERRIDE FUNCTIONS TO BLOCK THE ESFAS SIGNAL AND TO ENABLE MANUAL CONTROL OF THE ACTUATED DEVICE. THE OVERRIDE ITSELF DOES NOT AFFECT THE STATUS OF THE ACTUATED DEVICE.

THE ACTUATED DEVICE CAN THEN BE RETURNED TO THE "NORMAL" MODE OF OPERATION BY PLACING THE CONTROL SWITCH IN THE "NORMAL" POSITION.

EXHIBIT 2A2-2

2.A.2. ENGINEERED SAFETY FEATURES SYSTEM ACTUATED DEVICE TYPICAL LOGIC

EACH ESF SYSTEM-ACTUATED DEVICE IS MONITORED BY THE SAFETY EQUIPMENT STATUS SYSTEM (SESS) FOR

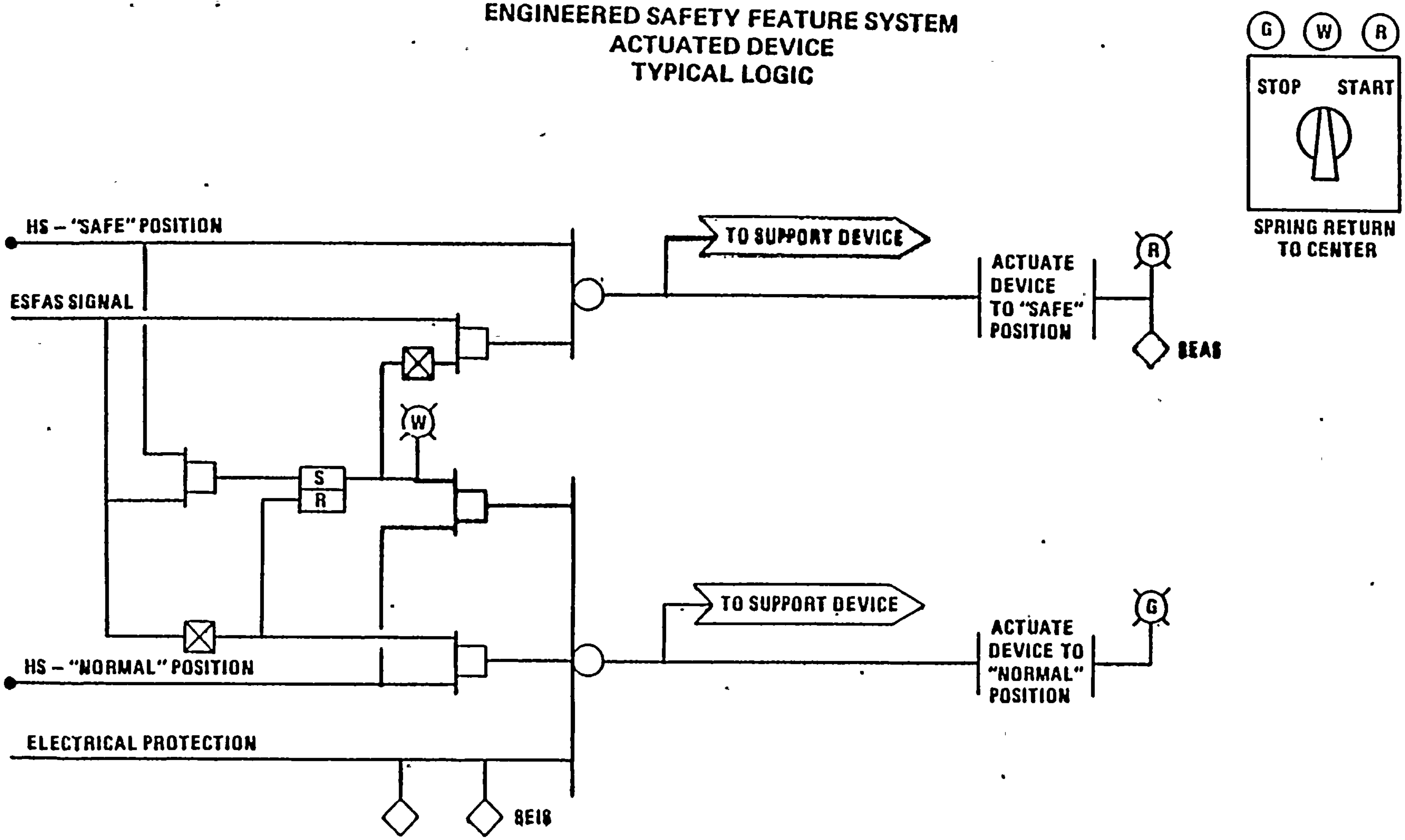
SAFETY EQUIPMENT ACTUATED STATUS (SEAS) WHICH PROVIDES ANNUNCIATION ON "FAILURE TO AUTOMATICALLY ACTUATE"

SAFETY EQUIPMENT INOPERABLE STATUS (SEIS) WHICH PROVIDES ANNUNCIATION ON "BYPASS OR INOPERABLE STATUS"

INTERFACING SIGNALS TO ACTUATE SUPPORT SYSTEMS OR DEVICES ARE PROVIDED AS NECESSARY.

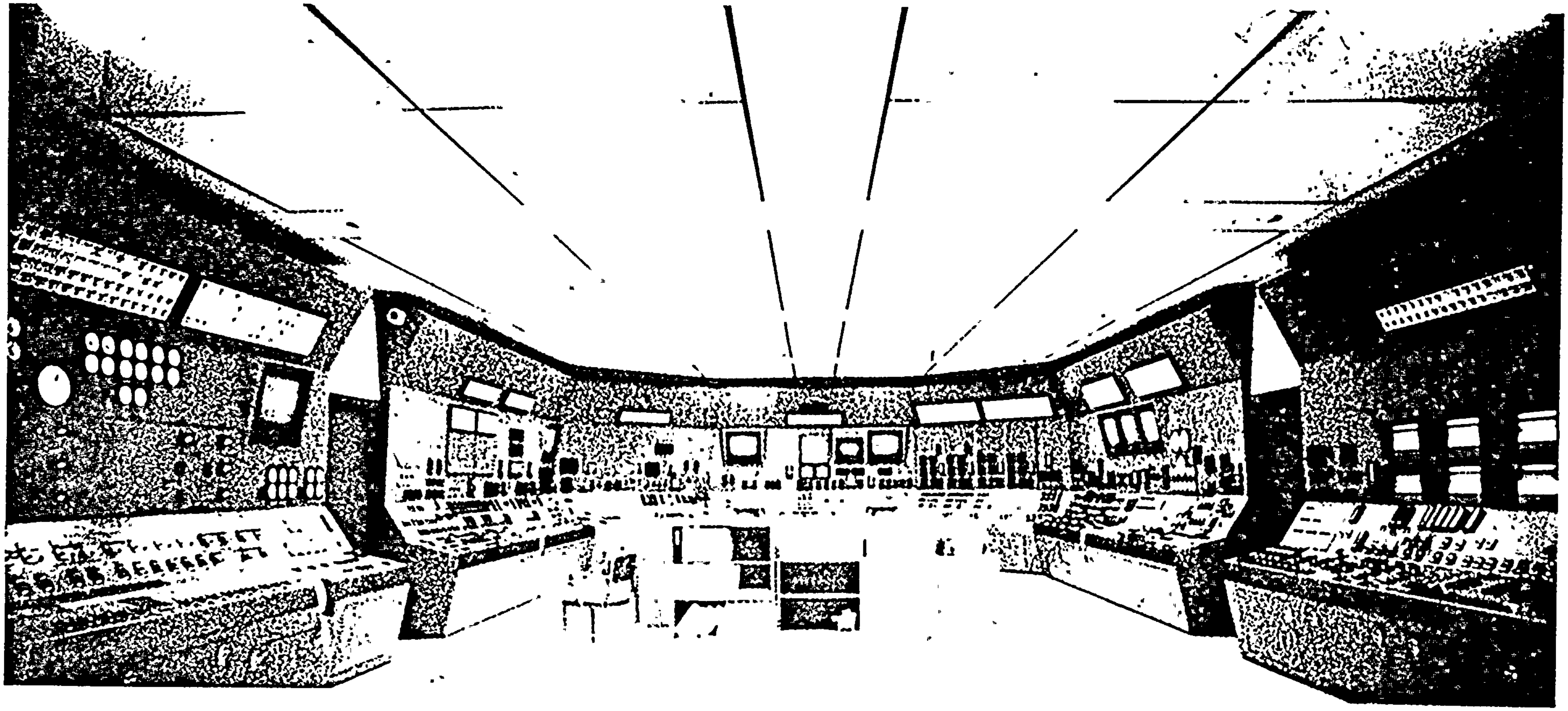
EXHIBIT 2A2-3

ENGINEERED SAFETY FEATURE SYSTEM
ACTUATED DEVICE
TYPICAL LOGIC

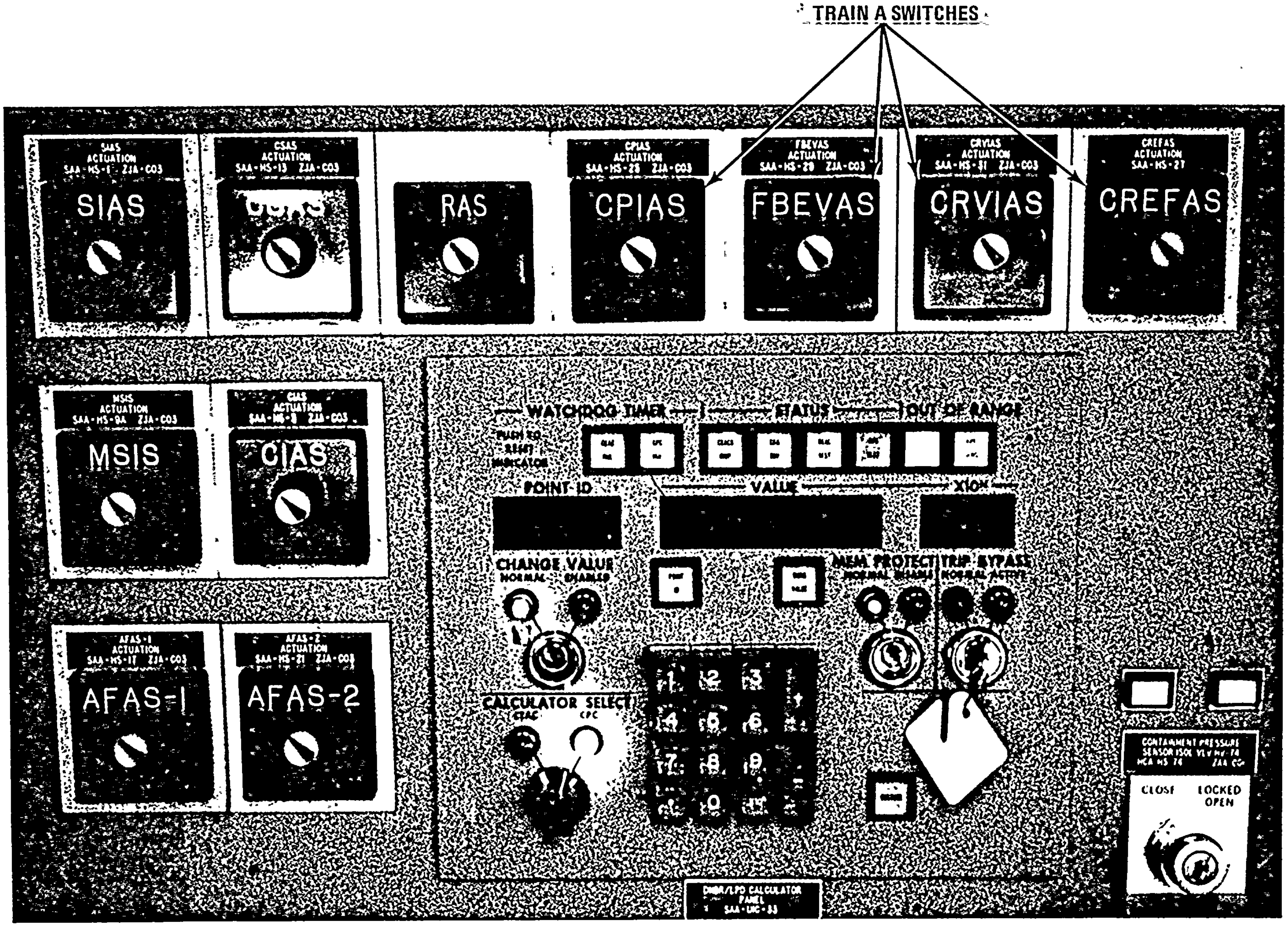


"SAFE" POSITION AS REQUIRED TO PERFORM ESF SYSTEM FUNCTION
"NORMAL" POSITION IS OPPOSITE FROM "SAFE" POSITION, NOT NECESSARILY THE OPERATING POSITION

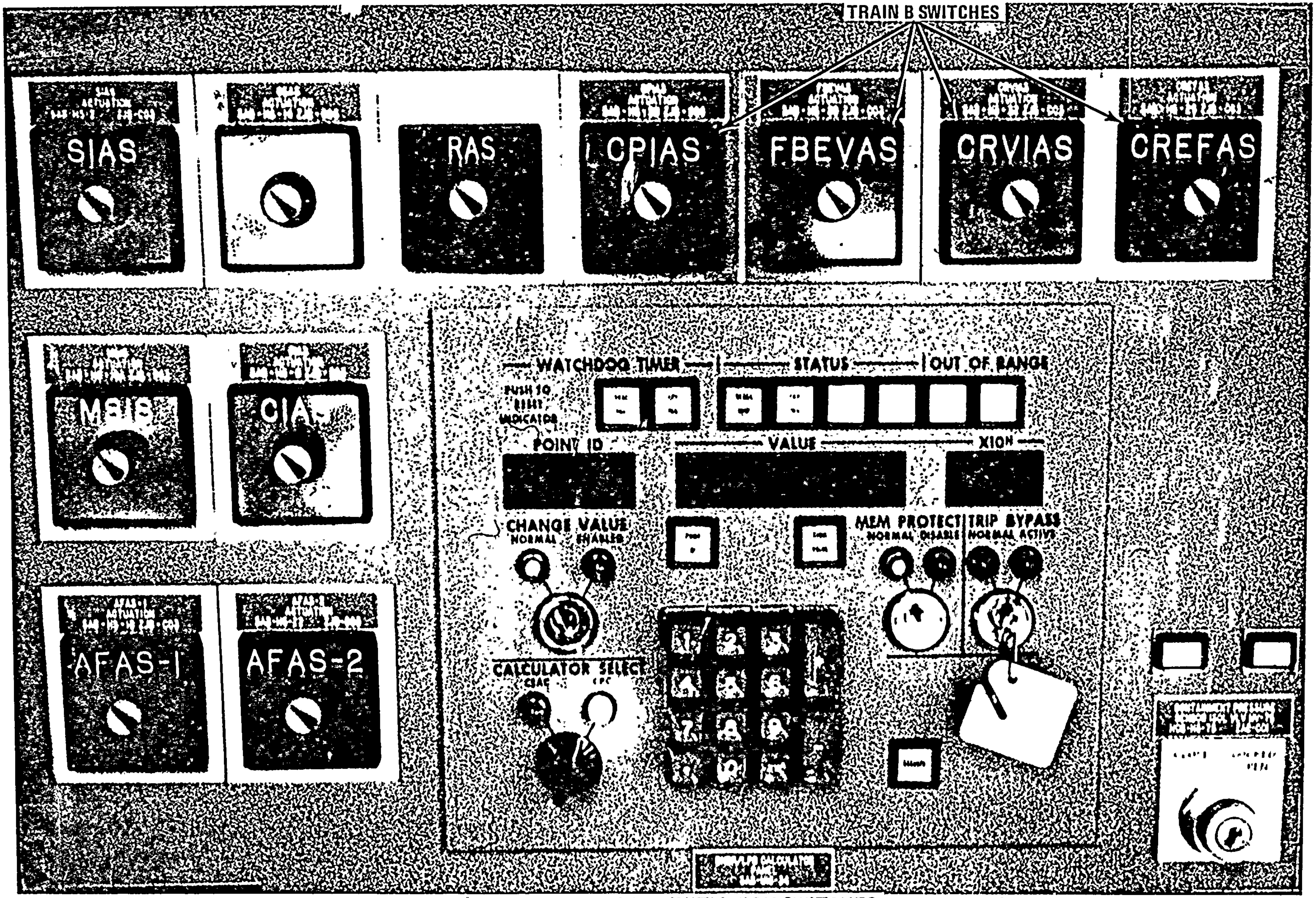
FIGURE 2A2-1



MAIN CONTROL ROOM
SLIDE 1



BOP ESFAS MANUAL INITIATION SWITCHES
SLIDE 2



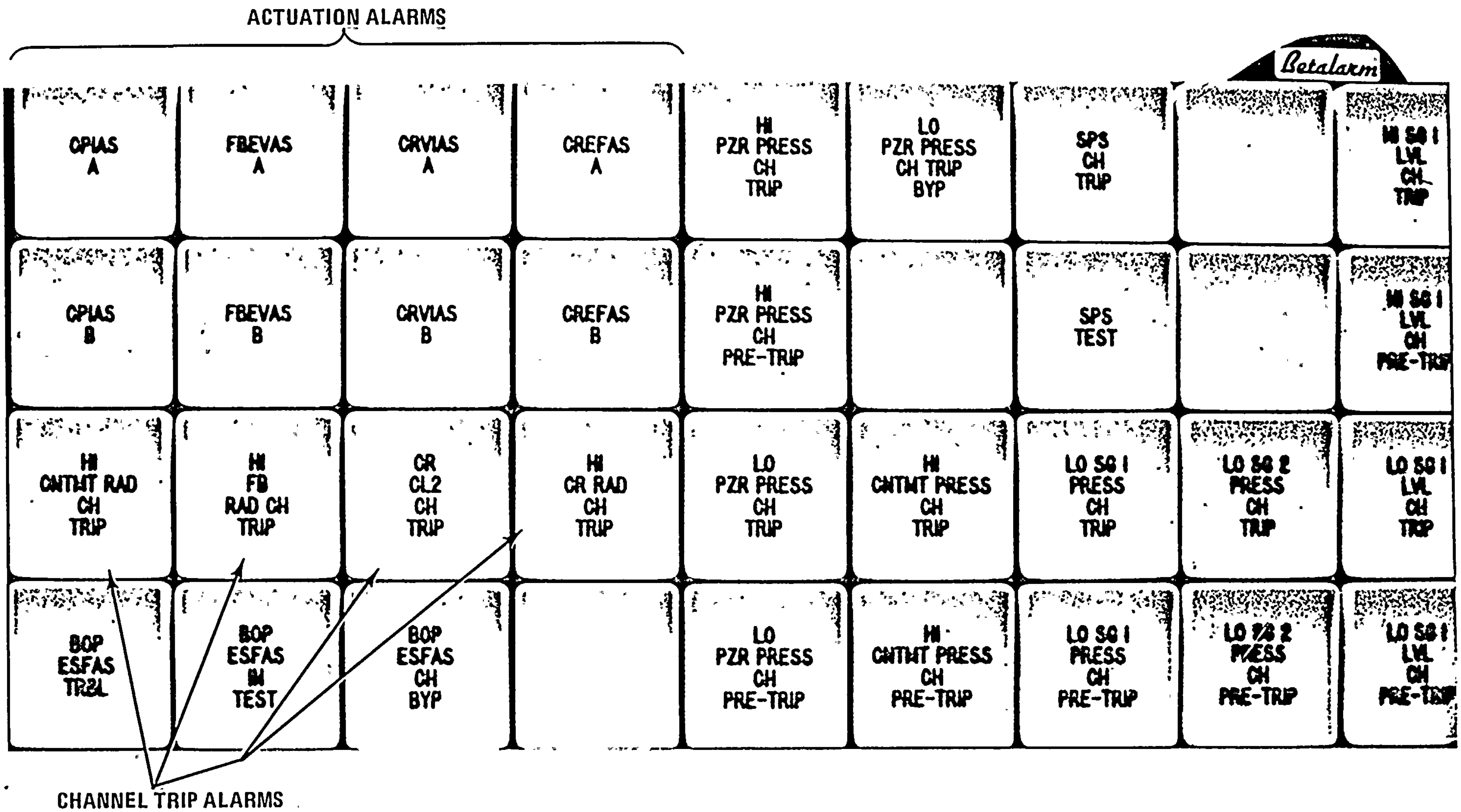
BOP ESFAS MANUAL INITIATION SWITCHES
SLIDE 3

BOP ESFAS (columns 1–4) — **REACTOR TRIP SYSTEM** (columns 5–16)

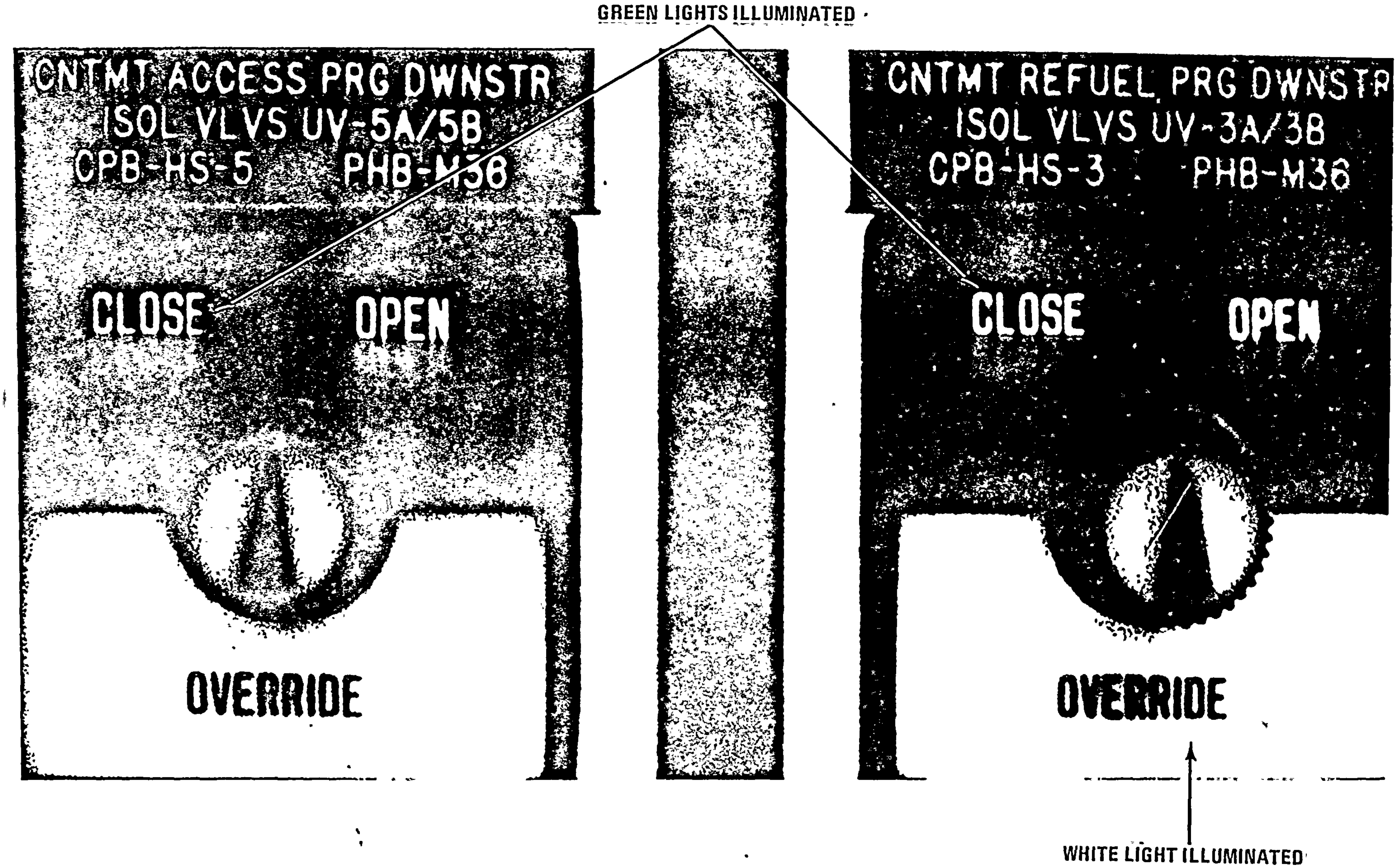
Betalarm

CPIAS A	FBEVAS A	CRVIAS A	CREFAS A	HI PZR PRESS CH TRIP	LO PZR PRESS CH TRIP BYP	SPS CH TRIP		HI SG 1 LVL CH TRIP	HI SG 2 LVL CH TRIP			DNBR/LPD BYP	CALIB AND EX-CORE LIN PWR DEV	[illegible] CH INOPERATIVE	RPS [illegible]
CPIAS B	FBEVAS B	CRVIAS B	CREFAS B	HI PZR PRESS CH PRE-TRIP		SPS TEST		HI SG 1 LVL CH PRE-TRIP	HI SG 2 LVL CH PRE-TRIP			CPC/CEAC TRBL	FIXED INCORE AMPLIFIER SYS. TRBL	HI LOG PWR LVL BYP PERM	HI RATE OF CHANGE OF PWR
HI CNTMT RAD CH TRIP	HI FB RAD CH TRIP	CR CL2 CH TRIP	HI CR RAD CH TRIP	LO PZR PRESS CH TRIP	HI CNTMT PRESS CH TRIP	LO SG 1 PRESS CH TRIP	LO SG 2 PRESS CH TRIP	LO SG 1 LVL CH TRIP	LO SG 2 LVL CH TRIP	LO RC FLOW SG 1 CH TRIP	LO RC FLOW SG 2 CH TRIP	LO DNBR CH TRIP	HI LPD CH TRIP	HI LOG PWR LVL CH TRIP	VAR OVER PWR CH TRIP
BOP ESFAS TRBL	BOP ESFAS IN TEST	BOP ESFAS CH BYP		LO PZR PRESS CH PRE-TRIP	HI CNTMT PRESS CH PRE-TRIP	LO SG 1 PRESS CH PRE-TRIP	LO SG 2 PRESS CH PRE-TRIP	LO SG 1 LVL CH PRE-TRIP	LO SG 2 LVL CH PRE-TRIP	LO RC FLOW SG 1 CH PRE-TRIP	LO RC FLOW SG 2 CH PRE-TRIP	LO DNBR CH PRE-TRIP	HI LPD CH PRE-TRIP	HI LOG PWR LVL CH PRE-TRIP	VAR OVER PWR CH PRE-TRIP

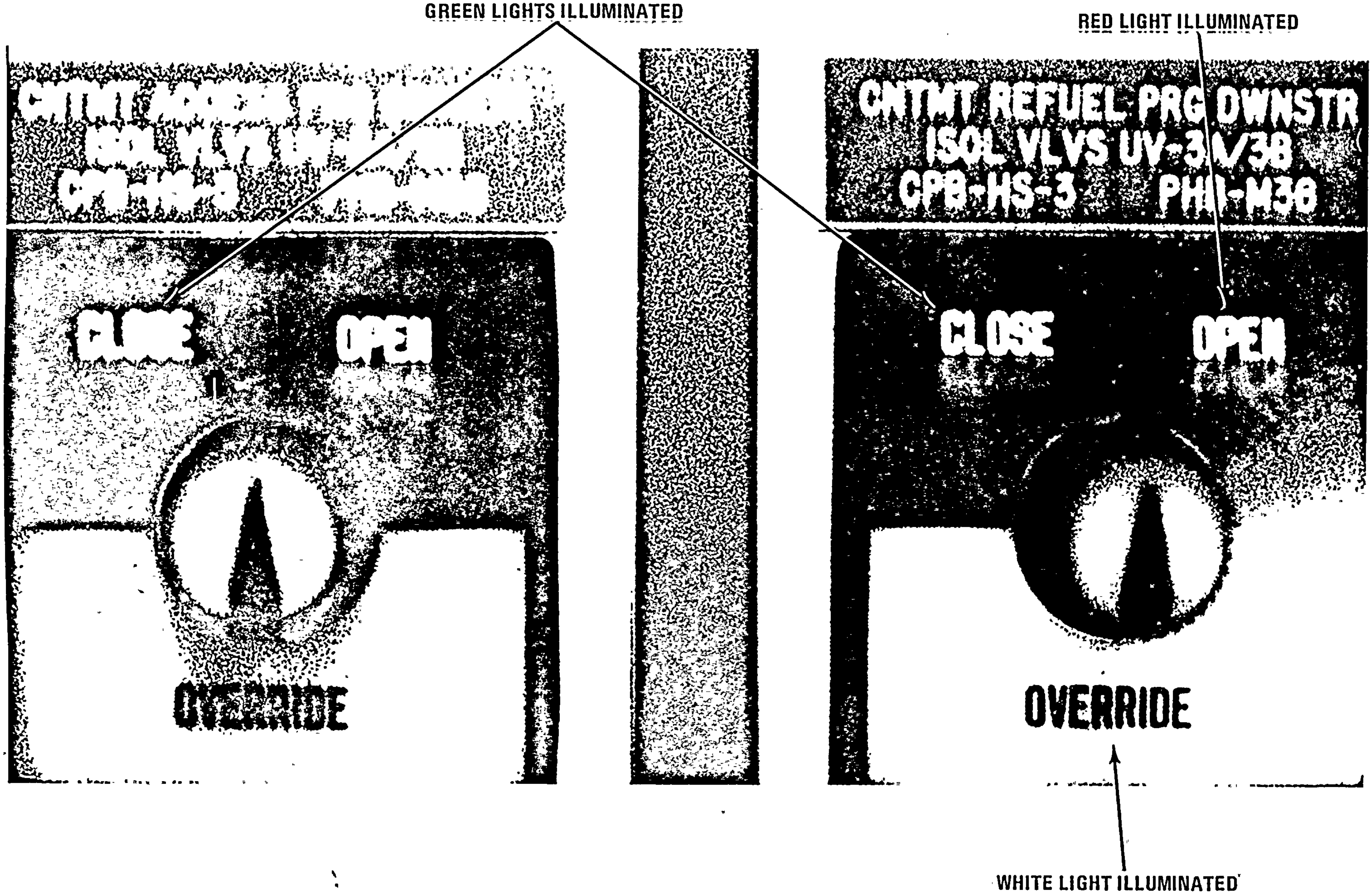
BOP ESFAS & RPS — ANNUNCIATION
SLIDE 4



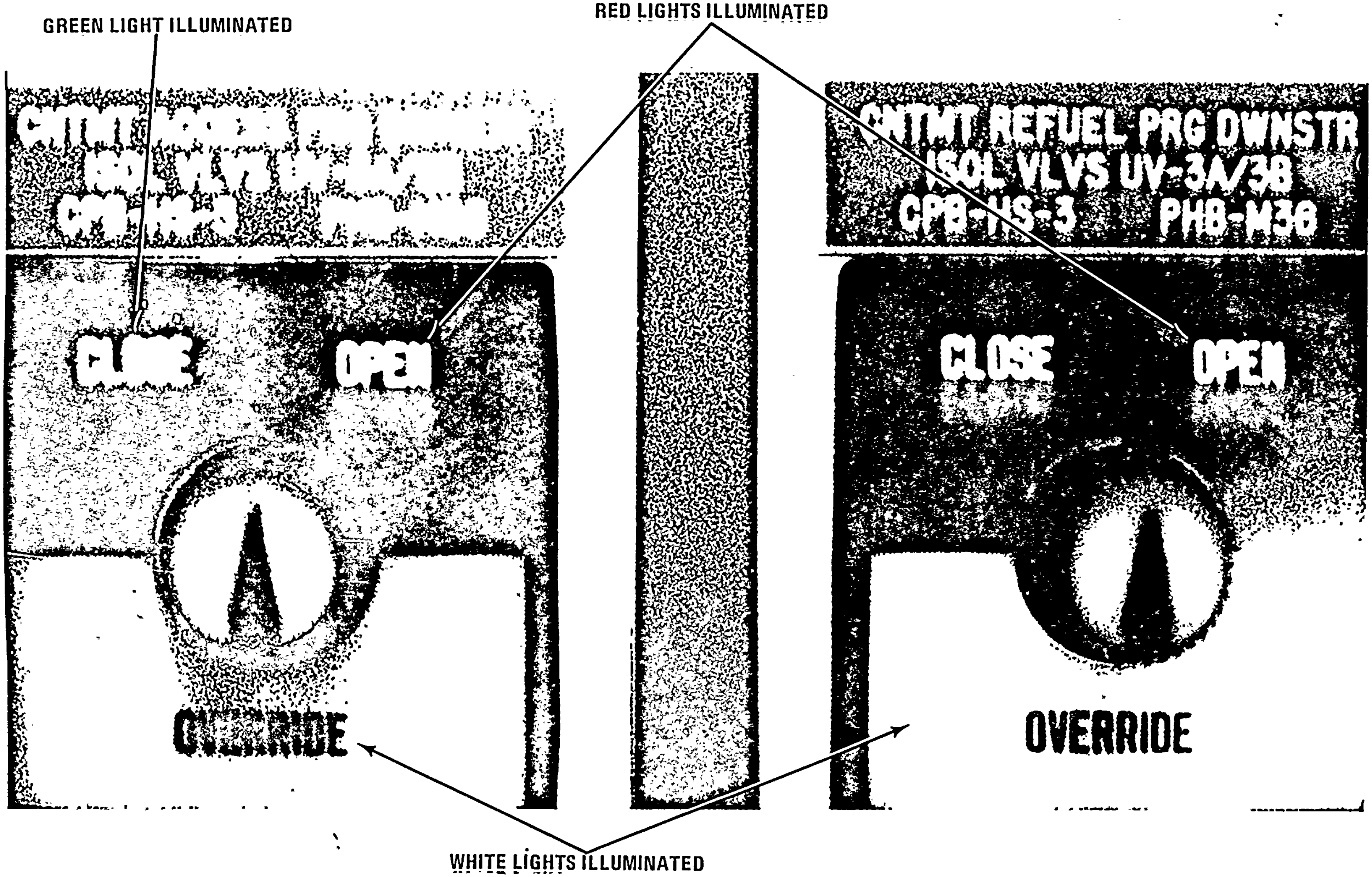
BOP ESFAS – ANNUNCIATION
SLIDE 5



ESF DEVICE SWITCHES
SLIDE 6

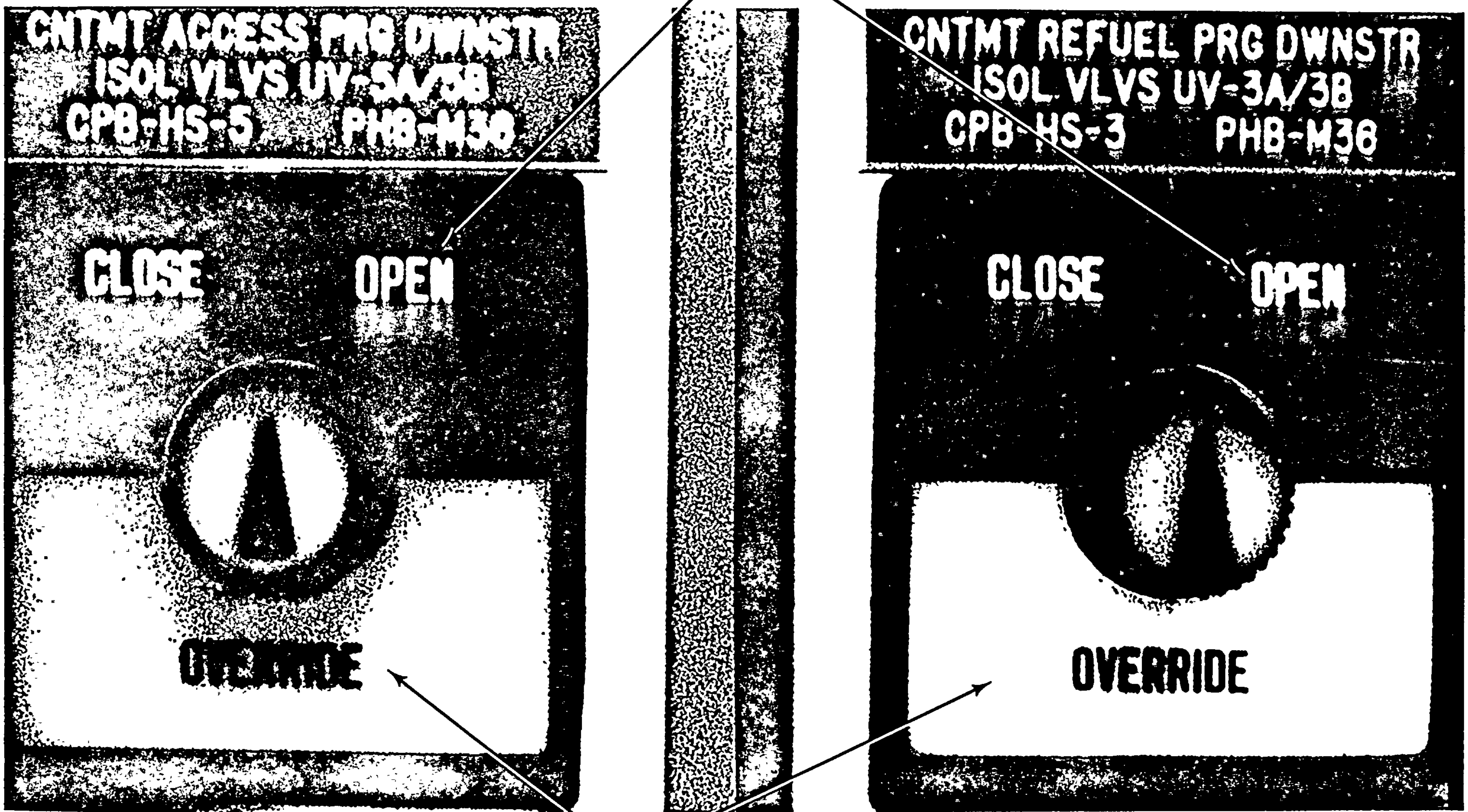


ESF DEVICE SWITCHES
SLIDE 7



ESF DEVICE SWITCHES
SLIDE 8

RED LIGHTS ILLUMINATED



WHITE LIGHTS ILLUMINATED

ESF DEVICE SWITCHES
SLIDE 9

2.A.3.A. ESF LOAD SEQUENCER SYSTEM

DESIGN CRITERIA

THE ESF LOAD SEQUENCER SYSTEM IS A SUBSYSTEM OF THE BOP ESFAS AND IS DESIGNED TO THE BOP ESFAS DESIGN CRITERIA.

BOP ESFAS DESIGN CRITERIA SPECIFIC TO THE ESF LOAD SEQUENCER SYSTEM ARE:

1) THE BOP ESFAS SHALL PROVIDE THE LOGIC TO AUTOMATICALLY START AND SEQUENTIALLY LOAD THE DIESEL GENERATORS AND TO SHED ALL 4.16 kV CLASS IE LOADS ON A LOSS OF POWER.

2) THE SYSTEM SHALL MONITOR THE UNDERVOLTAGE RELAYS ON THE 4.16 kV CLASS IE BUS AND INITIATE A LOGIC SIGNAL ON A TWO-OUT-OF-FOUR COINCIDENCE OF BUS UNDER-VOLTAGE. THIS LOGIC SIGNAL WILL BE USED TO SHED ALL CLASS IE 4.16 kV LOADS EXCEPT THE LOAD CENTER TRANSFORMERS, SHED CERTAIN 480 V LOADS, START THE DIESEL GENERATOR, START EQUIPMENT REQUIRED AFTER A LOSS OF OFFSITE POWER, AND TRIP THE 4.16 kV CLASS IE BUS PREFERRED POWER SUPPLY BREAKERS.

3) THE SYSTEM SHALL PROVIDE SEQUENCING LOGIC FOR SEQUENTIAL LOADING OF ESF AND FORCED SHUTDOWN LOADS ONTO THE ESF BUS UPON CLOSING OF THE DIESEL GENERATOR BREAKER, A SAFETY INJECTION ACTUATION SIGNAL (SIAS), OR AN AUXILIARY FEEDWATER ACTUATION SIGNAL (AFAS).

DESIGN CRITERIA

4) SHOULD ANOTHER ACCIDENT CONDITION OCCUR AFTER THE LOAD SEQUENCER HAS STARTED, THE SEQUENCER SHALL RESET TO ZERO. EQUIPMENT IN OPERATION AT THIS TIME SHALL REMAIN IN OPERATION. IF A LOSS OF OFFSITE POWER (LOP) SIGNAL IS INITIATED AFTER THE LOAD SEQUENCER HAS STARTED, ALL LOADS WILL BE SHED AND RESEQUENCED ON THE DIESEL GENERATOR BREAKER CLOSURE.

2.A.3.B. ESF LOAD SEQUENCER SYSTEM

SYSTEM DESCRIPTION

1) EACH REDUNDANT ESF LOAD SEQUENCER SYSTEM PERFORMS LOGIC FUNCTIONS TO GENERATE THE FOLLOWING SIGNALS:

   LOSS OF OFFSITE POWER (LOP) SIGNAL/LOAD SHED SIGNAL

   DIESEL GENERATOR START SIGNAL (DGSS)

   LOAD SEQUENCER START AND PERMISSIVE SIGNALS

2) EACH REDUNDANT ESF LOAD SEQUENCER SYSTEM IS SUPPLIED FROM A SEPARATE 120V VITAL AC DISTRIBUTION BUS AND A SEPARATE CLASS IE 125V DC DISTRIBUTION BUS.

3) ESF LOAD SEQUENCER SYSTEM SIGNALS ARE GENERATED FOR TWO LOAD GROUPS DESIGNATED LOAD GROUP 1 AND LOAD GROUP 2. THE LOGIC IS PHYSICALLY LOCATED IN THE TWO BOP ESFAS CABINETS. ONE CABINET CONTAINS THE LOGIC FOR ESF LOAD GROUP 1 EQUIPMENT, WHILE THE OTHER CABINET CONTAINS THE LOGIC FOR ESF LOAD GROUP 2 EQUIPMENT

SYSTEM DESCRIPTION

4) REDUNDANCY

REDUNDANT FEATURES OF THE ESF LOAD SEQUENCER SYSTEM INCLUDE:

TWO INDEPENDENT LOGIC PATHS FROM INPUT SIGNALS THROUGH AND INCLUDING OUTPUT RELAYS

POWER FOR THE SYSTEM PROVIDED FROM TWO SEPARATE BUSES (POWER FOR CONTROL AND OPERATION OF REDUNDANT ACTUATED COMPONENTS COMES FROM SEPARATE BUSES. LOAD GROUP 1 COMPONENTS AND SYSTEMS ARE ENERGIZED ONLY BY THE LOAD GROUP 1 BUS AND LOAD GROUP 2 COMPONENTS AND SYSTEMS ARE ENERGIZED ONLY BY THE LOAD GROUP 2 BUS.)

5) TESTING

PROVISIONS ARE MADE TO PERMIT PERIODIC TESTING OF THE ESF LOAD SEQUENCER SYSTEM.

TESTS COVER THE TRIP ACTIONS FROM INPUT SIGNALS THROUGH THE SYSTEM AND THE ACTUATION DEVICES.

SYSTEM TEST DOES NOT INTERFERE WITH THE PROTECTIVE FUNCTION OF THE SYSTEM.

SYSTEM DESCRIPTION

5) TESTING (CONT'D)

ACTUATION OF THE COMPONENTS CONTROLLED BY THE ESF LOAD SEQUENCER SYSTEM DOES NOT DISTURB NORMAL PLANT OPERATING CONDITIONS: THEREFORE THE ESF LOAD SEQUENCER SYSTEM IS TESTED BY COMPLETE ACTUATION. PROPER OPERATION MAY BE VERIFIED BY THE FOLLOWING:

CHECKING THE POSITION OF EACH ESF COMPONENT

CHECKING THE ACTUATION ANNUNCIATION

CHECKING THE ESF COMPONENT STATUS INDICATION

RESPONSE TIME TESTING WILL BE PERFORMED AT REFUELING INTERVALS.

6) ESF LOAD SEQUENCER SYSTEM SIGNAL LOGIC

A. LOSS OF OFFSITE POWER (LOP) SIGNAL/LOAD SHED SIGNAL

EACH LOP SIGNAL/LOAD SHED SIGNAL LOGIC PERFORMS THE FOLLOWING FUNCTIONS:

CONTINUOUSLY MONITOR THE CLASS IE 4.16 kV BUS FOR AN UNDERVOLTAGE CONDITION USING FOUR UNDERVOLTAGE RELAYS

PROVIDE INDICATION AND ANNUNCIATION OF AN UNDERVOLTAGE RELAY TRIP TO THE OPERATOR

PROVIDE A LOGIC OUTPUT ON A TWO-OUT-OF-FOUR COINCIDENCE OF UNDERVOLTAGE RELAY TRIP OR MANUAL ACTUATION

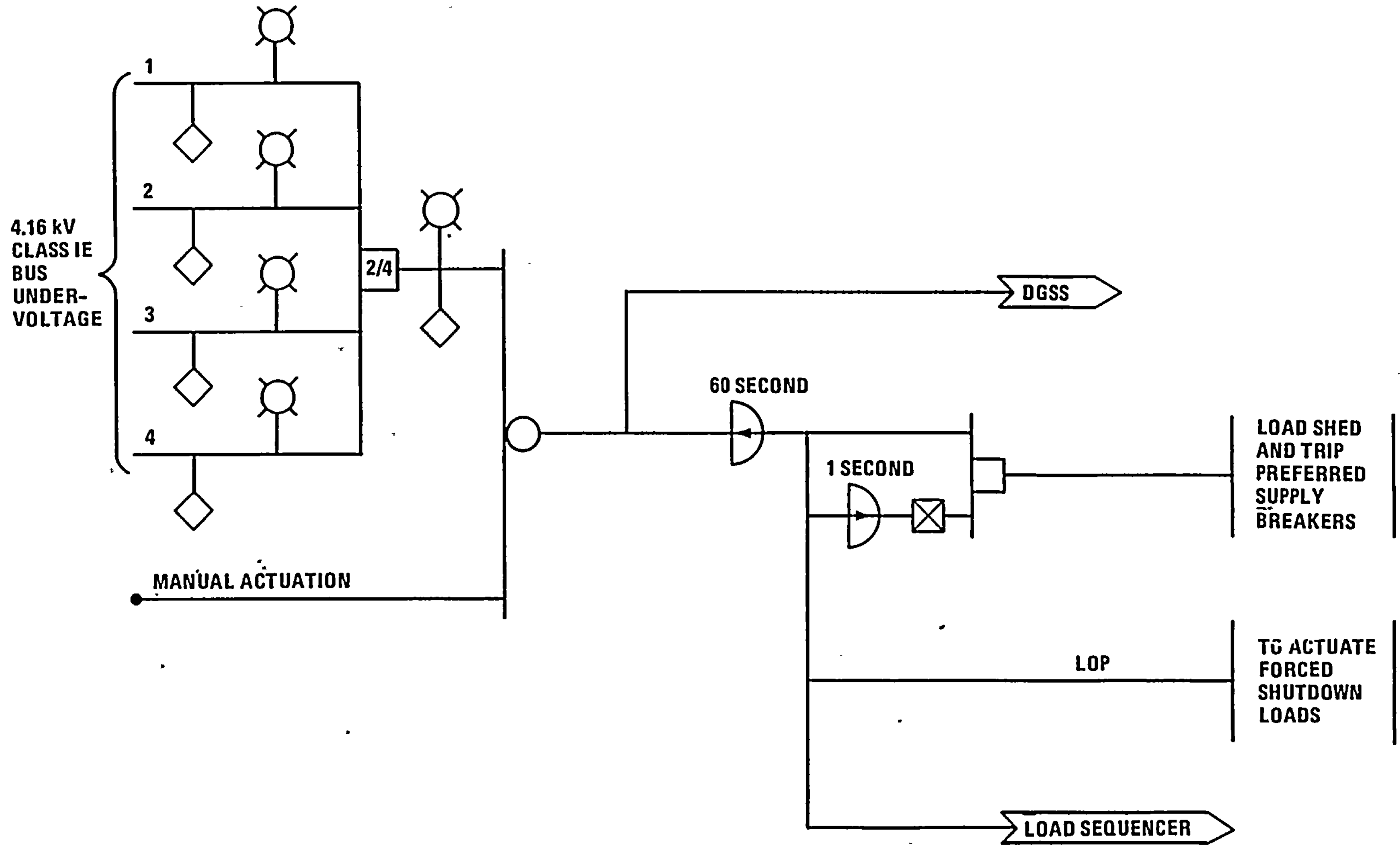
THIS LOGIC GENERATES

LOP SIGNAL TO THE DIESEL GENERATOR START SIGNAL LOGIC

LOP SIGNAL (MAINTAINED THROUGH A 60 SECOND OFF DELAY) TO ACTUATE FORCED SHUTDOWN SYSTEM LOADS BY DE-ENERGIZING ACTUATION RELAYS

LOAD SHED PULSE (1 SECOND) TO SHED 4.16 kV AND SELECTED 480V LOADS FROM THE CLASS IE 4.16 kV BUS AND TO TRIP THE 4.16 kV CLASS IE BUS PREFERRED (OFFSITE) POWER SUPPLY BREAKERS BY ENERGIZING ACTUATION RELAYS

INDICATION AND ANNUNCIATION TO THE OPERATOR



LOP SIGNAL/LOAD SHED LOGIC

FIGURE 2A3-1

2.A.3.B. ESF LOAD SEQUENCER SYSTEM

SYSTEM DESCRIPTION

B. DIESEL GENERATOR START SIGNAL (DGSS) LOGIC

EACH DGSS LOGIC PERFORMS THE FOLLOWING FUNCTION:

COMBINES THE LOP, THE SIAS, THE AFAS AND MANUAL ACTUATION IN A LOGICAL "OR" TO GENERATE A DGSS TO START THE DIESEL GENERATOR.

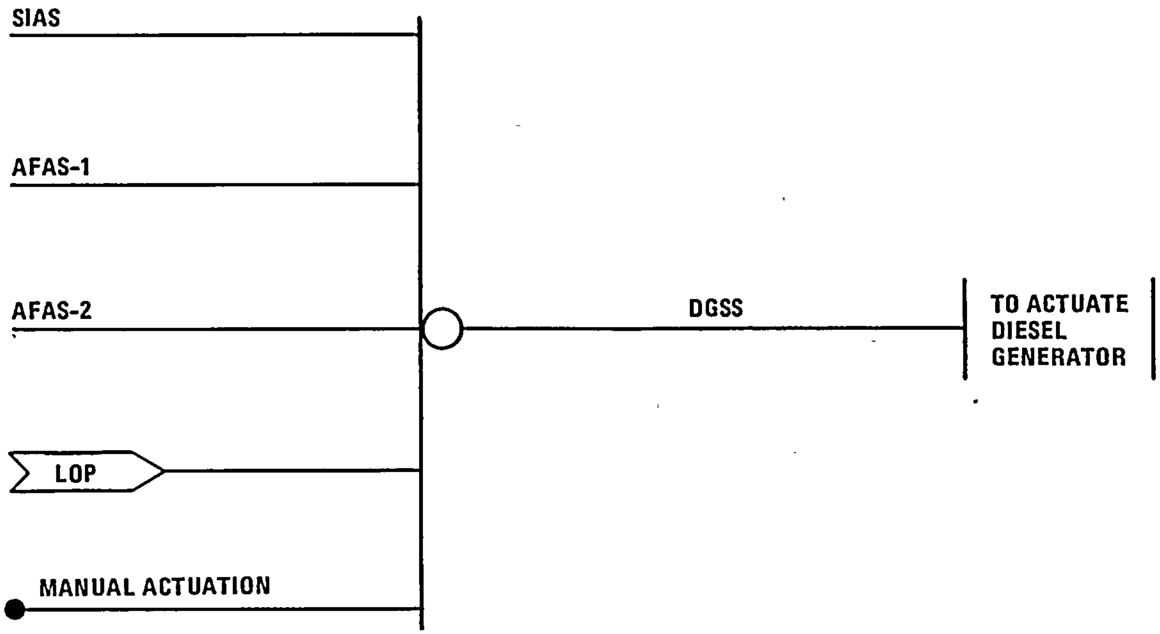
C. LOAD SEQUENCER START AND PERMISSIVE SIGNAL LOGIC

EACH LOAD SEQUENCER START AND PERMISSIVE SIGNAL LOGIC PERFORMS THE FOLLOWING FUNCTIONS:

MONITOR INPUT SIGNALS

DETERMINE THE APPROPRIATE MODE OF OPERATION

GENERATE SEQUENTIALLY-TIMED START AND PERMISSIVE SIGNALS TO ESF AND FORCED SHUTDOWN LOADS AS REQUIRED TO PREVENT INSTABILITY OF THE CLASS IE BUSES. START SIGNALS ACTUATE DEVICES BY DE-ENERGIZING ACTUATION RELAYS: PERMISSIVE SIGNALS ALLOW LOADING OF DEVICES BY ENERGIZING ACTUATION RELAYS.



DGSS LOGIC

FIGURE 2A3-2

2.A.3.B. ESF LOAD SEQUENCER SYSTEM

SYSTEM DESCRIPTION

THE LOAD SEQUENCER CONTROLS ONLY PUMPS, FANS AND CHILLERS, AND DOES NOT CONTROL ANY VALVES OR DAMPERS. AS SUCH THE LOAD SEQUENCER DOES NOT CAUSE COMPLETE ESF SYSTEM ACTUATION.

THE LOAD SEQUENCER IS DESIGNED TO RESPOND TO THE FOLLOWING CONDITIONS:

LOSS OF COOLANT ACCIDENT (LOCA) WITH OFFSITE POWER AVAILABLE

LOCA WITHOUT OFFSITE POWER AVAILABLE

ACCIDENT OTHER THAN LOCA WITH OFFSITE POWER AVAILABLE

ACCIDENT OTHER THAN LOCA WITHOUT OFFSITE POWER AVAILABLE

LOSS OF OFFSITE POWER WITH OR WITHOUT AN ACCIDENT OTHER THAN LOCA FOLLOWED AT A LATER TIME BY A LOCA

LOCA FOLLOWED AT A LATER TIME BY A LOP

2.A.3.B. ESF LOAD SEQUENCER SYSTEM

SYSTEM DESCRIPTION

THE LOAD SEQUENCER HAS A NORMAL MODE (MODE 0) AND FOUR OPERATING MODES

1. SIAS/CSAS WITHOUT AN LOP

2. SIAS/CSAS COINCIDENT WITH AN LOP

   SEQUENCING IS STARTED ON A DIESEL GENERATOR BREAKER CLOSURE SIGNAL

3. LOP WITHOUT AN SIAS/CSAS

   SEQUENCING IS STARTED ON A DIESEL GENERATOR BREAKER CLOSURE SIGNAL

4. OTHER SIGNALS WITHOUT AN SIAS/CSAS AND WITHOUT AN LOP. THESE SIGNALS ARE

   A. CRVIAS AND CREFAS COMBINED IN A LOGICAL "OR"

   B. FBEVAS

   C. AFAS-1 AND AFAS-2 COMBINED IN A LOGICAL "OR"

   D. DIESEL GENERATOR RUNNING

EXHIBIT 2A3-9

2.A.3.B. ESF LOAD SEQUENCER SYSTEM

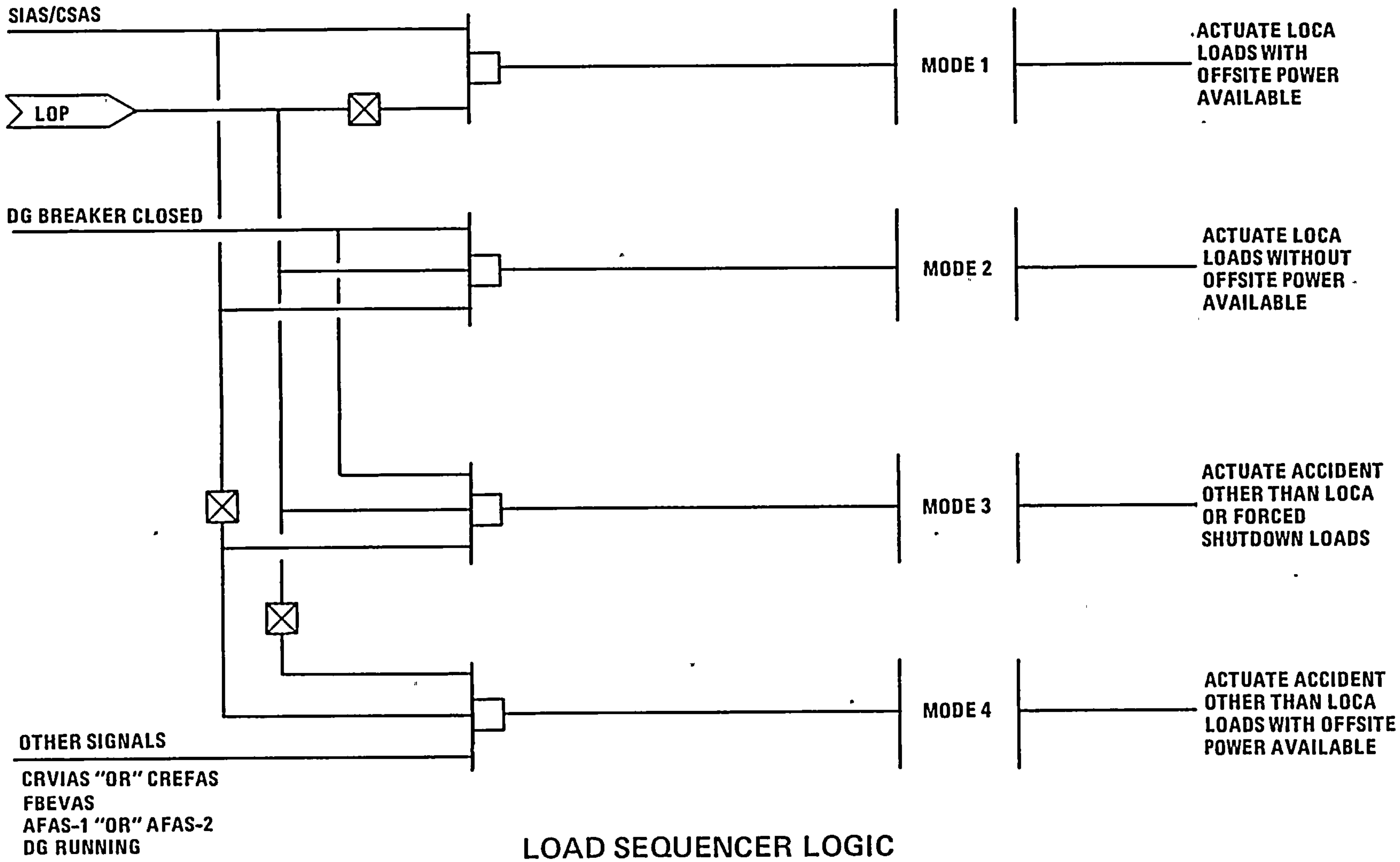
SYSTEM DESCRIPTION

RECEIPT OF SUBSEQUENT INPUT SIGNALS REQUIRING A CHANGE OF OPERATING MODE CAUSES THE LOAD SEQUENCER TO RESET, TRANSFER TO THE REQUIRED MODE AND INITIATE SEQUENCING OF THE REQUIRED LOADS.

THE DEVICES SEQUENTIALLY ACTUATED THROUGH THE LOAD SEQUENCER RECEIVE

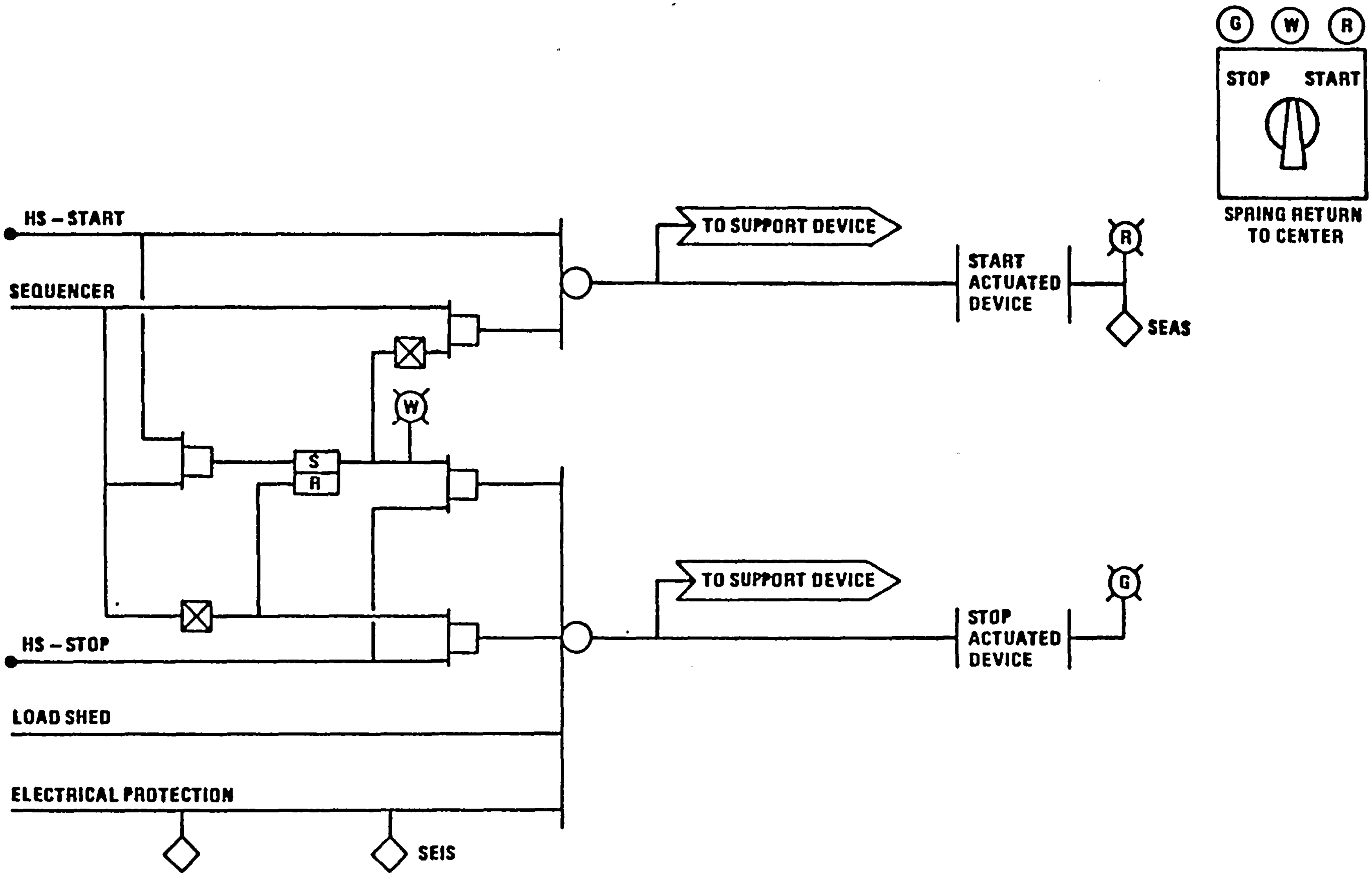
- LOAD SHED SIGNAL ON BUS UNDERVOLTAGE TO TRIP THE DEVICE LOAD
- LOAD SEQUENCER START SIGNAL TO START THE DEVICE AT THE APPROPRIATE TIME

RESET OF THE LOAD SEQUENCER AND ITS ACTUATION RELAYS DOES NOT STOP OR SHED ACTUATED DEVICES. DEVICES ARE SHED ONLY ON THE LOAD SHED SIGNAL.



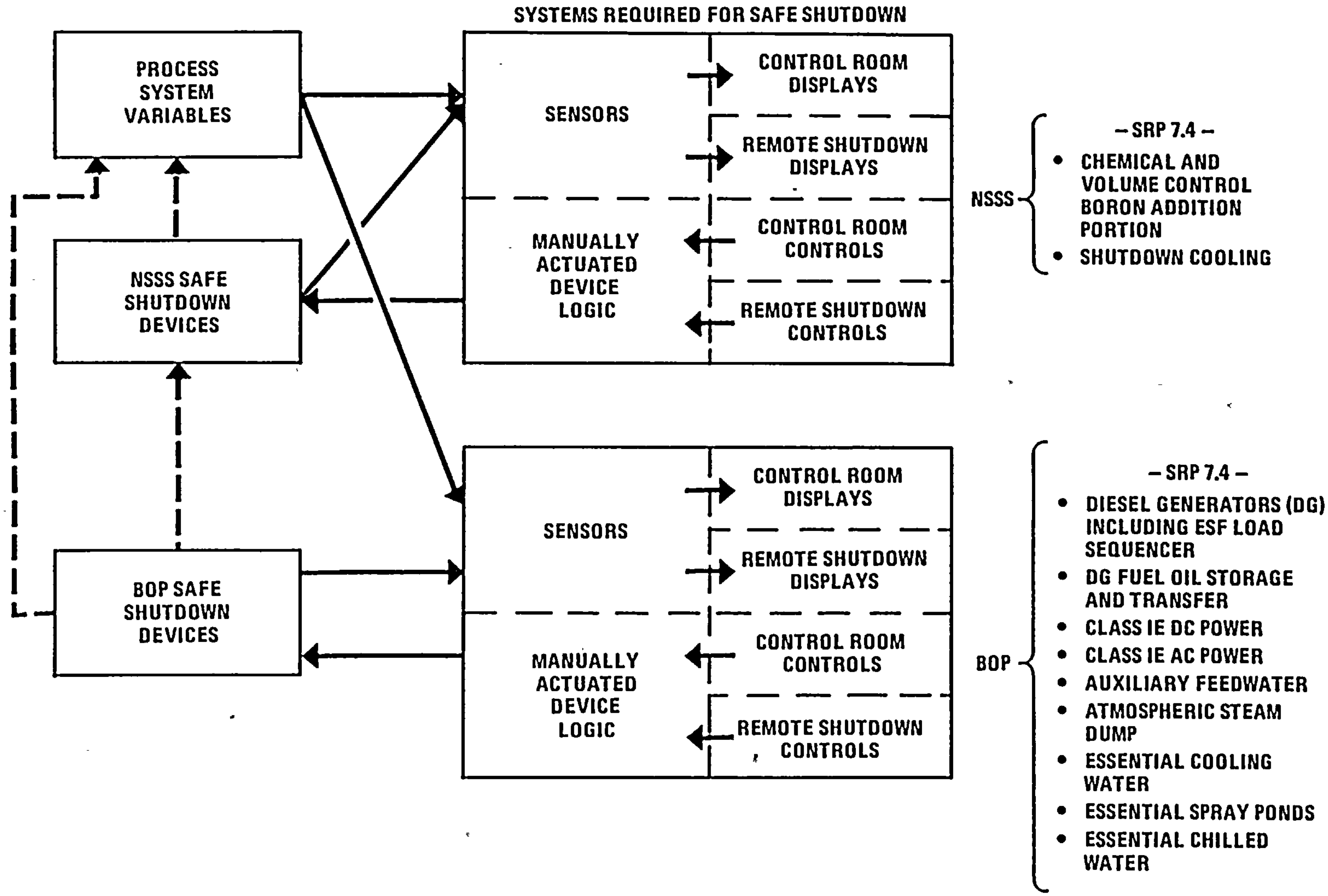
LOAD SEQUENCER LOGIC

FIGURE 2A3-3



ENGINEERED SAFETY FEATURE SYSTEM
SEQUENCER ACTUATED DEVICE
TYPICAL LOGIC

FIGURE 2A3-4



SYSTEMS REQUIRED FOR SAFE SHUTDOWN

ELECTRICAL AND MECHANICAL DEVICES AND CIRCUITRY REQUIRED TO ACHIEVE AND MAINTAIN A SAFE SHUTDOWN CONDITION OF THE PLANT.

FIGURE 2B-1

2.B.1.A. REMOTE SHUTDOWN PANEL AND COLD SHUTDOWN CAPABILITY

DESIGN CRITERIA

1) DESIGN FOR MAINTAINING THE PLANT IN A SAFE SHUTDOWN CONDITION WHEN THE MAIN CONTROL ROOM IS INACCESSIBLE SHALL BE IN ACCORDANCE WITH 10CFR50 APPENDIX A, GDC 19, "CONTROL ROOM."

   SAFE SHUTDOWN REQUIREMENTS COMPRISE:

   THE CAPABILITY FOR PROMPT HOT SHUTDOWN (REACTOR IS SUBCRITICAL AT NORMAL OPERATING PRESSURE AND TEMPERATURE) INCLUDING THE NECESSARY INSTRUMENTATION AND CONTROLS TO MAINTAIN THE UNIT IN A SAFE CONDITION DURING HOT SHUTDOWN, AND

   THE POTENTIAL CAPABILITY FOR SUBSEQUENT COLD SHUTDOWN OF THE REACTOR THROUGH THE USE OF SUITABLE PROCEDURES AND CONTROLS AND INSTRUMENTATION OUTSIDE THE CONTROL ROOM.

2) ACCESS BACK INTO THE MAIN CONTROL ROOM WILL GENERALLY BE ACHIEVED PRIOR TO THE INITIATION OF COLD SHUTDOWN: HOWEVER, THE CAPABILITY FOR BRINGING THE REACTOR TO COLD SHUTDOWN CONDITIONS EXISTS OUTSIDE THE CONTROL ROOM THROUGH THE USE OF SUITABLE PROCEDURES AND SECONDARY CONTROLS.

3) CONTROL ROOM EVACUATION IS INITIATED FROM AN "UNDEFINED" CAUSE, FOR EXAMPLE, CONTROL ROOM ENVIRONMENT NOT HABITABLE.

2.B.1.A. REMOTE SHUTDOWN PANEL AND COLD SHUTDOWN CAPABILITY

DESIGN CRITERIA

4) DFSIGN BASIS ACCIDENTS ARE ASSUMED NOT TO OCCUR SIMULTANEOUSLY WITH CONTROL ROOM EVACUATION.

5) LOP AND SEISMIC EVENTS (SSE) SHALL NOT JEOPARDIZE THE SAFE SHUTDOWN FUNCTION.

6) SYSTEMS, CONTROLS, AND INDICATIONS ESSENTIAL TO THE RESIDUAL HEAT REMOVAL FUNCTION DURING HOT SHUTDOWN SHALL BE DESIGNED WITH SUITABLE REDUNDANCY IN ACCORDANCE WITH 10CFR50 APPENDIX A, GDC 34, "RESIDUAL HEAT REMOVAL".

7) LOSS OF SAFE SHUTDOWN SYSTEM REDUNDANCY DOES NOT OCCUR AS A RESULT OF THE EVENT (EXCLUDING CONTROL ROOM FIRE) REQUIRING CONTROL ROOM EVACUATION.

8) ALL SEISMICALLY QUALIFIED AUTOMATIC FUNCTIONS PERFORM AS REQUIRED.

9) DESIGN OF THE REMOTE SHUTDOWN PANEL, SYSTEM CONTROLS, AND SURVEILLANCE INSTRUMENTATION SHALL NOT DEGRADE THE PRIMARY SHUTDOWN CONTROLS LOCATED IN THE MAIN CONTROL ROOM AND SHALL BE DESIGNED IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF IEEE 279 - 1971, "CRITERIA FOR PROTECTION SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS".

2.B.1.B. REMOTE SHUTDOWN PANEL AND COLD SHUTDOWN CAPABILITY

SYSTEM DESCRIPTION

1) THE FOLLOWING SYSTEMS ARE REQUIRED FOR SAFE SHUTDOWN

AUXILIARY FEEDWATER

ATMOSPHERIC STEAM DUMP

DIESEL GENERATORS INCLUDING ESF LOAD SEQUENCER

DG FUEL OIL STORAGE AND TRANSFER

ESSENTIAL COOLING WATER

ESSENTIAL SPRAY PONDS

ESSENTIAL CHILLED WATER

CLASS 1E AC POWER

CLASS 1E DC POWER

CHEMICAL AND VOLUME CONTROL, BORON ADDITION PORTION

SHUTDOWN COOLING

EXHIBIT 2B1-3

2.B.1.B. REMOTE SHUTDOWN PANEL AND COLD SHUTDOWN CAPABILITY

SYSTEM DESCRIPTION

2) SHOULD THE CONTROL ROOM BECOME INACCESSIBLE, THE REACTOR MAY BE MANUALLY TRIPPED FROM THE CONTROL ROOM, AS IT IS BEING EVACUATED, OR FROM THE REACTOR TRIP SWITCHGEAR SYSTEM (AUXILIARY BUILDING ELEV. 120').

3) HOT SHUTDOWN CONDITIONS CAN BE MAINTAINED FROM OUTSIDE THE CONTROL ROOM BY CONTROL OF PRESSURIZER PRESSURE AND LEVEL, AUXILIARY FEEDWATER FLOW, AND ATMOSPHERIC STEAM DUMP. INSTRUMENTATION AND CONTROLS ARE AVAILABLE AT THE REMOTE SHUTDOWN PANEL AND ESF SWITCHGEAR (CONTROL BUILDING ELEV. 100') FOR THESE SYSTEMS AND COMPONENTS.

4) THE REMOTE SHUTDOWN PANEL CONSISTS OF THREE PHYSICALLY SEPARATE CABINETS. INSTRUMENTATION, AND CONTROLS FOR CHANNEL A AND TRAIN A SYSTEMS AND COMPONENTS ARE PROVIDED IN ONE CABINET: INSTRUMENTATION AND CONTROLS FOR CHANNEL B AND TRAIN B SYSTEMS AND COMPONENTS ARE PROVIDED IN A SECOND CABINET: AND NON-SAFETY-RELATED INSTRUMENTATION IS PROVIDED IN THE THIRD CABINET. CONTROLS FOR CHANNEL C ARE PROVIDED IN A SEPARATE SUBSECTION OF THE TRAIN A CABINET AND CONTROLS FOR CHANNEL D ARE PROVIDED IN A SEPARATE SUBSECTION OF THE TRAIN B CABINET. CONTROLS FOR LARGE HORSEPOWER COMPONENTS (480V AND 4.16 kV SWITCHGEAR) ARE PROVIDED IN THE ADJACENT TRAIN A AND TRAIN B ESF SWITCHGEAR ROOMS.

THE TRAIN A REMOTE SHUTDOWN PANEL IS PHYSICALLY SEPARATED FROM THE TRAIN B REMOTE SHUTDOWN PANEL BY A FIRE WALL. DOORS PROVIDE ACCESS TO THE PANELS.

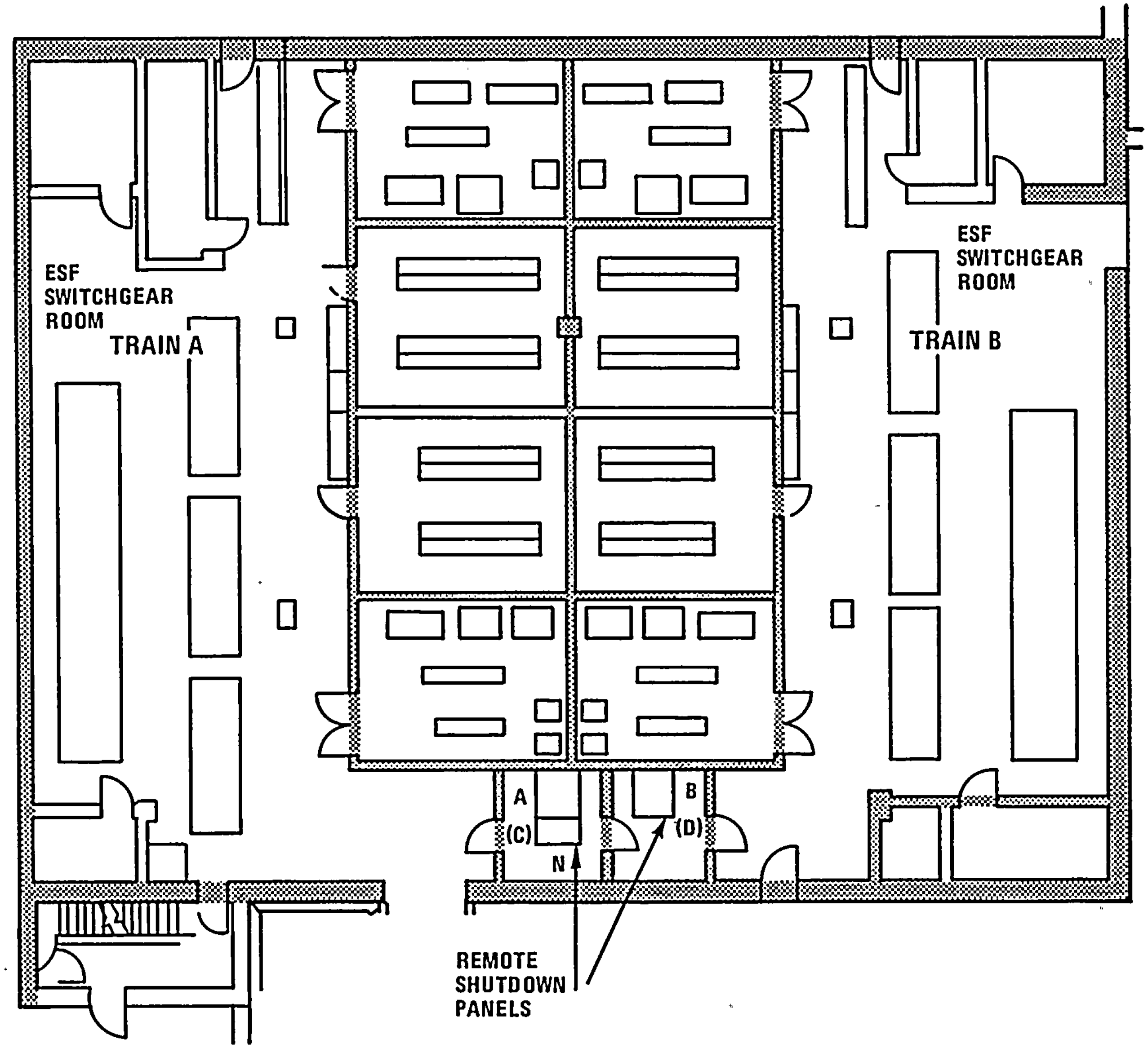


FIGURE 2B1-1
REMOTE SHUTDOWN PANEL LOCATION – CONTROL BLDG

SYSTEM DESCRIPTION

5) IN THE EVENT OF A LOP, THE DIESEL GENERATORS WILL AUTOMATICALLY BE STARTED AND SEQUENTIALLY LOADED BY THE ESF LOAD SEQUENCER SYSTEM AND THE DIESEL GENERATOR CONTROL SYSTEMS. CONTROL OUTSIDE OF THE CONTROL ROOM IS PROVIDED AT LOCAL PANELS IN THE DIESEL GENERATOR BUILDING.

6) COLD SHUTDOWN CAN BE ACHIEVED FROM OUTSIDE THE CONTROL ROOM THROUGH THE USE OF SUITABLE PROCEDURES AND LOCAL CONTROLS.

7) PARALLEL CONTROL BETWEEN THE CONTROL ROOM AND THE REMOTE SHUTDOWN PANEL, ESF SWITCHGEAR OR LOCAL CONTROL IS UTILIZED. TRANSFER OF CONTROL IS USED ONLY FOR ANALOG CONTROL (AUXILIARY FEEDWATER TURBINE SPEED CONTROL).

8) REDUNDANCY

REDUNDANT FEATURES INCLUDE:

TWO INDEPENDENT INSTRUMENTATION AND CONTROL CHANNELS FOR SAFE SHUTDOWN SYSTEMS AND COMPONENTS

POWER PROVIDED FROM TWO SEPARATE BUSES

REMOTE SHUTDOWN PANEL

INSTRUMENTATION	CABINET A(C)	CABINET B(D)	CABINET N
AUXILIARY FW REGULATING VALVE POSITION INDICATOR	X(X)	X	
AUXILIARY FW TURBINE SPEED INDICATOR	X		
AUXILIARY FW FLOW	X	X	
NEUTRON POWER LEVEL	X	X	
REACTOR COOLANT HOT LEG TEMPERATURE	X	X	
PRESSURIZER PRESSURE	X	X	
PRESSURIZER LEVEL	X	X	
SAFETY INJECTION TANK PRESSURE	X	X	
STEAM GENERATOR PRESSURE	X	X	
STEAM GENERATOR LEVEL	X	X	
REFUELING WATER TANK LEVEL	X	X	
LETDOWN SYSTEM PRESSURE			X
LETDOWN SYSTEM FLOW			X
LETDOWN SYSTEM TEMPERATURE			X
VOLUME CONTROL TANK LEVEL			X
CHARGING LINE PRESSURE	X		
CHARGING LINE FLOW		X	
SHUTDOWN COOLING HEAT EXCHANGER TEMPERATURES	X	X	
SHUTDOWN COOLING FLOW	X	X	
CONDENSATE STORAGE TANK LEVEL	X	X	

EXHIBIT 2B1-6

REMOTE SHUTDOWN PANEL

CONTROLS	CABINET A(C)	CABINET B(D)
SG ATMOSPHERIC DUMP VALVE PERMISSIVE CONTROL	X(X)	X(X)
AUXILIARY FW REGULATING VALVE CONTROL	X(X)	X
AUXILIARY FW ISOLATION VALVE CONTROL	X(X)	X
SG ATMOSPHERIC STEAM DUMP MODULATING CONTROLLER	X	X
AUXILIARY FW TURBINE STEAM SUPPLY VALVE CONTROL	X	
AUXILIARY FW TURBINE SPEED CONTROL TRANSFER SWITCH	X	
AUXILIARY FW TURBINE SPEED CONTROL POTENTIOMETER	X	
AUXILIARY FW TURBINE TRIP VALVE CONTROL	X	
AUXILIARY FW TURBINE TRIP PUSHBUTTON	X	
MSIS ACTUATION PUSHBUTTON	X(X)	X(X)
AUXILIARY PRESSURIZER SPRAY VALVE CONTROL	X	X
RCP CONTROLLED BLEEDOFF CONTAINMENT ISOLATION VALVE CONTROL	X	X
RCP CONTROLLED AND BLEEDOFF RELIEF ISOLATION VALVE CONTROL	X	
LETDOWN ISOLATION VALVE CONTROL	X	X
BACKUP HEATER GROUPS 1 AND 2 CONTROL	X	X
SAFETY INJECTION TANK VENT VALVE CONTROL AND POWER DISCONNECT SWITCH	X	X
SHUTDOWN COOLING PUMPS RECIRCULATION VALVE CONTROL	X	X
STEAM GENERATOR PRESSURE VARIABLE SETPOINT RESET	X(X)	X(X)
PRESSURIZER PRESSURE VARIABLE SETPOINT RESET	X(X)	X(X)

EXHIBIT 2B1-7

ESF SWITCHGEAR

	TRAIN A	TRAIN B
AUXILIARY FEEDWATER PUMP		X
ESSENTIAL COOLING WATER PUMP	X	X
ESSENTIAL SPRAY POND PUMP	X	X
CHARGING PUMP	X	X
ESSENTIAL CHILLER	X	X
LOW PRESSURE SAFETY INJECTION PUMP	X	X
CONTROL ROOM ESSENTIAL AHU	X	X

EXHIBIT 2B1-8

LOCAL CONTROLS

	TRAIN A	TRAIN B
SIT ISOLATION VALVES	X	X
LPSI/CS PUMPS CROSS-CONNECT VALVES	X	X
SHUTDOWN COOLING HEAT EXCHANGER INTAKE AND EXIT VALVES	X	X
LPSI PUMP SUCTION VALVES	X	X
LPSI ISOLATION VALVES	X	X
SHUTDOWN COOLING HEAT EXCHANGER SPRAY BYPASS VALVES	X	X
SHUTDOWN COOLING HEAT EXCHANGER FLOW CONTROL VALVES	X	X
SHUTDOWN COOLING WARM-UP BYPASS VALVES	X	X
SHUTDOWN COOLING SUCTION LINE VALVES	X	X
SHUTDOWN COOLING HEAT EXCHANGER BYPASS FLOW CONTROL VALVES	X	X

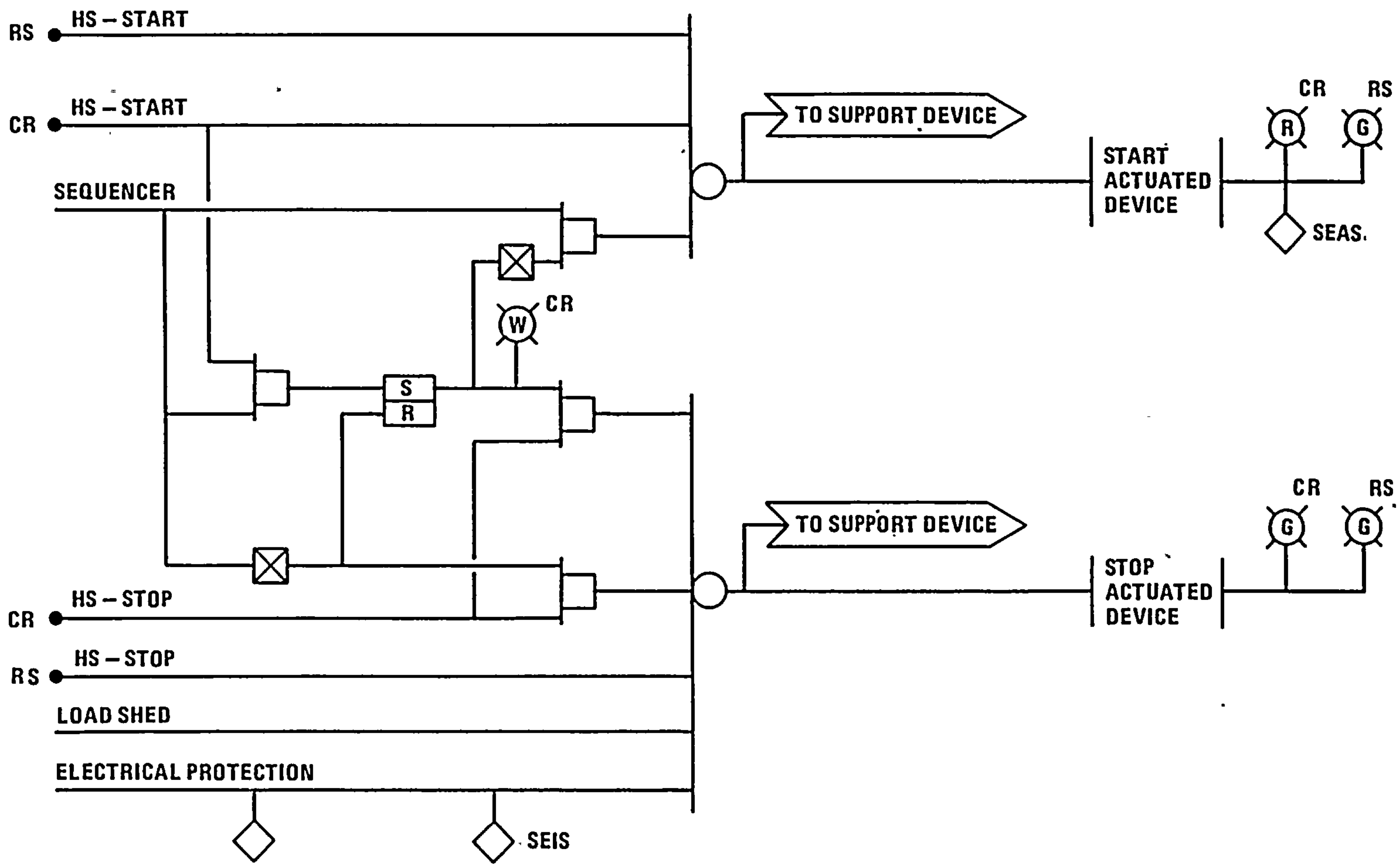
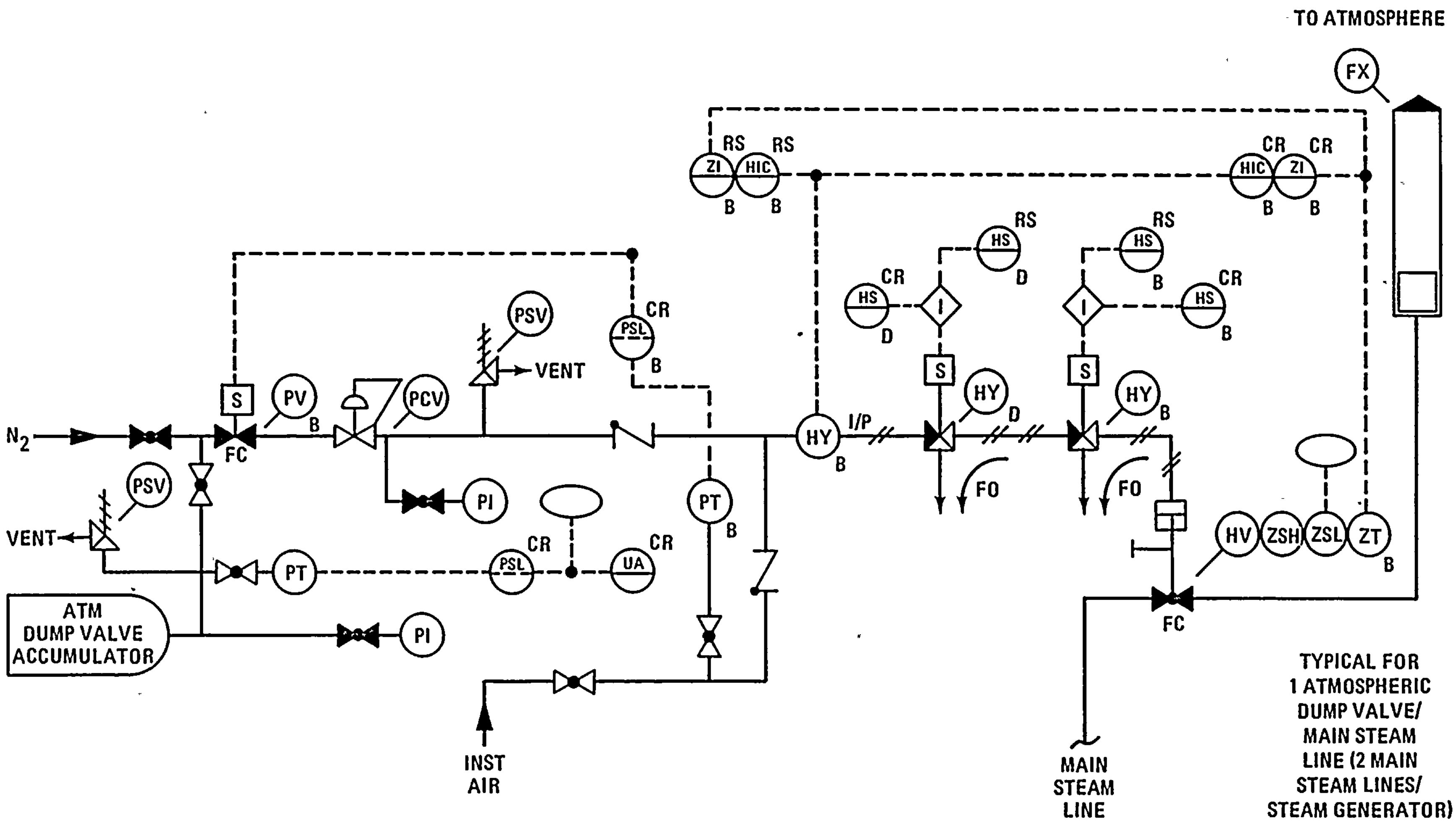
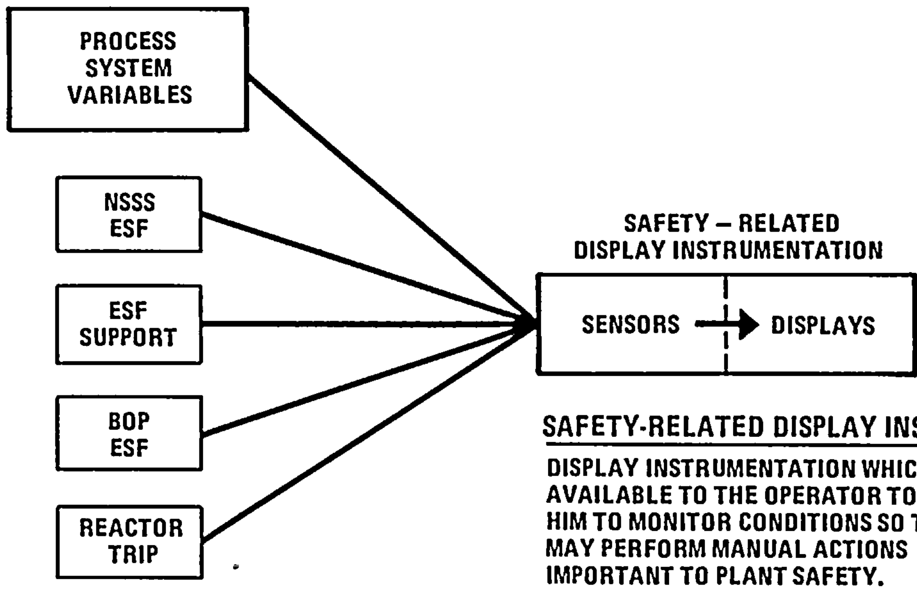


FIGURE 2B1-2
SAFE SHUTDOWN SYSTEM TYPICAL DEVICE LOGIC



TYPICAL ATMOSPHERIC DUMP VALVE
CONTROL SYSTEM
FIGURE 2B1-3



SAFETY-RELATED DISPLAY INSTRUMENTATION

DISPLAY INSTRUMENTATION WHICH IS AVAILABLE TO THE OPERATOR TO ALLOW HIM TO MONITOR CONDITIONS SO THAT HE MAY PERFORM MANUAL ACTIONS IMPORTANT TO PLANT SAFETY.

NSSS

– SRP 7.5 –

- SAFETY-RELATED PLANT PROCESS DISPLAY INSTRUMENTATION
- REACTOR TRIP SYSTEM MONITORING
- ESF SYSTEMS MONITORING
- CEA POSITION INDICATION
- POST-ACCIDENT MONITORING

BOP

– SRP 7.5 –

- ESF SYSTEMS MONITORING
- POST-ACCIDENT MONITORING
- AUTOMATIC BYPASS INDICATION – SAFETY EQUIPMENT STATUS SYSTEM (SESS)

FIGURE 2C-1

2.C.1.A PROCESS INSTRUMENTATION

DESIGN CRITERIA

1) Piping and Instrument Diagrams

2) Detailed Design Criteria

3) Codes and Standards:

   10CFR50, Appendix A, General Design Criteria for Nuclear Power Plants, July 15, 1971

   IEEE STD 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations

   IEEE STD 323-1974, Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations

   IEEE STD 344-1975, Recommended Practices for Seismic Qualification of Class IE Equipment for Nuclear Power Generating Stations

   IEEE STD 384-1974, Trial-use Standard Criteria for Separation of Class IE Equipment and Circuits, as modified by NRC Regulatory Guide 1.75

4) Instruments shall be provided to operate at a nominal 115 V-ac supplied to instrument cabinets. Controls and annunciators shall operate at 120 V-ac or 125 V-dc nominal. The maximum and minimum voltage limits for the 120 V-ac and 125 V-dc systems are given in the electrical systems design criteria.

2.C.1.A PROCESS INSTRUMENTATION

DESIGN CRITERIA

5) RESISTANCE TEMPERATURE DETECTORS (RTD) SHALL UTILIZE A THREE-WIRE CIRCUIT. THE RTD SENSORS SHALL HAVE AN R_0 = 100 OHMS (PREFERRED). EXCEPTIONS WILL BE CONSIDERED ON A CASE BY CASE BASIS. THERMOCOUPLE MATERIALS SHALL BE CHROMEL-ALUMEL, TYPE K.

6) ELECTRONIC TRANSMITTER LOOPS SHALL UTILIZE A CURRENT RANGE OF 4 TO 20 MILLI-AMPERES. PNEUMATIC LOOPS SHALL UTILIZE 3 TO 15 PSIG INSTRUMENT AIR.

7) CRITICAL DATA ACQUISITION, ALARMING, AND PROTECTIVE CONTROLS SHALL BE ENERGIZED FROM A DC-POWER SOURCE.

8) ALL CONTROL SYSTEMS DESIGNS SHALL INCLUDE SHIELDING, GROUNDING, AND PHYSICAL SEPARATION PROVISIONS WHICH WILL MINIMIZE THE EFFECTS OF HIGH VOLTAGE SWITCHING SURGES, INDUCTIVE COUPLING, AND ONSITE RADIO TRANSMISSION SIGNALS.

9) ALUMINUM SHALL NOT BE USED IN OR AROUND EQUIPMENT CONTAINING OR PRODUCING AMMONIA. ALUMINUM AND ZINC SHALL BE EXCLUDED WHEREVER POSSIBLE FROM INSTRUMENT AND CONTROL DEVICE CASINGS WHICH ARE IN THE CONTAINMENT AND COULD BE EXPOSED TO THE CONTAINMENT SPRAY FLUID. EXPOSED ALUMINUM SHALL NOT BE USED FOR INSTRUMENTS INSTALLED IN THE CIRCULATING WATER SYSTEM WHERE CONTACT WITH THE CIRCULATING WATER IS POSSIBLE.

2.C.1.A PROCESS INSTRUMENTATION

DESIGN CRITERIA

10) PROVISIONS SHALL BE MADE SUCH THAT RESPONSE TIME TESTING CAN BE PERFORMED ON SAFETY-RELATED CHANNELS.

11) NUCLEAR INSTRUMENTATION AND RADIATION MONITORING INDICATORS AND RECORDERS SHALL HAVE LOG SCALES AND CHARTS. ALL OTHER INDICATING AND RECORDING DEVICES WITH THE EXCEPTION OF MOTOR CURRENT INDICATORS SHALL BE LINEAR DIRECT READING WITH A MINIMUM SCALE LENGTH OF 4 INCHES. WHEREVER POSSIBLE, ALARMS SHALL NOT BE INITIATED FROM INDICATORS OR RECORDER CONTACTS.

12) IN-LINE PADDLE-TYPE FLOW SWITCHES SHALL NOT BE USED. MAGNETIC-TYPE FLOW METERS ARE PREFERRED FOR SLUDGE OR SLURRY SERVICE.

13) FLOW ELEMENTS SHALL BE SIZED, WHEREVER PRACTICABLE, FOR 100 IN. H_2O AND DESIGN FLOW SHALL BE 85 PERCENT OF RANGE.

14) EQUIPMENT CONTROL CIRCUIT STATUS (AUTOMATIC OR MANUAL) SHALL BE INDICATED ON THE CONTROL ROOM CONTROL PANELS ALONG WITH THE EQUIPMENT STATUS (RUNNING OR STOPPED).

15) ALL OVERRIDES OF ENGINEERED SAFETY FEATURES EQUIPMENT SHALL BE INDICATED.

16) IN GENERAL, TIME DELAY RELAYS SHALL NOT BE USED TO BYPASS SHORT TIME NUISANCE ALARMS UPON EQUIPMENT STARTUP. NUISANCE ALARMS SHALL BE BYPASSED UPON MANUAL SHUTDOWN OF STANDBY OR REDUNDANT COMPONENTS.

DESIGN CRITERIA

17) MERCURY SHALL NOT BE USED FOR ANY APPLICATION WITHIN THE CONTAINMENT BUILDING, SPENT FUEL POOL AREA, BORON RECOVERY AREA, CHEMICAL AND VOLUME CONTROL AREAS, OR IN THE RADWASTE BUILDING. SWITCHES USING MERCURY, WHETHER ENCAPSULATED OR NOT, AND MERCURY-WETTED RELAYS SHALL NOT BE USED IN SAFETY SYSTEMS.

18) MERCURY SHALL NOT BE USED IN INSTRUMENTS IN DIRECT OR INDIRECT CONTACT WITH:

- THE PRIMARY COOLANT SYSTEM
- THE FEEDWATER AND CONDENSATE SYSTEMS
- SYSTEMS WHICH PROVIDE MAKEUP TO THE PRIMARY, FEEDWATER, AND CONDENSATE SYSTEMS.

19) INSTRUMENTS CONTAINING MERCURY FOR LEVEL, PRESSURE DIFFERENTIAL PRESSURE, TEMPERATURE, OR FLOW SWITCHES MAY BE USED OUTSIDE OF THE SPECIFIC MERCURY EXCLUSION AREAS AND SYSTEMS. ONLY HERMETICALLY-SEALED MERCURY SWITCH ASSEMBLIES CONTAINED WITHIN NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) NEMA-4 HOUSINGS SHALL BE USED. CARE SHALL BE TAKEN IN SELECTING INSTRUMENTS FOR USE SUCH THAT A BROKEN MERCURY SWITCH CAPSULE SHALL NOT RESULT IN MERCURY ENTERING SUMPS. SWITCHES WHICH WILL CONTAIN THE MERCURY WITHIN THE INSTRUMENT CASE MAY BE USED; I.E., MAGNETROL TYPE SWITCH.

2.C.1.A PROCESS INSTRUMENTATION

DESIGN CRITERIA

20) MERCURY MANOMETERS SHALL BE RESTRICTED FROM USE IN THE PLANT OPERATING PROCESS INSTRUMENTATION, BUT MAY BE USED IN INSTRUMENT SHOPS.

21) ALL SYSTEMS SHALL INCLUDE THE REQUIRED STRAIGHT RUNS FOR FLOW MEASUREMENT NOZZLES. FLOW METERING RUNS SHALL BE IN ACCORDANCE WITH ASME PUBLICATION, "FLUID METERS, THEIR THEORY AND APPLICATION," SUPPLEMENT TO ASME PTC-19.

2.C.1.B PROCESS INSTRUMENTATION

SYSTEM DESCRIPTION

1) A TYPICAL PROCESS INSTRUMENTATION LOOP CONSISTS OF:

   SENSOR
   PROCESSING ELECTRONICS
   DISPLAY

2) VARIOUS SENSORS INCLUDE:

   THERMOCOUPLES AND RTD'S
   PRESSURE TRANSMITTERS INCLUDING DIFFERENTIAL PRESSURE TRANSMITTERS FOR LEVEL AND FLOW MONITORING
   RADIATION MONITORS - β SCINTILLATION, GEIGER-MUELLER
   ANALYZERS - H_2 (THERMAL CONDUCTIVITY), CL_2 (CHEMICALLY IMPREGNATED PAPER TAPE)
   FLOAT AND DISPLACER TYPE LEVEL INSTRUMENTS

3) PROCESSING ELECTRONICS INCLUDE:

   SIGNAL CONVERTERS (I/E, E/E INCLUDING ISOLATORS, SQUARE ROOT) BISTABLES

4) PROCESSING ELECTRONICS ARE HOUSED WITHIN CONTROL ROOM CABINETS, 2 SEPARATE CLASS IE CABINETS (A AND B), AND SEPARATE NON-IE CABINETS

EXHIBIT 2C1-6

2.C.1.B PROCESS INSTRUMENTATION

SYSTEM DESCRIPTION

5) DISPLAYS INCLUDE:

INDICATORS
RECORDERS
INDICATING LIGHTS
ANNUNCIATOR

EXHIBIT 2C1-7

1.C.1.B PROCESS INSTRUMENTATION

SYSTEM DESCRIPTION

ENGINEERED SAFETY FEATURE SYSTEM MONITORING (SHEET 1 OF 6)

PARAMETER	TYPE OF READOUT	NUMBER OF CHANNELS	LOCATION	RANGE	DISPLAYED ACCURACY
FUEL BUILDING (FB) ESSENTIAL VENTILATION SYSTEM					
FB VENTILATION ISOLATION DAMPER POSITION	INDICATING LIGHTS	1 PAIR/ DAMPER	CONTROL ROOM	NA	NA
FB ESSENTIAL EXHAUST FANS MOTOR STARTER CONTACT POSITION	INDICATING LIGHTS	1 PAIR/FAN	CONTROL ROOM	NA	NA
FUEL POOL AREA RADIATION MONITOR	INDICATOR	1	CONTROL ROOM	10^{-1} - 10^{4} MR/H	±20%
FUEL BUILDING EXHAUST GAS ACTIVITY MONITOR	INDICATOR	1	CONTROL ROOM	10^{-6} - 10^{-1} μ CI/CM^{3}	±25%

EXHIBIT 2C1-8

ENGINEERED SAFETY FEATURE SYSTEM MONITORING (SHEET 2 OF 6)

PARAMETER	TYPE OF READOUT	NUMBER OF CHANNELS	LOCATION	RANGE	DISPLAYED ACCURACY
FUEL BUILDING AFU CHARCOAL DIFFERENTIAL TEMPERATURE MONITOR	INDICATOR	2	CONTROL ROOM	0 TO 10F	±1%
FUEL BUILDING NEGATIVE PRESSURE (DIFF PRES ACROSS INSIDE OF BLDG AND AMBIENT)	INDICATOR	1	CONTROL ROOM	0 TO 0.5 IN. H_2O	±1%
CONTAINMENT PURGE ISOLATION SYSTEM					
NORMAL PURGE ISOLATION VALVE POSITION	INDICATOR LIGHTS	1 PAIR/ VALVE	CONTROL ROOM	NA	NA

SYSTEM DESCRIPTION

ENGINEERED SAFETY FEATURE SYSTEM MONITORING (SHEET 3 OF 6)

PARAMETER	TYPE OF READOUT	NUMBER OF CHANNELS	LOCATION	RANGE	DISPLAYED ACCURACY
REFUELING MACHINE SERVICE PLATFORM AREA RADIATION MONITOR	INDICATOR	1	CONTROL ROOM	10^{-1} TO 10^{4} MR/H	±20%
CONTAINMENT PURGE EXHAUST GAS ACTIVITY MONITOR	INDICATOR	1	CONTROL ROOM	10^{-6} TO 10^{-1} μCI/CM^3	±25%
CONTROL ROOM/BUILDING ESSENTIAL VENTILATION SYSTEM					
CONTROL ROOM/ BUILDING VENTILATION ISOLATION DAMPER POSITION	INDICATING LIGHTS	1 PAIR/ DAMPER	CONTROL ROOM	NA	NA

EXHIBIT 2C1-10

1.C.1.B PROCESS INSTRUMENTATION

SYSTEM DESCRIPTION

ENGINEERED SAFETY FEATURE SYSTEM MONITORING (SHEET 4 OF 6)

PARAMETER	TYPE OF READOUT	NUMBER OF CHANNELS	LOCATION	RANGE	DISPLAYED ACCURACY
CONTROL ROOM/BUILDING ESSENTIAL FAN MOTOR STARTER CONTACT POSITION	INDICATING LIGHTS	1 PAIR/FAN	CONTROL ROOM	NA	NA
CONTROL ROOM AIR INTAKE GAS ACTIVITY MONITORS	INDICATOR	2	CONTROL ROOM	10^{-6} TO 10^{-1} CI/CM^3	±25%
CONTROL ROOM AIR INTAKE CHLORINE MONITOR	INDICATOR	2	CONTROL ROOM	0 TO 4 PPM	±20% OF CONCENTRATION
CONTROL ROOM TEMPERATURE MONITORS	INDICATOR	2	CONTROL ROOM	0 TO 160F	±2%

EXHIBIT 2C1-11

ENGINEERED SAFETY FEATURE SYSTEM MONITORING (SHEET 5 OF 6)

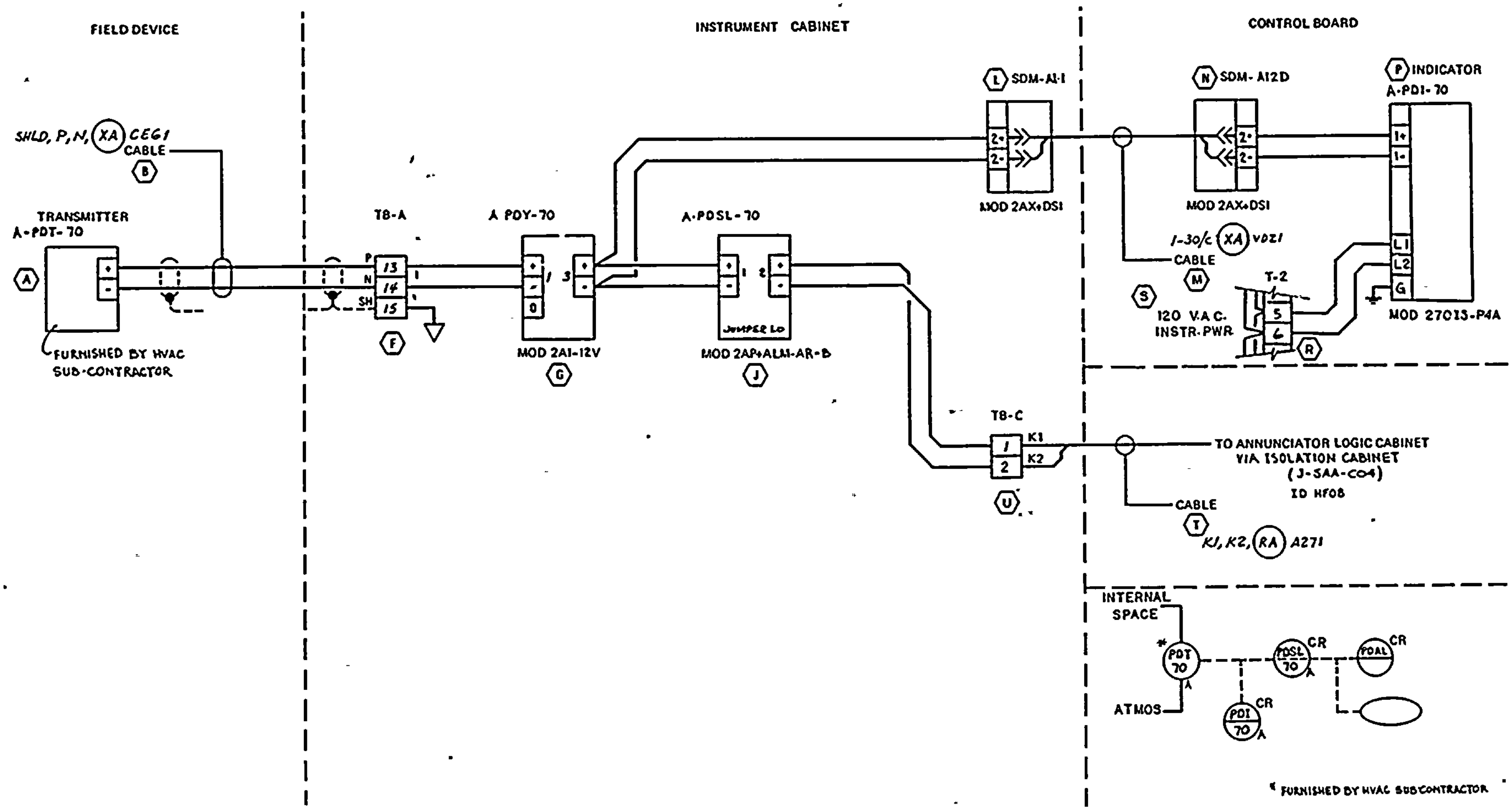
PARAMETER	TYPE OF READOUT	NUMBER OF CHANNELS	LOCATION	RANGE	DISPLAYED ACCURACY
CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM					
CONTAINMENT HYDROGEN	INDICATOR	2	CONTROL ROOM	0 TO 10%	±2.5%
HYDROGEN CONTROL CONTAINMENT ISOLATION VALVE POSITION	INDICATING LIGHTS	1 PAIR/ VALVE	CONTROL ROOM	NA	NA
AUXILIARY FEEDWATER SYSTEM					
AUXILIARY FEEDWATER PUMP DISCHARGE PRESSURE	INDICATOR	1/PUMP	CONTROL ROOM	0 TO 2000 PSIG	±1.5%

SYSTEM DESCRIPTION

ENGINEERED SAFETY FEATURE SYSTEM MONITORING (SHEET 6 OF 6)

PARAMETER	TYPE OF READOUT	NUMBER OF CHANNELS	LOCATION	RANGE	DISPLAYED ACCURACY
AUXILIARY FEEDWATER FLOW	INDICATOR	1/AUXILIARY FEEDWATER LINE	CONTROL ROOM	0 TO 2000 GAL/MIN	±2%
AUXILIARY FEEDWATER REGULATING VALVES	INDICATING LIGHTS	1 PAIR/ VALVE	CONTROL ROOM	NA	NA
AUXILIARY FEEDWATER PUMP TURBINE SPEED	INDICATOR	1	CONTROL ROOM	0 TO 6000 R/MIN	±1.5%
AUXILIARY FEEDWATER SUCTION FROM CST ISOLATION VALVES	INDICATING LIGHTS	1 PAIR/ VALVE	CONTROL ROOM	NA	NA
ESF STATUS PANEL					
SYSTEM AVAILABILITY	INDICATING LIGHTS	1 LIGHT/ SYSTEM/ TRIP	CONTROL ROOM	NA	NA

EXHIBIT 2C1-13



INSTRUMENT LOOP DIAGRAM
HVAC – FUEL BUILDING

FIGURE 2C1-1

2.C.2.A SAFETY EQUIPMENT STATUS SYSTEM

DESIGN CRITERIA

1) THE SAFETY EQUIPMENT STATUS SYSTEM (SESS) SHALL FUNCTION TO ALERT THE OPERATOR BY VISUAL AND AUDIBLE MEANS INSOFAR AS PRACTICABLE AT A SYSTEM LEVEL WHEN ANY PIECE OF AUTOMATICALLY-ACTUATED ESF EQUIPMENT HAS BEEN BYPASSED OR RENDERED INOPERABLE AND NOT AVAILABLE FOR USE.

2) THE SESS SHALL ALSO, IN THE EVENT OF AN ESFAS, MONITOR ALL OF THE ESF COMPONENTS AND ALERT THE OPERATOR BY VISUAL AND AUDIBLE MEANS WHEN ANY PIECE OF EQUIPMENT HAS NOT COMPLETED THE TRANSITION TO THE SAFE OPERATING POSITION.

3) THE SAFETY EQUIPMENT STATUS SYSTEM WILL BE DESIGNED IN COMPLIANCE WITH THE FOLLOWING STANDARDS:

   AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), STANDARD C37.90A, SURGE WITHSTAND CAPABILITY

   INSULATED POWER CABLE ENGINEERS ASSOCIATION (IPCEA), STANDARD S-61-402, SECTION 6.5, FLAME RESISTING TEST

   NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION (NEMA), STANDARD ICS-1970 PART 1-109, INDUSTRIAL CONTROLS AND SYSTEMS TESTS

EXHIBIT 2C2-1

2.C.2.A SAFETY EQUIPMENT STATUS SYSTEM

DESIGN CRITERIA

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE), STANDARD 279, SECTION 4.13, CRITERIA FOR PROTECTION SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS

NRC REGULATORY GUIDE 1.29, SEISMIC DESIGN CLASSIFICATION

NRC REGULATORY GUIDE 1.47, BYPASSED AND INOPERABLE STATUS INDICATION FOR NUCLEAR POWER PLANT SAFETY SYSTEMS

NRC REGULATORY GUIDE 1.75, PHYSICAL INDEPENDENCE OF ELECTRIC SYSTEMS

4) THE SYSTEM SHALL CONSIST OF TWO PORTIONS: ONE REPORTING THE STATUS OF SAFETY TRAIN A EQUIPMENT, THE OTHER REPORTING THE STATUS OF SAFETY TRAIN B EQUIPMENT. THE SYSTEM SHALL ACCEPT CHANNELIZED CLASS IE ASSOCIATED INPUTS. THE SYSTEM INPUTS ARE CLASS IE ASSOCIATED, THEREFORE THE SYSTEM SHALL BE POWERED FROM CLASS IE 125V-DC POWER SUPPLIES.

5) STATUS CONTACTS SHALL CONTINUOUSLY MONITOR THE AVAILABILITY OF CONTROL POWER AND THE POSITION OF CIRCUIT BREAKERS OF ALL AUTOMATICALLY ACTUATED ESF DEVICES. A LOSS OF CONTROL POWER OR DELIBERATE RACKING OUT OF A BREAKER SHALL AUTOMATICALLY INDICATE AT THE COMPONENT LEVEL THE DEVICE WHICH HAS BEEN RENDERED INOPERABLE. SIMULTANEOUSLY, A SYSTEM LEVEL INDICATION WITH AUDIBLE ALARM SHALL BE INITIATED.

DESIGN CRITERIA

6) THE CAPABILITY FOR INITIATING A MANUAL BYPASS INDICATION AND ALARM IS PROVIDED TO INDICATE THE BYPASS CONDITION TO THE OPERATOR FOR THOSE MANUAL VALVES AND OTHER COMPONENTS WHICH ARE NOT AUTOMATICALLY MONITORED. THE INITIATION AND REMOVAL OF MANUAL BYPASS INDICATION WILL BE UNDER ADMINISTRATIVE CONTROL.

7) A SYSTEM OF STATUS CONTACTS SHALL MONITOR THE SAFE OPERATING POSITION OF ALL AUTOMATICALLY ACTUATED ESF DEVICES DURING AN ESFAS. THESE STATUS CONTACTS SHALL AUTOMATICALLY INDICATE AT THE COMPONENT LEVEL THE DEVICE WHICH HAS FAILED TO AUTOMATICALLY COMPLETE THE TRANSITION TO THE SAFE OPERATING POSITION WITHIN A NORMAL TIME PERIOD. SIMULTANEOUSLY, A SYSTEM LEVEL INDICATION WITH AUDIBLE ALARM SHALL BE INITIATED.

8) ALL SYSTEMS AFFECTED BY THE BYPASSING/INOPERABILITY OF A GIVEN COMPONENT WHICH IS SHARED BY MULTIPLE SYSTEMS AUTOMATICALLY GENERATES A BYPASS/INOPERABLE AUDIBLE AND VISUAL ALARM IN EACH SYSTEM AFFECTED.

9) INDICATION AND ANNUNCIATION TEST CAPABILITY IS PROVIDED BY SIMULATING A TROUBLE CONTACT CONDITION WHEN THE TEST BUTTON IS DEPRESSED. THE TEST FEATURE IS INDEPENDENT FOR EACH CHANNEL.

10) A MINIMUM OF TWO LAMPS, CONNECTED IN PARALLEL, SHALL BE FURNISHED FOR EACH ANNUNCIATOR WINDOW, INDICATOR WINDOW, AND INDICATOR SWITCH.

DESIGN CRITERIA

11) ALL COMPONENTS INCLUDING SOLID-STATE DEVICES, TRANSFORMERS, RESISTORS, AND RELAYS SHALL BE OF A QUALITY, AND SHALL BE USED IN THE SYSTEM IN A WAY THAT WILL ENSURE HIGH RELIABILITY, MINIMUM MAINTENANCE REQUIREMENTS, AND LOW FAILURE RATES. EASE OF MAINTENANCE SHALL BE A PRIMARY CONSIDERATION IN THE EQUIPMENT DESIGN OF ALL COMPONENTS OPERATED BELOW THEIR ELECTRICAL AND THERMAL RATED VALUES, TAKING INTO ACCOUNT ALL POSSIBLE COMBINATIONS OF OPERATING ENVIRONMENTS, POWER SOURCE RANGES, AND TRANSIENT CONDITIONS.

12) THE SAFETY EQUIPMENT STATUS SYSTEM SHALL BE LOCATED IN THE CONTROL ROOM AND SEISMICALLY QUALIFIED TO THE FOLLOWING ACCEPTANCE CRITERIA:

    STRUCTURAL FAILURE WHICH WOULD CAUSE THE SYSTEM LOGIC CABINETS AND/OR WINDOW DISPLAYS TO DISLODGE FROM THEIR MOUNTING OR CAUSE ANY PART OF THESE SUBASSEMBLIES TO DETACH AND FALL DURING AN OBE AND SSE SHALL NOT BE PERMITTED.

    THE EQUIPMENT SHALL NOT CAUSE SHORT CIRCUITS OR SPURIOUS SIGNALS THAT WOULD ADVERSELY AFFECT THE CLASS IE EQUIPMENT PROVIDING INPUTS TO THIS SYSTEM.

2.C.2.B SAFETY EQUIPMENT STATUS SYSTEM

SYSTEM DESCRIPTION

1) THE SESS CONSISTS OF TWO PHYSICALLY SEPARATE SYSTEMS. ONE OF THESE SYSTEMS PROVIDES MONITORING AND ANNUNCIATION FOR SAFETY TRAIN A EQUIPMENT, THE OTHER SYSTEM PROVIDES MONITORING AND ANNUNCIATION FOR SAFETY TRAIN B EQUIPMENT.

2) EACH OF THE TRAIN RELATED SYSTEMS CONSISTS OF

   SYSTEM LEVEL WINDOW CABINET,

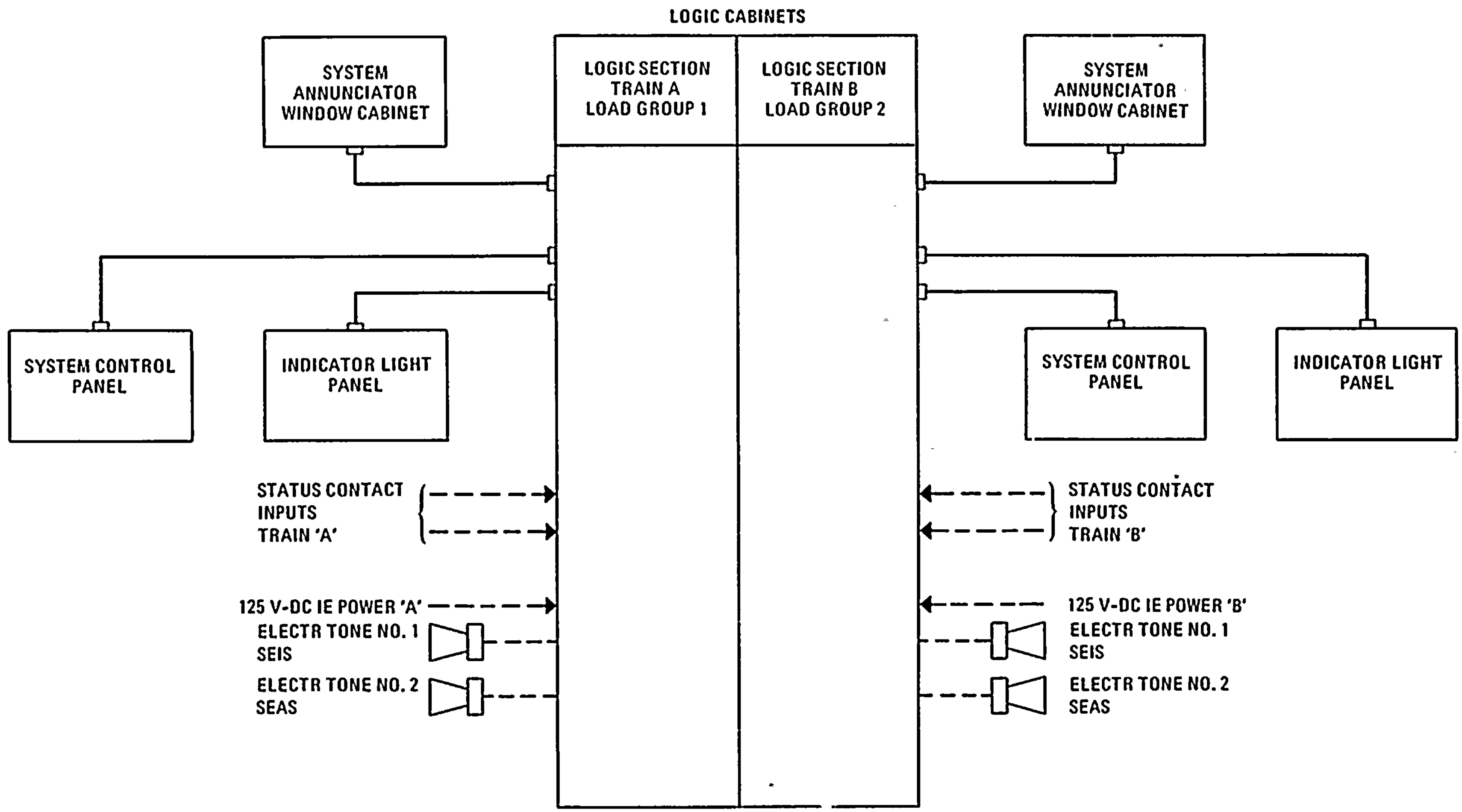
   COMPONENT LEVEL INDICATOR LIGHT PANEL,

   SYSTEM CONTROL PANEL,

   LOGIC CABINET,

   AUDIBLE ALARM DEVICES, AND

   INTERCONNECTING CABLES.



SAFETY EQUIPMENT STATUS SYSTEM
SYSTEM ARRANGEMENT
FIGURE 2C-1A

2.C.2.B SAFETY EQUIPMENT STATUS SYSTEM

3) EACH OF THE TRAIN RELATED SYSTEMS PERFORMS INDICATION OF

   SAFETY EQUIPMENT ACTUATED STATUS (SEAS)

   SAFETY EQUIPMENT INOPERABLE STATUS (SEIS)

4) EACH OF THE TRAIN RELATED SYSTEMS IS POWERED FROM A SEPARATE CLASS IE 125V-DC DISTRIBUTION BUS.

5) THE ANNUNCIATION SEQUENCE OF OPERATION AND TESTING FOR SESS ALARMS IS SAME AS THAT FOR THE PLANT ANNUNCIATOR.

6) SAFETY EQUIPMENT ACTUATED STATUS (SEAS) LOGIC

THE SEAS LOGIC

- CONTINUOUSLY MONITORS THE OPERATING STATUS OF ESF AND ESF SUPPORT SYSTEM ACTUATED DEVICES.

- CONTINUOUSLY MONITORS THE STATUS OF ESFAS SIGNALS.

- PROVIDES "FAILURE TO AUTOMATICALLY ACTUATE" ANNUNCIATION IF ALL ACTUATED DEVICES IN A SYSTEM DO NOT TRANSITION TO THE "SAFE" POSITION REQUIRED TO PERFORM THE ESF SYSTEM FUNCTION AFTER RECEIPT OF AN ESFAS SIGNAL AND AN ALLOWABLE TRANSITION TIME. THIS ANNUNCIATION IS AUDIBLE AND INDICATED ON THE SYSTEM LEVEL WINDOW CABINET.

- PROVIDES INDICATION OF COMPONENTS OR GROUP OF COMPONENTS WHICH FAILED TO TRANSITION TO THE "SAFE" POSITION. THIS INDICATION IS ON THE COMPONENT LEVEL INDICATOR LIGHT PANEL.

- PROVIDES "FAILURE TO AUTOMATICALLY ACTUATE" ANNUNCIATION IF ALL THE ACTUATED DEVICES IN A SUPPORT SYSTEM DO NOT TRANSITION TO THE "SAFE" POSITION REQUIRED TO PERFORM THE ESF SUPPORT SYSTEM FUNCTION.

7) SAFETY EQUIPMENT INOPERABLE STATUS (SEIS) LOGIC

THE SEIS LOGIC

- CONTINUOUSLY MONITORS THE "AVAILABILITY" OF ESF AND ESF SUPPORT SYSTEM COMPONENTS TO RESPOND TO AND PERFORM THE ESF SYSTEM FUNCTIONS WHEN REQUIRED. "AVAILABILITY" CONSISTS OF THE FOLLOWING AS APPROPRIATE

  AVAILABILITY OF CONTROL POWER TO ACTUATE THE DEVICE

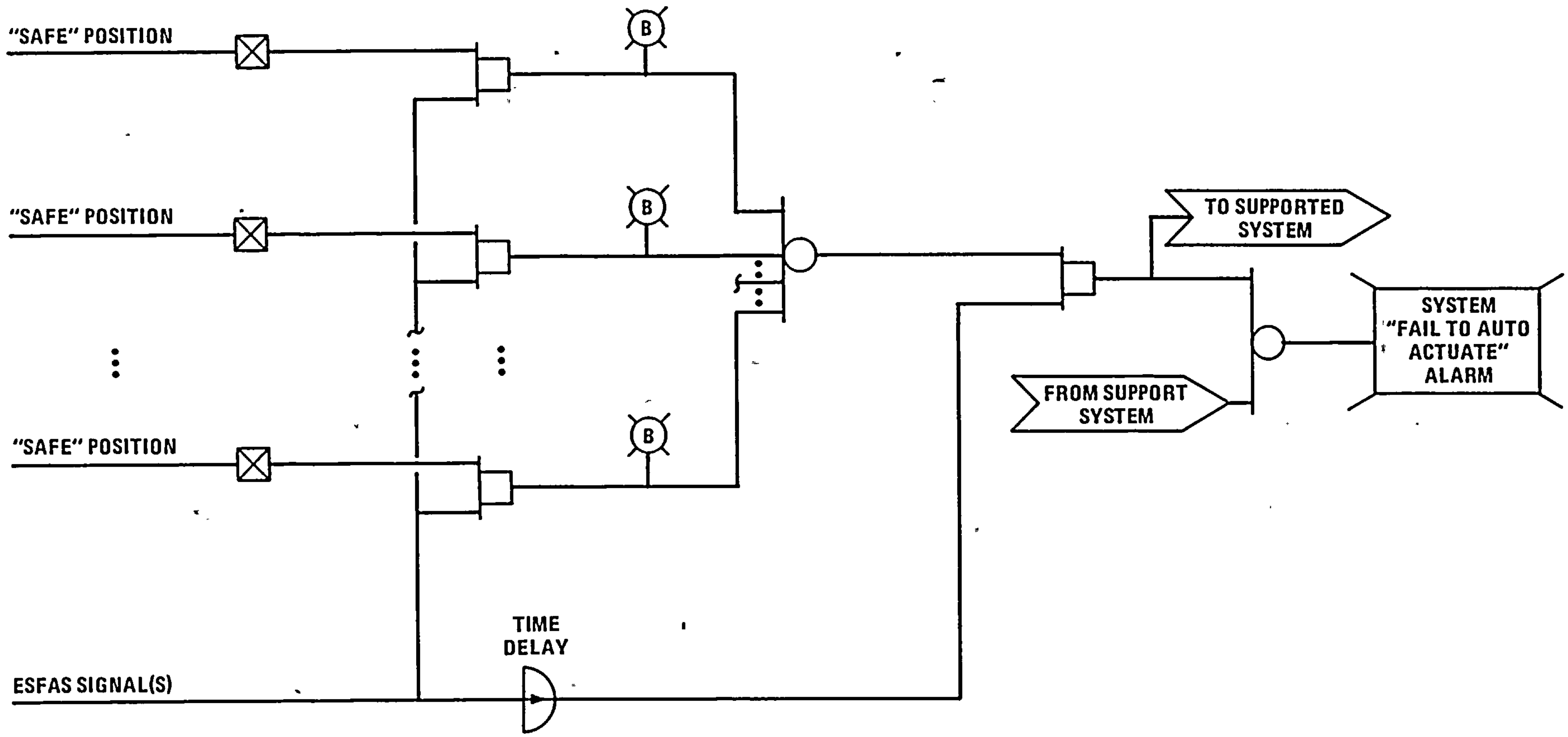
  CIRCUIT BREAKER IS NOT "RACKED-OUT"

  MANUALLY OPERATED VALVE INTENDED FOR USE MORE THAN ONCE A YEAR IS PROPERLY ALIGNED

- PROVIDES "INOPERABLE STATUS" ANNUNCIATION IF ANY MONITORED COMPONENT IN A SYSTEM IS NOT "AVAILABLE" TO PERFORM ITS REQUIRED FUNCTION.

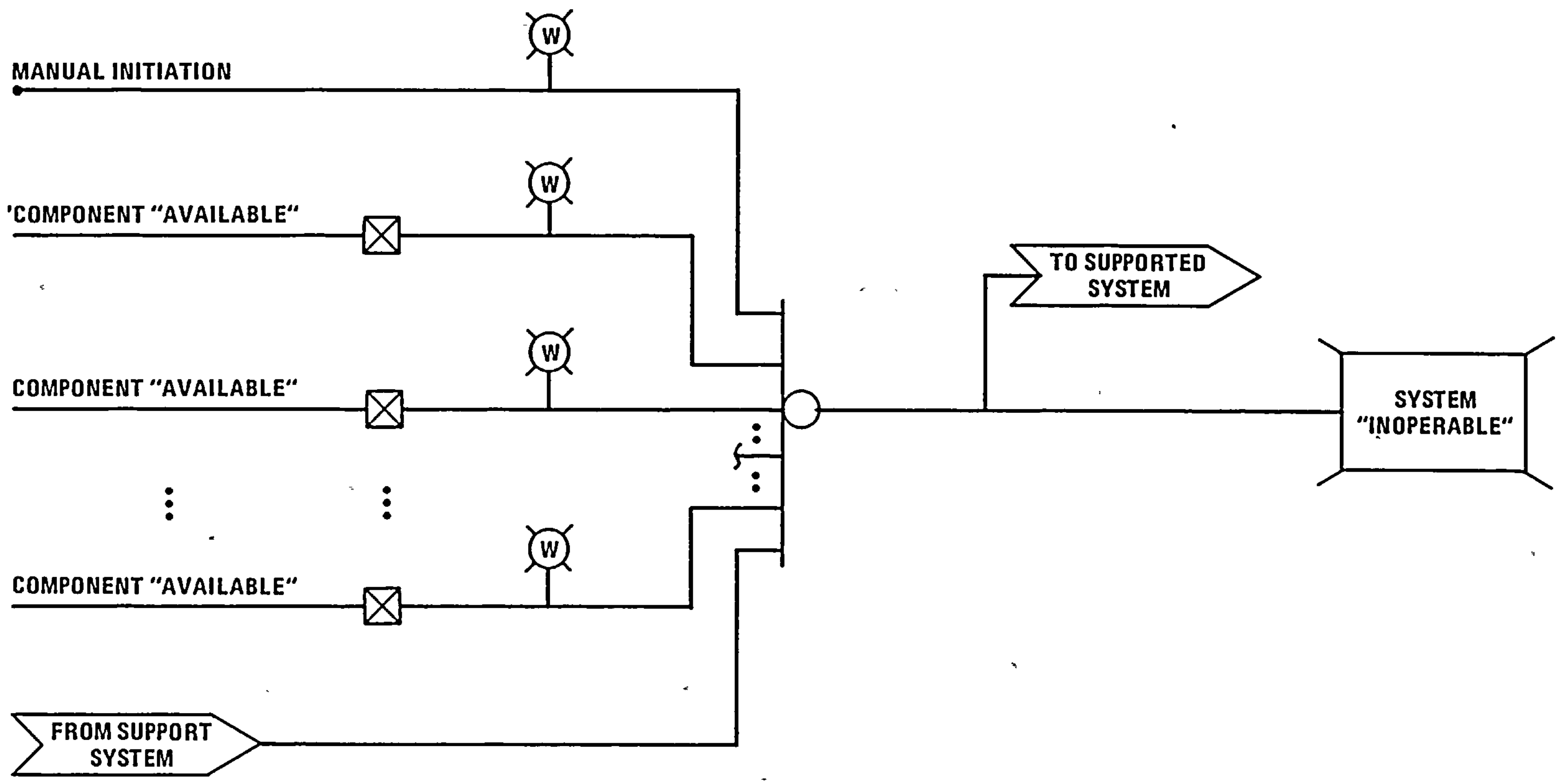
- PROVIDES A MEANS TO MANUALLY INITIATE SYSTEM "INOPERABLE STATUS" IF A MANUAL VALVE INTENDED FOR USE LESS THAN ONCE A YEAR OR OTHER COMPONENT IS REMOVED FROM SERVICE. THIS INITIATION IS UNDER ADMINISTRATIVE CONTROL.

- PROVIDES "INOPERABLE STATUS" ANNUNCIATION IF ANY SUPPORT-SYSTEM-MONITORED COMPONENT IS INOPERABLE OR HAS A MANUAL "INOPERABLE STATUS" INITIATION.



SAFETY EQUIPMENT STATUS SYSTEM (SESS)
SAFETY EQUIPMENT ACTUATED STATUS (SEAS) TYPICAL LOGIC
FOR AN ESF OR ESF SUPPORT SYSTEM

FIGURE 2C-2



SAFETY EQUIPMENT STATUS SYSTEM (SESS)
SAFETY EQUIPMENT INOPERABLE STATUS (SEIS) TYPICAL LOGIC
FOR AN ESF OR ESF SUPPORT SYSTEM

FIGURE 2C-3

CONTAINMENT ISOLATION	MAIN STEAM ISOLATION	HIGH PRESSURE SAFETY INJECTION	RECIRCULATION	AUX FW STEAM GEN NO. 1	AUX FW STEAM GEN NO. 2		
LOW PRESSURE SAFETY INJECTION	PASSIVE SAFETY INJECTION	CONTAINMENT SPRAY	IODINE REMOVAL	CONTAINMENT PURGE ISOLATION			
CONTROL ROOM FILTRATION & ISOLATION	CONTROL BLDG ESSENTIAL ACU'S	FUEL BUILDING ESSENTIAL VENTILATION	CONTAINMENT COMBUSTIBLE GAS CONTROL	BOP ESFAS	NSSS ESFAS		
ESSENTIAL CHILLED WATER	ESSENTIAL COOLING WATER	ESSENTIAL SPRAY POND	DIESEL GENERATOR	IE LOAD CENTER BREAKERS	NON-ESF LOAD SHED		

SESS ANNUNCIATOR PANEL

FIGURE 2C-4

CONTAINMENT ISOLATION	MAIN STEAM ISOLATION	HIGH PRESSURE SAFETY INJECTION	RECIRCULATION	AUX FW STEAM GEN NO. 1	AUX FW STEAM GEN NO. 2	
LOW PRESSURE SAFETY INJECTION	PASSIVE SAFETY INJECTION	CONTAINMENT SPRAY	IODINE REMOVAL	CONTAINMENT PURGE ISOLATION		
CONTROL ROOM FILTRATION & ISOLATION	CONTROL BLDG ESSENTIAL ACU'S	FUEL BUILDING ESSENTIAL VENTILATION	CONTAINMENT COMBUSTIBLE GAS CONTROL	BOP ESFAS	NSSS ESFAS	
ESSENTIAL CHILLED WATER	ESSENTIAL COOLING WATER	ESSENTIAL SPRAY POND	DIESEL GENERATOR	IE LOAD CENTER BREAKERS	NON-ESF LOAD SHED	

MANUAL BYPASS INITIATE

ALARM RESET	FLASHER RESET	LAMP RESET	BYPASS/INOP TEST	STATUS TEST	STATUS DISPLAY

SYSTEM RESET AND TEST

SESS CONTROL PANEL

FIGURE 2C-5

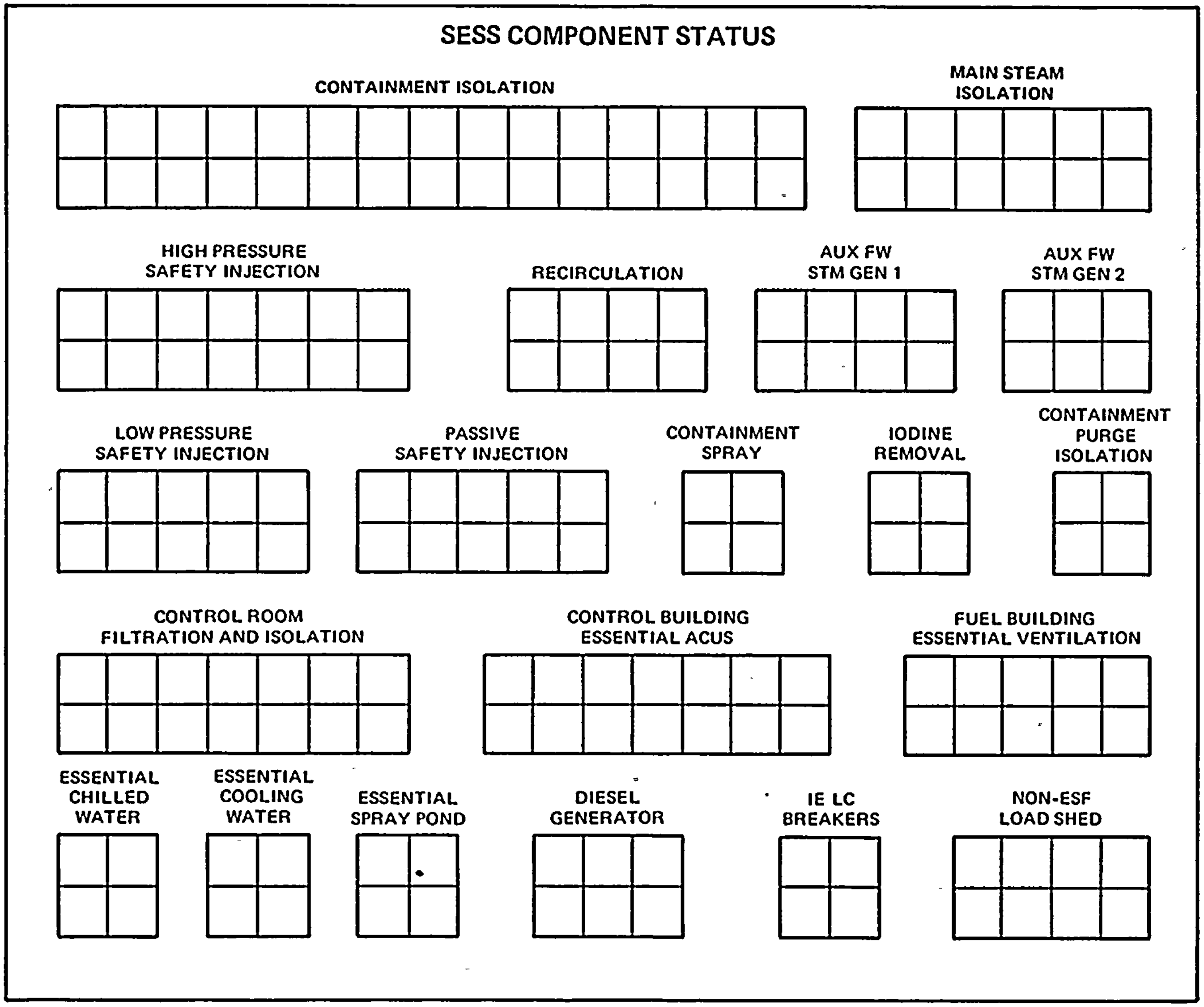
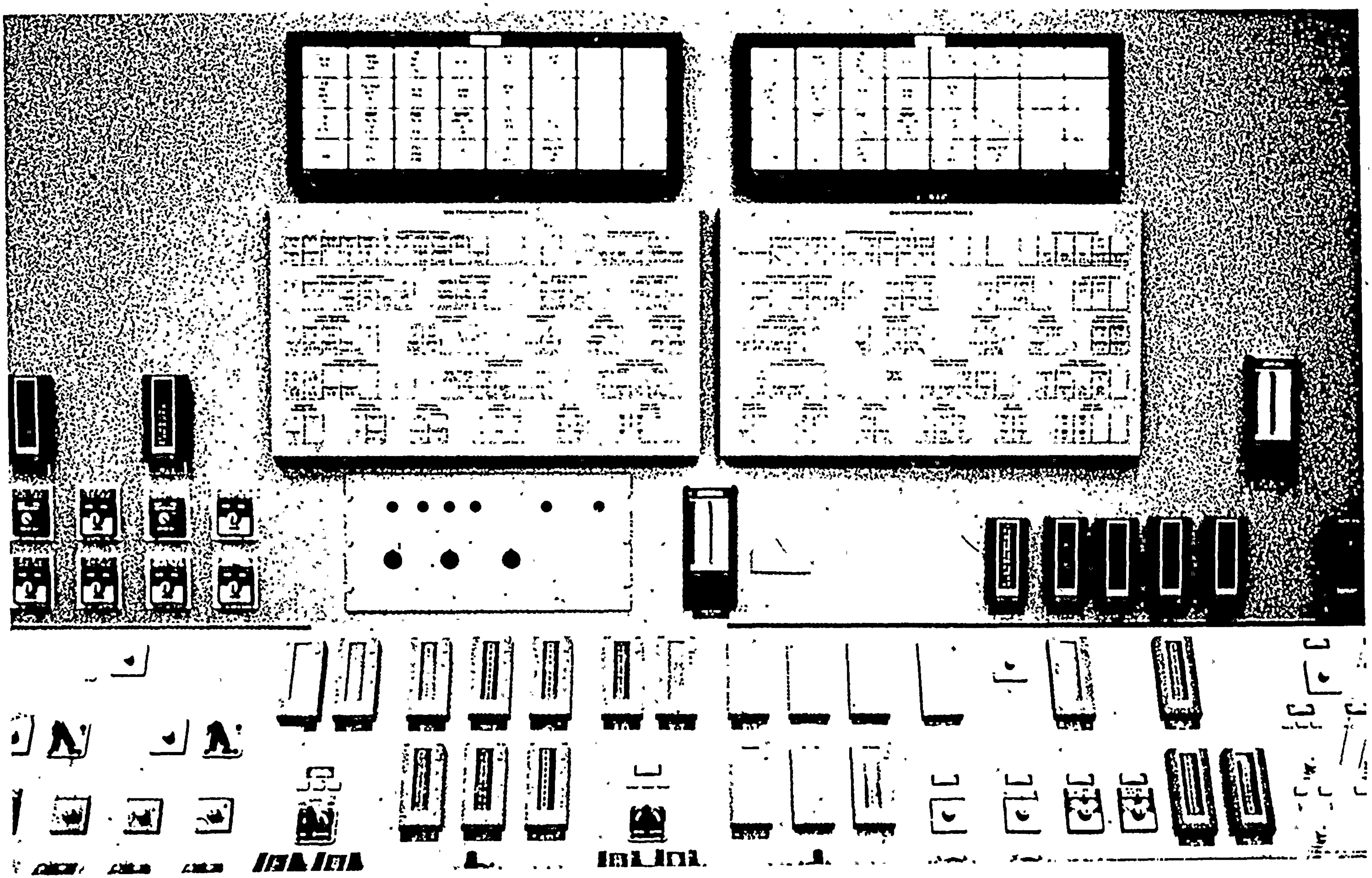
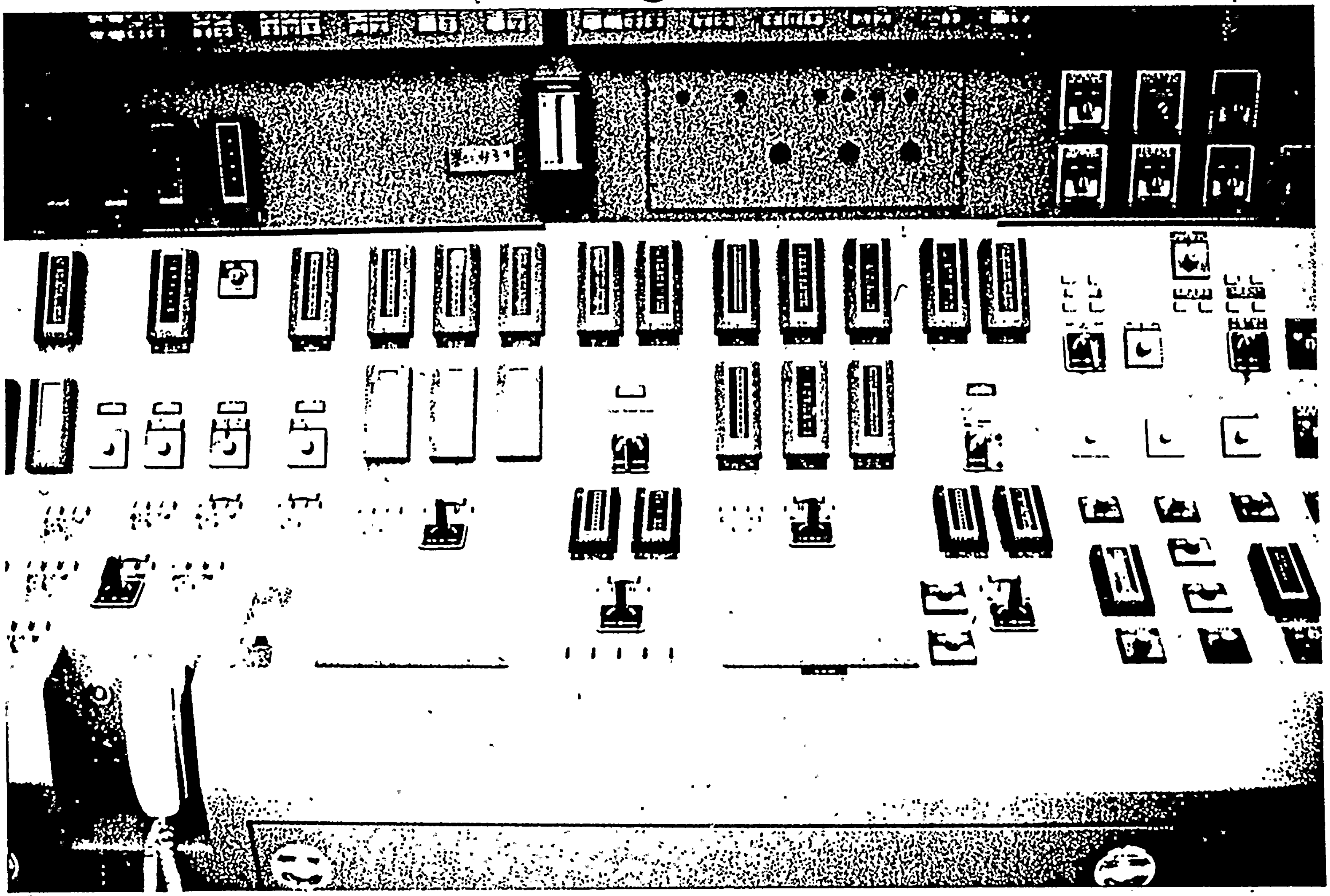

SESS COMPONENT STATUS
CONTAINMENT ISOLATION
MAIN STEAM ISOLATION
HIGH PRESSURE SAFETY INJECTION
RECIRCULATION
AUX FW STM GEN 1
AUX FW STM GEN 2
LOW PRESSURE SAFETY INJECTION
PASSIVE SAFETY INJECTION
CONTAINMENT SPRAY
IODINE REMOVAL
CONTAINMENT PURGE ISOLATION
CONTROL ROOM FILTRATION AND ISOLATION
CONTROL BUILDING ESSENTIAL ACUS
FUEL BUILDING ESSENTIAL VENTILATION
ESSENTIAL CHILLED WATER
ESSENTIAL COOLING WATER
ESSENTIAL SPRAY POND
DIESEL GENERATOR
IE LC BREAKERS
NON-ESF LOAD SHED

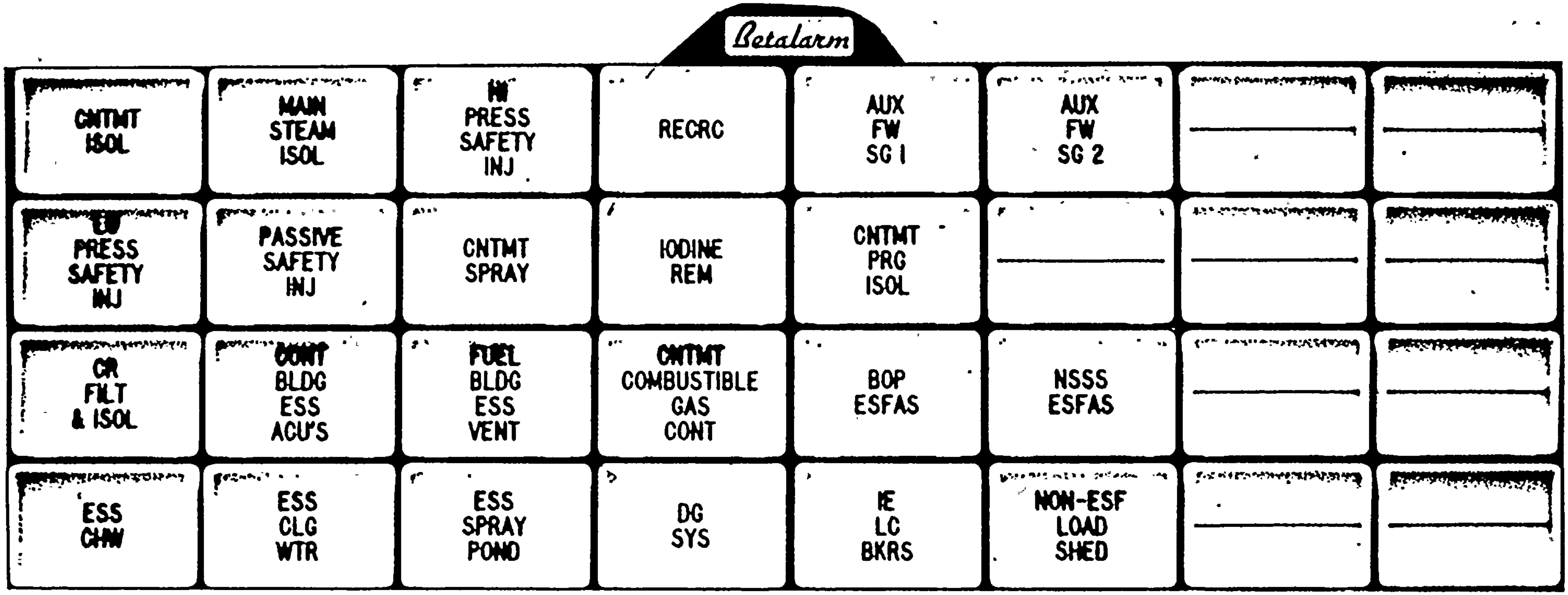
FIGURE 2C-6



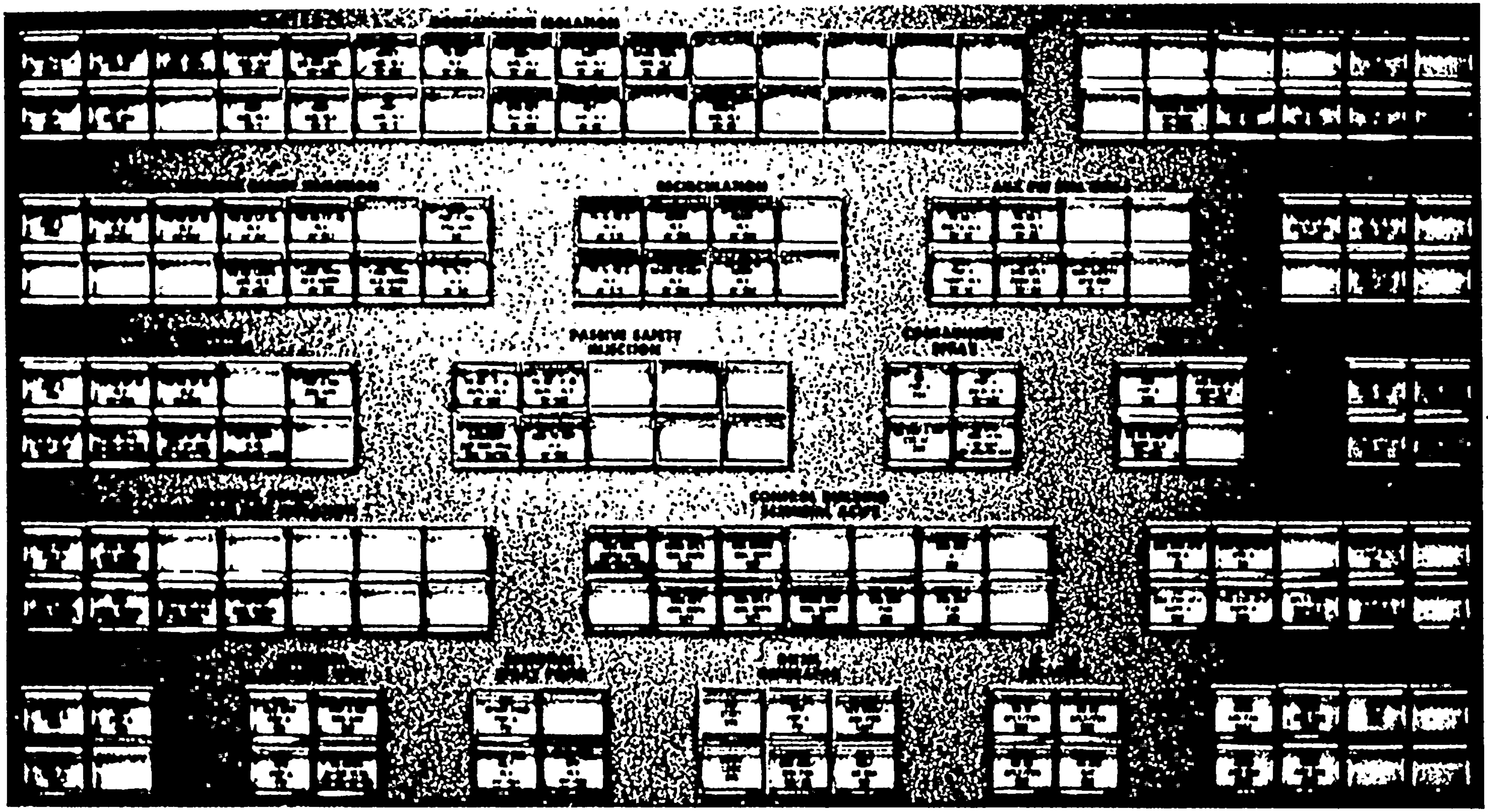
SESS PANELS
SLIDE 10



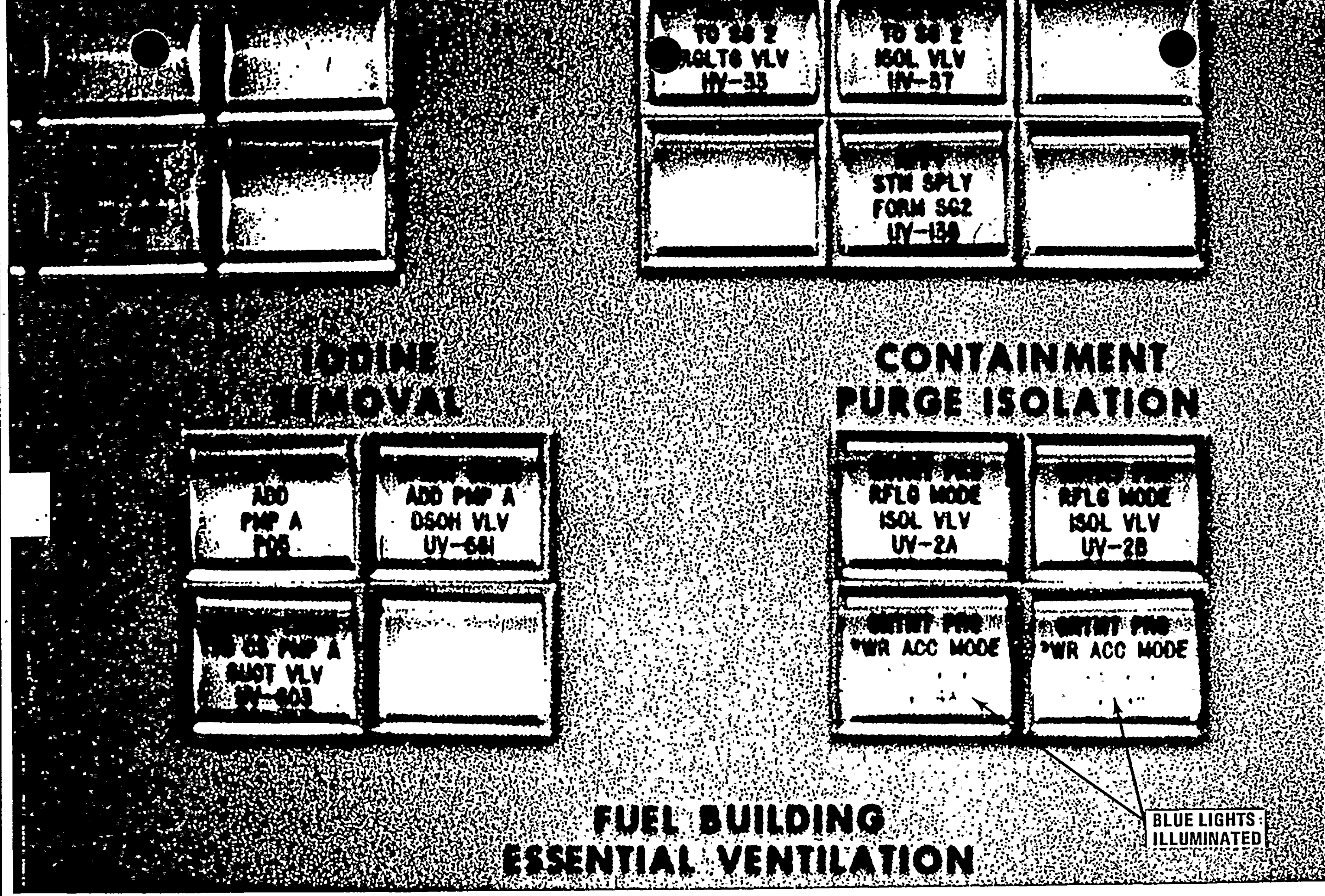
SESS CONTROL PANELS
SLIDE 11



SESS ANNUNCIATOR PANEL
SLIDE 12

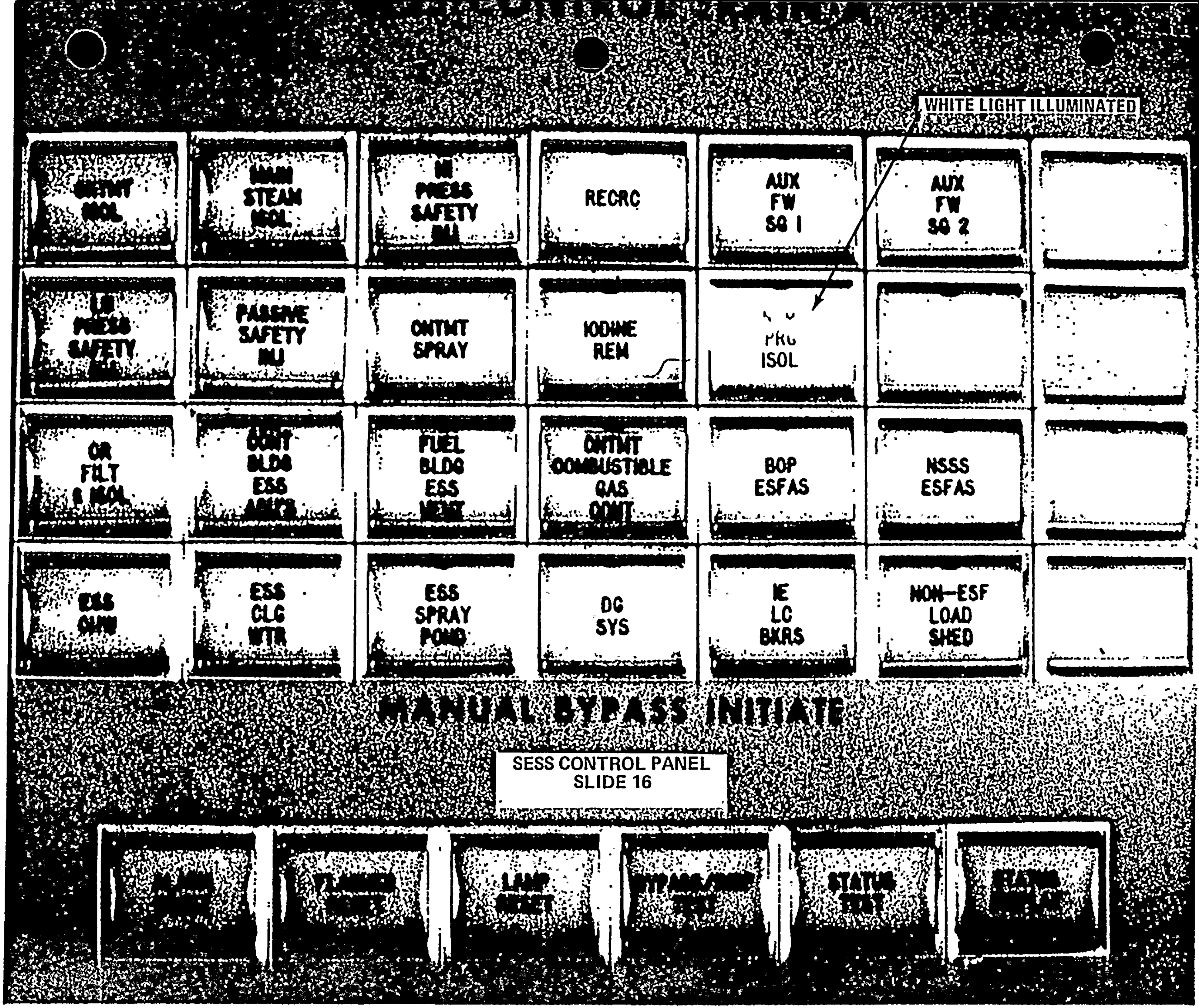


SESS COMPONENT STATUS
SLIDE 13



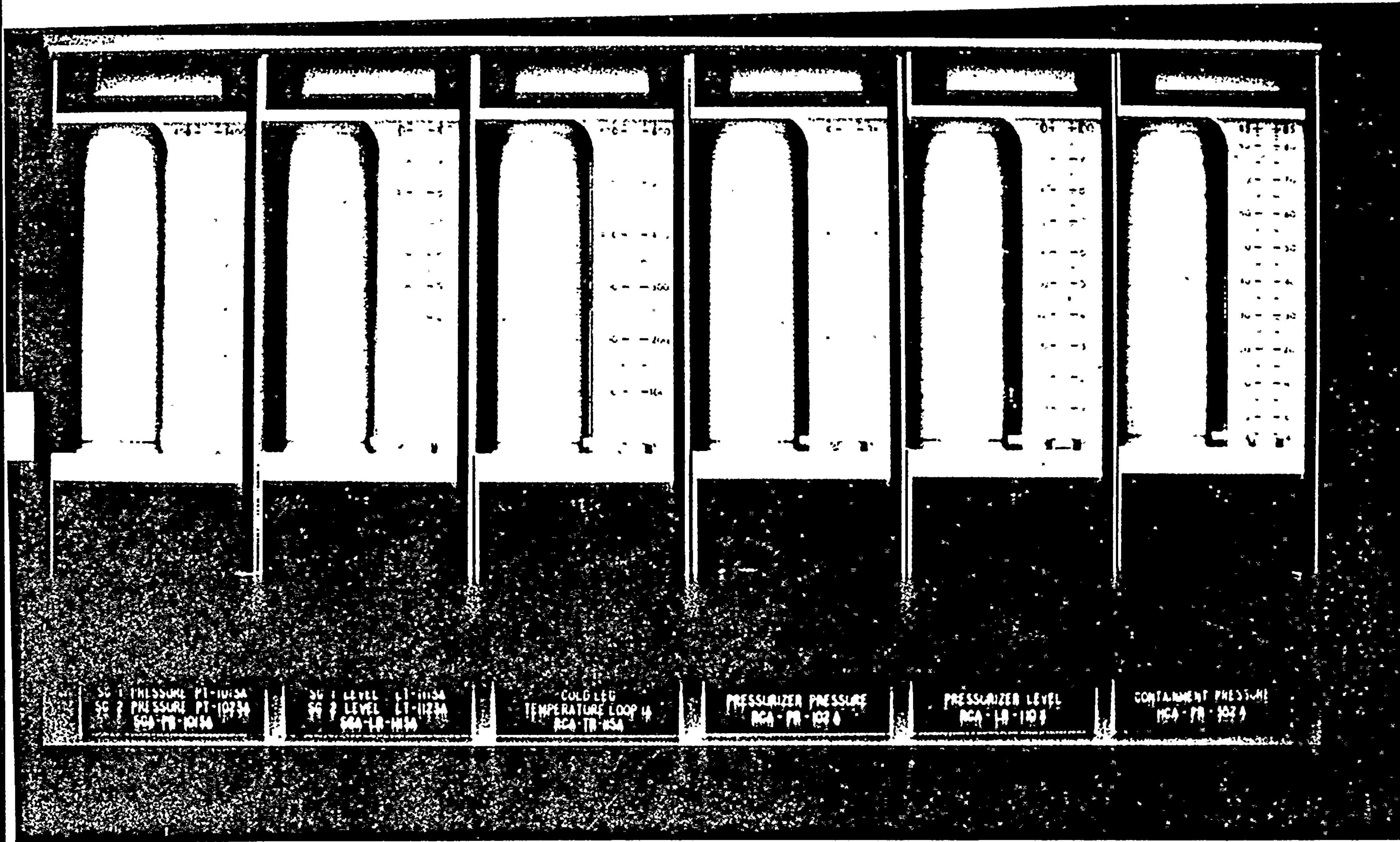
SESS COMPONENT STATUS
SLIDE 14

SESS CONTROL PANEL
SLIDE 15



SESS CONTROL PANEL
SLIDE 16

ESF PARAMETER DISPLAY
SLIDE 17



POST ACCIDENT MONITORING
RECORDERS
SLIDE 18

2.C.3.A POST ACCIDENT MONITORING

DESIGN CRITERIA

POST ACCIDENT MONITORING INSTRUMENTATION SHALL BE PROVIDED IN ACCORDANCE WITH REGULATORY GUIDE 1.97, REVISION 2, "INSTRUMENTATION FOR LIGHT-WATER-COOLED NUCLEAR POWER PLANTS TO ACCESS PLANT AND ENVIRONS CONDITIONS DURING AND FOLLOWING AN ACCIDENT."

1) THE FOLLOWING DESIGN AND QUALIFICATION CRITERIA CATEGORIES SHALL BE USED:

CATEGORY 1:

- INSTRUMENTATION SHALL BE QUALIFIED IN ACCORDANCE WITH REGULATORY GUIDE 1.89 (NUREG-0588) AND REGULATORY GUIDE 1.100

- INSTRUMENTATION SHALL BE DESIGNED SO THAT ANY SINGLE FAILURE SHALL NOT RESULT IN LOSS OF THE SURVEILLANCE FUNCTION ON THE SYSTEM LEVEL AFTER AN INCIDENT. REDUNDANT OR DIVERSE CHANNELS SHALL BE ELECTRICALLY INDEPENDENT AND PHYSICALLY SEPARATED IN ACCORDANCE WITH REGULATORY GUIDE 1.75

- INSTRUMENTATION SHALL BE POWERED FROM CLASS IE POWER

- INSTRUMENTATION SHALL BE AVAILABLE PRIOR TO AN ACCIDENT EXCEPT AS PROVIDED IN IEEE 279 PARAGRAPH 4.11 OR AS SPECIFIED IN TECHNICAL SPECIFICATIONS

- INSTRUMENTATION SHALL BE QUALITY CLASS Q

2.C.3.A POST ACCIDENT MONITORING

DESIGN CRITERIA

- CONTINUOUS INDICATION SHALL BE PROVIDED
- RECORDING SHALL BE PROVIDED (ONE CHANNEL)
- TRANSMISSION OF SIGNALS FOR OTHER USE SHALL BE THROUGH ISOLATION DEVICES
- TYPES A, B, AND C INSTRUMENTS SHALL BE SPECIFICALLY IDENTIFIED ON THE CONTROL PANELS.

CATEGORY 2:

- SENSORS SHALL BE QUALIFIED IN ACCORDANCE WITH REGULATORY GUIDE 1.89 (NUREG-0588). SEISMIC QUALIFICATION IN ACCORDANCE WITH REGULATORY GUIDE 1.100 SHALL BE PROVIDED WHEN THE INSTRUMENTATION IS PART OF A SAFETY RELATED SYSTEM.
- INSTRUMENTATION SHALL BE POWERED FROM A NON-CLASS IE INSTRUMENT BUS WITH CLASS IE POWER AS BACKUP OR FROM CLASS IE POWER
- THE OUT-OF-SERVICE INTERVAL SHALL BE BASED ON NORMAL TFCHNICAL SPECIFICATION REQUIREMENTS ON THE APPLICABLE SYSTEM.
- SENSORS SHALL BE QUALITY CLASS Q, (IN SOME CASES, QUALITY CLASS R) DISPLAYS SHALL BE QUALITY CLASS R

2.C.3.A POST ACCIDENT MONITORING

DESIGN CRITERIA

- DISPLAY SHALL BE ON AN INDIVIDUAL INSTRUMENT OR ON DEMAND ON A CRT

- DATA RECORDING SHALL BE PROVIDED FOR EFFLUENT RADIOACTIVITY MONITORS, AREA RADIATION MONITORS, AND METEOROLOGY MONITORS. DEDICATED RECORDERS SHALL BE PROVIDED WHERE DIRECT OR IMMEDIATE TREND OR TRANSIENT INFORMATION IS ESSENTIAL FOR OPERATOR INFORMATION OR ACTION.

- TRANSMISSION OF SIGNALS FOR OTHER USE SHALL BE THROUGH ISOLATION DEVICES.

- TYPES A, B, AND C INSTRUMENTS SHALL BE SPECIFICALLY IDENTIFIED ON THE CONTROL PANELS.

CATEGORY 3:

- INSTRUMENTATION SHALL BE OF HIGH-QUALITY COMMERCIAL GRADE AND SHALL BE SELECTED TO WITHSTAND THE SERVICE ENVIRONMENT.

- DISPLAY SHALL BE ON AN INDIVIDUAL INSTRUMENT OR ON DEMAND ON A CRT. DATA RECORDING SHALL BE PROVIDED FOR EFFLUENT RADIOACTIVITY MONITORS, AREA RADIATION MONITORS, AND METEOROLOGY MONITORS. DEDICATED RECORDERS SHALL BE PROVIDED WHERE DIRECT OR IMMEDIATE TREND OR TRANSIENT INFORMATION IS ESSENTIAL FOR OPERATOR INFORMATION OR ACTION.

EXHIBIT 2C3-3

2.C.3.A POST ACCIDENT MONITORING

DESIGN CRITERIA

2) SERVICING, TESTING, AND CALIBRATION PROGRAMS SHALL BE PROVIDED TO MAINTAIN THE CAPABILITY OF THE MONITORING INSTRUMENTATION. FOR THOSE INSTRUMENTS WHERE THE REQUIRED INTERVAL BETWEEN TESTING WILL BE LESS THAN THE NORMAL TIME INTERVAL BETWEEN GENERATING STATION SHUTDOWNS, A CAPABILITY FOR TESTING DURING POWER OPERATION SHALL BE PROVIDED.

3) WHENEVER MEANS FOR REMOVING CHANNELS FROM SERVICE ARE INCLUDED IN THE DESIGN, THE DESIGN SHALL FACILITATE ADMINISTRATIVE CONTROL OF THE ACCESS TO SUCH REMOVAL MEANS.

4) THE DESIGN SHALL FACILITATE ADMINISTRATIVE CONTROL OF THE ACCESS TO ALL SETPOINT ADJUSTMENTS, MODULE CALIBRATION ADJUSTMENTS, AND TEST POINTS.

5) THE MONITORING INSTRUMENTATION DESIGN SHALL MINIMIZE THE DEVELOPMENT OF CONDITIONS THAT WOULD CAUSE METERS, ANNUNCIATORS, RECORDERS, ALARMS, ETC., TO GIVE ANOMALOUS INDICATIONS POTENTIALLY CONFUSING TO THE OPERATOR.

6) THE INSTRUMENTATION SHALL BE DESIGNED TO FACILITATE THE RECOGNITION, LOCATION, REPLACEMENT, REPAIR, OR ADJUSTMENT OF MALFUNCTIONING COMPONENTS OR MODULES.

7) TO THE EXTENT PRACTICABLE, MONITORING INSTRUMENTATION INPUTS SHALL BE FROM SENSORS THAT DIRECTLY MEASURE THE DESIRED VARIABLES.

EXHIBIT 2C3-4

2.C.3.A POST ACCIDENT MONITORING

DESIGN CRITERIA

8) TO THE EXTENT PRACTICAL, THE SAME INSTRUMENTS SHALL BE USED FOR ACCIDENT MONITORING AS ARE USED FOR THE NORMAL OPERATIONS OF THE PLANT TO ENABLE THE OPERATOR TO USE, DURING ACCIDENT SITUATIONS, INSTRUMENTS WITH WHICH HE IS MOST FAMILIAR. HOWEVER, WHERE THE REQUIRED RANGE OF MONITORING INSTRUMENTATION RESULTS IN A LOSS OF INSTRUMENTATION SENSITIVITY IN THE NORMAL OPERATING RANGE SEPARATE INSTRUMENTS SHALL BE USED.

9) PERIODIC TESTING SHALL BE IN ACCORDANCE WITH THE APPLICABLE PORTIONS OF REGULATORY GUIDE 1.118 PERTAINING TO TESTING OF INSTRUMENTS CHANNELS. (NOTE: RESPONSE TIME TESTING NOT USUALLY NEEDED.)

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

1) TYPE A VARIABLES: THOSE VARIABLES TO BE MONITORED THAT PROVIDE THE PRIMARY INFORMATION REQUIRED TO PERMIT THE CONTROL ROOM OPERATOR TO TAKE SPECIFIC MANUALLY CONTROLLED ACTIONS FOR WHICH NO AUTOMATIC CONTROL IS PROVIDED AND WHICH ARE REQUIRED FOR SAFETY SYSTEMS TO ACCOMPLISH THEIR SAFETY FUNCTION FOR DESIGN BASIS ACCIDENT EVENTS. PRIMARY INFORMATION IS THAT WHICH IS ESSENTIAL FOR THE DIRECT ACCOMPLISHMENT OF THE SPECIFIED SAFETY FUNCTIONS; IT DOES NOT INCLUDE THOSE VARIABLES WHICH ARE ASSOCIATED WITH CONTINGENCY ACTIONS THAT MAY ALSO BE IDENTIFIED IN WRITTEN PROCEDURES.

A C-E REVIEW OF EMERGENCY GUIDELINES (LOCA, MSLB, SG TUBE RUPTURE, ATWS, REACTOR TRIP, LOSS OF FEED AND LOSS OF FORCED FLOW) IS UNDERWAY TO IDENTIFY FOR EACH EVENT:

REQUIRED MANUAL ACTION

INSTRUMENT CONSULTED

REQUIRED RANGE AND ACCURACY

CURRENT QUALIFICATION STATUS

COMPLETION IS EXPECTED IN NOVEMBER, 1981.

IN ADDITION, A REVIEW OF THE EMERGENCY PROCEDURES AFTER THEY ARE DEVELOPED WILL BE PERFORMED TO ENSURE THE REQUIRED VARIABLES HAVE BEEN IDENTIFIED

EXHIBIT 2C3-6

2.C.3.B POST ACCIDENT MONITORING SYSTEM DESCRIPTION

2) TYPE B VARIABLES: THOSE VARIABLES THAT PROVIDE INFORMATION TO INDICATE WHETHER PLANT SAFETY FUNCTIONS ARE BEING ACCOMPLISHED. PLANT SAFETY FUNCTIONS ARE (1) REACTIVITY CONTROL, (2) CORE COOLING, (3) MAINTAINING REACTOR COOLANT SYSTEM INTEGRITY, AND (4) MAINTAINING CONTAINMENT INTEGRITY (INCLUDING RADIOACTIVE EFFLUENT CONTROL). VARIABLES ARE LISTED WITH DESIGNATED RANGES AND CATEGORY FOR DESIGN AND QUALIFICATION REQUIREMENTS. KEY VARIABLES ARE INDICATED BY DESIGN AND QUALIFICATION CATEGORY 1.

- CATEGORY 1

VARIABLE	REQUIREMENT	DESIGN FEATURE
CONTAINMENT SUMP WATER LEVEL - WIDE RANGE	BOTTOM OF CONTAINMENT TO 600,000 GALLON EQUIVALENT	SENSOR RANGE - 11 FT. (+6 IN. ABOVE SUMP TO +6 IN. ABOVE MAXIMUM EXPECTED FLOOD LEVEL) DISPLAY - 2 CHANNELS, CLASS IE, RECORDING ON ONE CHANNEL

2.C.3.B POST ACCIDENT MONITORING SYSTEM DESCRIPTION

TYPE B CATEGORY 1 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
CONTAINMENT PRESSURE	0 TO DESIGN PRESSURE (60 PSIG) 10 PSIA TO DESIGN PRESSURE (60 PSIG)	SENSOR RANGE - -5 PSIG TO 180 PSIG DISPLAY - 2 CHANNELS, CLASS IE, RECORDING ON ONE CHANNEL
CONTAINMENT ISOLATION VALVE POSITION (EXCLUDING CHECK VALVES)	CLOSED - NOT CLOSED	DISPLAY - VALVE STATUS FOR ALL AUTOMATIC OR REMOTE MANUAL CONTAINMENT ISOLATION VALVES

CATEGORY 2

VARIABLE	REQUIREMENT	DESIGN FEATURE
CONTAINMENT SUMP WATER LEVEL - NARROW RANGE	SUMP	SENSOR RANGE - +6 IN. ABOVE BOTTOM OF RADWASTE DRAIN SUMP TO +6 IN. ABOVE TOP OF SUMP DISPLAY - 1/SUMP, SENSOR QUALIFIED TO POST LOCA ENVIRONMENT, SEISMIC CATEGORY II

EXHIBIT 2C3-8

2.C.3.B POST ACCIDENT MONITORING
SYSTEM DESCRIPTION

- TYPE B CATEGORY 3

VARIABLE	REQUIREMENT	DESIGN FEATURE
RCS SOLUBLE BORON CONCENTRATION	0 TO 6000 PPM	POST ACCIDENT SAMPLING SYSTEM: RANGE - 0 TO 6000 PPM, REMOTE SAMPLE, IN-LINE AUTOMATIC (GRAB SAMPLE BACKUP)

3) TYPE C VARIABLES - THOSE VARIABLES THAT PROVIDE INFORMATION TO INDICATE THE POTENTIAL FOR BEING BREACHED OR THE ACTUAL BREACH OF THE BARRIERS TO FISSION PRODUCT RELEASES. THE BARRIERS ARE (1) FUEL CLADDING, (2) PRIMARY COOLANT PRESSURE BOUNDARY, AND (3) CONTAINMENT.

- CATEGORY 1

VARIABLE	REQUIREMENT	DESIGN FEATURE
RADIOACTIVITY CONCENTRATION OR RADIATION LEVEL IN CIRCULATING PRIMARY COOLANT	1/2 TECH SPEC LIMIT TO 100 TIMES TECH SPEC LIMIT, R/HR	SENSOR RANGE - 1R/HR TO 10^5R/HR DISPLAY - CRT, NON-CLASS IE, & 2 SAFETY RELATED CHANNEL DISPLAYS AT CABINET, CLASS IE, RECORDING ON ONE CHANNEL
CONTAINMENT PRESSURE	10 PSIA TO DESIGN PRESSURE (60 PSIG) 10 PSIA TO 3 TIMES DESIGN PRESSURE	SENSOR RANGE - -5 PSIG TO 180 PSIG DISPLAY - 2 CHANNELS, CLASS IE, RECORDING ON ONE CHANNEL

EXHIBIT 2C3-10

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE C CATEGORY 1 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
CONTAINMENT SUMP WATER LEVEL - WIDE RANGE	BOTTOM OF CONTAINMENT TO 600,000 GALLON EQUIVALENT	SENSOR RANGE - 11 FT. (+6 IN. ABOVE SUMP TO +6 IN. ABOVE MAXIMUM EXPECTED FLOOD LEVEL) DISPLAY - 2 CHANNELS, CLASS IE, RECORDING ON ONE CHANNEL
CONTAINMENT HYDROGEN CONCENTRATION	0 TO 10% (CAPABLE OF OPERATING FROM 10 PSIA TO MAXIMUM DESIGN PRESSURE)	SENSOR RANGE - 0 TO 10% AVAILABLE 30 MINUTES AFTER INITIATION OF SAFETY INJECTION CAPABLE OF OPERATING FROM -5 PSIG TO 60 PSIG (CONTAINMENT DESIGN PRESSURE) DISPLAY - 2 CHANNELS, CLASS IE RECORDING ON ONE CHANNEL

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

• TYPE C CATEGORY 2

VARIABLE	REQUIREMENT	DESIGN FEATURE
CONTAINMENT SUMP WATER LEVEL - NARROW RANGE	SUMP	SENSOR RANGE - +6 IN. ABOVE BOTTOM OF RADWASTE DRAIN SUMP TO 6 IN. ABOVE TOP OF SUMP DISPLAY - 1/SUMP SENSOR QUALIFIED TO POST LOCA ENVIRONMENT, SEISMIC CATEGORY II
CONTAINMENT EFFLUENT RADIOACTIVITY - NOBLE GASES FROM IDENTIFIED RELEASE POINTS	$10^{-6}\mu$CI/CC TO $10^{-2}\mu$CI/CC	SENSOR RANGE - $10^{-6}\mu$CI/CC TO $10^{-2}\mu$CI/CC AT PLANT VENT DISPLAY - CRT SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT, SEISMIC CATEGORY II
RADIATION EXPOSURE RATE (INSIDE BUILDINGS OR AREAS WHICH ARE IN DIRECT CONTACT WITH PRIMARY CONTAINMENT WHERE PENETRATIONS AND HATCHES ARE LOCATED)	10^{-1}R/HR TO 10^{4}R/HR	13 MONITORS SENSOR RANGE - 10^{-1}R/HR TO 10^{4}R/HR DISPLAY - CRT SENSORS QUALIFIED TO POST ACCIDENT ENVIRONMENT, SEISMIC CATEGORY II

EXHIBIT 2C3-12

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE C CATEGORY 2 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
EFFLUENT RADIOACTIVITY-NOBLE GASES (FROM BUILDINGS INDICATED ABOVE)	10^{-6} µCI/CC TO 10^{3} µCI/CC	SENSOR RANGE - 10^{-6} µCI/CC TO 10^{5} µCI/CC AT FUEL BUILDING VENT DISPLAY - CRT SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT, SEISMIC CATEGORY II

- CATEGORY 3

VARIABLE	REQUIREMENT	DESIGN FEATURE
ANALYSIS OF PRIMARY COOLANT (GAMMA SPECTRUM)	10µCI/GM TO 10 CI/GM OR TID-14844 SOURCE TERM IN COOLANT VOLUME	POST ACCIDENT SAMPLING SYSTEM: RANGE - 10^{-3} µCI/CC TO 10 CI/CC REMOTE SAMPLE, ISOTOPIC, IN-LINE AUTOMATIC (GRAB SAMPLE BACKUP)
CONTAINMENT AREA RADIATION	1 R/HR TO 10^{4} R/HR	SENSOR RANGE - 1 R/HR TO 10^{4} R/HR DISPLAY - CRT

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE C CATEGORY 3 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
EFFLUENT RADIOACTIVITY-NOBLE GAS EFFLUENT FROM CONDENSER AIR REMOVAL SYSTEM EXHAUST	10^{-6} µCI/CC TO 10^{-2} µCI/CC	SENSOR RANGE 10^{-6} µCI/CC TO 10^{+3} µCI/CC DISPLAY CRT SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT

4) TYPE D VARIABLES - THOSE VARIABLES THAT PROVIDE INFORMATION TO INDICATE THE OPERATION OF INDIVIDUAL SAFETY SYSTEMS AND OTHER SYSTEMS IMPORTANT TO SAFETY. THESE VARIABLES ARE TO HELP THE OPERATOR MAKE APPROPRIATE DECISIONS IN USING THE INDIVIDUAL SYSTEMS IMPORTANT TO SAFETY IN MITIGATING THE CONSEQUENCES OF AN ACCIDENT.

- CATEGORY 1

VARIABLE	REQUIREMENT	DESIGN FEATURE
CONDENSATE STORAGE TANK LEVEL	PLANT SPECIFIC	SENSOR RANGE - 0 TO 50 FT DISPLAY - 2 CHANNELS, CLASS IE RECORDING ON ONE CHANNEL

EXHIBIT 2C3-14

2.C.3.B POST ACCIDENT MONITORING SYSTEM DESCRIPTION

- TYPE D CATEGORY 2

VARIABLE	REQUIREMENT	DESIGN FEATURE
PRIMARY SYSTEM SAFETY RELIEF VALVE POSITIONS	CLOSED - NOT CLOSED	PVNGS WILL COMPLY
PRESSURIZER HEATER STATUS	ELECTRIC CURRENT	PVNGS WILL COMPLY
SAFETY/RELIEF VALVE POSITIONS OR MAIN STEAM FLOW	CLOSED - NOT CLOSED	PVNGS WILL COMPLY
AUXILIARY FEEDWATER FLOW	0 TO 110% DESIGN FLOW	SENSOR RANGE - 0 TO 2000 GPM = 0 TO 228% DISPLAY - 2 CHANNELS, CLASS IE
CONTAINMENT ATMOSPHERE TEMPERATURE	40^{O}F TO 400^{O}F	PVNGS WILL COMPLY
CONTAINMENT SUMP WATER TEMPERATURE	50^{O}F TO 250^{O}F	DESIGN IMPLEMENTATION IS IN REVIEW

EXHIBIT 2C3-15

2.C.3.B POST ACCIDENT MONITORING SYSTEM DESCRIPTION

- TYPE D CATEGORY 2 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
ESSENTIAL COOLING WATER SYSTEM TEMPERATURE	32^{0}F TO 200^{0}F	SENSOR RANGE - 0 TO 200^{0}F DISPLAY - 1/TRAIN, SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT, SEISMIC CATEGORY II
ESSENTIAL COOLING WATER SYSTEM FLOW	0 TO 110% DESIGN FLOW	SENSOR RANGE - 0 TO 20,000 GPM = 0 TO 114% DISPLAY - 1/TRAIN, SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT, SEISMIC CATEGORY II
EMERGENCY VENTILATION DAMPER POSITION	OPEN - CLOSED STATUS	DISPLAY - DAMPER STATUS FOR ALL AUTOMATIC OR REMOTE MANUAL EMERGENCY VENTILATION DAMPERS
STATUS OF STANDBY POWER AND OTHER ENERGY SOURCES	VOLTAGES, CURRENTS, PRESSURES	DISPLAY - ESF BUS VOLTAGES AND CURRENTS, CLASS IE LOW PRESSURE ALARMS ON MSIV, MFIV AND ATMOSPHERIC DUMP VALVE ACCUMULATORS. SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT, SEISMIC CATEGORY II

EXHIBIT 2C3-16

2.C.3.B POST ACCIDENT MONITORING
SYSTEM DESCRIPTION

- TYPE D CATEGORY 3

VARIABLE	REQUIREMENT	DESIGN FEATURE
REACTOR COOLANT PUMP STATUS	MOTOR CURRENT	DISPLAY - PUMP MOTOR CURRENT
HIGH-LEVEL RADIOACTIVE LIQUID TANK LEVEL	TOP TO BOTTOM	DISPLAY - SENSOR RANGE 0-32,000 GPM MAIN CONTROL ROOM ALARM OF RADWASTE SYSTEM TROUBLE RADWASTE SYSTEMS ARE NORMALLY CONTROLLED FROM RADWASTE CONTROL ROOM. MAIN CONTROL ROOM DISPLAY ON DEMAND VIA CRT TERMINAL.
RADIOACTIVE GAS HOLDUP TANK PRESSURE	0 TO 150% DESIGN PRESSURE	DISPLAY - SENSOR RANGE WILL BE PROVIDED TO COMPLY WITH 0 TO 150% DESIGN PRESSURE. MAIN CONTROL ROOM ALARM OF RADWASTE SYSTEM TROUBLE. RADWASTE SYSTEMS ARE NORMALLY CONTROLLED FROM RADWASTE CONTROL ROOM. MAIN CONTROL ROOM DISPLAY ON DEMAND VIA CRT TERMINAL.

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

5) TYPE E VARIABLES - THOSE VARIABLES TO BE MONITORED AS REQUIRED FOR USE IN DETERMINING THE MAGNITUDE OF THE RELEASE OF RADIOACTIVE MATERIALS AND CONTINUALLY ASSESSING SUCH RELEASES.

- CATEGORY 1

VARIABLE	REQUIREMENT	DESIGN FEATURE
CONTAINMENT AREA RADIATION-HIGH RANGE	1 R/HR TO 10^7 R/HR	SENSOR RANGE: 1 R/HR TO 10^7 R/HR DISPLAY: CRT AND 2 SAFETY RATED CHANNEL DISPLAYS AT CABINET, CLASS 1E, RECORDING ON ONE CHANNEL

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 2

VARIABLE	REQUIREMENT	DESIGN FEATURE
RADIATION EXPOSURE RATE (INSIDE BUILDINGS OR AREAS WHERE ACCESS IS REQUIRED TO SERVICE EQUIPMENT IMPORTANT TO SAFETY)	10^{-1} R/HR TO 10^{4} R/HR	10 MONITORS SENSOR RANGE - 10^{-1} R/HR TO 10^{4} R/HR DISPLAY - CRT SENSORS QUALIFIED TO POST ACCIDENT ENVIRONMENT LOCAL DISPLAY AND ANNUNCIATION
CONTAINMENT OR PURGE EFFLUENT - NOBLE GASES AND VENT FLOW RATE	10^{-6} μCI/CC TO 10^{5} μCI/CC 0 TO 110% VENT DESIGN FLOW	PLANT VENT MONITORED AS IDENTIFIED BELOW
COMMON PLANT VENT - NOBLE GASES AND VENT FLOW RATE	10^{-6} μCI/CC TO 10^{3} μCI/CC 0 TO 110% DESIGN FLOW	PLANT VENT MONITORED AS IDENTIFIED BELOW

EXHIBIT 2C3-19

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 2 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
AUXILIARY BUILDING - NOBLE GASES AND VENT FLOW RATE	10^{-6} μCI/CC TO 10^{3} μCI/CC 0 TO 110% VENT DESIGN FLOW	SENSOR RANGE - 10^{-9} μCI/CC TO 10^{5} μCI/CC AT PLANT VENT DISPLAY - CRT, NON-CLASS IE SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT FLOW MEASUREMENT WILL BE PROVIDED
CONDENSER AIR REMOVAL SYSTEM EXHAUST - NOBLE GASES AND VENT FLOW RATE	10^{-6} μCI/CC TO 10^{5} μCI/CC 0 TO 110% VENT DESIGN FLOW	SENSOR RANGE - 10^{-6} μCI/CC TO 10^{5} μCI/CC DISPLAY - CRT, NON-CLASS IE SENSOR QUALIFIED TO POST ACCIDENT ENVIRONMENT FLOW MEASUREMENT WILL BE PROVIDED
VENT FROM STEAM GENERATORS SAFETY RELIEF VALVES OR ATMOSPHERIC DUMP VALVES - NOBLE GASES AND VENT FLOW RATE	10^{-1} μCI/CC TO 10^{3} μCI/CC (DURATION OF RELEASES IN SECONDS AND MASS OF STEAM PER UNIT TIME)	MONITOR/STEAM LINE SENSOR RANGE - 10^{-1} μCI/CC TO 10^{3} μCI/CC DISPLAY - CRT SENSORS QUALIFIED TO POST ACCIDENT ENVIRONMENT

EXHIBIT 2C3-20

2.C.3.B POST ACCIDENT MONITORING
SYSTEM DESCRIPTION

- TYPE E CATEGORY 2 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
FUEL BUILDING VENT - NOBLE GASES AND VENT FLOW RATE	10^{-6} µCI/CC TO 10^{2} µCI/CC 0 TO 110% VENT DESIGN FLOW	SENSOR RANGE - 10^{-6} µCI/CC TO 10^{2} µCI/CC DISPLAY - CRT SENSORS QUALIFIED TO POST ACCIDENT ENVIRONMENT FLOW MEASUREMENT WILL BE PROVIDED

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 3

VARIABLE	REQUIREMENT	DESIGN FEATURE
PARTICULATES AND HALOGENS AT ALL IDENTIFIED RELEASE POINTS (EXCEPT STEAM GENERATOR SAFETY RELIEF VALVES OR ATMOSPHERIC STEAM DUMP VALVES AND CONDENSOR AIR REMOVAL SYSTEM EXHAUST) SAMPLING, WITH ONSITE ANALYSIS CAPABILITY	10^{-3} μCI/CC TO 10^{2} μCI/CC 0 TO 110% VENT DESIGN FLOW	MONITORS AT PLANT VENT FUEL BUILDING VENT MAIN CONDENSER AIR REMOVAL EXHAUST SENSOR RANGE - 10^{-3} μCI/CC TO 10^{2} μCI/CC FLOW MEASUREMENT WILL BE PROVIDED

EXHIBIT 2C3-22

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 3 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
AIRBORN RADIO-HALOGENS AND PARTICULATES (PORTABLE SAMPLING WITH ONSITE ANALYSIS CAPABILITY)	10^{-9} μCI/CC TO 10^{-3} μCI/CC	PVNGS WILL COMPLY

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 3 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
PLANT AND ENVIRONS RADIATION (PORTABLE INSTRUMENTATION)	10^{-3} R/HR TO 10^{4} R/HR, PHOTONS 10^{-3} RADS/HR TO 10^{4} RADS/HR, BETA RADIATIONS AND LOW-ENERGY PHOTONS	PVNGS WILL COMPLY
PLANT AND ENVIRONS RADIOACTIVITY (PORTABLE INSTRUMENTATION)	MULTICHANNEL GAMMA-RAY SPECTROMETER	PVNGS WILL COMPLY

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 3 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
WIND DIRECTION	0 TO 360^{0} ($\pm 5^{0}$ ACCURACY WITH A DEFLECTION OF 15^{0}). STARTING SPEED 0.45 MPS (1.0 MPH). DAMPING RATIO BETWEEN 0.4 AND 0.6, DISTANCE CONSTANT 2 METERS.	0 TO 540^{0} ($\pm 5^{0}$ ACCURACY). STARTING THRESHOLD 0.75 MPH. DAMPING RATIO 0.4, DISTANCE CONSTANT 3.3 FT.
WIND SPEED	0 TO 30 MPS (67 MPH) $\pm$0.22 MPS (0.5 MPH) ACCURACY FOR WIND SPEEDS LESS THAN 11 MPS (25 MPH), WITH A STARTING THRESHOLD OF LESS THAN 0.45 MPS (1.0 MPH).	0 TO 50 MPH $\pm$1% OR 0.15 MPH OR WHICHEVER IS GREATER, WITH A STARTING THRESHOLD OF 0.6 MPH.

EXHIBIT 2C3-25

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 3 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
ESTIMATION OF ATMOSPHERIC STABILITY	BASED ON VERTICAL TEMPERATURE DIFFERENCE FROM PRIMARY SYSTEM, $-5^{0}C$ TO $10^{0}C$ ($-9^{0}F$ TO $18^{0}F$) AND $\pm 0.15^{0}C$ ACCURACY PER 50 METER INTERVALS ($+0.3^{0}F$ ACCURACY PER 164-FOOT INTERVALS) OR ANALOGOUS RANGE FOR ALTERNATIVE STABILITY ESTIMATES	BASED ON A VERTICAL DIFFERENCE OF 160 FT, $\pm 6^{0}F$ ANALOG AND DIGITAL, $+18^{0}$ TO $-6^{0}F$ ANALOG ONLY AND $\pm 0.18^{0}F$ ACCURACY.

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 3 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
ACCIDENT SAMPLING CAPABILITY (ANALYSIS CAPABILITY ONSITE)		POST ACCIDENT SAMPLING SYSTEM: (REMOTE SAMPLE, IN-LINE AUTOMATIC GRAB SAMPLE BACKUP)
PRIMARY COOLANT & SUMP VIA GRAB SAMPLE	GRAB SAMPLE	RANGES:
• GROSS ACTIVITY	10 μCI/Ml TO 10 CI/Ml	10^{-3} μCI/CC TO 10 CI/CC
• GAMMA SPECTRUM	(ISOTOPIC ANALYSIS)	ISOTOPIC ANALYSIS
• BORON CONTENT	0 TO 6000 PPM	0 TO 6000 PPM
• CHLORIDE CONTENT	0 TO 20 PPM	0 TO 20 PPM
• DISSOLVED HYDROGEN	0 TO 2000 CC (STP)/KG	0 TO 2000 CC (STP)/KG
• DISSOLVED OXYGEN	0 TO 20 PPM	0 TO 20 PPM
• pH	1 TO 13	1 TO 13

EXHIBIT 2C3-27

2.C.3.B POST ACCIDENT MONITORING

SYSTEM DESCRIPTION

- TYPE E CATEGORY 3 (CONT'D)

VARIABLE	REQUIREMENT	DESIGN FEATURE
ACCIDENT SAMPLING CAPABILITY (ANALYSIS CAPABILITY ON-SITE)		POST ACCIDENT SAMPLING SYSTEM: (REMOTE SAMPLE, IN-LINE AUTOMATIC)
CONTAINMENT AIR	GRAB SAMPLE	
• HYDROGEN CONTENT	0 TO 10%	0 TO 10%
• OXYGEN CONTENT	0 TO 30%	0 TO 30%
• GAMMA SPECTRUM	(ISOTOPIC ANALYSIS)	10^{-7} μCI/CC TO 10^{5} μCI/CC ISOTOPIC ANALYSIS

EXHIBIT 2C3-28

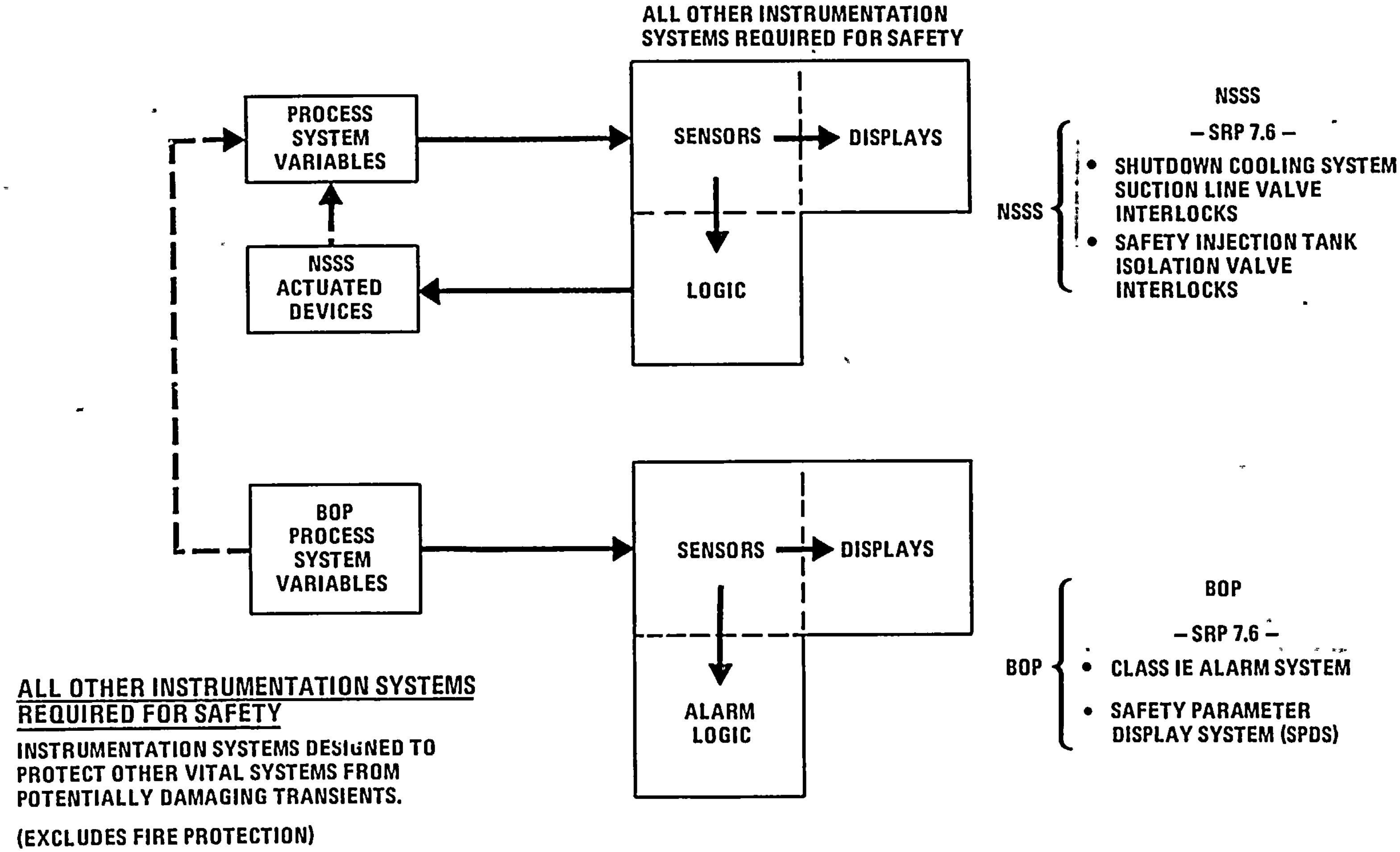

ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY
PROCESS SYSTEM VARIABLES
NSSS ACTUATED DEVICES
SENSORS
DISPLAYS
LOGIC
NSSS
– SRP 7.6 –
NSSS
• SHUTDOWN COOLING SYSTEM SUCTION LINE VALVE INTERLOCKS
• SAFETY INJECTION TANK ISOLATION VALVE INTERLOCKS
BOP PROCESS SYSTEM VARIABLES
SENSORS
DISPLAYS
ALARM LOGIC
BOP
– SRP 7.6 –
BOP
• CLASS IE ALARM SYSTEM
• SAFETY PARAMETER DISPLAY SYSTEM (SPDS)
ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY
INSTRUMENTATION SYSTEMS DESIGNED TO PROTECT OTHER VITAL SYSTEMS FROM POTENTIALLY DAMAGING TRANSIENTS.
(EXCLUDES FIRE PROTECTION)

FIGURE 2D-1

2.D.1.A CLASS IE ALARM SYSTEM

DESIGN CRITERIA

1) THE CLASS IE ALARM SYSTEM SHALL BE PROVIDED FOR A LIMITED NUMBER OF OPERATIONAL OCCURRENCES FOR WHICH NO SPECIFIC AUTOMATIC ACTUATION OF A SAFETY SYSTEM IS REQUIRED. THE SYSTEM ALERTS THE OPERATOR TO KEEP THE PLANT OPERATING WITHIN TECHNICAL SPECIFICATION LIMITS AND AIDS IN PRECLUDING EQUIPMENT DAMAGE.

2) THE CLASS IE ALARM SYSTEM SHALL BE DESIGNED IN COMPLIANCE WITH THE FOLLOWING STANDARDS:

    10CFR50, LICENSING OF PRODUCTION AND UTILIZATION FACILITIES, APPENDIX A, GENERAL DESIGN CRITERIA FOR NUCLEAR POWER PLANTS, JULY 15, 1971.

    INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) STD 279-1971, CRITERIA FOR PROTECTION SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS.

    IEEE STD 323-1974, STANDARD FOR QUALIFYING CLASS IE EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS.

    IEEE STD 338-1971, TRIAL-USE CRITERIA FOR THE PERIODIC TESTING OF NUCLEAR POWER GENERATING STATION PROTECTION SYSTEMS.

    IEEE STD 344-1975, RECOMMENDED PRACTICES FOR SEISMIC QUALIFICATION OF CLASS IE EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS.

2.D.1.A CLASS IE ALARM SYSTEM

DESIGN CRITERIA

IEEE STD 384-1974, TRIAL-USE STANDARD CRITERIA FOR SEPARATION OF CLASS IE EQUIPMENT AND CIRCUITS, AS MODIFIED BY NRC REGULATORY GUIDE 1.75.

3) POWER FOR EACH REDUNDANT CLASS IE ANNUNCIATOR SHALL BE SUPPLIED FROM A SEPARATE CLASS IE 125V-DC DISTRIBUTION BUS.

4) EACH CLASS IE ANNUNCIATOR SHALL BE A UNIT INDEPENDENT FROM THE PLANT ANNUNCIATOR AND SHALL BE WITH INTEGRAL WINDOWS, HORN, POWER SUPPLY, AND LOGIC CARDS.

5) THE ANNUNCIATION SEQUENCE OF OPERATION AND TESTING FOR THE CLASS IE ANNUNCIATORS SHALL BE THE SAME AS THE PLANT ANNUNCIATOR WITH THE FOLLOWING EXCEPTIONS:

   CLASS IE ANNUNCIATOR SHALL HAVE A KEY-LOCKED ALARM ACKNOWLEDGE FUNCTION, AND

   CLASS IE ANNUNCIATOR DOES NOT REQUIRE A RETURN-TO-NORMAL AUDIBLE.

6) THE CLASS IE ALARM SYSTEM SHALL BE DESIGNED TO THE REQUIREMENTS FOR NUCLEAR SAFETY-RELATED SYSTEMS SUCH THAT THE DEVICES MUST MAINTAIN THEIR SAFETY-RELATED FUNCTIONAL CAPABILITY UNDER ALL NORMAL AND ABNORMAL PLANT OPERATING CONDITIONS.

2.D.1.B CLASS IE ALARM SYSTEM

SYSTEM DESCRIPTION

1) CLASS IE ALARMS ARE PROVIDED TO ALERT THE OPERATOR IN THE EVENT OF

LOSS OF NUCLEAR COOLING WATER TO THE REACTOR COOLANT PUMPS SEAL COOLERS

INADEQUATE SAFETY INJECTION TANK PRESSURE

HIGH WATER LEVEL IN AN ECCS PUMP ROOM.

2) SILENCING OF THE ALARM AUDIBLE IS PROVIDED BY A KEY-LOCKED ALARM ACKNOWLEDGE SWITCH FOR EACH CLASS IE ANNUNCIATOR.

3) FOUR CLASS IE ANNUNCIATORS ARE PROVIDED, TWO IN INSTRUMENT CHANNEL A AND TWO IN INSTRUMENT CHANNEL B. THE INSTRUMENT CHANNEL A ANNUNCIATORS ARE PHYSICALLY SEPARATE AND INDEPENDENT OF THE INSTRUMENT CHANNEL B ANNUNCIATORS. THE INSTRUMENT CHANNEL A ANNUNCIATORS ARE SUPPLIED POWER FROM A CLASS IE 125V-DC DISTRIBUTION BUS (LOAD GROUP 1) SEPARATE FROM THE INSTRUMENT CHANNEL B ANNUNCIATORS (LOAD GROUP B).

2.D.1.B CLASS IE ALARM SYSTEM

SYSTEM DESCRIPTION

4) THE FOUR CLASS IE ANNUNCIATORS ARE:

ANNUNCIATOR	CHANNEL	ALARMS PROVIDED
J-RKA-UA-2C	A	INADEQUATE SAFETY INJECTION TANK PRESSURE- SAFETY INJECTION TANKS 3 AND 4 HIGH WATER LEVEL IN ECCS TRAIN A PUMP ROOMS (1 ANNUNCIATOR WINDOW/PUMP ROOM)
J-RKB-UA-2D	B	INADEQUATE SAFETY INJECTION TANK PRESSURE- SAFETY INJECTION TANKS 1 AND 2 HIGH WATER LEVEL IN ECCS TRAIN B PUMP ROOMS (1 ANNUNCIATOR WINDOW/PUMP ROOM)
J-RKA-UA-4D	A	LOSS OF NUCLEAR COOLING WATER TO THE REACTOR COOLANT PUMPS SEAL COOLERS (1 ANNUNCIATOR WINDOW/PUMP)
J-RKB-UA-4E	B	LOSS OF NUCLEAR COOLING WATER TO THE REACTOR COOLANT PUMPS SEAL COOLERS (1 ANNUNCIATOR WINDOW/PUMP)

EXHIBIT 2D1-4

SYSTEM DESCRIPTION

5) EACH CLASS IE ANNUNCIATOR IS A UNIT WITH INTEGRAL WINDOWS, HORN, POWER SUPPLY AND ANNUNCIATOR LOGIC CARDS MOUNTED IN THE ANNUNCIATOR SECTION OF THE MAIN CONTROL BOARDS. SEPARATE SWITCHES FOR ALARM ACKNOWLEDGE (SILENCING), FLASHER RESET, LAMP RESET, AND TEST ARE LOCATED WITHIN OPERATOR REACH.

6) CLASS IE ALARM FUNCTIONS

A) LOSS OF NUCLEAR COOLING WATER TO THE REACTOR COOLANT PUMPS SEAL COOLERS

REDUNDANT SAFETY GRADE INSTRUMENT CHANNELS CONTINUOUSLY MONITOR NUCLEAR COOLING WATER FLOW TO THE SEAL COOLERS FOR EACH REACTOR COOLANT PUMP.

ANNUNCIATION IS PROVIDED IF THE NUCLEAR COOLING WATER FLOW RATE IS REDUCED BELOW THE MINIMUM REQUIRED FOR PUMP OPERATION. MONITORING IS AVAILABLE DURING NORMAL OPERATION COINCIDENT WITH LOP.

B) INADEQUATE SAFETY INJECTION TANK PRESSURE

SAFETY GRADE INSTRUMENT CHANNELS MONITOR THE PRESSURE IN EACH SAFETY INJECTION TANK AND THE PRESSURIZER.

ANNUNCIATION IS PROVIDED IF PRESSURE IN A SAFETY INJECTION TANK FALLS BELOW 600 PSIG WHILE PRESSURIZER PRESSURE IS ABOVE 700 PSIG, INDICATING THE UNAVAILABILITY OF THE SAFETY INJECTION TANK TO PERFORM ITS CORE FLOODING FUNCTION IN THE EVENT OF A LOCA.

2.D.1.B CLASS IE ALARM SYSTEM

SYSTEM DESCRIPTION

C) HIGH WATER LEVEL IN AN ECCS PUMP ROOM

SAFETY GRADE INSTRUMENT CHANNELS MONITOR LEVEL IN THE DRAIN BASIN IN THE ROOMS FOR THE

LOW PRESSURE SAFETY INJECTION PUMPS,

HIGH PRESSURE SAFETY INJECTION PUMPS, AND

CONTAINMENT SPRAY PUMPS.

ANNUNCIATION IS PROVIDED ON A HIGH LEVEL SIGNAL INDICATING LEAKAGE IN A PUMP ROOM.

2.D.2.A SAFETY PARAMETER DISPLAY SYSTEM

DESIGN CRITERIA

1) THE SAFETY PARAMETER DISPLAY SYSTEM (SPDS) SHALL BE PROVIDED TO ASSIST CONTROL ROOM PERSONNEL IN EVALUATING THE SAFETY STATUS OF THE PLANT. THE PRIMARY FUNCTION OF THE SPDS IS TO AID THE OPERATOR IN THE RAPID DETECTION OF ABNORMAL OPERATING CONDITIONS.

2) THE SPDS SHALL BE DESIGNED TO THE FOLLOWING CODES AND STANDARDS:

   A. 10 CFR 50, APPENDIX A, GENERAL DESIGN CRITERIA FOR NUCLEAR POWER PLANTS, JULY 15, 1971.

   B. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE), STANDARD 344-1975, RECOMMENDED PRACTICES FOR SEISMIC QUALIFICATION OF CLASS IE EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS.

   C. NUREG-0696, FUNCTIONAL CRITERIA FOR EMERGENCY RESPONSE FACILITIES.

2.D.2.A SAFETY PARAMETER DISPLAY SYSTEM

3) THE IMPORTANT PLANT FUNCTIONS RELATED TO THE PRIMARY SPDS DISPLAY WHILE THE PLANT IS GENERATING POWER SHALL INCLUDE BUT NOT BE LIMITED TO:

- REACTIVITY CONTROL
- REACTOR CORE COOLING
- HEAT REMOVAL FROM THE PRIMARY SYSTEM
- REACTOR COOLANT SYSTEM INTEGRITY
- RADIOACTIVITY CONTROL
- CONTAINMENT INTEGRITY

4) THE SPDS FUNCTION IN THE CONTROL ROOM SHALL BE PROVIDED DURING AND FOLLOWING ALL EVENTS EXPECTED TO OCCUR DURING THE LIFE OF THE PLANT, INCLUDING SSE.

5) THE SPDS DISPLAY SHALL TAKE ACCOUNT OF HUMAN FACTORS AND THE MAN-MACHINE INTERFACE. THE SPDS DISPLAY SHALL BE INCORPORATED INTO THE MAIN CONTROL ROOM WITH A LOCATION THAT WILL ALLOW THE DISPLAYS TO BE EASILY OBSERVED BY THE OPERATIONS STAFF.

6) THE SPDS DISPLAY SHALL REFLECT AND BE CAPABLE OF SUPPORTING ALL OPERATING MODES.

2.D.2.A SAFETY PARAMETER DISPLAY SYSTEM

7) THE SPDS DISPLAY SHALL ALSO BE AVAILABLE IN THE TSC, SATELLITE TSC, AND EOF.

8) THE SPDS SHALL BE DESIGNED TO AN OPERATIONAL UNAVAILABILITY GOAL AS DEFINED IN NUREG 0696 OF 0.01 FOR THE DATA DISPLAY FUNCTION AT EACH FACILITY WHEN THE REACTOR IS ABOVE COLD SHUTDOWN STATUS. IN ADDITION, THE SPDS DISPLAY FUNCTION IN THE CONTROL ROOM SHALL BE DESIGNED TO AN OPERATIONAL UNAVAILABILITY GOAL OF 0.2 FOR COLD SHUTDOWN STATUS INCLUDING THE REFUELING MODE.

SAFETY PARAMETER DISPLAY SYSTEM

SYSTEM DESCRIPTION

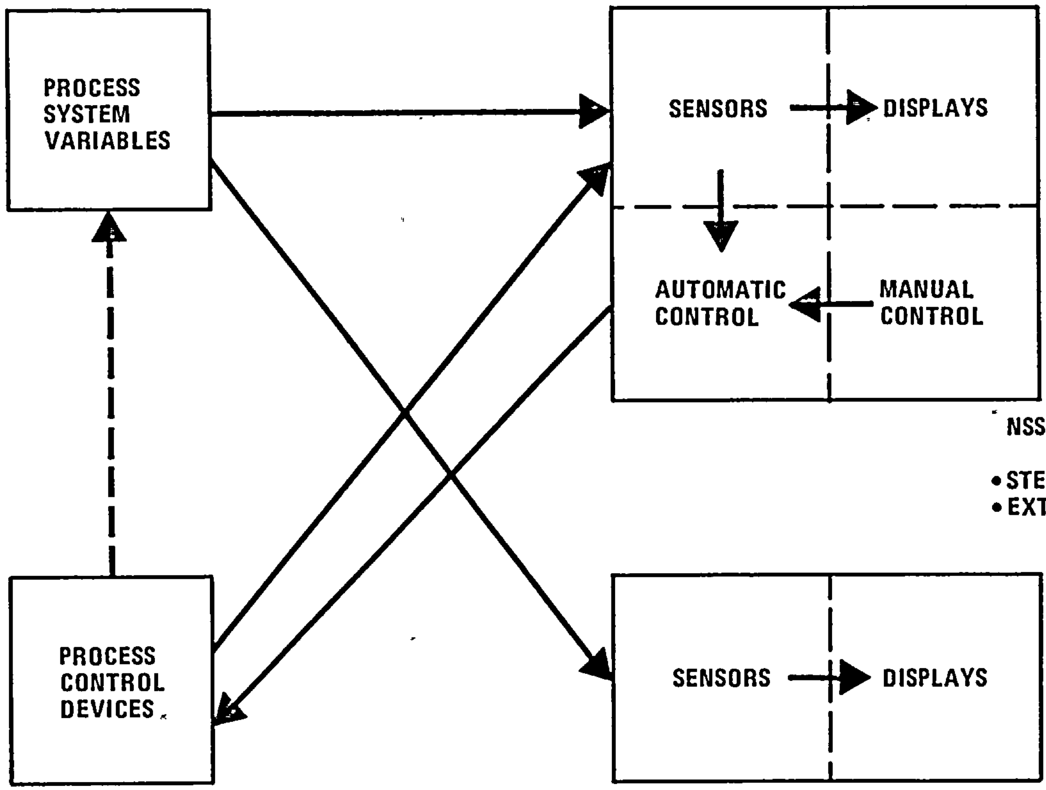
1) THE SPDS CONSISTS OF TWO DISPLAY SYSTEMS LOCATED IN THE CONTROL ROOM.

   - A FULL-COLOR CRT DISPLAY DRIVEN FROM THE TECHNICAL SUPPORT CENTER (TSC) COMPUTER SYSTEM.
   - A SEISMICALLY QUALIFIED DISPLAY SYSTEM DRIVEN FROM A SEPARATE CONTROL ROOM PROCESSOR SYSTEM.

2) PLANT FUNCTIONS INCLUDED IN THE SPDS DISPLAYS ARE:

   - REACTIVITY CONTROL
   - REACTOR CORE COOLING
   - HEAT REMOVAL FROM THE PRIMARY SYSTEM
   - REACTOR COOLANT SYSTEM INTEGRITY
   - RADIOACTIVITY CONTROL
   - CONTAINMENT INTEGRITY

EXHIBIT 2D2-4



NSSS (WITHIN CESSAR SCOPE)
– SRP 7.7 –

- STEAM BYPASS CONTROL SYSTEM
- FEEDWATER CONTROL SYSTEM (15% - 100%)
- PRESSURIZER LEVEL CONTROL SYSTEM
- PRESSURIZER PRESSURE CONTROL SYSTEM
- BORON CONTROL SYSTEM
- REACTOR POWER CUTBACK SYSTEM
- REACTOR REGULATING SYSTEM
- CONTROL ELEMENT DRIVE MECHANISM CONTROL SYSTEM
- EX-CORE NEUTRON FLUX MONITORING SYSTEM
- IN-CORE NEUTRON FLUX MONITORING SYSTEM
- CORE OPERATING LIMIT SUPERVISORY SYSTEM
- PLANT MONITORING SYSTEM

NSSS (OUTSIDE CESSAR SCOPE)
– SRP 7.7 –

- STEAM BYPASS CONTROL SYSTEM OPTION WITH 2 VALVES TO ATMOSPHERE
- EXTENDED RANGE (0% – 15%) FEEDWATER CONTROL SYSTEM

BOP – SRP 7.7 –
LOOSE PARTS MONITORING SYSTEM

CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

ELECTRICAL AND MECHANICAL DEVICES AND CIRCUITRY REQUIRED FOR PLANT OPERATION BUT WHOSE FUNCTIONS ARE NOT ESSENTIAL FOR THE SAFETY OF THE PLANT

CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

FIGURE 2E-1

2E.1 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

DESIGN CRITERIA

1) FEEDWATER CONTROL SYSTEM - EXTENDED RANGE

FOR OPERATION BETWEEN 0 AND 15% POWER, THE FEEDWATER CONTROL SYSTEM (FWCS) SHALL AUTOMATICALLY CONTROL THE STEAM GENERATOR DOWNCOMER WATER LEVEL. STEAM GENERATOR LEVEL WILL BE CONTROLLED DURING THE FOLLOWING CONDITIONS (ASSUMING THAT ALL OTHER CONTROL SYSTEMS ARE OPERATING IN AUTOMATIC):

1. STEADY STATE OPERATIONS;
2. 1% PER MINUTE TURBINE LOAD RAMPS BETWEEN 0 AND 15% NSSS POWER;
3. LOSS OF ONE OF TWO OPERATING FEEDWATER PUMPS; AND
4. LOAD REJECTION OF ANY MAGNITUDE.

2E.1 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

DESIGN CRITERIA

2) STEAM BYPASS CONTROL SYSTEM - OPTION WITH TWO VALVES TO ATMOSPHERE

THE CESSAR SYSTEM IS MODIFIED FOR PVNGS TO DUMP STEAM TO ATMOSPHERE THROUGH TWO OF THE TURBINE BYPASS VALVES. THESE VALVES SHALL BE THE LAST TO OPEN AND FIRST TO CLOSE DURING STEAM BYPASS OPERATION.

2E.1 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

DESIGN CRITERIA

3) LOOSE PARTS MONITORING SYSTEM

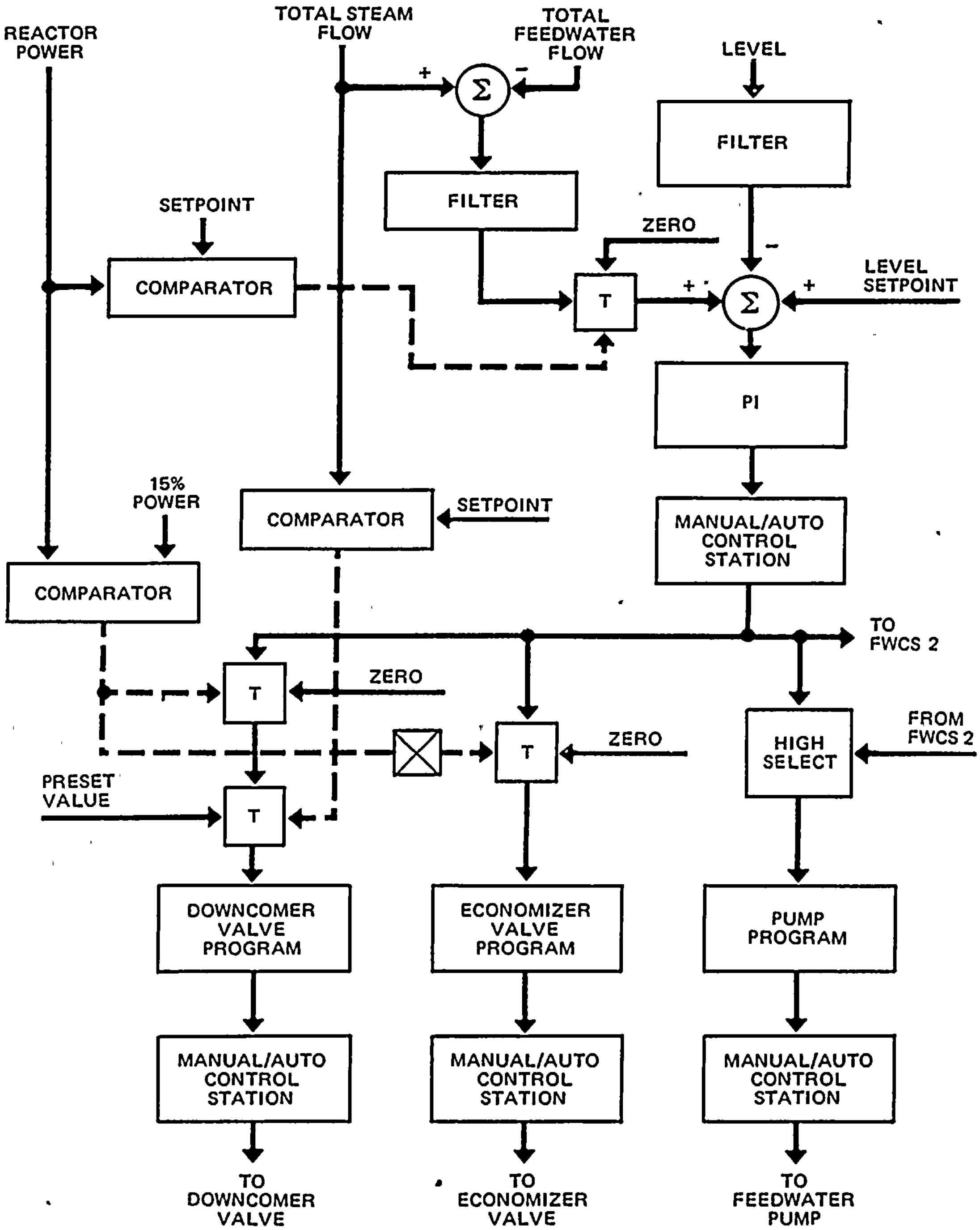
A LOOSE PARTS MONITORING SYSTEM (LPMS) SHALL BE PROVIDED TO DETECT AND RECORD SIGNALS RESULTING FROM IMPACTS OCCURRING WITHIN THE REACTOR COOLANT SYSTEM.

2E.2 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

SYSTEM DESCRIPTION

1) FEEDWATER CONTROL SYSTEM - EXTENDED RANGE

BELOW 15% NSSS POWER, THE FWCS PERFORMS DYNAMIC COMPENSATION ON THE LEVEL SIGNAL TO GENERATE AN OUTPUT SIGNAL INDICATIVE OF THE REQUIRED FEEDWATER FLOW. THE OUTPUT SIGNAL IS USED TO GENERATE THE DOWNCOMER VALVE POSITION DEMAND SIGNAL. WHEN IN THIS CONTROL MODE THE ECONOMIZER VALVE WILL BE CLOSED AND THE PUMP SPEED SETPOINT WILL BE AT ITS MINIMUM VALUE.



FEEDWATER CONTROL
SYSTEM BLOCK DIAGRAM
FIGURE 2E-2

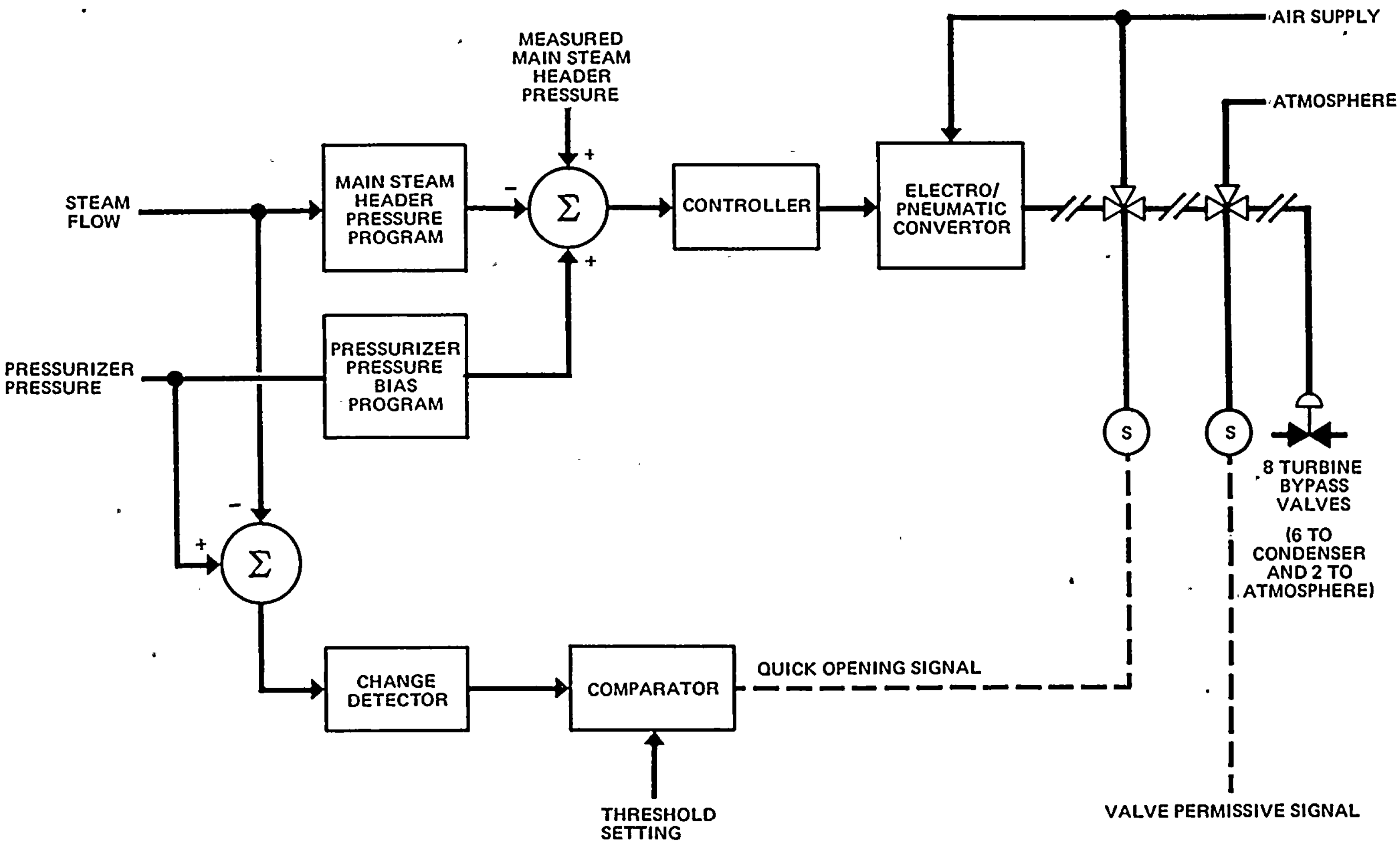
2E.2 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

SYSTEM DESCRIPTION

2) STEAM BYPASS CONTROL SYSTEM - OPTION WITH TWO VALVES TO ATMOSPHERE

THE CESSAR SYSTEM IS MODIFIED FROM 4 VALVE GROUPS TO 5 VALVE GROUPS. VALVE GROUP 5 CONTAINS THE 7TH AND 8TH STEAM BYPASS VALVES WHICH DISCHARGE TO ATMOSPHERE. VALVE GROUP 5 IS THE LAST GROUP TO SEQUENCE OPEN AND IS NOT INTERLOCKED WITH A LOSS OF CONDENSER VACUUM SIGNAL.

EXHIBIT 2E-5



STEAM BYPASS CONTROL SYSTEM
BLOCK DIAGRAM
FIGURE 2E-3

2E.2 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

SYSTEM DESCRIPTION

3) LOOSE PARTS MONITORING SYSTEM

EIGHT HIGH TEMPERATURE PIEZOELECTRIC ACCELEROMETERS (TRANSDUCERS) WILL BE LOCATED IN THE AREAS WHERE LOOSE PARTS ARE MOST LIKELY TO BECOME ENTRAPPED. THESE ARE:

1. TWO REDUNDANT TRANSDUCERS WILL BE CLAMP MOUNTED ON THE IN-CORE INSTRUMENT GUIDE TUBES ON THE REACTOR VESSEL LOWER HEAD, DIAMETRICALLY OPPOSED

2. TWO REDUNDANT TRANSDUCERS WILL BE STUD MOUNTED ON THE REACTOR VESSEL UPPER HEAD SERVICE STRUCTURE FLANGE, DIAMETRICALLY OPPOSED

3. TWO REDUNDANT TRANSDUCERS ON THE LOWER HEAD REGION OF EACH STEAM GENERATOR. ONE TRANSDUCER WILL BE CLAMPED TO THE PRIMARY INLET PIPE AND THE OTHER WILL BE CLAMPED TO THE PRIMARY OUTLET PIPE.

2E.2 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

SYSTEM DESCRIPTION

A DATA ACQUISITION PANEL LOCATED IN THE CONTROL ROOM AREA CONTAINS ALARM MODULES THAT CONTINUALLY MONITOR THE INCOMING SIGNALS FROM THE PREAMPLIFIER FOR THE PRESENCE OF IMPACTING.

THE OCCURRENCE OF A LOOSE PART IMPACTING ON THE INSIDE OF THE STRUCTURE CAUSES BURSTS OF SIGNALS THAT EXCEED THE ALARM SET POINT AND TRIGGER THE ALARM.

THE DATA ACQUISITION PANEL INCLUDES TAPE RECORDERS WITH PLAYBACK AND AN AUDIO MONITOR.

EXHIBIT 2E-7

3. COMPLIANCE WITH REGULATORY REQUIREMENTS

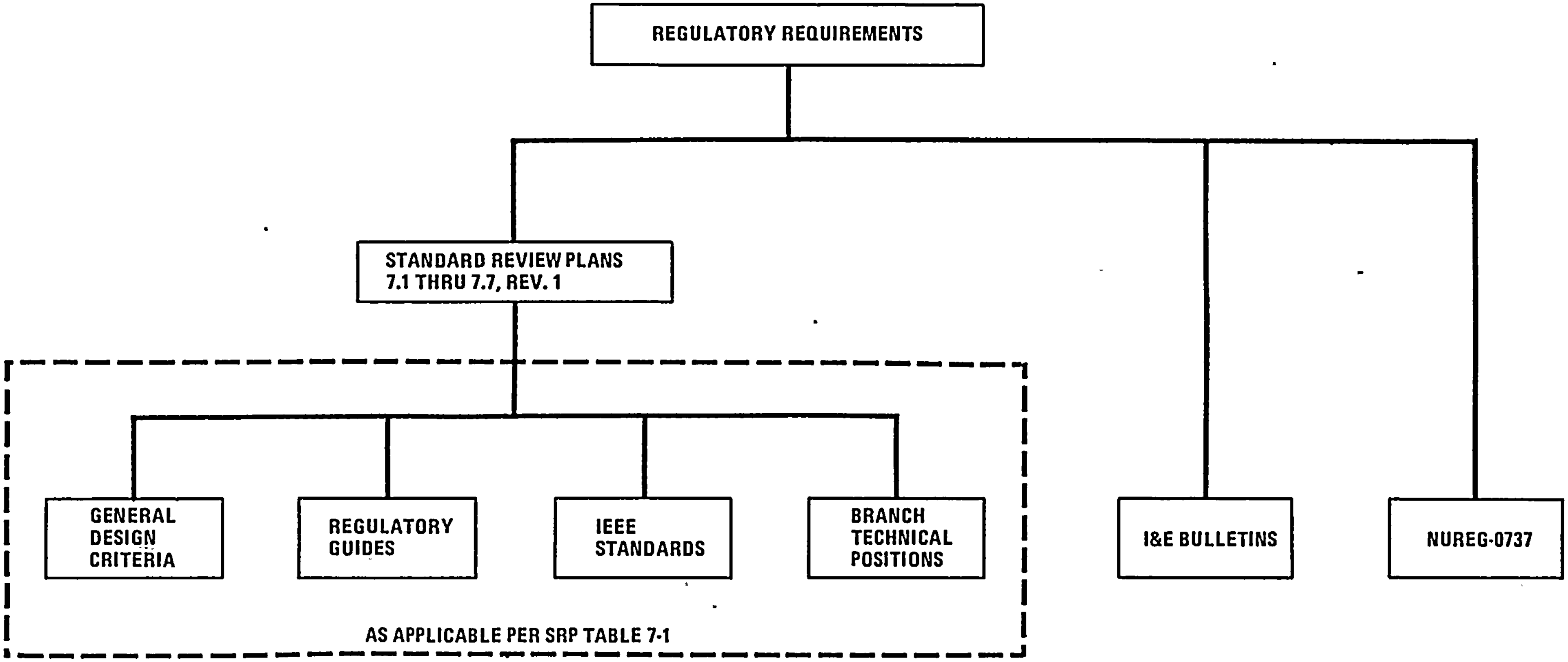
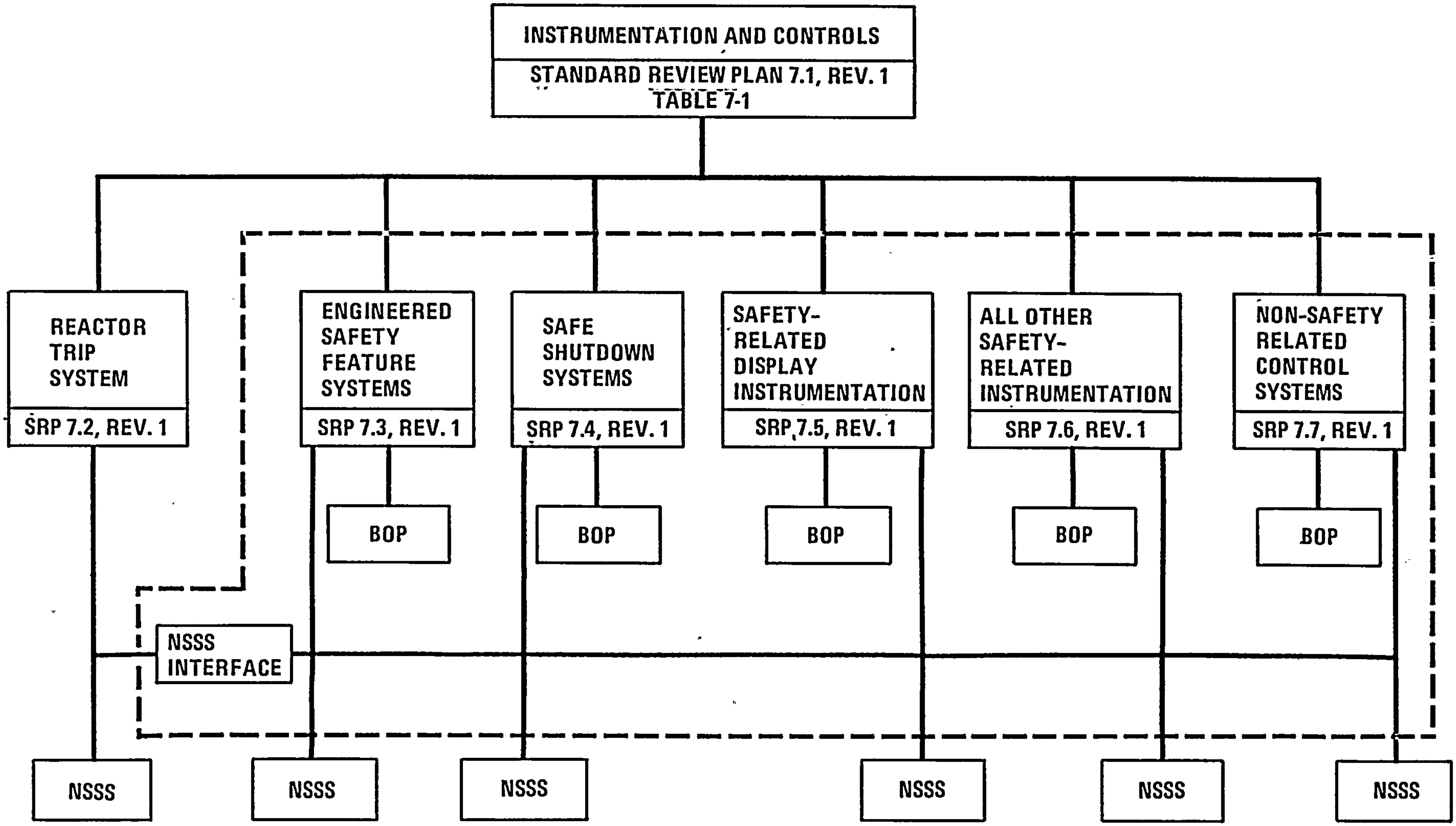


FIGURE 3-1
SUMMARY OF REGULATORY REQUIREMENTS



SCOPE OF BOP INSTRUMENTATION
AND CONTROLS REVIEW BOARD

FIGURE 3A-1

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.3

REQUIREMENT	DESIGN FEATURE
THE GENERAL DESIGN CRITERIA AND IEEE STD 279 SET FORTH REQUIREMENTS THAT MUST BE MET BY ALL DESIGNS FOR THE ESFAS. IN ADDITION, THESE ARE ALSO USED FOR THE INSTRUMENTATION AND CONTROLS FOR THE ESSENTIAL AUXILIARY SUPPORTING SYSTEMS.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.4

REQUIREMENT	DESIGN FEATURE
1. SYSTEM REDUNDANCY REQUIREMENTS GENERAL DESIGN CRITERIA 26, 33 AND 34, AND IEEE STD 279 SPECIFY THE REQUIREMENTS THAT SYSTEMS REQUIRED FOR SAFE SHUTDOWN, AMONG OTHERS, MUST MEET WITH REGARD TO ALL OPERATING CONDITIONS (SUCH AS LOSS OF OFFSITE POWER), SO THAT THEY CAN PERFORM THEIR SAFETY FUNCTION ASSUMING A SINGLE FAILURE. IF A DETERMINATION IS MADE THAT THE SYSTEMS REQUIRED FOR SAFE SHUTDOWN MEET THE REQUIREMENTS OF THESE CRITERIA, THEY ARE ACCEPTABLE IN THIS REGARD. ELECTRICAL AND PHYSICAL INDEPENDENCE REQUIREMENTS AS DISCUSSED IN SRP SECTIONS 7.2 AND 7.3 SHOULD BE MET.	IN COMPLIANCE
2. CONFORMANCE WITH THE SINGLE FAILURE CRITERION IEEE STD 279, IEEE STD 379, AND REGULATORY GUIDE 1.53 PROVIDE RECOMMENDATIONS AND GUIDANCE FOR MEETING THE SINGLE FAILURE CRITERION. REGARDING THE APPLICATION OF THE SINGLE FAILURE CRITERION TO THE DESIGN OF MANUALLY-CONTROLLED ELECTRICALLY-OPERATED VALVES, THE ACCEPTABILITY OF PROPOSED DESIGNS IS BASED ON BRANCH TECHNICAL POSITION ICSB 18.	IN COMPLIANCE

EXHIBIT 3A-2

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.4 (CONT)

REQUIREMENT	DESIGN FEATURE
3. IDENTIFICATION OF CABLES, CABLE TRAYS, AND INSTRUMENT PANELS THE METHOD USED FOR IDENTIFYING POWER AND SIGNAL CABLES AND CABLE TRAYS AS SAFETY-RELATED EQUIPMENT, AND THE IDENTIFICATION SCHEME USED TO DISTINGUISH BETWEEN REDUNDANT CABLES, CABLE TRAYS, AND INSTRUMENT PANELS SHOULD BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF SECTIONS 5.1.2 AND 5.6.3 OF REGULATORY GUIDE 1.75, "PHYSICAL INDEPENDENCE OF ELECTRIC SYSTEMS," AND SECTION 4.2.2 OF IEEE STD 279. COLOR CODING IS A PREFERRED METHOD OF IDENTIFICATION.	IN COMPLIANCE
4. VITAL SUPPORTING SYSTEMS THE INSTRUMENTATION, CONTROL, AND ELECTRIC EQUIPMENT ASSOCIATED WITH THE AUXILIARY SYSTEMS THAT SUPPORT THE SYSTEMS REQUIRED FOR SAFE SHUTDOWN SHOULD MEET THE SAME ACCEPTANCE CRITERIA AS FOR THE SYSTEMS THEY SUPPORT.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.4 (CONT)

REQUIREMENT	DESIGN FEATURE
5. SYSTEM TESTING, QUALITY ASSURANCE, AND SURVEILLANCE GENERAL DESIGN CRITERIA 1 AND 21, IEEE STD 279, IEEE STD 336, AND REGULATORY GUIDES 1.22, 1.47 AND 1.68 CONTAIN THE APPLICABLE ACCEPTANCE CRITERIA WITH REGARD TO PREOPERATION AND PERIODIC TESTING, QUALITY ASSURANCE, AND DESIGN PROVISIONS FOR INDICATING THE AVAILABILITY OF SYSTEMS REQUIRED FOR SAFE SHUTDOWN AND ESSENTIAL AUXILIARY SUPPORTING SYSTEMS.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.5

REQUIREMENT	DESIGN FEATURE
1. THE SRDI SHOULD COVER APPROPRIATE VARIABLES, CONSISTENT WITH THE ASSUMPTIONS FOR ACCIDENT ANALYSES AND WITH THE INFORMATION NEEDS OF THE OPERATORS IN NORMAL, TRANSIENT, AND ACCIDENT CONDITIONS. THE DESIGN OF THE POST-ACCIDENT SRDI SHOULD CONFORM TO THE RECOMMENDATIONS OF REGULATORY GUIDE 1.97. THE ACCURACY AND RANGE OF INDICATING INSTRUMENTATION SHOULD BE CONSISTENT WITH THE ASSUMPTIONS OF THE ACCIDENT ANALYSES. ANY EXCEPTIONS TO THESE REQUIREMENTS WILL BE REFERRED TO THE APPROPRIATE BRANCH FOR RESOLUTION ON AN INDIVIDUAL CASE BASIS.	IN COMPLIANCE
2. ALL MONITORING CHANNELS SHOULD BE REDUNDANT, TO ASSURE THAT WRONG INDICATION DUE TO DEVICE MALFUNCTION WILL NOT CAUSE FALSE ACTION OR INACTION ON THE PART OF THE OPERATOR. IDENTIFICATION MALFUNCTIONS CAN BE IDENTIFIED BY CROSS CHECKING BETWEEN REDUNDANT CHANNELS.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.5 (CONT)

REQUIREMENT	DESIGN FEATURE
3. REDUNDANT CHANNELS OF SAFETY-RELATED DISPLAY INSTRUMENTATION SHOULD BE ISOLATED PHYSICALLY AND ELECTRICALLY TO ASSURE THAT A SINGLE FAILURE WILL NOT RESULT IN COMPLETE LOSS OF INFORMATION ABOUT A MONITORED VARIABLE. SINGLE FAILURES MIGHT INCLUDE SUCH POSSIBLE FAULTS AS SHORTS OR OPEN CIRCUITS OR INTERCONNECTING SIGNAL OR POWER CABLES. IT ALSO INCLUDES SINGLE CREDIBLE MALFUNCTIONS OR EVENTS THAT MIGHT CAUSE A NUMBER OF SUBSEQUENT COMPONENT, MODULE, OR CHANNEL FAILURES. ALL SRDI SHOULD BE CAPABLE OF OPERATING FROM ONSITE POWER. IF SIGNALS FROM THE POST-ACCIDENT MONITORING EQUIPMENT ARE USED FOR CONTROL, THE REQUIRED ISOLATION DEVICES WILL BE CLASSIFIED AS PART OF THE POST-ACCIDENT MONITORING INSTRUMENTATION. NO CREDIBLE FAILURE AT THE OUTPUT OF AN ISOLATION DEVICE SHOULD PREVENT THE ASSOCIATED MONITORING CHANNEL FROM MEETING MINIMUM PERFORMANCE REQUIREMENTS CONSIDERED IN THE DESIGN BASES.	IN COMPLIANCE

SRP SECTION 7.5 (CONT)

REQUIREMENT	DESIGN FEATURE
4. CAPABILITY SHOULD BE PROVIDED FOR CHECKING, WITH A HIGH DEGREE OF CONFIDENCE, THE OPERATIONAL AVAILABILITY OF EACH SYSTEM INPUT SENSOR DURING REACTOR OPERATION. AN ACCEPTABLE WAY OF ACCOMPLISHING THIS WOULD BE BY: A. PERTURBATING THE MONITORED VARIABLE AND OBSERVING THE RESULTING INDICATIONS. B. INTRODUCING AND VARYING A SUBSTITUTE INPUT TO THE SENSOR OF THE SAME NATURE AS THE MEASURED VARIABLE. C. CROSS CHECKING BETWEEN CHANNELS THAT BEAR A KNOWN RELATIONSHIP TO EACH OTHER AND THAT HAVE READOUTS AVAILABLE. FOR CHANNELS WHICH MONITOR A NORMALLY STATIC PARAMETER, PROVISIONS SHOULD BE MADE TO ALLOW PERIODIC TESTING IN ACCORDANCE WITH REGULATORY GUIDE 1.22, THEREBY VERIFYING CHANNEL OPERABILITY.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.5 (CONT)

	REQUIREMENT	DESIGN FEATURE
5.	AN INDICATION SYSTEM SHOULD BE PROVIDED COVERING BYPASSED OR DELIBERATELY INOPERABLE CONDITIONS OF SAFETY SYSTEMS. GUIDELINES FOR THE INDICATION SYSTEM ARE PROVIDED IN REGULATORY GUIDE 1.47 AND BRANCH TECHNICAL POSITION ICSB 21.	IN COMPLIANCE
6.	CABLES, CABLE TRAYS, COMPONENTS, MODULES, AND INTERCONNECTING WIRING SHOULD BE IDENTIFIED. THE METHOD USED FOR IDENTIFICATION AND THE SCHEME USED TO DISTINGUISH BETWEEN REDUNDANT CABLES, CABLE TRAYS, COMPONENTS, MODULES, AND INTERCONNECTING WIRING ARE ACCEPTABLE IF THEY ARE IN ACCORDANCE WITH THE RECOMMENDATIONS OF REGULATORY GUIDE 1.75.	IN COMPLIANCE
7.	COMPONENTS AND MODULES SHOULD BE OF A QUALITY CONSISTENT WITH THE RELIABILITY REQUIREMENTS FOR SAFETY-RELATED SYSTEMS. AN ACCEPTABLE QUALITY WOULD BE THAT OF COMPONENTS AND MODULES THAT HAVE BEEN PREVIOUSLY USED IN SIMILAR SERVICE CONDITIONS AND HAVE DEMONSTRATED LOW MAINTENANCE REQUIREMENTS AND FAILURE RATES. OTHER MEANS TO DEMONSTRATE ACCEPTABLE QUALITY WOULD BE THROUGH ANALYSIS AND TESTING OF COMPONENTS AND MODULES, IN ACCORDANCE WITH CRITERIA CITED IN TABLE 7-1.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.5 (CONT)

REQUIREMENT	DESIGN FEATURE
8. IN ORDER TO ASSURE THAT THE REQUIREMENTS OF GENERAL DESIGN CRITERION 1, "QUALITY STANDARDS AND RECORDS," ARE MET IN THE SRDI, THE QUALITY ASSURANCE PROGRAM MUST SATISFY THE REQUIREMENTS OF IEEE STD 336, AS AMPLIFIED BY REGULATORY GUIDE 1.30.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.6

REQUIREMENT	DESIGN FEATURE
1. System Redundancy Requirements GDC 26 and 33 and IEEE Std 279 specify the requirements that "other instrumentation systems required for safety," among others, must meet with regard to all operating conditions (such as loss of offsite power), so that they can perform needed safety functions assuming a single failure. If a determination is made that these systems meet the requirements of these criteria, they are acceptable with regard to redundancy requirements.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.6 (CONT)

REQUIREMENT	DESIGN FEATURE
2. CONFORMANCE WITH THE SINGLE FAILURE CRITERION IEEE STD 279, IEEE STD 379, AND REGULATORY GUIDE 1.53 PROVIDE THAT SAFETY SYSTEMS SHOULD BE CAPABLE OF PERFORMING NEEDED SAFETY FUNCTIONS AFTER SUSTAINING A SINGLE FAILURE. REGARDING THE APPLICATION OF THE SINGLE FAILURE CRITERION TO THE DESIGN OF MANUALLY-CONTROLLED ELECTRICALLY-OPERATED VALVES IN SAFETY SYSTEMS, THE ACCEPTABILITY OF PROPOSED DESIGNS IS BASED ON BRANCH TECHNICAL POSITION ICSB 18 (PSB). THIS POSITION STATES THAT IT IS ACCEPTABLE TO DISCONNECT ELECTRIC POWER TO A SAFETY-RELATED VALVE AS A MEANS OF DESIGNING AGAINST AN ACTIVE VALVE MALFUNCTION. THE REQUIREMENTS FOR TOLERANCE OF SINGLE FAILURES IN FIRE DETECTION SYSTEMS ARE GIVEN IN NFPA 72D.	IN COMPLIANCE
3. IDENTIFICATION OF CABLES AND RACEWAYS THE METHOD USED FOR IDENTIFYING POWER AND SIGNAL CABLES AND RACEWAYS AS SAFETY-RELATED EQUIPMENT, AND THE IDENTIFICATION SCHEME USED TO DISTINGUISH BETWEEN REDUNDANT CABLES, RACEWAYS, AND INSTRUMENT PANELS SHOULD BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF REGULATORY GUIDE 1.75.	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.6 (CONT)

REQUIREMENT	DESIGN FEATURE
4. VITAL SUPPORTING SYSTEMS THE INSTRUMENTATION, CONTROL, AND ELECTRIC EQUIPMENT ASSOCIATED WITH AUXILIARY SYSTEMS THAT SUPPORT "OTHER SYSTEMS REQUIRED FOR SAFETY" SHOULD MEET THE SAME ACCEPTANCE CRITERIA AS THE SYSTEMS THEY SUPPORT.	IN COMPLIANCE
5. TESTING, QUALITY ASSURANCE, AND SYSTEM AVAILABILITY SURVEILLANCE GDC 1 AND 21, IEEE STDS 279, 336, AND 338; AND REGULATORY GUIDES 1.22, 1.47, 1.68, AND 1.118 CONTAIN THE APPLICABLE ACCEPTANCE CRITERIA WITH REGARD TO PREOPERATIONAL AND PERIODIC TESTING, QUALITY ASSURANCE, AND DESIGN PROVISIONS FOR INDICATING THE AVAILABILITY OF "OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY".	IN COMPLIANCE

SRP ACCEPTANCE CRITERIA

SRP SECTION 7.7

REQUIREMENT	DESIGN FEATURE
1. CONFORMANCE WITH GENERAL DESIGN CRITERION 13 FOR INSTRUMENTATION AND CONTROL REQUIREMENTS. INSTRUMENTATION SHOULD BE PROVIDED TO MONITOR VARIABLES AND SYSTEMS OVER THEIR ANTICIPATED RANGES FOR NORMAL OPERATION AND FOR ANTICIPATED OPERATIONAL OCCURRENCES AS APPROPRIATE TO MINIMIZE CHALLENGES TO SAFETY SYSTEMS. APPROPRIATE CONTROLS SHOULD BE PROVIDED TO MAINTAIN THESE VARIABLES AND SYSTEMS WITHIN PRESCRIBED OPERATING RANGES.	IN COMPLIANCE
2. CONFORMANCE WITH GENERAL DESIGN CRITERIA 24 FOR SEPARATION OF CONTROL SYSTEMS FROM PROTECTION SYSTEMS. THE PROTECTION SYSTEM SHALL BE SEPARATED FROM CONTROL SYSTEMS TO THE EXTENT THAT FAILURE OF ANY SINGLE CONTROL SYSTEM COMPONENT OR CHANNEL WHICH IS COMMON TO CONTROL AND PROTECTION SYSTEMS SHALL NOT VIOLATE THE RELIABILITY, REDUNDANCY, AND INDEPENDENCE REQUIREMENTS OF THE PROTECTION SYSTEM. THE INTERCONNECTIONS BETWEEN THE PROTECTION AND CONTROL SYSTEM SHALL BE LIMITED SO AS TO ASSURE THAT SAFETY IS NOT SIGNIFICANTLY IMPAIRED.	IN COMPLIANCE

SRP SECTION 7.7 (CONT)

REQUIREMENT	DESIGN FEATURE
3. CONFORMANCE TO IEEE STD 279, SECTION 4.7, FOR CONTROL AND PROTECTION SYSTEM INTERACTION. THE DIRECT CIRCUIT-TO-CIRCUIT AND FUNCTIONAL INTERACTIONS BETWEEN CONTROL AND PROTECTION SYSTEMS FOR SINGLE RANDOM OR MULTIPLE FAILURES IN THE CONTROL SYSTEM SHALL NOT PREVENT THE PROTECTION SYSTEM CHANNEL FROM MEETING THE MINIMUM PERFORMANCE REQUIREMENTS SPECIFIED IN THE DESIGN BASES.	IN COMPLIANCE

KEY TO ACCEPTANCE CRITERIA
COMPLIANCE STATEMENT

C = IN COMPLIANCE

NSSS = WITHIN CESSAR SCOPE

I = CESSAR INTERFACE REQUIREMENT,
IN COMPLIANCE

N/A = NOT APPLICABLE PER SRP TABLE 7-1

I/C = CESSAR INTERFACE REQUIREMENT,
IN COMPLIANCE FOR NSSS SCOPE/
IN COMPLIANCE FOR BOP SCOPE

EXHIBIT 3A-15

SRP ACCEPTANCE CRITERIA
REFERENCE: SRP TABLE 7-1

REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
10 CFR 50.34, CONTENTS OF APPLICATIONS: TECHNICAL INFORMATION						
REQUIREMENT						
ALL APPLICATIONS REQUIRED OF A UTILITY TO LICENSE A NUCLEAR POWER PLANT MUST INCLUDE A PRELIMINARY SAFETY ANALYSIS REPORT (PSAR) AND A FINAL SAFETY ANALYSIS REPORT (FSAR).	NSSS	C	C	C	C	C
10 CFR 50.36, TECHNICAL SPECIFICATIONS						
REQUIREMENT						
EACH APPLICANT SHALL INCLUDE IN THEIR APPLICATION PROPOSED TECHNICAL SPECIFICATIONS.	NSSS	C	C	C	C	N/A
10 CFR 50.55A, CODES AND STANDARDS						
REQUIREMENT						
ALL OPERATING LICENSES AND CONSTRUCTION PERMITS WILL BE SUBJECT TO THE QUALITY STANDARDS AND CODES AND SHALL DEMONSTRATE COMPLIANCE WITH IEEE 279-1971	NSSS	C	C	C	C	C

GENERAL DESIGN CRITERIA

REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 1, QUALITY STANDARDS AND RECORDS REQUIREMENT STRUCTURES, SYSTEMS AND COMPONENTS IMPORTANT TO SAFETY SHALL BE DESIGNED, FABRICATED, ERECTED, AND TESTED TO QUALITY STANDARDS COMMENSURATE WITH THE IMPORTANCE OF THE SAFETY FUNCTIONS TO BE PERFORMED.	NSSS	I/C	I/C	I/C	I/C	N/A
GENERAL DESIGN CRITERION 2, DESIGN BASES FOR PROTECTION AGAINST NATURAL PHENOMENA REQUIREMENT STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY SHALL BE DESIGNED TO WITHSTAND THE EFFECTS OF NATURAL PHENOMENA SUCH AS EARTHQUAKES, TORNADOES, HURRICANES, FLOODS, TSUNAMI, AND SEICHES WITHOUT LOSS OF CAPABILITY TO PERFORM THEIR SAFETY FUNCTIONS.	I	I/C	I/C	I/C	I/C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 3, FIRE PROTECTION REQUIREMENT STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY SHALL BE DESIGNED AND LOCATED TO MINIMIZE, CONSISTENT WITH OTHER SAFETY REQUIREMENTS, THE PROBABILITY AND EFFECT OF FIRES AND EXPLOSIONS.	I	I/C	I/C	I/C	I/C	N/A
GENERAL DESIGN CRITERION 4, ENVIRONMENTAL AND MISSILE DESIGN BASES REQUIREMENT STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY SHALL BE DESIGNED FOR THE ENVIRONMENTAL CONDITIONS ASSOCIATED WITH NORMAL OPERATION, MAINTENANCE, TESTING, AND POSTULATED ACCIDENTS, INCLUDING LOSS-OF-COOLANT ACCIDENTS: AND PROTECTED AGAINST DYNAMIC EFFECTS, INCLUDING MISSILES, PIPE WHIPPING, AND DISCHARGING FLUIDS.	I	I/C	I/C	I/C	I/C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 5, SHARING OF STRUCTURES, SYSTEMS AND COMPONENTS REQUIREMENT STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY SHALL NOT BE SHARED BETWEEN NUCLEAR POWER UNITS UNLESS IT IS SHOWN THAT SHARING WILL NOT IMPAIR THEIR ABILITY TO PERFORM THEIR SAFETY FUNCTIONS, INCLUDING, IN THE EVENT OF AN ACCIDENT IN ONE UNIT, AN ORDERLY SHUTDOWN AND COOLDOWN OF THE REMAINING UNITS.	NSSS	C	C	C	C	N/A
GENERAL DESIGN CRITERION 10, REACTOR DESIGN REQUIREMENT THE REACTOR CORE AND ASSOCIATED COOLANT, CONTROL, AND PROTECTION SYSTEMS SHALL BE DESIGNED WITH APPROPRIATE MARGIN TO ASSURE FUEL DESIGN LIMITS ARE NOT EXCEEDED DURING ANY CONDITION OF NORMAL OPERATION.	←		NSSS	SCOPE		→

EXHIBIT 3B-3

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 12, SUPPRESSION OF REACTOR POWER OSCILLATIONS REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
THE REACTOR CORE AND ASSOCIATED COOLANT, CONTROL, AND PROTECTION SYSTEMS SHALL BE DESIGNED TO ASSURE THAT POWER OSCILLATIONS WHICH CAN RESULT IN CONDITIONS EXCEEDING FUEL DESIGN LIMITS ARE NOT POSSIBLE OR CAN BE RELIABLY AND READILY DETECTED AND SUPPRESSED.	←		NSSS	SCOPE		→

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 13, INSTRUMENTATION AND CONTROL REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
INSTRUMENTATION AND CONTROL SHALL BE PROVIDED TO MONITOR VARIABLES AND SYSTEMS OVER THEIR ANTICIPATED RANGES FOR NORMAL OPERATION, AND FOR ACCIDENT CONDITIONS TO ASSURE ADEQUATE SAFETY. APPROPRIATE CONTROLS SHALL BE PROVIDED TO MAINTAIN THESE VARIABLES AND SYSTEMS WITHIN PRESCRIBED OPERATING RANGES.	NSSS	C	C	C	C	C

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
	←		NSSS	SCOPE		→
GENERAL DESIGN CRITERION 15, REACTOR COOLANT SYSTEM DESIGN REQUIREMENT THE REACTOR COOLANT SYSTEM AND ASSOCIATED AUXILIARY, CONTROL, AND PROTECTION SYSTEMS SHALL BE DESIGNED WITH SUFFICIENT MARGIN TO ASSURE THAT THE DESIGN CONDITIONS OF THE REACTOR COOLANT PRESSURE BOUNDARY ARE NOT EXCEEDED.						
GENERAL DESIGN CRITERION 19, CONTROL ROOM REQUIREMENT A CONTROL ROOM SHALL BE PROVIDED FROM WHICH ACTIONS CAN BE TAKEN TO OPERATE THE NUCLEAR POWER UNIT SAFELY UNDER NORMAL CONDITIONS AND TO MAINTAIN IT IN A SAFE CONDITION UNDER ACCIDENT CONDITIONS. EQUIPMENT AT APPROPRIATE LOCATIONS OUTSIDE THE CONTROL ROOM SHALL BE PROVIDED WITH DESIGN CAPABILITY FOR PROMPT HOT SHUTDOWN, INCLUDING NECESSARY INSTRUMENTATION AND CONTROLS, AND POTENTIAL CAPABILITY FOR SUBSEQUENT COLD SHUTDOWN.	I	I/C	I/C	I/C	I/C	I/C

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 20, PROTECTION SYSTEM FUNCTIONS REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
THE PROTECTION SYSTEM SHALL BE DESIGNED (1) TO INITIATE AUTOMATICALLY, TO ASSURE THAT SPECIFIED ACCEPTABLE FUEL DESIGN LIMITS ARE NOT EXCEEDED AND (2) TO SENSE ACCIDENT CONDITIONS AND TO INITIATE THE OPERATION OF SYSTEMS AND COMPONENTS IMPORTANT TO SAFETY. CLARIFICATION THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM IS MANUALLY INITIATED.	NSSS	C	C	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 21, PROTECTION SYSTEM RELIABILITY AND TESTABILITY	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REQUIREMENT THE PROTECTION SYSTEM SHALL BE DESIGNED FOR HIGH FUNCTIONAL RELIABILITY AND INSERVICE TESTABILITY WITH ADEQUATE SUFFICIENT REDUNDANCY AND INDEPENDENCE. CLARIFICATION THE BOP ESFAS "ONE-OUT-OF-TWO" SYSTEMS DO NOT MEET THE SINGLE FAILURE CRITERION DURING CHANNEL BYPASS. THE BYPASS TIME INTERVAL REQUIRED FOR MAINTENANCE IS A SHORT TIME INTERVAL. THE PROBABILITY OF FAILURE OF THE REMAINING CHANNEL IS LOW DURING SUCH MAINTENANCE PERIODS.	NSSS	C	C	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 22, PROTECTION SYSTEM INDEPENDENCE REQUIREMENT THE PROTECTION SYSTEM SHALL BE DESIGNED TO ASSURE THAT THE EFFECTS OF NATURAL PHENOMENA, AND OF NORMAL OPERATING, MAINTENANCE, TESTING, AND POSTULATED ACCIDENT CONDITIONS DO NOT RESULT IN LOSS OF THE PROTECTION FUNCTION.	NSSS	C	C	C	C	N/A
GENERAL DESIGN CRITERION 23, PROTECTION SYSTEM FAILURE MODES REQUIREMENT THE PROTECTION SYSTEM SHALL BE DESIGNED TO FAIL INTO A SAFE STATE IF CONDITIONS SUCH AS DISCONNECTION OF THE SYSTEM, LOSS OF ENERGY, OR POSTULATED ADVERSE ENVIRONMENTS ARE EXPERIENCED.	NSSS	C	C	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 24, SEPARATION OF PROTECTION AND CONTROL SYSTEMS REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
THE PROTECTION SYSTEM SHALL BE SEPARATED FROM CONTROL SYSTEMS SUCH THAT FAILURE OF ANY SINGLE CONTROL SYSTEM COMPONENT OR CHANNEL, COMMON TO BOTH LEAVES INTACT A SYSTEM SATISFYING ALL REQUIREMENTS OF THE PROTECTION SYSTEM.	NSSS	C	C	C	C	C

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 25, PROTECTION SYSTEM REQUIREMENT FOR REACTIVITY CONTROL MALFUNCTIONS REQUIREMENT THE PROTECTION SYSTEM SHALL BE DESIGNED TO ASSURE THAT SPECIFIED ACCEPTABLE FUEL DESIGN LIMITS ARE NOT EXCEEDED FOR ANY SINGLE MALFUNCTION OF THE REACTIVITY CONTROL SYSTEMS.	←		NSSS	SCOPE		→
GENERAL DESIGN CRITERION 26, REACTIVITY CONTROL SYSTEM REDUNDANCY AND CAPABILITY REQUIREMENT TWO INDEPENDENT REACTIVITY CONTROL SYSTEMS OF DIFFERENT DESIGN PRINCIPLES SHALL BE PROVIDED.	←		NSSS	SCOPE		→

EXHIBIT 3B-11

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 27, COMBINED REACTIVITY CONTROL SYSTEMS CAPABILITY REQUIREMENT THE REACTIVITY CONTROL SYSTEMS SHALL BE DESIGNED TO HAVE A COMBINED CAPABILITY, POISON ADDITION AND RELIABILITY CONTROLLING REACTIVITY CHANGES.	←		NSSS	SCOPE		→
GENERAL DESIGN CRITERION 28, REACTIVITY LIMITS REQUIREMENT THE REACTIVITY CONTROL SYSTEMS SHALL BE DESIGNED WITH APPROPRIATE LIMITS ON THE POTENTIAL AMOUNT AND RATE OF REACTIVITY INCREASE.	←		NSSS	SCOPE		→

EXHIBIT 3B-12

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 29, PROTECTION AGAINST ANTICIPATED OPERATIONAL CHANGES REQUIREMENT THE PROTECTION AND REACTIVITY CONTROL SYSTEMS SHALL BE DESIGNED TO ASSURE AN EXTREMELY HIGH PROBABILITY OF ACCOMPLISHING THEIR SAFETY FUNCTIONS IN THE EVENT OF ANTICIPATED OPERATIONAL OCCURRENCES.	NSSS	C	C	C	C	C
GENERAL DESIGN CRITERION 33, REACTOR COOLANT MAKEUP REQUIREMENT A SYSTEM TO SUPPLY REACTOR COOLANT MAKEUP FOR PROTECTION AGAINST SMALL BREAKS IN THE REACTOR COOLANT PRESSURE BOUNDARY SHALL BE PROVIDED.	←		NSSS	SCOPE		→

EXHIBIT 3B-13

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 34, RESIDUAL HEAT REMOVAL REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
A SYSTEM TO REMOVE RESIDUAL HEAT SHALL BE PROVIDED	N/A	C	C	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 35, EMERGENCY CORE COOLING REQUIREMENT A SYSTEM TO PROVIDE ABUNDANT EMERGENCY CORE COOLING SHALL BE PROVIDED.	←		NSSS	SCOPE		→
GENERAL DESIGN CRITERION 37, TESTING OF EMERGENCY CORE COOLING SYSTEM REQUIREMENT THE EMERGENCY CORE COOLING SYSTEM SHALL BE DESIGNED TO PERMIT APPROPRIATE PERIODIC PRESSURE AND FUNCTIONAL TESTING.	←		NSSS	SCOPE		→

EXHIBIT 3B-15

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 38, CONTAINMENT HEAT REMOVAL REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
A SYSTEM TO REMOVE HEAT FROM THE REACTOR CONTAINMENT SHALL BE PROVIDED.	←		NSSS	SCOPE		→
GENERAL DESIGN CRITERION 40, TESTING OF CONTAINMENT HEAT REMOVAL SYSTEM REQUIREMENT						
THE CONTAINMENT HEAT REMOVAL SYSTEM SHALL BE DESIGNED TO PERMIT APPROPRIATE PERIODIC PRESSURE AND FUNCTIONAL TESTING.	←		NSSS	SCOPE		→

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 41, CONTAINMENT ATMOSPHERE CLEANUP REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SYSTEMS TO CONTROL FISSION PRODUCTS, HYDROGEN, OXYGEN, AND OTHER SUBSTANCES WHICH MAY BE RELEASED INTO THE REACTOR CONTAINMENT SHALL BE PROVIDED AS NECESSARY TO REDUCE THE CONCENTRATION AND QUALITY OF FISSION PRODUCTS, RELEASED TO THE ENVIRONMENT FOLLOWING POSTULATED ACCIDENTS.	N/A	C	N/A	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 43, TESTING OF CONTAINMENT ATMOSPHERE CLEANUP SYSTEMS REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
THE CONTAINMENT ATMOSPHERE CLEANUP SYSTEMS SHALL BE DESIGNED TO PERMIT APPROPRIATE PERIODIC PRESSURE AND FUNCTIONAL TESTING.	N/A	C	N/A	C	C	N/A
GENERAL DESIGN CRITERION 44, COOLING WATER REQUIREMENT						
A SYSTEM TO TRANSFER HEAT FROM STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY, TO AN ULTIMATE HEAT SINK SHALL BE PROVIDED.	N/A	C	C	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
GENERAL DESIGN CRITERION 46, TESTING OF COOLING WATER SYSTEM REQUIREMENT THE COOLING WATER SYSTEM SHALL BE DESIGNED TO PERMIT APPROPRIATE PERIODIC PRESSURE AND FUNCTIONAL TESTING.	N/A	C	C	C	C	N/A
GENERAL DESIGN CRITERION 50, CONTAINMENT DESIGN BASIS REQUIREMENT THE REACTOR CONTAINMENT STRUCTURE, INCLUDING ACCESS OPENINGS, PENETRATIONS, AND THE CONTAINMENT HEAT REMOVAL SYSTEM, SHALL BE DESIGNED TO ACCOMMODATE, WITHOUT EXCEEDING THE DESIGN LEAKAGE RATE AND WITH SUFFICIENT MARGIN, THE CALCULATED PRESSURE AND TEMPERATURE CONDITIONS RESULTING FROM ANY LOSS-OF-COOLANT ACCIDENT.	N/A	C	N/A	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 54, PIPING SYSTEMS PENETRATING CONTAINMENT REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
PIPING SYSTEMS PENETRATING PRIMARY REACTOR CONTAINMENT SHALL BE PROVIDED WITH LEAK DETECTION, ISOLATION, AND CONTAINMENT CAPABILITIES.	N/A	C	N/A	C	C	N/A
GENERAL DESIGN CRITERION 55, REACTOR COOLANT PRESSURE BOUNDARY PENETRATING CONTAINMENT REQUIREMENT						
EACH LINE THAT IS PART OF THE REACTOR COOLANT PRESSURE BOUNDARY AND THAT PENETRATES PRIMARY REACTOR CONTAINMENT SHALL BE PROVIDED WITH CONTAINMENT ISOLATION VALVES.	N/A	C	N/A	C	C	N/A

GENERAL DESIGN CRITERIA
REFERENCE: SRP TABLE 7-1

GENERAL DESIGN CRITERION 56, PRIMARY CONTAINMENT ISOLATION REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
EACH LINE THAT CONNECTS DIRECTLY TO THE CONTAINMENT ATMOSPHERE AND PENETRATES PRIMARY REACTOR CONTAINMENT SHALL BE PROVIDED WITH CONTAINMENT ISOLATION VALVES.	N/A	C	N/A	C	C	N/A
GENERAL DESIGN CRITERION 57, CLOSED SYSTEM ISOLATION VALVES REQUIREMENT						
EACH LINE THAT PENETRATES PRIMARY REACTOR CONTAINMENT AND IS NEITHER PART OF THE REACTOR COOLANT PRESSURE BOUNDARY NOR CONNECTED DIRECTLY TO THE CONTAINMENT ATMOSPHERE SHALL HAVE AT LEAST ONE CON-TAINMENT ISOLATION VALVE WHICH SHALL BE EITHER AUTOMATIC, OR LOCKED CLOSED, OR CAPABLE OF REMOTE MANUAL OPERATION.	N/A	C	N/A	C	C	N/A

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.6 (REV. 0), INDEPENCENCE BETWEEN REDUNDANT STANDBY POWER SOURCES AND THEIR DISTRIBUTION SYSTEMS REQUIREMENT AN ACCEPTABLE DEGREE OF INDEPENDENCE BETWEEN REDUNDANT STANDBY (ONSITE) POWER SOURCES AND BETWEEN THEIR DISTRIBUTION SYSTEMS.	N/A	C	C	C	C	N/A
REGULATORY GUIDE 1.7 (REV. 0), CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOCA REQUIREMENT COMBUSTIBLE GAS CONTROL SYSTEMS AND THE PROVISIONS FOR MIXING, MEASURING AND SAMPLING SHALL MEET THE REQUIREMENTS FOR AN ENGINEERED SAFETY FEATURE.	N/A	C	N/A	C	N/A	N/A

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.11 (REV. 0), INSTRUMENT LINES PENETRATING CONTAINMENT REQUIREMENT INSTRUMENT LINES PENETRATING CONTAINMENT SHALL BE QUALIFIED TO THE SAME LEVEL AS THE SYSTEM OF WHICH THEY ARE PART. CLARIFICATION INSTRUMENT LINES THAT ARE A PART OF CONTAINMENT PRESSURE BOUNDARY AND A PROTECTION SYSTEM ARE PROVIDED WITH ISOLATION CAPABILITY THAT MEETS THE REQUIREMENTS FOR REDUNDANCY, INDEPENDENCE AND TESTABILITY OF THAT PROTECTION SYSTEM.	C	C	C	C	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.12 (REV. 1), INSTRUMENTATION FOR EARTHQUAKES **REQUIREMENT** THE FACILITY SHALL HAVE APPROPRIATE INSTRUMENTATION TO ACCURATELY MONITOR AN EARTHQUAKE AND ASSIST IN POST EVENT ANALYSIS. **CLARIFICATION** STRONG MOTION ACCELEROMETERS (SMA'S) ARE USED INSIDE CONTAINMENT RATHER THAN PEAK RECORDING ACCELEROGRAPHS (PRA'S). TIME-HISTORY SMA'S PROVIDE DATA FOR RESPONSE SPECTRA ANALYSIS RATHER THAN RESPONSE SPECTRUM RECORDERS. THIRTY (30) MINUTE BATTERY POWER IS PROVIDED FOR CONTINUOUS OPERATION IN THE EVENT OF A LOSS OF EXTERNAL POWER. SEISMIC MONITORING INSTRUMENTATION HAS A RESPONSE ESSENTIALLY FLAT OR EQUIVALENTLY CORRECTABLE BY COMPUTATIONAL TECHNIQUES OVER THE RANGE OF 1 to 30 HZ. DAMPING VALUES ARE APPLICABLE TO THE OVERALL SMA. SEISMIC TRIGGERS ARE ADJUSTABLE OVER A MINIMUM RANGE OF 0.01 TO 0.03 G ON THE BASE SLAB.	N/A	N/A	N/A	N/A	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.22 (REV. 0), PERIODIC TESTING OF PROTECTION SYSTEM ACTUATION FUNCTIONS. REQUIREMENT THE PROTECTION SYSTEM, INCLUDING ACTUATION DEVICES, SHALL BE TESTED PERIODICALLY TO ASSURE PROPER FUNCTIONING.	NSSS	C	C	C	C	N/A
REGULATORY GUIDE 1.29 (REV. 1), SEISMIC DESIGN CLASSIFICATION REQUIREMENT ALL STRUCTURES, SYSTEMS, AND COMPONENTS DESIGNATED SEISMIC CATEGORY I SHALL WITHSTAND EFFECTS OF THE SSE AND REMAIN FUNCTIONAL.	NSSS	C	C	C	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.30 (REV. 0), QUALITY ASSURANCE REQUIREMENTS REQUIREMENT QUALITY ASSURANCE REQUIREMENTS FOR THE INSTALLATION, INSPECTION, AND TESTING OF INSTRUMENTATION AND ELECTRICAL EQUIPMENT SHALL BE MET.	NSSS	C	C	C	C	C
REGULATORY GUIDE 1.32 (REV. 0), CRITERIA FOR SAFETY-RELATED POWER SYSTEMS REQUIREMENT IEEE STANDARD 308 SHALL BE MET IN REGARDS TO CRITERIA, REQUIREMENTS AND RECOMMENDATIONS OF SAFETY-RELATED POWER SYSTEMS.	I	I/C	I/C	I/C	I/C	N/A

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.45 (REV. 0), RCPB LEAKAGE DETECTION SYSTEM REQUIREMENT SOURCES OF REACTOR COOLANT PRESSURE BOUNDARY LEAKAGE SHOULD BE IDENTIFIABLE AND PROPERLY MONITORED.	N/A	N/A	N/A	C	C	N/A
REGULATORY GUIDE 1.47 (REV. 0), BYPASSED AND INOPERABLE STATUS INDICATION REQUIREMENT INDICATION MUST BE READILY AVAILABLE IN THE CONTROL ROOM OF INOPERABLE STATUS OF THE PROTECTION SYSTEM, ITS ACTUATED SYSTEMS, AND AUXILIARY OR SUPPORTING SYSTEMS REQUIRED TO PERFORM ITS FUNCTION.	I	I/C	I/C	C	C	N/A

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.53 (REV. 0), SINGLE FAILURE CRITERION REQUIREMENT NO SINGLE FAILURE WITHIN THE PROTECTION SYSTEM SHALL PREVENT PROPER PROTECTIVE ACTION AT SYSTEM LEVEL WHEN REQUIRED.	NSSS	C	C	C	C	N/A
REGULATORY GUIDE 1.62 (REV. 0), MANUAL INITIATION OF PROTECTIVE ACTIONS REQUIREMENT MANUAL INITIATION OF PROTECTIVE ACTIONS AT THE SYSTEM LEVEL SHALL BE EASILY ACCOMPLISHED FROM THE CONTROL ROOM.	NSSS	C	C	N/A	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.63 (REV. 2), ELECTRIC PENETRATIONS REQUIREMENT ELECTRICAL PENETRATION ASSEMBLIES SHALL WITHSTAND THE MAXIMUM TEMPERATURE AND PRESSURE EXPECTED FROM ANY LOCA WITHOUT EXCEEDING THE DESIGN LEAK RATE.	I	I/C	I/C	I/C	I/C	I/C
REGULATORY GUIDE 1.67 (REV. 0), OVER-PRESSURE PROTECTION DEVICES REQUIREMENT ANALYSES SHALL BE DONE TO SHOW PROPER FUNCTIONING OF THE PRESSURE RELIEF VALVES INSTALLED WITH NO ADVERSE EFFECTS ON OTHER PIPING OR VALVES.	N/A	N/A	N/A	N/A	NSSS	N/A

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.68 (REV. 0), INITIAL TEST PROGRAMS REQUIREMENT AN INITIAL TEST PROGRAM SHALL BE CONDUCTED TO DEMONSTRATE THAT THE PLANT CAN BE OPERATED SAFELY, AS DEFINED IN 10CFR50 APPENDIX A.	NSSS	C	C	C	C	C
REGULATORY GUIDE 1.70 (REV. 3), STANDARD FORMAT AND CONTENT OF S.A.R.'S REQUIREMENT THE PROPER FORMAT SHALL BE USED WHEN SUBMITTING THE SAFETY ANALYSIS REPORT TO THE NRC.	NSSS	C	C	C	C	C

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.75 (REV. 1), PHYSICAL INDEPENDENCE OF ELECTRIC SYSTEMS REQUIREMENT ADEQUATE PHYSICAL SEPARATION OF ELECTRICAL SYSTEMS SHALL BE PROVIDED SO THAT A DESIGN BASIS EVENT WILL NOT PREVENT PROPER PROTECTIVE ACTION.	NSSS	C	C	C	C	C
REGULATORY GUIDE 1.78 (REV. 0), CONTROL ROOM HABITABILITY REQUIREMENT THE CONTROL ROOM SHALL BE PROTECTED FROM HAZARDOUS CHEMICALS, WHETHER IT BE FROM EQUIPMENT FAILURE, OPERATOR ERROR, OR EVENTS OUTSIDE THE CONTROL OF THE POWER PLANT.	N/A	C	N/A	C	N/A	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.80 (REV. 0), PRE-OP. TESTING OF INSTRUMENT AIR REQUIREMENT A SUITABLE PREOPERATIONAL TEST PROGRAM FOR THE INSTRUMENT AIR SYSTEM IS TO BE DEVELOPED WHICH WILL SUPPORT THE VALIDITY OF THE RESULTS.	N/A	C	C	N/A	C	N/A
REGULATORY GUIDE 1.89 (REV. 0), QUALIFICATION OF CLASS IE EQUIPMENT REQUIREMENT CLASS IE EQUIPMENT SHALL WITHSTAND NORMAL AND ABNORMAL OPERATION, DESIGN BASIS EVENT AND CONTAINMENT TEST CONDITIONS WITH NO LOSS OF FUNCTION.	NSSS	C	C	C	C	N/A

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.95 (REV. 0), PROTECTION AGAINST CHLORINE RELEASE REQUIREMENT THE CONTROL ROOM OPERATORS SHALL BE PROTECTED AGAINST THE ACCIDENTAL RELEASE OF CHLORINE GAS.	N/A	C	N/A	C	N/A	N/A
REGULATORY GUIDE 1.97 (REV. 2), INSTRUMENTATION USED DURING AND FOLLOWING AN ACCIDENT REQUIREMENT INSTRUMENTATION USED DURING AND FOLLOWING AN ACCIDENT SHOULD PROVIDE ALL REQUIRED INFORMATION TO PROPERLY ASSESS THE ACCIDENT. CLARIFICATION SEE SEC. 2.C.3	N/A	I/C	I/C	I/C	I/C	I/C

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.100 (REV. 0), SEISMIC QUALIFICATION OF ELECTRICAL EQUIPMENT REQUIREMENT CLASS IE ELECTRIC EQUIPMENT SHALL WITHSTAND THE EFFECTS OF AN SSE AND NUMEROUS OBE'S.	NSSS	C	C	C	C	N/A
REGULATORY GUIDE 1.105 (REV. 1), INSTRUMENT SETPOINTS REQUIREMENT INSTRUMENT SETPOINTS IN SYSTEMS IMPORTANT TO SAFETY INITIALLY ARE WITHIN AND REMAIN WITHIN THE SPECIFIED LIMITS.	NSSS	C	C	C	C	N/A

REGULATORY GUIDE 1.106 (REV. 1), THERMAL OVERLOAD PROTECTION ELECTRIC MOTORS ON MOTOR-OPERATED VALVES REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
THERMAL OVERLOAD PROTECTION DEVICES THAT ARE NORMALLY IN FORCE DURING PLANT OPERATION SHOULD BE BYPASSED UNDER ACCIDENT CONDITIONS.	N/A	C	C	N/A	N/A	N/A

SRP ACCEPTANCE CRITERIA

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
REGULATORY GUIDE 1.118 (REV. 1), PERIODIC TESTING REQUIREMENT PROTECTION SYSTEMS AND SAFETY-RELATED ELECTRICAL SYSTEMS MUST BE TESTED PERIODICALLY TO ENSURE PROPER FUNCTIONING CAPABILITIES.	NSSS	C	C	C	C	N/A
REGULATORY GUIDE 1.120 (REV. 1), FIRE PROTECTION REQUIREMENT PROPER FIRE PROTECTION AND PROTECTION SYSTEM DESIGNS ALONG WITH SUFFICIENT ADMINISTRATIVE PROCEDURES MUST ENSURE SAFE SHUTDOWN CAPABILITY IN THE EVENT OF A FIRE.	I	C	C	C	C	C

IEEE STANDARD 279-1971, CRITERIA FOR PROTECTION SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS SECTION 4.1 GENERAL FUNCTIONAL REQUIREMENTS	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
THE PROTECTION SYSTEM SHALL AUTOMATICALLY INITIATE APPROPRIATE PROTECTIVE ACTION WHENEVER A CONDITION MONITORED BY THE SYSTEM REACHES A PRESET LEVEL. CLARIFICATION INSTRUMENTATION OF THE CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM ALARMS ON HIGH HYDROGEN CONCENTRATION. MANUAL CONTROLS ALLOW SYSTEM ACTUATION.	NSSS	C	C	C	C	N/A

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.2 SINGLE FAILURE CRITERION ANY SINGLE FAILURE WITHIN THE PROTECTION SYSTEM SHALL NOT PREVENT PROPER PROTECTIVE ACTION AT THE SYSTEM LEVEL WHEN REQUIRED. CLARIFICATION ALTHOUGH NO SINGLE FAILURE IN THE BOP ESFAS WILL DEFEAT MORE THAN ONE OF THE TWO PROTECTIVE CHANNELS, A SINGLE FAILURE MAY CAUSE SPURIOUS ACTUATION. HOWEVER, THIS SPURIOUS ACTUATION IS ALLOWABLE SINCE IT DOES NOT CREATE PLANT CONDITIONS REQUIRING PROTECTIVE ACTION NOR DOES IT INTERFERE WITH NORMAL REACTOR OPERATIONS.	NSSS	C	C	C	C	N/A

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.3 QUALITY OF COMPONENTS AND MODULES						
COMPONENTS AND MODULES SHALL BE OF A QUALITY THAT IS CONSISTENT WITH MINIMUM MAINTENANCE REQUIREMENTS AND LOW FAILURE RATES.	NSSS	C	C	C	C	N/A
SECTION 4.4 EQUIPMENT QUALIFICATION						
TEST DATA SHALL BE AVAILABLE TO VERIFY THAT PROTECTION SYSTEM EQUIPMENT SHALL MEET THE PERFORMANCE DETERMINED TO BE NECESSARY.	NSSS	C	C	C	C	N/A
SECTION 4.5 CHANNEL INTEGRITY						
ALL PROTECTION SYSTEM CHANNELS SHALL MAINTAIN FUNCTIONAL CAPABILITY UNDER EXTREME CONDITIONS.	I	I/C	I/C	I/C	I/C	N/A

IEEE STANDARD 279 (CONTINUED)

SECTION 4.6 CHANNEL INDEPENDENCE

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
CHANNELS THAT PROVIDE SIGNALS FOR THE SAME PROTECTIVE FUNCTION SHALL BE INDEPENDENT AND PHYSICALLY SEPARATED TO DECOUPLE EFFECTS OF UNSAFE ENVIRONMENTAL FACTORS, ELECTRIC TRANSIENTS, AND PHYSICAL ACCIDENT CONSEQUENCES DOCUMENTED IN THE DESIGN BASIS, AND TO REDUCE THE LIKELIHOOD OF INTERACTIONS BETWEEN CHANNELS DURING MAINTENANCE OPERATIONS OR IN THE EVENT OF CHANNEL MALFUNCTION.	I	I/C	I/C	I/C	I/C	N/A

IEEE STANDARD 279 (CONTINUED) SECTION 4.7 CONTROL AND PROTECTION SYSTEM INTERACTION	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU- MENTATION	7.6 ALL OTHER INSTRU- MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
4.7.1 CLASSIFICATION OF EQUIPMENT. ANY EQUIPMENT THAT IS USED FOR BOTH PROTECTIVE AND CONTROL FUNCTIONS SHALL BE CLASSIFIED AS PART OF THE PROTECTION SYSTEM AND SHALL MEET ALL THE REQUIREMENTS OF THIS DOCUMENT.	NSSS	C	C	C	C	C
4.7.2 ISOLATION DEVICES. THE TRANSMISSION OF SIGNALS FROM PROTECTION SYSTEM EQUIPMENT FOR CONTROL SYSTEM USE SHALL BE THROUGH ISOLATION DEVICES WHICH SHALL BE CLASSIFIED AS PART OF THE PROTECTION SYSTEM AND SHALL MEET ALL THE REQUIREMENTS OF THIS DOCUMENT. NO CREDIBLE FAILURE AT THE OUTPUT OF AN ISOLATION DEVICE SHALL PREVENT THE ASSOCIATED PROTECTION SYSTEM CHANNEL FROM MEETING THE MINIMUM PERFORMANCE REQUIREMENTS SPECIFIED IN THE DESIGN BASES.						

IEEE STANDARD 279 (CONTINUED)

SECTION 4.7 (CONTINUED)

Section 4.7.3 SINGLE RANDOM FAILURE. WHERE A SINGLE RANDOM FAILURE CAN CAUSE A CONTROL SYSTEM ACTION THAT REQUIRES PROTECTIVE ACTION AND CAN ALSO PREVENT PROPER ACTION OF A PROTECTION SYSTEM CHANNEL DESIGNED TO PROTECT AGAINST THE CONDITION, THE REMAINING REDUNDANT PROTECTION CHANNELS SHALL BE CAPABLE OF PROVIDING THE PROTECTIVE ACTION EVEN WHEN DEGRADED BY A SECOND RANDOM FAILURE.

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.7.4 MULTIPLE FAILURES RESULTING FROM A CREDIBLE SINGLE EVENT. WHERE A CREDIBLE SINGLE EVENT CAN CAUSE A CONTROL SYSTEM ACTION THAT RESULTS IN A CONDITION REQUIRING PROTECTIVE ACTION FROM THOSE PROTECTION SYSTEM CHANNELS DESIGNED TO PROVIDE PRINCIPAL PROTECTION AGAINST THE CONDITION, ONE OF THE FOLLOWING MUST BE MET.						

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.8 DERIVATION OF SYSTEM INPUTS						
TO THE EXTENT FEASIBLE AND PRACTICAL, PROTECTON SYSTEM INPUTS SHALL BE DERIVED FROM SIGNALS THAT ARE DIRECT MEASURES OF THE DESIRED VARIABLES.	NSSS	C	C	C	C	N/A
SECTION 4.9 CAPABILITY FOR SENSOR CHECKS						
MEANS SHALL BE PROVIDED FOR CHECKING, WITH A HIGH DEGREE OF CONFIDENCE, THE OPERATIONAL AVAILABILITY OF EACH SYSTEM INPUT SENSOR DURING REACTOR OPERATION.	NSSS	C	C	C	C	N/A

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.10 CAPABILITY FOR TEST AND CALIBRATION CAPABILITY SHALL BE PROVIDED FOR TESTING AND CALIBRATING CHANNELS AND THE DEVICES USED TO DERIVE THE FINAL SYSTEM OUTPUT SIGNAL FROM THE VARIOUS CHANNEL SIGNALS. FOR THOSE PARTS OF THE SYSTEM WHERE THE REQUIRED INTERVAL BETWEEN TESTING WILL BE LESS THAN NORMAL TIME INTERVAL BETWEEN GENERATING STATION SHUTDOWNS, THERE SHALL BE CAPABILITY FOR TESTING DURING POWER OPERATION.	NSSS	C	C	C	C	N/A

IEEE STANDARD 279 (CONTINUED)

SECTION 4.11 CHANNEL BYPASS OR REMOVAL FROM OPERATION

THE SYSTEM SHALL BE DESIGNED TO PERMIT ANY ONE CHANNEL TO BE MAINTAINED, AND WHEN REQUIRED, TESTED OR CALIBRATED DURING POWER OPERATION WITHOUT INITIATING A PROTECTIVE ACTION AT THE SYSTEM LEVEL. DURING SUCH OPERATION AND ACTIVE PARTS OF THE SYSTEM SHALL OF THEMSELVES CONTINUE TO MEET THE SINGLE FAILURE CRITERION.

EXCEPTION: "ONE-OUT-OF-TWO" SYSTEMS ARE PERMITTED TO VIOLATE THE SINGLE FAILURE CRITERION DURING CHANNEL BYPASS PROVIDED THAT ACCEPTABLE RELIABILITY OF OPERATION CAN BE OTHERWISE DEMONSTRATED. FOR EXAMPLE, THE BYPASS TIME INTERVAL REQUIRED FOR A TEST, CALIBRATION, OR MAINTENANCE OPERATION COULD BE SHOWN TO BE SO SHORT

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
NSSS	C	C	N/A	C	N/A

IEEE STANDARD 279 (CONTINUED)

SECTION 4.11 (CONTINUED)

THAT THE PROBABILITY OF FAILURE OF THE ACTIVE CHANNEL WOULD BE COMMENSURATE WITH THE PROBABILITY OF FAILURE OF THE "ONE-OUT-OF-TWO" SYSTEMS DURING ITS NORMAL INTERVAL BETWEEN TESTS.

CLARIFICATION

TESTING OF THE BOP ESFAS IS DONE BY CHANNEL ACTUATION. EITHER ONE OF THE TWO CHANNELS MAY BE CALIBRATED OR REPAIRED WITHOUT DETRIMENTAL EFFECTS ON THE SYSTEM. INDIVIDUAL TRIP CHANNELS MAY BE BYPASSED TO EFFECT A SINGLE CHANNEL LOGIC ON THE ESFAS SIGNAL. MAINTENANCE AND CALIBRATION OF THE BYPASSED CHANNEL CAN BE ACCOMPLISHED IN A SHORT TIME INTERVAL. PROBABILITY OF FAILURE OF THE REMAINING

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.11 (CONTINUED) CHANNEL IS ACCEPTABLY LOW DURING SUCH MAINTENANCE PERIODS.						
SECTION 4.12 OPERATING BYPASSES WHERE OPERATING REQUIREMENTS NECESSITATE AUTOMATIC OR MANUAL BYPASS OF A PROTECTIVE FUNCTION, THE DESIGN SHALL BE SUCH THAT THE BYPASS WILL BE REMOVED AUTOMATICALLY WHENEVER PERMISSIVE CONDITIONS ARE NOT MET. DEVICES USED TO ACHIEVE AUTOMATIC REMOVAL OF THE BYPASS OF A PROTECTIVE FUNCTION ARE PART OF THE PROTECTION SYSTEM AND SHALL BE DESIGNED IN ACCORDANCE WITH THESE CRITERIA. CLARIFICATION THERE ARE NO OPERATING BYPASSES.	NSSS	C	C	N/A	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
IEEE STANDARD 279 (CONTINUED)						
SECTION 4.13 INDICATION OF BYPASSES						
IF THE PROTECTIVE ACTION OF SOME PART OF THE SYSTEM HAS BEEN BYPASSED OR DELIBERATELY RENDERED INOPERATIVE FOR ANY PURPOSE, THIS FACT SHALL BE CONTINUOUSLY INDICATED IN THE CONTROL ROOM.	NSSS	C	C	N/A	C	N/A
SECTION 4.14 ACCESS TO MEANS FOR BYPASSING						
THE DESIGN SHALL PERMIT THE ADMINISTRATIVE CONTROL OF THE MEANS FOR MANUALLY BYPASSING CHANNELS OR PROTECTIVE FUNCTIONS.	NSSS	C	C	N/A	N/A	N/A

IEEE STANDARD 279 (CONTINUED)

SECTION 4.15 MULTIPLE SET POINTS

WHERE IT IS NECESSARY TO CHANGE TO A MORE RESTRICTIVE SET POINT TO PROVIDE ADEQUATE PROTECTION FOR A PARTICULAR MODE OF OPERATION OR SET OF OPERATING CONDITIONS, THE DESIGN SHALL PROVIDE POSITIVE MEANS OF ASSURING THAT THE MORE RESTRICTIVE SET POINT IS USED. THE DEVICES USED TO PREVENT IMPROPER USE OF LESS RESTRICTIVE SET POINTS SHALL BE CONSIDERED A PART OF THE PROTECTION SYSTEM AND SHALL BE DESIGNED IN ACCORDANCE WITH THE OTHER PROVISIONS OF THESE CRITERIA REGARDING PERFORMANCE AND RELIABILITY.

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
NSSS	C	N/A	N/A	N/A	N/A

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.16 COMPLETION OF PROTECTIVE ACTION ONCE IT IS INITIATED THE PROTECTION SYSTEM SHALL BE SO DESIGNED THAT, ONCE INITIATED, A PROTECTIVE ACTION AT THE SYSTEM LEVEL SHALL GO TO COMPLETION. RETURN TO OPERATION SHALL REQUIRE SUBSEQUENT DELIBERATE OPERATOR ACTION.	NSSS	C	N/A	N/A	N/A	N/A
SECTION 4.17 MANUAL INITIATION THE PROTECTION SYSTEM SHALL INCLUDE MEANS FOR MANUAL INITIATION OF EACH PROTECTION ACTION AT THE SYSTEM LEVEL. NO SINGLE FAILURE WITHIN THE MANUAL, AUTOMATIC, OR COMMON PORTIONS OF THE PROTECTION SYSTEM SHALL PREVENT INITIATION OF PROTECTIVE ACTION BY MANUAL OR AUTOMATIC MEANS. MANUAL INITIATION SHOULD DEPEND UPON THE OPERATION OF A MINIMUM OF EQUIPMENT.	NSSS	C	C	N/A	N/A	N/A

IEEE STANDARD 279 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.18 ACCESS TO SET POINT ADJUSTMENTS, CALIBRATION, AND TEST POINTS						
THE DESIGN SHALL PERMIT THE ADMINISTRATIVE CONTROL OF ACCESS TO ALL SET POINT ADJUSTMENTS, MODULE CALIBRATION ADJUSTMENTS, AND TEST POINTS.	I	I/C	I/C	I/C	I/C	N/A
SECTION 4.19 IDENTIFICATION OF PROTECTIVE ACTIONS						
PROTECTIVE ACTIONS SHALL BE INDICATED AND IDENTIFIED DOWN TO THE CHANNEL LEVEL.	NSSS	C	C	C	C	N/A

IEEE STANDARD 279 CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
SECTION 4.20 INFORMATION READ OUT						
THE PROTECTIVE SYSTEM SHALL BE DESIGNED TO PROVIDE THE OPERATOR WITH ACCURATE, COMPLETE, AND TIMELY INFORMATION PERTINENT TO ITS OWN STATUS AND TO GENERATING STATION SAFETY. THE DESIGN SHALL MINIMIZE THE DEVELOPMENT OF CONDITIONS WHICH WOULD CAUSE METERS, ANNUNCIATORS, RECORDERS, ALARMS, ETC., TO GIVE ANOMALOUS INDICATIONS CONFUSING TO THE OPERATOR.	NSSS	C	C	C	C	N/A
SECTION 4.21 SYSTEM REPAIR						
THE SYSTEM SHALL BE DESIGNED TO FACILITATE THE RECOGNITION, LOCATION, REPLACEMENT, REPAIR, OR ADJUSTMENT OF MALFUNCTIONING COMPONENTS OR MODULES.	NSSS	C	C	C	C	N/A

SRP ACCEPTANCE CRITERIA

IEEE STANDARD 279 (CONTINUED)

SECTION 4.22 IDENTIFICATION

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
IN ORDER TO PROVIDE ASSURANCE THAT THE REQUIREMENTS GIVEN IN THIS DOCUMENT CAN BE APPLIED DURING THE DESIGN, CONSTRUCTION, MAINTENANCE, AND OPERATION OF THE PLANT, THE PROTECTION SYSTEM EQUIPMENT (FOR EXAMPLE, INTERCONNECTING WIRING, COMPONENTS, MODULES, ETC.), SHALL BE IDENTIFIED DISTINCTIVELY AS BEING IN THE PROTECTIVE SYSTEM. THIS IDENTIFICATION SHALL DISTINGUISH BETWEEN REDUNDANT PORTIONS OF THE PROTECTION SYSTEM. IN THE INSTALLED EQUIPMENTS, COMPONENTS, OR MODULES MOUNTED IN ASSEMBLIES THAT ARE CLEARLY IDENTIFIED AS BEING IN THE PROTECTION SYSTEM DO NOT THEMSELVES REQUIRE IDENTIFICATION.	NSSS	C	C	C	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
IEEE STANDARD 308-1974, CRITERIA FOR CLASS IE POWER SYSTEMS REQUIREMENT THE CLASS IE POWER SYSTEMS SHALL MEET THE FUNCTIONAL REQUIREMENTS TO ENABLE THE SYSTEM TO FUNCTION UNDER CONDITIONS OF DESIGN BASIS EVENTS.	I	I/C	I/C	I/C	I/C	N/A
IEEE STANDARD 317-1972, ELECTRICAL PENETRATING ASSEMBLIES IN CONTAINMENT STRUCTURES REQUIREMENT ELECTRICAL PENETRATION ASSEMBLIES SHALL BE QUALIFIED BY TESTING AND ANALYSIS.	I	I/C	I/C	I/C	I/C	I/C

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
<u>IEEE STANDARD 336-1971</u>, INSTALLATION, INSPECTION AND TESTING REQUIREMENTS FOR INSTRUMENTATION AND ELECTRIC EQUIPMENT DURING CONSTRUCTION						
<u>REQUIREMENT</u>						
MEASURES SHALL BE ESTABLISHED FOR ASSURING PROPER DOCUMENTATION FOR INSTALLATION, INSPECTION AND TESTING OF SYSTEMS.	NSSS	C	C	C	C	C
<u>IEEE STANDARD 338-1971</u>, CRITERIA FOR PERIODIC TESTING OF CLASS IE POWER AND PROTECTION SYSTEMS						
<u>REQUIREMENT</u>						
ASSURE CLASS IE POWER AND PROTECTION SYSTEMS ARE PERIODICALLY TESTED COMMENSURATE TO THEIR FUNCTION.	NSSS	C	C	C	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
<u>IEEE STANDARD 344-1975</u>, SEISMIC QUALIFICATION OF CLASS IE EQUIPMENT <u>REQUIREMENT</u> CLASS IE EQUIPMENT MUST BE SEISMICALLY QUALIFIED TO WITHSTAND THE EFFECTS FROM DESIGN BASIS EVENTS.	NSSS	C	C	C	C	N/A
<u>IEEE STANDARD 379-1972</u>, APPLICATION OF SINGLE-FAILURE CRITERIA <u>REQUIREMENT</u> THE PROTECTION SYSTEM SHALL ADHERE TO THE SINGLE-FAILURE CRITERION.	NSSS	C	C	C	C	C

IEEE STANDARD 384-1974, CRITERIA FOR SEPARATION OF CLASS IE EQUIPMENT AND CIRCUITS REQUIREMENT	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
PROPER SEPARATION OF CLASS IE EQUIPMENT AND CIRCUITS SHALL BE PROVIDED TO ASSUME REQUIRED FUNCTIONS CAN BE ACCOMPLISHED FOLLOWING A DESIGN BASIS EVENT.	I	I/C	I/C	I/C	I/C	I/C

BRANCH TECHNICAL POSITION ICSB 1	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
1. INSTRUMENTATION AND ELECTRIC EQUIPMENT ESSENTIAL TO SAFETY WHICH MUST FUNCTION IN AN ACCIDENT ENVIRONMENT SHOULD BE ANALYZED OR TESTED TO DEMONSTRATE THIS CAPABILITY.	NSSS	C	C	N/A	C	N/A
2. PROTECTION CIRCUITS ESSENTIAL TO SAFETY SHOULD MEET THE SINGLE FAILURE CRITERION OF SECTION 4.2 OF IEEE 279.						
3. WHERE D-C POWER IS REQUIRED FOR SAFETY, REDUNDANT D-C SOURCES SHOULD BE PROVIDED AND THE D-C CIRCUITS SHOULD MEET THE SINGLE FAILURE CRITERION.						

BRANCH TECHNICAL POSITION 1 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
4. FOR REACTOR PLANTS SUPPLYING ELECTRIC POWER TO ELECTRIC UTILITY GRIDS, REDUNDANT SOURCES OF ONSITE A-C POWER SHOULD BE PROVIDED AND THE A-C CIRCUITS SHOULD MEET THE SINGLE FAILURE CRITERION.						

BRANCH TECHNICAL POSITION ICSB 3	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
THE FOLLOWING MEASURES SHOULD BE INCORPORATED IN DESIGNS OF THE INTERFACES BETWEEN LOW PRESSURE SYSTEMS AND THE HIGH PRESSURE REACTOR COOLANT SYSTEM: 1. AT LEAST TWO VALVES IN SERIES SHOULD BE PROVIDED FOR ISOLATION. 2. WHERE BOTH VALVES ARE MOTOR-OPERATED, THE VALVES SHOULD HAVE INDEPENDENT AND DIVERSE INTERLOCKS. 3. WHERE ONE CHECK VALVE AND ONE MOTOR-OPERATED VALVE ARE PROVIDED, THE MOTOR-OPERATED VALVE SHOULD BE INTERLOCKED TO OPERATE AS ABOVE.	N/A	N/A	C	N/A	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
BRANCH TECHNICAL POSITION 3 (CONTINUED)						
4. SUITABLE VALVE POSITION INDICATION SHOULD BE PROVIDED IN THE CONTROL ROOM FOR THE INTERFACE VALVES.						
5. FOR THOSE INTERFACES WHERE THE SUBSYSTEM IS REQUIRED FOR ECCS OPERATION, THE ABOVE RECOMMENDATIONS NEED NOT BE IMPLEMENTED.						
BRANCH TECHNICAL POSITION ICSB 4 (PSB)						
THE FOLLOWING FEATURES SHOULD BE INCORPORATED IN THE DESIGN OF MOIV SYSTEMS FOR SAFETY INJECTION TANKS TO MEET THE INTENT OF IEEE STD 279:	N/A	N/A	C	N/A	C	N/A
1. AUTOMATIC OPENING OF THE VALVES WHEN EITHER PRIMARY COOLANT SYSTEM PRESSURE						

BRANCH TECHNICAL POSITION 4 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
EXCEEDS A PRESELECTED VALUE OR A SAFETY INJECTION SIGNAL IS PRESENT.						
2. VISUAL INDICATION IN THE CONTROL ROOM OF THE OPEN OR CLOSED STATUS OF THE VALVE.						
3. AN AUDIBLE AND VISUAL ALARM, INDEPENDENT OF ITEM (2) ABOVE, THAT IS ACTUATED BY A SENSOR ON THE VALVE WHEN THE VALVE IS NOT IN THE FULLY-OPEN POSITION.						
4. UTILIZATION OF A SAFETY INJECTION SIGNAL TO REMOVE AUTOMATICALLY ANY BYPASS FEATURE THAT MAY BE PROVIDED.						

BRANCH TECHNICAL POSITION 4 (CONTINUED)

CLARIFICATION

A NORMALLY OPEN, LOCKED OPEN MOIV IS USED. THE VALVE OPENS ON SIAS. WHEN RCS PRESSURE IS 100 PSI ABOVE TANK OPERATING PRESSURE, MOTOR BREAKER IS MANUALLY LOCKED OPEN. POSITION INDICATION AND CLOSED ALARM ARE PROVIDED ON BREAKER.

BRANCH TECHNICAL POSITION ICSB 5

THE REQUIREMENT THAT CONTROL ROD DRIVE TRIP BREAKERS ARE TESTED MONTHLY SHOULD BE INCLUDED IN ALL PLANT TECHNICAL SPECIFICATIONS ISSUED.

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
← NSSS SCOPE →					

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
BRANCH TECHNICAL POSITION ICSB 9						
THE "DAILY ADJUSTMENT", WHICH DOES NOT FULFILL THE INTENT OF REQUIREMENTS OF A CALIBRATION PROCEDURE, SHOULD REMAIN AS A DAILY REQUIREMENT BUT BE DELETED FROM THE "CHANNEL CALIBRATION" CATEGORY IN THE TECHNICAL SPECIFICATIONS.	I	I/C	I/C	I/C	I/C	N/A
BRANCH TECHNICAL POSITION ICSB 12						
1. THE CHANGE TO THE MORE RESTRICTIVE TRIP POINTS SHOULD BE ACCOMPLISHED AUTOMATICALLY WHEN REQUIRED.	I	N/A	N/A	N/A	N/A	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
<u>BRANCH TECHNICAL POSITION 12</u> (CONTINUED) 2. PLANTS WITH DESIGNS NOT IN ACCORDANCE WITH THE ABOVE SHOULD HAVE A REQUIREMENT THAT THE REACTOR BE SHUT DOWN PRIOR TO CHANGING THE SET POINTS MANUALLY.						
<u>BRANCH TECHNICAL POSITION ICSB 13</u> THE AUXILIARY FEEDWATER SYSTEM SHOULD BE CAPABLE OF SATISFYING THE SYSTEM FUNCTIONAL REQUIREMENTS AFTER A POSTULATED BREAK IN THE AUXILIARY FEEDWATER PIPING <u>INSIDE</u> CONTAINMENT TOGETHER WITH A SINGLE ELECTRICAL FAILURE.	N/A	C	C	N/A	N/A	N/A

BRANCH TECHNICAL POSITION ICSB 14

APPLICANTS HAVE TO DEMONSTRATE COMPLIANCE WITH THE REQUIREMENTS OF GDC 20 TO 25. (SPURIOUS WITHDRAWAL OF SINGLE CONTROL RODS.)

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
		NSSS	SCOPE		

BRANCH TECHNICAL POSITION 16

THE FOLLOWING INTERLOCKS ARE CONSIDERED SAFETY-RELATED AND SHOULD BE DESIGNED TO MEET THE REQUIREMENTS OF IEEE STD 279. THE INTERLOCKS ARE INTENDED TO PREVENT THE FOLLOWING ACTIONS:

1. INSERTION OF SHUTDOWN CEAs BEFORE THE REGULATING CEAs ARE INSERTED.

2. SIMULTANEOUS WITHDRAWAL OF MORE THAN TWO GROUPS OF CEAs.

3. WITHDRAWAL OF A CEA GROUP OR GROUPS OUT OF PROPER SEQUENCE.

CLARIFICATION

APPLICABLE TO REACTOR TRIP SYSTEM.

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
		NSSS			

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
BRANCH TECHNICAL POSITION ICSB 18						
WHERE A SINGLE FAILURE IN AN ELECTRICAL SYSTEM CAN RESULT IN LOSS OF CAPABILITY TO PERFORM A SAFETY FUNCTION, THE EFFECT ON PLANT SAFETY MUST BE EVALUATED. THIS POSITION ESTABLISHES ACCEPTABILITY OF DISCONNECTING POWER TO ELECTRICAL COMPONENTS AS ONE MEANS OF DESIGNING AGAINST A SINGLE FAILURE.	N/A	C	C	N/A	C	N/A
BRANCH TECHNICAL POSITION ICSB 20						
1. A MANUAL INITIATION OF THE TRANSFER TO THE RECIRCULATION MODE IS SUFFICIENT AND SATISFIES THE INTENT OF IEEE STD 279 PROVIDED THAT ADEQUATE INSTRUMENTATION, TIME, AND INFORMATION DISPLAY ARE AVAILABLE.	N/A	C	C	N/A	C	N/A

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
	NSSS SCOPE					
<u>BRANCH TECHNICAL POSITION 20</u> (CONTINUED)						
2. AUTOMATIC TRANSFER TO THE RECIRCULATION MODE IS PREFERABLE AND SHOULD BE PROVIDED.						
<u>BRANCH TECHNICAL POSITION ICSB 21</u>						
1. THE BYPASS INDICATORS SHOULD ENABLE THE OPERATOR TO DETERMINE THE STATUS OF EACH SAFETY SYSTEM AND WHETHER CONTINUED REACTOR OPERATION IS PERMISSIBLE.	I	I/C	I/C	I/C	I/C	N/A

BRANCH TECHNICAL POSITION 21 (CONTINUED)

2. WHEN A PROTECTIVE FUNCTION OF A SHARED SYSTEM CAN BE BYPASSED, INDICATION OF THAT BYPASS CONDITION SHOULD BE PROVIDED IN THE CONTROL ROOM.

3. MEANS BY WHICH THE OPERATOR CAN CANCEL ERRONEOUS BYPASS INDICATIONS, IF PROVIDED, SHOULD BE JUSTIFIED.

4. THE INDICATION SYSTEM MUST BE A SAFETY SYSTEM TO PERFORM FUNCTIONS THAT ARE ESSENTIAL TO SAFETY. ADMINISTRATIVE PROCEDURES SHOULD NOT REQUIRE IMMEDIATE OPERATOR ACTION BASED SOLELY ON THE BYPASS INDICATIONS.

7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRUMENTATION	7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

BRANCH TECHNICAL POSITION 21 (CONTINUED)	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
5. THE INDICATION SYSTEM SHOULD BE DESIGNED AND INSTALLED IN A MANNER WHICH PRECLUDES THE POSSIBILITY OF ADVERSE EFFECTS ON PLANT SAFETY SYSTEMS.						
6. THE INDICATION SYSTEM SHOULD INLCUDE A CAPABILITY OF ASSURING ITS OPERABLE STATUS DURING NORMAL PLANT OPERATION.						

	7.2 REACTOR TRIP SYSTEM	7.3 ENGINEERED SAFETY FEATURE SYSTEMS	7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN	7.5 SAFETY RELATED DISPLAY INSTRU-MENTATION	7.6 ALL OTHER INSTRU-MENTATION SYSTEMS REQUIRED FOR SAFETY	7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY
<u>BRANCH TECHNICAL POSITION ICSB 22</u>						
ALL POSITIONS OF THE PROTECTION SYSTEMS SHOULD BE DESIGNED IN ACCORDANCE WITH IEEE STD 279.	NSSS	C	C	C	C	N/A
<u>BRANCH TECHNICAL POSITION ICSB 25</u>						
IN ORDER TO COMPLY WITH THE REQUIREMENTS OF GDC 37, ALL ECCS PUMPS SHOULD BE INCLUDED IN THE SYSTEM TESTS.	N/A	C	C	N/A	N/A	N/A
<u>BRANCH TECHNICAL POSITION ICSB 26</u>						
ALL REACTOR TRIPS INCORPORATED IN THE REACTOR PROTECTION SYSTEM SHOULD BE DESIGNED TO MEET THE REQUIREMENTS OF IEEE STD 279, WITHOUT EXCEPTION. THIS POSITION APPLIES TO THE ENTIRE TRIP FUNCTION FROM THE SENSOR TO THE FINAL ACTUATED DEVICE.	← NSSS SCOPE →					

3.F IE BULLETINS, CIRCULARS AND INFORMATION NOTICES

BULLETINS

78-01	FLAMMABLE CONTACT-ARM RETAINERS IN GE CR120A RELAYS	NOT USED IN PVNGS DESIGN
78-02	TERMINAL BLOCK QUALIFICATION	QUALIFICATION PER IEEE 323-1974 (NUREG 0588)
78-04	ENVIRONMENTAL QUALIFICATION OF CERTAIN STEM MOUNTED LIMIT SWITCHES INSIDE REACTOR CONTAINMENT	LIMIT SWITCH QUALIFICATION REQUIRED FOR CONTAINMENT ISOLATION VALVE INDICATION PER R.G. 1.97 TO BE IEEE 323-1974 (NUREG 0588)
78-05	MALFUNCTIONING OF CIRCUIT BREAKER AUXILIARY CONTACT MECHANISM - GENERAL ELECTRIC MODEL CR105X	NOT USED IN PVNGS DESIGN
78-06	DEFECTIVE CUTLER-HAMMER, TYPE M RELAYS WITH DC COILS	NOT USED IN PVNGS DESIGN

<u>BULLETINS</u> (CONT'D)

79-05 79-05A 79-05B 79-05C	NUCLEAR INCIDENT AT THREE MILE ISLAND	ADDRESSED TO NUREG 0737
79-06 79-06A 79-06B 79-06C	REVIEW OF OPERATIONAL ERRORS AND SYSTEM MISALIGNMENTS IDENTIFIED DURING THE THREE MILE ISLAND INCIDENT	ADDRESSED TO NUREG 0737
79-09	FAILURES OF GE TYPE AK-2 CIRCUIT BREAKER IN SAFETY RELATED SYSTEMS	WILL FOLLOW MANUFACTURER'S SERVICE ADVICE IN PREVENTIVE MAINTENANCE
79-11	FAULTY OVERCURRENT TRIP DEVICE IN CIRCUIT BREAKERS FOR ENGINEERED SAFETY SYSTEMS	WESTINGHOUSE DB-50 NOT USED IN PVNGS DESIGN

3.F IE BULLETINS, CIRCULARS AND INFORMATION NOTICES

BULLETINS (CONT'D)

79-25	FAILURE OF WESTINGHOUSE BFD RELAYS IN SAFETY-RELATED SYSTEMS	NOT USED IN PVNGS DESIGN
79-27	LOSS OF NON-CLASS 1E INSTRUMENTATION AND CONTROL POWER BUS DURING OPERATION	THE DESIGN PROVIDES FOR 2 UNGROUNDED NON-1E INSTRUMENT DISTRIBUTION PANELS AND 4 UNGROUNDED VITAL (CLASS 1E) PANELS. ALL NON 1E INSTRUMENTATION HAS A 1E COUNTERPART TO PROVIDE CONTINUOUS CONTROL ROOM READOUT OF SHUTDOWN PARAMETERS EVEN WITH A TOTAL LOSS OF ALL NON 1E INSTRUMENTATION.
79-28	MALFUNCTION OF NAMCO LIMIT SWITCHES	NAMCO HAS CORRECTED THE PROBLEM BY THE USE OF A SUITABLE GASKET MATERIAL. ACTION HAS BEEN TAKEN TO ENSURE THAT ALL NAMCO SWITCHES ON PVNGS WILL BE INSTALLED WITH SUITABLE GASKET MATERIAL.

BULLETINS (CONT'D)

80-06	ENGINEERED SAFETY FEATURES (ESF) RESET CONTROLS	PVNGS ESF-ACTUATED DEVICES REMAIN IN EMERGENCY MODE ON RESET OF AN ESF ACTUATION SIGNAL WITH THE FOLLOWING CLARIFICATIONS - ACTUATED DEVICES WITH DIFFERENT SAFETY MODES IN RESPONSE TO DIFFERENT ESF ACTUATION SIGNALS BY DESIGN MAY ACTUATE TO A DIFFERENT SAFETY MODE ON RESET OF AN ESF ACTUATION SIGNAL. THE AUXILIARY FEEDWATER VALVES BY DESIGN CYCLE CLOSED ON AUTOMATIC AFAS RESET.
80-12	DECAY HEAT REMOVAL SYSTEM OPERABILITY	PVNGS DESIGN INCORPORATES FOUR INDEPENDENT POWER CHANNELS FOR ESFAS INITIATION AND TWO FULL CAPACITY, INDEPENDENT SHUTDOWN COOLING TRAINS. THE SERIES OF EVENTS RESULTING IN LOSS OF DECAY HEAT REMOVAL ARE NOT POSSIBLE IN THE PVNGS DESIGN.

BULLETINS (CONT'D)

80-16	MISAPPLICATION OF ROSEMOUNT PRESSURE TRANSMITTERS	PVNGS USE OF THE SUBJECT ROSEMOUNT PRESSURE TRANSMITTERS HAS BEEN REVIEWED AND THEIR USE IN SAFETY RELATED APPLICATIONS ARE WITHIN THE CALIBRATED RANGE OF THE TRANSMITTER.
80-20	FAILURE OF WESTINGHOUSE W-2 TYPE SPRING SWITCHES	WESTINGHOUSE TYPE W-2 CONTROL SWITCHES ARE NOT USED IN THE PVNGS DESIGN.
80-23	FAILURES OF SOLENOID VALVES MANUFACTURED BY VALCOR ENGINEERING CORP.	NO VALCOR SOLENOID VALVES USED IN SAFETY RELATED SERVICE IN THE PVNGS DESIGN.

CIRCULARS

78-08	ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT AT NUCLEAR POWER PLANTS	QUALIFICATION PER IEEE 323-1974 (NUREG 0588)
78-19	MANUAL OVERRIDE (BYPASS) OF SAFETY SYSTEMS ACTUATION SIGNALS	OVERRIDE OF AN ESF ACTUATION SIGNAL IN THE COMPONENT LOGIC PLACES THE COMPONENT UNDER MANUAL CONTROL BLOCKING ANY SUBSEQUENT ESF ACTUATION. OVERRIDE IS AUTOMATICALLY REMOVED ON RESET OF THE ESF ACTUATION SIGNAL. ONCE IN THE OVERRIDE MODE, THE SESS ALARMS AT THE SYSTEM LEVEL EVERY SYSTEM IMPACTED WHEN THE COMPONENT IS RETURNED TO ITS NORMAL (NON-ESF) POSITION. CONTAINMENT PURGE ISOLATION VALVES HAVE SEPARATE OVERRIDE LOGIC FOR CPIAS AND FOR CIAS.

CIRCULARS (CONT'D)

80-01	SERVICE ADVISE FOR GE INDUCTION DISC RELAYS	FIELD INSPECTION TO IDENTIFY AFFECTED RELAYS IN WORK
80-12	VALVE SHAFT-TO-ACTUATOR KEY MAY FALL OUT OF PLACE WHEN MOUNTED BELOW HORIZONTAL AXIS	ON PVNGS, LOCTITE ADHESIVE IS USED IN ADDITION TO THE PRESS FIT KEY CONNECTION
80-16	OPERATIONAL DEFICIENCIES IN ROSEMOUNT MODEL 510DU TRIP UNITS AND MODEL 1152 TRANSMITTERS	NOT USED IN PVNGS DESIGN
81-01	DESIGN PROBLEMS INVOLVING INDICATING PUSHBUTTON SWITCHES MANUFACTURED BY HONEYWELL INCORPORATED	IN WORK

INFORMATION NOTICES

79-22	QUALIFICATION OF CONTROL SYS.	ANALYSIS OF HIGH ENERGY LINE BREAK EFFECTS ON CONTROL SYSTEMS RESULTING IN COMPLICATING FAILURES IS IN PROCESS.
79-29	LOSS OF NONSAFETY-RELATED REACTOR COOLANT SYSTEM INSTRUMENTATION DURING OPERATION	THE DESIGN PROVIDES FOR 2 UNGROUDED NON-1E INSTRUMENT PANELS AND 4 UNGROUNDED VITAL (CLASS 1E) PANELS TO PROVIDE CONTINUOUS CONTROL ROOM READOUT OF SHUTDOWN PARAMETERS EVEN WITH A TOTAL LOSS OF ALL NON-1E INSTRUMENTATION.
79-30	REPORTING OF DEFECTS AND NON-COMPLIANCE, 10CFR21	IN COMPLIANCE
80-08	THE STATES COMPANY SLIDING LINK ELECTRICAL TERMINAL BLOCKS	NOT USED IN PVNGS DESIGN
80-10	PARTIAL LOSS OF NON-NUCLEAR INSTRUMENT SYSTEM POWER SUPPLY DURING OPERATION	INSTRUMENTATION PROVIDED IS CLASS 1E AND WOULD NOT CAUSE THE OPERATOR TO BE "INSTRUMENT BLIND".

INFORMATION NOTICES (CONT'D)

80-13	GE TYPE SBM CONTROL SWITCHES DEFECTIVE CAM FOLLOWERS	ALL SBM SWITCHES USED ON PVNGS ARE POST-1976 MANUFACTURE AND NOT SUBJECT TO DEFECTIVE CAM FOLLOWERS.
80-20	LOSS OF DECAY HEAT REMOVAL AT DAVIS BESSE UNIT #1 WHILE IN REFUELING MODE	THE SERIES OF EVENTS RESULTING IN THE LOSS OF DECAY HEAT REMOVAL ARE NOT POSSIBLE IN THE PVNGS DESIGN WHICH USES FOUR INDEPENDENT SOURCES OF INSTRUMENT POWER, AND HAS TWO INDEPENDENT, FULL CAPACITY TRAINS FOR SHUTDOWN COOLING WHICH DO NOT ISOLATE ON SPURIOUS ESF ACTUATION SIGNALS.
80-31	MALOPERATION OF GOULD-BROWN BOVERI TYPE 480 VOLT K600S AND K-DON 600S CIRCUIT BREAKERS	NOT APPLICABLE TO PVNGS SUPPLIED BREAKERS WHICH WERE SUPPLIED AFTER 1977.

INFORMATION NOTICES (CONT'D)

80-40	EXCESSIVE N_2 SUPPLY PRESSURE ACTUATES SRV OPERATION TO CAUSE REACTOR DEPRESSURIZATION	PVNGS DESIGN USES SPRING-LOADED RELIEF VALVES. THE ATMOSPHERIC DUMP VALVES HAVE REDUNDANT SOLENOID VALVES IN PNEUMATIC SUPPLY TO ISOLATE OVER PRESSURE SOURCE. LEAKAGE THROUGH SOLENOID VALVES WOULD BE TO ATMOSPHERE.
81-01	POSSIBLE FAILURE OF GENERAL ELECTRIC TYPE HFA RELAYS	IN WORK - FIELD INSPECTION REQUIRED TO IDENTIFY AFFECTED RELAYS.
81-05	DEGRADED DC SYSTEM AT PALISADES	BREAKER ALARM IS ANNUNCIATED ON SESS
81-06	FAILURE OF ITE MODEL K-600 CIRCUIT BREAKER	IN WORK

ITEM I.D.1, CONTROL ROOM DESIGN REVIEWS

REQUIREMENT

PER NUREG-0660, ALL LICENSEES AND APPLICANTS FOR OPERATING LICENSES WILL BE REQUIRED TO CONDUCT A DETAILED CONTROL-ROOM DESIGN REVIEW TO IDENTIFY AND CORRECT DESIGN DEFICIENCIES. THE OFFICE OF NUCLEAR REACTOR REGULATION REQUIRES THAT THOSE APPLICANTS FOR OPERATING LICENSES WHO ARE UNABLE TO COMPLETE THIS REVIEW PRIOR TO ISSUANCE OF A LICENSE MAKE PRELIMINARY ASSESSMENTS OF THEIR CONTROL ROOMS TO IDENTIFY SIGNIFICANT HUMAN FACTORS AND INSTRUMENTATION PROBLEMS AND ESTABLISH A SCHEDULE APPROVED BY NRC FOR CORRECTING DEFICIENCIES.

DESIGN FEATURE

IN COMPLIANCE. APS FORMED A CONTROL ROOM DESIGN REVIEW (CRDR) MANAGEMENT TEAM AND IS PERFORMING A PRELIMINARY ASSESSMENT OF THE PVNGS CONTROL ROOM.

THE EARLY PART OF THIS EFFORT WAS DIVIDED INTO THREE PHASES. PHASE I OF THE STUDY DEVELOPED THE GUIDELINES TO BE USED WHILE CONDUCTING THE CRDR. PHASE II CONSISTED OF THE DETAILED DATA-TAKING EFFORT AND THE IDENTIFICATION OF HUMAN FACTORS DEFICIENCIES. THE THREE TASK AREAS ADDRESSED WERE HUMAN FACTORS, SYSTEMS FACTORS, AND OPERATOR PREPAREDNESS FACTORS. THE DEFICIENCIES IDENTIFIED WERE ANALYZED FOR PROPER RESOLUTION AND ASSIGNED PRIORITIES TO ASSIST IN DETERMINING A SCHEDULE FOR IMPLEMENTATION.

REQUIREMENT	DESIGN FEATURE
ITEM I.D.1 (CONT'D)	PHASE III, WHICH IS CURRENTLY IN PROGRESS, INCLUDES PREPARATION AND PUBLICATION OF A PRELIMINARY REPORT. THE REVIEW HAS RESULTED IN APS INITIATING IMPLEMENTATION OF THE FOLLOWING TO DATE: • COLOR DEMARCATION • INSTRUMENT RELOCATION • ALARM PRIORITIZATION • ADDITIONAL INSTRUMENTATION WHEN THE CRDR IS COMPLETED, A FINAL REPORT FOR SUBMITTAL TO THE NRC WILL BE PREPARED. THE SUBMITTAL DATE IS TARGETED FOR DECEMBER, 1981.

ITEM I.D.2 PLANT SAFETY PARAMETER DISPLAY CONSOLE

REQUIREMENT	DESIGN FEATURE
PER NUREG-0660, EACH APPLICANT AND LICENSEE SHALL INSTALL A SAFETY PARAMETER DISPLAY SYSTEM (SPDS) THAT WILL DISPLAY TO OPERATING PERSONNEL A MINIMUM SET OF PARAMETERS WHICH DEFINE THE SAFETY STATUS OF THE PLANT. THIS CAN BE ATTAINED THROUGH CONTINUOUS INDICATION OF DIRECT AND DERIVED VARIABLES AS NECESSARY TO ASSESS PLANT SAFETY STATUS.	IN COMPLIANCE. A SPDS IS BEING DEVELOPED TO DISPLAY TO OPERATING PERSONNEL A MINIMUM SET OF PARAMETERS WHICH DEFINE THE SAFETY STATUS OF THE PLANT. THE SPDS WILL PROVIDE CONTINUOUS INDICATION OF DIRECT AND DERIVED VARIABLES. THE REQUIREMENTS OF NUREG-0696 WILL BE UTILIZED IN DEVELOPMENT AND INSTALLATION OF THE SPDS.

ITEM II.B.3 POST ACCIDENT SAMPLING

REQUIREMENT	DESIGN FEATURE
A DESIGN AND OPERATIONAL REVIEW OF THE RADIOLOGICAL SPECTRUM ANALYSIS FACILITIES SHALL BE PERFORMED TO DETERMINE THE CAPABILITY TO PROMPTLY QUANTIFY (IN LESS THAN 2 HOURS) CERTAIN RADIONUCLIDES THAT ARE INDICATORS OF THE DEGREE OF CORE DAMAGE. IN ADDITION TO THE RADIOLOGICAL ANALYSES, CERTAIN CHEMICAL ANALYSES ARE NECESSARY FOR MONITORING REACTOR CONDITIONS. PROCEDURES SHALL BE PROVIDED TO PERFORM BORON AND CHLORIDE CHEMICAL ANALYSES ASSUMING A HIGHLY RADIOACTIVE INITIAL SAMPLE (RG 1.3 OR 1.4 SOURCE TERM). BOTH ANALYSES SHALL BE CAPABLE OF BEING COMPLETED PROMPTLY (I.E., THE BORON SAMPLE ANALYSIS WITHIN AN HOUR AND THE CHLORIDE SAMPLE ANALYSIS WITHIN A SHIFT).	IN COMPLIANCE (SEE SEC. 2.C.3)

ITEM II.D.3 DIRECT INDICATION OF RELIEF AND SAFETY-VALVE POSITION

REQUIREMENT	DESIGN FEATURE
REACTOR COOLANT SYSTEM RELIEF AND SAFETY VALVES SHALL BE PROVIDED WITH A POSITIVE INDICATION IN THE CONTROL ROOM DERIVED FROM A RELIABLE VALVE-POSITION DETECTION DEVICE OR A RELIABLE INDICATION OF FLOW IN THE DISCHARGE PIPE.	PVNGS WILL COMPLY. PVNGS DOES NOT UTILIZE POWER OPERATED RELIEF VALVES. THE PVNGS PRIMARY CODE SAFETY VALVES, LOCATED AT THE TOP OF THE PRESSURIZER, ARE HEADERED INTO THE REACTOR DRAIN TANK (RDT) INSIDE CONTAINMENT. UPSTREAM OF THE COMMON HEADER EACH CODE SAFETY VALVE IS MONITORED FOR SEAL LEAKAGE BY AN IN-LINE RESISTIVE-TEMPERATURE DEVICE (REFER TO FSAR FIGURE 5.1-1). INDIRECT INDICATION OF CODE SAFETY VALVE LEAKAGE IS PROVIDED BY AN INCREASE OF RDT PRESSURE AND A DECREASE OF PRESSURIZER PRESSURE AND PRESSURIZER LEVEL, MONITORED BY SAFETY-GRADE INSTRUMENTATION. POSITIVE INDICATION OF SAFETY VALVE POSITION WILL BE PROVIDED IN THE CONTROL ROOM. THE INSTRUMENTATION WILL BE ENVIRONMENTALLY QUALIFIED IN COMPLIANCE WITH REGULATORY GUIDE 1.89. A PLANT ANNUNCIATOR ALARM WILL BE PROVIDED TO ALARM VALVE OPENING.

ITEM II.E.1.2, SUBPART 2 AUXILIARY FEEDWATER SYSTEM (AFWS) FLOWRATE INDICATION

REQUIREMENT

AS PER GDC 13 TO PROVIDE THE CAPABILITY IN THE CONTROL ROOM TO ASCERTAIN THE ACTUAL PERFORMANCE OF THE AFWS WHEN IT IS CALLED TO PERFORM ITS INTENDED FUNCTION, THE FOLLOWING REQUIREMENTS SHALL BE IMPLEMENTED:

(1) SAFETY-GRADE INDICATION OF AUXILIARY FEEDWATER FLOW TO EACH STEAM GENERATOR SHALL BE PROVIDED IN THE CONTROL ROOM.

(2) THE AUXILIARY FEEDWATER FLOW INSTRUMENT CHANNELS SHALL BE POWERED FROM THE EMERGENCY BUSES CONSISTENT WITH SATISFYING THE EMERGENCY POWER DIVERSITY REQUIREMENTS OF THE AUXILIARY FEEDWATER SYSTEM SET FORTH IN AUXILIARY SYSTEMS BTP 10-1 OF THE SRP, SECTION 10.4.9.

RESPONSE

1. IN COMPLIANCE. THE PVNGS DESIGN INCLUDES CLASS IE MONITORING OF AUXILIARY FEEDWATER FLOW TO BOTH STEAM GENERATORS. THESE FLOW INDICATOR CHANNELS ARE DISPLAYED ON THE MAIN CONTROL BOARDS. CLASS IE (SAFETY GRADE) PRESSURE INDICATORS LOCATED UP-STREAM OF THE MANUAL BLOCK VALVES AND CLASS IE STEAM GENERATOR LEVEL INDICATORS ARE ALSO PROVIDED.

2. THE SAFETY GRADE PRESSURE, LEVEL, AND FLOW INDICATION CHANNELS ARE POWERED FROM REDUNDANT CLASS IE BUSES.

ITEM II.E.3.1 EMERGENCY POWER FOR PRESSURIZER HEATERS

REQUIREMENT	DESIGN FEATURE
THE PRESSURIZER HEATER POWER SUPPLY DESIGN SHALL PROVIDE THE CAPABILITY TO SUPPLY, FROM EITHER THE OFFSITE POWER SOURCE OR THE EMERGENCY POWER SOURCE (WHEN OFFSITE POWER IS NOT AVAILABLE), A PREDETERMINED NUMBER OF PRESSURIZER HEATERS AND ASSOCIATED CONTROLS NECESSARY TO ESTABLISH AND MAINTAIN NATURAL CIRCULATION AT HOT STANDBY CONDITIONS. THE REQUIRED HEATERS AND THEIR CONTROLS SHALL BE CONNECTED TO THE EMERGENCY BUSES IN A MANNER THAT WILL PROVIDE REDUNDANT POWER SUPPLY CAPABILITY. PRESSURIZER HEATER MOTIVE AND CONTROL POWER INTERFACES WITH THE EMERGENCY BUSES SHALL BE ACCOMPLISHED THROUGH DEVICES THAT HAVE BEEN QUALIFIED IN ACCORDANCE WITH SAFETY-GRADE REQUIREMENTS.	THE C-E INTERFACE REQUIREMENTS FOR THE PRESSURIZER HEATERS ARE INCORPORATED INTO THE PVNGS DESIGN.

PVNGS PRESSURIZER HEATERS

ITEM II.E.3.1 (CONT'D)

NUMBER OF HEATERS	CAPACITY (KW)	480V BUS	IE POWER	IE CONTROLS	SIAS TRIP	RESET FROM CONTROL ROOM
5-3 ELEMENT GROUPS	750	NGN-L11	NO	NO	NO	N/A
5-3 ELEMENT GROUPS	750	NGN-L12	NO	NO	NO	N/A
1-3 ELEMENT GROUPS	150	PGA-L33	TRAIN A	TRAIN A	YES	NO
1-3 ELEMENT GROUPS	150	PGB-L32	TRAIN B	TRAIN B	YES	NO

ITEM II.E.4.2 CONTAINMENT ISOLATION DEPENDABILITY

REQUIREMENT	DESIGN FEATURE
1) CONTAINMENT ISOLATION SYSTEM DESIGNS SHALL COMPLY WITH THE RECOMMENDATIONS OF SRP SECTION 6.2.4 (I.E., THAT THERE BE DIVERSITY IN THE PARAMETERS SENSED FOR THE INITIATION OF CONTAINMENT ISOLATION).	1) IN COMPLIANCE. A CONTAINMENT ISOLATION SIGNAL IS DIVERSELY GENERATED BY EITHER A HIGH CONTAINMENT PRESSURE SIGNAL (5 PSIG) OR A LOW PRESSURIZER PRESSURE SIGNAL (1685 PSIG). THE POWER ACCESS PURGE AND REFUELING PURGE ARE ADDITIONALLY ISOLATED BY HIGH CONTAINMENT PURGE RADIOACTIVITY.

ITEM II.E.4.2 (CONTINUED)

REQUIREMENT	DESIGN FEATURE
4) THE DESIGN OF CONTROL SYSTEMS FOR AUTOMATIC CONTAINMENT ISOLATION VALVES SHALL BE SUCH THAT RESETTING THE ISOLATION SIGNAL WILL NOT RESULT IN THE AUTOMATIC REOPENING OF CONTAINMENT ISOLATION VALVES. REOPENING OF CONTAINMENT ISOLATION VALVES SHALL REQUIRE DELIBERATE OPERATOR ACTION.	4) IN COMPLIANCE. OVERRIDE OF A CIAS SIGNAL IS AVAILABLE FOR EACH CONTAINMENT ISOLATION VALVE VIA THE CONTROL SWITCH FOR THAT VALVE. RESETTING OF A CIAS DOES NOT RESULT IN THE AUTOMATIC OPENING OF CONTAINMENT ISOLATION VALVES. REOPENING REQUIRES OPERATOR ACTION FOR EACH VALVE AND DOES NOT COMPROMISE THE CONTAINMENT ISOLATION SIGNAL.
5) THE CONTAINMENT SETPOINT PRESSURE THAT INITIATES CONTAINMENT ISOLATION FOR NONESSENTIAL PENETRATIONS MUST BE REDUCED TO THE MINIMUM COMPATIBLE WITH NORMAL OPERATING CONDITIONS.	5) IN COMPLIANCE. ITEM 1 ABOVE IDENTIFIES 5 PSIG AS THE CONTAINMENT SETPOINT PRESSURE THAT INITIATES CONTAINMENT ISOLATION. CALCULATIONS ARE IN PROGRESS CONFIRMING THAT THE TRIP SETPOINT REPRESENTS THE MINIMUM VALUE COMPATIBLE WITH NORMAL OPERATING CONDITIONS.

ITEM II.E.4.2 (CONTINUED)

REQUIREMENT	DESIGN FEATURE
6) CONTAINMENT PURGE AND VENT ISOLATION VALVES MUST CLOSE ON A HIGH RADIATION SIGNAL.	6) IN COMPLIANCE. BOTH THE POWER ACCESS PURGE AND THE REFUELING PURGE ISOLATE ON HIGH CONTAINMENT PURGE RADIOACTIVITY.

ITEM II.F.1 ADDITIONAL ACCIDENT-MONITORING INSTRUMENTATION

REQUIREMENT	DESIGN FEATURE
1) NOBLE GAS EFFLUENT MONITORS SHALL BE INSTALLED WITH AN EXTENDED RANGE DESIGNED TO FUNCTION DURING ACCIDENT CONDITIONS AS WELL AS DURING NORMAL OPERATING CONDITIONS. MULTIPLE MONITORS ARE CONSIDERED NECESSARY TO COVER THE RANGES OF INTEREST.	
A) NOBLE GAS EFFLUENT MONITORS WITH AN UPPER RANGE CAPACITY OF 10^5 Ci/cc (Xe-133) ARE CONSIDERED TO BE PRACTICAL AND SHOULD BE INSTALLED IN ALL OPERATING PLANTS.	IN COMPLIANCE (SEE SEC. 2.C.3)
B) NOBLE GAS EFFLUENT MONITORING SHALL BE PROVIDED FOR THE TOTAL RANGE OF CONCENTRATION EXTENDING FROM NORMAL CONDITION (AS LOW AS REASONABLY ACHIEVABLE (ALARA)) CONCENTRATIONS TO A MAXIMUM OF 10^5 Ci/cc (Xe-133). MULTIPLE MONITORS ARE CONSIDERED TO BE NECESSARY TO COVER THE RANGES OF INTEREST. THE RANGE CAPACITY OF INDIVIDUAL MONITORS SHOULD OVERLAP BY A FACTOR OF TEN.	IN COMPLIANCE (SEE SEC. 2.C.3)

ITEM II.F.1 (CONTINUED)

REQUIREMENT	DESIGN FEATURE
2) BECAUSE IODINE GASEOUS EFFLUENT MONITORS FOR THE ACCIDENT CONDITION ARE NOT CONSIDERED TO BE PRACTICAL AT THIS TIME, CAPABILITY FOR EFFLUENT MONITORING OF RADIOIODINES FOR THE ACCIDENT CONDITION SHALL BE PROVIDED WITH SAMPLING CONDUCTED BY ADSORPTION ON CHARCOAL OR OTHER MEDIA, FOLLOWED BY ONSITE LABORATORY ANALYSIS.	IN COMPLIANCE. (SEE SEC. 2.C.3)
3) IN CONTAINMENT RADIATION-LEVEL MONITORS WITH A MAXIMUM RANGE OF 10^8 RAD/HR SHALL BE INSTALLED. A MINIMUM OF TWO SUCH MONITORS THAT ARE PHYSICALLY SEPARATED SHALL BE PROVIDED. MONITORS SHALL BE DEVELOPED AND QUALIFIED TO FUNCTION IN AN ACCIDENT ENVIRONMENT. THIS REQUIREMENT WAS REVISED IN THE OCTOBER 30, 1979 LETTER FROM H.R. DENTON TO ALL OPERATING NUCLEAR POWER PLANTS TO PROVIDE FOR A PHOTON-ONLY MEASUREMENT WITH AN UPPER RANGE OF 10^7 R/HR.	IN COMPLIANCE. REDUNDANT 10^7 R/HR MONITORS ARE PROVIDED. (SEE SEC. 2.C.3)

ITEM II.F.1 (CONT'D)

REQUIREMENT	DESIGN FEATURE
4) A CONTINUOUS INDICATION OF CONTAINMENT PRESSURE SHALL BE PROVIDED IN THE CONTROL ROOM OF EACH OPERATING REACTOR. MEASUREMENT AND INDICATION CAPABILITY SHALL INCLUDE THREE TIMES THE DESIGN PRESSURE OF THE CONTAINMENT FOR CONCRETE, FOUR TIMES THE DESIGN PRESSURE FOR STEEL, AND -5 PSIG FOR ALL CONTAINMENTS.	IN COMPLIANCE. (SEE SEC. 2.C.3.)

ITEM II.F.1 (CONT'D)

REQUIREMENT	DESIGN FEATURE
5) A CONTINUOUS INDICATION OF CONTAINMENT WATER LEVEL SHALL BE PROVIDED IN THE CONTROL ROOM FOR ALL PLANTS. A NARROW RANGE INSTRUMENT SHALL BE PROVIDED FOR PWR'S AND COVER THE RANGE FROM THE BOTTOM TO THE TOP OF THE CONTAINMENT SUMP. A WIDE RANGE INSTRUMENT SHALL ALSO BE PROVIDED FOR PWR'S AND SHALL COVER THE RANGE FROM THE BOTTOM OF THE CONTAINMENT TO THE ELEVATION EQUIVALENT TO A 600,000 GALLON CAPACITY. FOR BWR'S, A WIDE RANGE INSTRUMENT SHALL BE PROVIDED AND COVER THE RANGE FROM THE BOTTOM TO 5 FEET ABOVE THE NORMAL WATER LEVEL OF THE SUPPRESSION POOL.	IN COMPLIANCE. (SEE SEC. 2.C.3)

ITEM II.F.1 (CONT'D)

REQUIREMENT		DESIGN FEATURE
6)	A CONTINUOUS INDICATION OF HYDROGEN CONCENTRATION IN THE CONTAINMENT ATMOSPHERE SHALL BE PROVIDED IN THE CONTROL ROOM. MEASUREMENT CAPABILITY SHALL BE PROVIDED OVER THE RANGE OF 0 TO 10% HYDROGEN CONCENTRATION UNDER BOTH POSITIVE AND NEGATIVE AMBIENT PRESSURE.	IN COMPLIANCE. CONTINUOUS INDICATION OF CONTAINMENT ATMOSPHERE HYDROGEN CONCENTRATION IS AVAILABLE IN THE CONTROL ROOM (INDICATION IS AVAILABLE WITHIN 30 MINUTES OF THE INITIATION OF SAFETY INJECTION). (SEE SEC. 2.C.3)

II.F.1 INSTRUMENTATION FOR DETECTION OF INADEQUATE CORE COOLING

REQUIREMENT	DESIGN FEATURE
LICENSEES SHALL PROVIDE A DESCRIPTION OF ANY ADDITIONAL INSTRUMENTATION OR CONTROLS (PRIMARY OR BACKUP) PROPOSED FOR THE PLANT TO SUPPLEMENT EXISTING INSTRUMENTATION (INCLUDING PRIMARY COOLANT SATURATION MONITORS) IN ORDER TO PROVIDE AN UNAMBIGUOUS, EASY-TO-INTERPRET INDICATION OF INADEQUATE CORE COOLING (ICC). A DESCRIPTION OF THE FUNCTIONAL DESIGN REQUIREMENTS FOR THE SYSTEM SHALL ALSO BE INCLUDED. A DESCRIPTION OF THE PROCEDURES TO BE USED WITH THE PROPOSED EQUIPMENT, THE ANALYSIS USED IN DEVELOPING THESE PROCEDURES, AND A SCHEDULE FOR INSTALLING THE EQUIPMENT SHALL BE PROVIDED.	PVNGS WILL COMPLY. CONTROL ROOM INDICATION OF THE FOLLOWING PARAMETERS (SENSORS PROVIDED BY C-E) WILL BE PROVIDED AS INDICATION OF ICC: CORE EXIT THERMOCOUPLES SUBCOOLED MARGIN MONITOR HEATED JUNCTION THERMOCOUPLES (SEE SEC. 2.C.3)

II.G.1 POWER SUPPLIES FOR PRESSURIZER RELIEF VALVES, BLOCK VALVES AND LEVEL INDICATORS

REQUIREMENT	DESIGN FEATURE
PER GDC 10, 14, 15, 17, AND 20 FOR THE EVENT OF LOSS-OF-OFFSITE POWER, THE FOLLOWING POSITIONS SHALL BE IMPLEMENTED:	
POWER SUPPLY FOR PRESSURIZER RELIEF AND BLOCK VALVES AND PRESSURIZER LEVEL INDICATORS	PVNGS DOES NOT USE POWER-OPERATED RELIEF VALVES OR BLOCK VALVES
1) MOTIVE AND CONTROL COMPONENTS OF THE POWER-OPERATED RELIEF VALVES (PORVS) SHALL BE CAPABLE OF BEING SUPPLIED FROM EITHER THE OFFSITE POWER SOURCE OR THE EMERGENCY POWER SOURCE WHEN THE OFFSITE POWER IS NOT AVAILABLE.	
2) MOTIVE AND CONTROL COMPONENTS ASSOCIATED WITH THE PORV BLOCK VALVES SHALL BE CAPABLE OF BEING SUPPLIED FROM EITHER THE OFFSITE POWER SOURCE OR THE EMERGENCY POWER SOURCE WHEN THE OFFSITE POWER IS NOT AVAILABLE.	

II.G.1 (CONTINUED)

REQUIREMENT	DESIGN FEATURE
3) MOTIVE AND CONTROL POWER CONNECTIONS TO THE EMERGENCY BUSES FOR THE PORVS AND THEIR ASSOCIATED BLOCK VALVES SHALL BE THROUGH DEVICES THAT HAVE BEEN QUALIFIED IN ACCORDANCE WITH SAFETY-GRADE REQUIREMENTS.	
4) THE PRESSURIZER LEVEL INDICATION INSTRUMENT CHANNELS SHALL BE POWERED FROM THE VITAL INSTRUMENT BUSES. THE BUSES SHALL HAVE THE CAPABILITY OF BEING SUPPLIED FROM EITHER THE OFFSITE POWER SOURCE OR THE EMERGENCY POWER SOURCE WHEN OFFSITE POWER IS NOT AVAILABLE.	IN COMPLIANCE

III.A.1.2 UPGRADE EMERGENCY SUPPORT FACILITIES

REQUIREMENT	DESIGN FEATURE
EACH OPERATING NUCLEAR POWER PLANT SHALL MAINTAIN AN ONSITE TECHNICAL SUPPORT CENTER (TSC) SEPARATE FROM AND IN CLOSE PROXIMITY TO THE CONTROL ROOM THAT HAS THE CAPABILITY TO DISPLAY AND TRANSMIT PLANT STATUS TO THOSE INDIVIDUALS WHO ARE KNOWLEDGEABLE OF AND RESPONSIBLE FOR ENGINEERING AND MANAGEMENT SUPPORT OF REACTOR OPERATIONS IN THE EVENT OF AN ACCIDENT. THE CENTER SHALL BE HABITABLE TO THE SAME DEGREE AS THE CONTROL ROOM FOR POSTULATED ACCIDENT CONDITIONS. THE LICENSEE SHALL REVISE HIS EMERGENCY PLANS AS NECESSARY TO INCORPORATE THE ROLE AND LOCATION OF THE TSC. RECORDS THAT PERTAIN TO THE AS-BUILT CONDITIONS AND LAYOUT OF STRUCTURES, SYSTEMS, AND COMPONENTS SHALL BE READILY AVAILABLE TO PERSONNEL IN THE TSC.	PVNGS WILL COMPLY. DISPLAY OF DATA AT THE TSC AND EOF WILL BE IN ACCORDANCE WITH NUREG 0696.

III.A.1.2 (CONTINUED)

REQUIREMENT	DESIGN FEATURE
AN OPERATIONAL SUPPORT CENTER (OSC) SHALL BE ESTABLISHED SEPARATE FROM THE CONTROL ROOM AND OTHER EMERGENCY RESPONSE FACILITIES AS A PLACE WHERE OPERATIONS SUPPORT PERSONNEL CAN ASSEMBLE AND REPORT IN AN EMERGENCY SITUATION TO RECEIVE INSTRUCTIONS FROM THE OPERATING STAFF. COMMUNICATIONS SHALL BE PROVIDED BETWEEN THE OSC, TSC, EOF, AND CONTROL ROOM.	PVNGS WILL COMPLY (CONT'D)
AN EMERGENCY OPERATING FACILITY (EOF) WILL BE OPERATED BY THE LICENSEE FOR CONTINUED EVALUATION AND COORDINATION OF ALL LICENSEE ACTIVITIES RELATED TO AN EMERGENCY HAVING OR POTENTIALLY HAVING ENVIRONMENTAL CONSEQUENCES.	

4. ADDITIONAL ITEMS OF CONCERN

EXHIBIT 4-i

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.01 LOSS OF NON-CLASS IE INSTRUMENTATION AND CONTROL POWER SYSTEM BUS DURING POWER OPERATION (IE BULLETIN 79-27)	
IF REACTOR CONTROLS AND VITAL INSTRUMENTS DERIVE POWER FROM COMMON ELECTRICAL DISTRIBUTION SYSTEMS, THE FAILURE OF SUCH ELECTRICAL DISTRIBUTION SYSTEMS MAY RESULT IN AN EVENT REQUIRING OPERATOR ACTION CONCURRENT WITH FAILURE OF IMPORTANT INSTRUMENTATION UPON WHICH THESE OPERATOR ACTIONS SHOULD BE BASED. THIS CONCERN WAS ADDRESSED IN IE BULLETIN 79-27. ON NOVEMBER 30, 1979, IE BULLETIN 79-27 WAS SENT TO OPERATING LICENSE (OL) HOLDERS, THE NEAR TERM OL APPLICANTS (NORTH ANNA 2, DIABLO CANYON, MCGUIRE, SALEM 2, SEQUOYAH, AND ZIMMER), AND OTHER HOLDERS OF CONSTRUCTION PERMITS (CP), INCLUDING PALO VERDE. OF THESE RECIPIENTS, THE CP HOLDERS WERE NOT GIVEN EXPLICIT DIRECTION FOR MAKING A SUBMITTAL AS PART OF THE LICENSING REVIEW. HOWEVER, THEY WERE INFORMED THAT THE ISSUE WOULD BE ADDRESSED LATER.	COVERED IN AC REVIEW BOARD AS OPEN ITEM NO. 10. (PROVIDED IN SECTION 5) THIS RESPONSE WILL BE IN AN FSAR AMENDMENT.

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.01 (CONT'D) YOU ARE REQUESTED TO ADDRESS THIS ISSUE BY TAKING IE BULLETIN 79-27 ACTIONS 1 THRU 3 UNDER "ACTIONS TO BE TAKEN BY LICENSEES". WITHIN THE RESPONSE TIME CALLED FOR IN THE ATTACHED TRANSMITTAL LETTER, COMPLETE THE REVIEW AND EVALUATION REQUIRED BY ACTIONS 1 THRU 3 AND PROVIDE A WRITTEN RESPONSE DESCRIBING YOUR REVIEWS AND ACTIONS. THIS REPORT SHOULD BE IN THE FORM OF AN AMENDMENT TO YOUR FSAR AND SUBMITTED TO THE NRC OFFICE OF NUCLEAR REACTOR REGULATION AS A LICENSING SUBMITTAL.	

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.02 Engineered Safety Features (ESF) Reset Controls (IE Bulletin 80-06)	
If safety equipment does not remain in its emergency mode upon reset of an engineered safeguards actuation signal, system modification, design change or other protective action of the affected equipment is not compromised once the associated actuation signal is reset. This issue was addressed in IE Bulletin 80-06 (enclosed). For facilities with operating licenses as of March 13, 1980, IE bulletin 80-06 required that reviews be conducted by the licensees to determine which, if any, safety functions might be unavailable after reset, and what changes could be implemented to correct the problem. For facilities with a construction permit including OL applicants Bulletin 80-06 was issued for information only.	See Exhibits 4-5 thru 4-12

EXHIBIT 4-3
6-8-81

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.02 (CONT'D) THE NRC STAFF HAS DETERMINED THAT ALL CP HOLDERS, AS A PART OF THE OL REVIEW PROCESS ARE TO BE REQUESTED TO ADDRESS THIS ISSUE. ACCORDINGLY, YOU ARE REQUESTED TO TAKE THE ACTIONS CALLED FOR IN BULLETIN 80-06 ACTIONS 1 THRU 4 UNDER "ACTIONS TO BE TAKEN BY LICENSEES". WITHIN THE RESPONSE TIME CALLED FOR IN THE ATTACHED TRANSMITTAL LETTER, COMPLETE THE REVIEW VERIFICATIONS AND DESCRIPTIONS OF CORRECTIVE ACTIONS TAKEN OR PLANNED AS STATED IN ACTION 1 THRU 3 AND SUBMIT THE REPORT CALLED FOR IN ACTIONS ITEM 4. THE REPORT SHOULD BE SUBMITTED TO THE NRC OFFICE OF NUCLEAR REGULATION AS A LICENSING SUBMITTAL IN THE FORM OF AN FSAR AMENDMENT.	

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE

222.02 (CONT'D)

THE ENGINEERED SAFETY FEATURES (ESF) ACTUATION SIGNALS INCORPORATED IN THE PVNGS DESIGN INCLUDE:

1) NSSS ESFAS

CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS)
CONTAINMENT SPRAY ACTUATION SIGNAL (CSAS)
MAIN STEAM ISOLATION SIGNAL (MSIS)
SAFETY INJECTION ACTUATION SIGNAL (SIAS)
RECIRCULATION ACTUATION SIGNAL (RAS)
AUXILIARY FEEDWATER ACTUATION SIGNALS (AFAS) 1 AND 2;

2) AND BOP ESFAS

FUEL BUILDING ESSENTIAL VENTILATION ACTUATION SIGNAL (FBEVAS)
CONTAINMENT PURGE ISOLATION ACTUATION SIGNAL (CPIAS)
CONTROL ROOM VENTILATION ISOLATION ACTUATION SIGNAL (CRVIAS)
CONTROL ROOM ESSENTIAL FILTRATION ACTUATION SIGNAL (CREFAS).

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE

222.02 (CONT'D)

MANUAL RESET OF THE ESF ACTUATION SIGNALS IN BOTH THE NSSS AND BOP SYSTEMS DESIGN CAN BE PERFORMED ONLY AFTER THE INITIATING SIGNALS, I.E. LOW PRESSURIZER PRESSURE, HAVE CLEARED. RESET SWITCHES ARE LOCATED AT THE PPS, ESFAS AUXILIARY RELAY, AND BOP ESFAS CABINETS.

PVNGS EQUIPMENT WHICH MAY CHANGE POSITION FROM THE SAFETY OR EMERGENCY STATE ON RESET OF AN ESF ACTUATION SIGNAL IS IDENTIFIED IN TABLE 1. THESE ACTUATED DEVICES CAN BE CATEGORIZED AS FOLLOWS:

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.02 (CONT'D)	
	A. CERTAIN ACTUATED DEVICES, I.E. JOG TYPE VALVES OR THE ESF LOAD SEQUENCER, REQUIRE A MAINTAINED ESF SIGNAL THROUGH COMPLETION OF THEIR SAFETY FUNCTION. IF AN ESF ACTUATION SIGNAL IS RESET PRIOR TO COMPLETION OF VALVE STROKE OR COMPLETION OF ESF LOAD SEQUENCING, THE VALVE WILL STOP MID-TRAVEL OR THE SEQUENCER WILL NOT COMPLETE SEQUENCING ON THE REQUIRED EQUIPMENT (EQUIPMENT ALREADY SEQUENCED OR DOES NOT STOP). SINCE COMPLETION OF THESE ACTIONS TAKES NO MORE THAN 60 SECONDS, ESF ACTUATION SIGNAL RESET IS NOT CONSIDERED. ESF ACTUATION, FOLLOWED BY CLEARING OF THE INITIATING SIGNALS WITH THE REQUIREMENT OF MANUAL RESET AT THE APPROPRIATE CABINET ALL OCCURRING WITHIN A SHORT PERIOD OF TIME (<1 MIN) IS NOT CREDIBLE UNDER TRUE ACCIDENT CONDITIONS. NO MODIFICATION TO THESE EQUIPMENT CONTROL CIRCUITS IS REQUIRED.

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.02 (CONT'D)	

B. AN SIAS IS EMPLOYED IN SOME INSTANCES TO TRIP NON-ESF EQUIPMENT OFF THE IE BUSES. THIS EQUIPMENT IS CONSIDERED IMPORTANT TO PROTECT OTHER EQUIPMENT SUCH AS CEDM'S. THE DESIGN ALLOWS AUTOMATIC RESTART OF THIS HVAC EQUIPMENT AND THE PRESSURIZER HEATERS ON PROCESS DEMAND AFTER THE SIAS IS RESET. THIS DESIGN RELIEVES THE OPERATOR FROM MANUALLY RESTARTING THIS EQUIPMENT IN THE CASE OF A SPURIOUS SIAS OR A SMALL BREAK LOCA. THIS WILL MINIMIZE THE POTENTIAL FOR EQUIPMENT DAMAGE LEADING TO REPAIR AND PERSONNEL EXPOSURE. IN THE CASE OF A VALID SIAS, RESETTING OF THE SIAS IS NOT REQUIRED IN THE SHORT TERM, AND THE OPERATOR CAN OVERRIDE THE SIAS TO MANUALLY RESTART THIS EQUIPMENT AS REQUIRED.

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE

222.02 (CONT'D)

C. CERTAIN ACTUATED DEVICES HAVE DIFFERENT SAFETY MODES IN RESPONSE TO DIFFERENT ESF ACTUATION SIGNALS. IN THE EVENT THAT ESF ACTUATION SIGNALS REQUIRING BOTH SAFETY MODES OCCUR, ONE SAFETY MODE BY DESIGN WILL HAVE PRIORITY. ON RESET OF THAT PARTICULAR ESF ACTUATION SIGNAL, THE ACTUATED DEVICE WILL CHANGE POSITION TO THE SAFETY MODE REQUIRED BY THE REMAINING ESF ACTUATION SIGNAL. THIS MEANS OF CONTROL DOES NOT DEFEAT REQUIRED ESF SYSTEM FUNCTIONS, AND NO MODIFICATION IS REQUIRED TO THESE EQUIPMENT CONTROL CIRCUITS.

D. THE AFAS 1 AND AFAS 2 SIGNALS TO THE AUXILIARY FEEDWATER VALVES ARE DESIGNED TO CYCLE BASED ON STEAM GENERATOR LEVEL. THIS AUTOMATIC RESETTING OF THE AFAS 1 AND AFAS 2 DOES NOT AFFECT THE AFAS 1 AND AFAS 2 SIGNALS TO OTHER ACTUATED EQUIPMENT. THE AUXILIARY FEEDWATER VALVE CYCLING REPRESENTS THE DESIRED ESF SYSTEM FUNCTION AND NO MODIFICATION IS REQUIRED TO THE EQUIPMENT CONTROL CIRCUITS.

IDENTIFICATION OF ACTUATED DEVICES WHICH CHANGE POSITION ON RESET OF ESF ACTUATION SIGNAL

ACTUATED DEVICE	TAG NO.	ELEMENTARY DIAGRAM	ESF ACTUATION SIGNAL	SAFETY MODE	ACTION OF ESF ACTUATION SIGNAL RESET	CORRECTIVE ACTION
• AUXILIARY FEEDWATER REGULATING VALVES TO SG 1	J-AFB-HV-30 J-AFA-HV-32	13-E-AFB-003 13-E-AFB-004	AFAS-1	OPEN/CLOSE	VALVES CYCLE ON AFAS-1	NONE (D)
• AUXILIARY FEEDWATER REGULATING VALVES TO SG 2	J-AFB-HV-31 J-AFC-HV-33	13-E-AFB-003 13-E-AFB-006	AFAS-2	OPEN/CLOSE	VALVES CYCLE ON AFAS-2	NONE (D)
• AUXILIARY FEEDWATER ISOLATION VALVES TO SG 1	J-AFB-UV-34 J-AFC-UV-36	13-E-AFB-005 13-E-AFB-011	AFAS-1	OPEN/CLOSE	VALVES CYCLE ON AFAS-1	NONE (D)
• AUXILIARY FEEDWATER ISOLATION VALVES TO SG 2	J-AFB-UV-35 J-AFA-UV-37	13-E-AFB-005 13-E-AFB-010	AFAS-2	OPEN/CLOSE	VALVES CYCLE ON AFAS-2	NONE (D)
• CEDM NORMAL ACU FANS	M-HCN-A02A, -A02B,-A02C, & A02D	13-E-HCB-001 13-E-HCB-002	SIAS	STOPS	RETURNS TO AUTO IF NOT IN "PULL-TO-LOCK"	NONE (B)
• CONTAINMENT NORMAL ACU FANS	M-HCN-A01A, -A01B,-A01C, & A01D	13-E-HCB-004 13-E-HCB-005	SIAS	STOPS	RETURNS TO AUTO IF NOT IN "PULL-TO-LOCK"	NONE (B)
• FUEL BUILDING ESSENTIAL EXHAUST AFU DAMPERS	M-HFA-M05 M-HFB-M05	13-E-HFB-005	SIAS FBEVAS	CLOSES OPENS	SIAS IS THE PRIORITY MODE. ON RESET OF SIAS, DAMPERS WILL RE-OPEN IF FBEVAS IS PRESENT.	NONE (C)

EXHIBIT 4-10

6-8-81

IDENTIFICATION OF ACTUATED DEVICES WHICH CHANGE POSITION ON RESET OF ESF ACTUATION SIGNAL

SHEET 2

ACTUATED DEVICE	TAG NO.	ELEMENTARY DIAGRAM	ESF ACTUATION SIGNAL	SAFETY MODE	ACTION OF ESF ACTUATION SIGNAL RESET	CORRECTIVE ACTION
o AUXILIARY BUILDING ESSENTIAL EXHAUST AFU DAMPERS	M-HFA-M06 M-HFB-M06	13-E-HFB-011	SIAS FBEVAS	OPENS CLOSES	SIAS IS THE PRIORITY MODE. ON RESET OF SIAS, DAMPERS WILL RE-OPEN IF FBEVAS IS PRESENT.	NONE (C)
o CONTROL ROOM ESSENTIAL AHU OSA INTAKE DAMPERS	M-HJA-024 & -M03 M-HJB-M02 & -M03	13-E-HJB-024	SIAS CREFAS CRVIAS	OPENS CLOSES	CRVIAS IS THE PRIORITY MODE. ON RESET OF CRVIAS, DAMPERS WILL RE-OPEN IF SIAS OR CREFAS IS PRESENT.	NONE (C)
o PRESSURIZER BACKUP HEATERS	M-RCE-A5, -A14,-B1, -B9,-B10, & -B18	13-E-RCB-010	SIAS	STOPS	RETURNS TO AUTO IF NOT IN "PULL-TO-LOCK"	NONE (B)
o ESF LOAD SEQUENCERS	J-SAA-C02A J-SAB-C02B	13-E-SAB-004	CSAS SIAS AFAS-1 AFAS-2 FBEVAS CRVIAS CREFAS	SEQUENTIAL STARTING OF ESF PUMPS AND FANS	RESET OF SEQUENCER OUTPUTS DEPENDING ON ESF ACTUATION SIGNALS PRESENT. RESET OF SEQUENCER OUTPUTS DOES NOT RESET ANY ACTUATED EQUIPMENT. RESET PRIOR TO COMPLETION OF SEQUENCING TERMINATES SEQUENCE.	NONE (A)
o SG 2 TO AUXILIARY FEEDWATER PUMP A STEAM SUPPLY VALVE	J-SGA-UV-138	13-E-SGB-002	AFAS-2	OPENS IF AFAS-1 IS NOT PRESENT	AFAS-1 HAS PRIORITY. ON RESET OF AFAS-1, VALVE WILL OPEN IF AFAS-2 IS PRESENT.	NONE (C)

IDENTIFICATION OF ACTUATED DEVICES WHICH CHANGE POSITION ON RESET OF ESF ACTUATION SIGNAL

SHEET 3

ACTUATED DEVICE	TAG NO.	ELEMENTARY DIAGRAM	ESF ACTUATION SIGNAL	SAFETY MODE	ACTION OF ESF ACTUATION SIGNAL RESET	CORRECTIVE ACTION
• LP SAFETY INJECTION PUMPS	M-SIA-P01 M-SIB-P01	13-E-SIB-002	SIAS (VIA SEQUENCER) RAS	STARTS STOPS	RAS IS THE PRIORITY MODE. ON RESET OF RAS, PUMPS WILL RE-START IF SIAS (VIA SEQUENCER) IS PRESENT.	NONE (C)
• SAFETY INJECTION TANK ISOLATION VALVES	J-SIA-UV-634 & -644 J-SIB-UV-614 & -624	13-E-SIB-005 13-E-SIB-006	SIAS	OPENS	JOG TYPE VALVES MAY STOP MID-TRAVEL. BREAKERS ARE LOCKED OPEN DURING POWER OPERATION.	NONE (A)
• LPSI FLOW CONTROL TO REACTOR COOLANT VALVES	J-SIB-UV-615 & -625 J-SIA-UV-625 & -645	13-E-SIB-007 13-E-SIB-008	SIAS	OPENS	JOG TYPE VALVES MAY STOP MID-TRAVEL	NONE (A)
• HPSI FLOW CONTROL TO REACTOR COOLANT VALVES	J-SIA-UV- -617,-627, -637,-647, J-SIB-UV- -616,-626, -636,-646	13-E-SIB-009 13-E-SIB-010 13-E-SIB-011 13-E-SIB-012	SIAS	OPENS	JOG TYPE VALVES MAY STOP MID-TRAVEL	NONE (A)
• CONTAINMENT SPRAY CONTROL VALVES	J-SIA-UV-672 J-SIB-UV-671	13-E-SIB-020	CSAS	OPENS	JOG TYPE VALVES MAY STOP MID-TRAVEL	NONE (A)
• NORMAL CHILLER	M-WCN-E01A	13-E-WCB-001	SIAS	STOPS	RETURNS TO AUTO IF NOT IN "PULL-TO-LOCK"	NONE (B)

EXHIBIT 4-12

6-8-81

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.03 Qualification of Control Systems (IE Information Notice 79-22) Operating reactor licensees were informed by IE Information Notice 79-22, issued September 19, 1979, that certain non-safety grade or control equipment, if subjected to the adverse environment of a high energy line break, could impact the safety analyses and the adequacy of the protection functions performed by the safety grade equipment. Enclosed is a copy of IE Information Notice 79-22, and reprinted copies of an August 20, 1979 Westinghouse letter and a September 10, 1979 Public Service Electric and Gas Company letter which address this matter. Operating Reactor licensees conducted reviews to determine whether such problems could exist at operating facilities.	In Review

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.03 (CONT'D) WE ARE CONCERNED THAT A SIMILAR POTENTIAL MAY EXIST AT LIGHT WATER FACILITIES NOW UNDER CONSTRUCTION. YOU ARE, THEREFORE, REQUESTED TO PERFORM A REVIEW TO DETERMINE WHAT, IF ANY, DESIGN CHANGES OR OPERATOR ACTIONS WOULD BE NECESSARY TO ASSURE THAT HIGH ENERGY LINE BREAKS WILL NOT CAUSE SYSTEM FAILURES TO COMPLICATE THE EVENT BEYOND YOUR FSAR ANALYSIS. PROVIDE THE RESULTS OF YOUR REVIEWS INCLUDING ALL IDENTIFIED PROBLEMS AND THE MANNER IS WHICH YOU HAVE RESOLVED THEM TO NRR. THE SPECIFIC "SCENARIOS" DISCUSSED IN THE ABOVE REFERENCED WESTINGHOUSE LETTER ARE TO BE CONSIDERED AS EXAMPLES OF THE KIND OF INTERACTIONS WHICH MIGHT OCCUR. YOUR REVIEW SHOULD INCLUDE THOSE SCENARIOS, WHERE APPLICABLE, BUT SHOULD NOT NECESSARILY BE LIMITED TO THEM. APPLICANTS WITH OTHER LWR DESIGNS SHOULD CONSIDER ANALOGOUS INTERACTIONS AS RELEVANT TO THEIR DESIGNS.	

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.04 CONTROL SYSTEM FAILURES	
THE ANALYSIS REPORTED IN CHAPTER 15 OF THE FSAR ARE INTENDED TO DEMONSTRATE THE ADEQUACY OF SAFETY SYSTEMS IN MITIGATING ANTICIPATED OPERATIONAL OCCURRENCES AND ACCIDENTS.	IN REVIEW
BASED ON THE CONSERVATIVE ASSUMPTIONS MADE IN DEFINING THESE DESIGN-BASIS EVENTS AND THE DETAILED REVIEW OF THE ANALYSES BY THE STAFF, IT IS LIKELY THAT THEY ADEQUATELY BOUND THE CONSEQUENCES OF SINGLE CONTROL SYSTEM FAILURES.	
TO PROVIDE ASSURANCE THAT THE DESIGN BASIS EVENT ANALYSES ADEQUATELY BOUND OTHER MORE FUNDAMENTAL CREDIBLE FAILURES YOU ARE REQUESTED TO PROVIDE THE FOLLOWING INFORMATION:	
1) IDENTIFY THOSE CONTROL SYSTEMS WHOSE FAILURE OR MALFUNCTION COULD SERIOUSLY IMPACT PLANT SAFETY.	

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.04 (CONT'D)	
2) INDICATE WHICH, IF ANY, OF THE CONTROL SYSTEMS IDENTIFIED IN (1) RECEIVE POWER FROM COMMON POWER SOURCES. THE POWER SOURCES CONSIDERED SHOULD INCLUDE ALL POWER SOURCES WHOSE FAILURE OR MALFUNCTION COULD LEAD TO FAILURE OR MALFUNCTION OF MORE THAN ONE CONTROL SYSTEM AND SHOULD EXTEND TO THE EFFECTS OF CASCADING POWER LOSSES DUE TO THE FAILURE OF HIGHER LEVEL DISTRIBUTION PANELS AND LOAD CENTERS.	IN REVIEW (CONT'D)
3) INDICATE WHICH, IF ANY, OF THE CONTROL SYSTEMS IDENTIFIED IN (1) RECEIVE INPUT SIGNALS FROM COMMON SENSORS. THE SENSORS CONSIDERED SHOULD INCLUDE, BUT SHOULD NOT NECESSARILY BE LIMITED TO, COMMON HYDRAULIC HEADERS OR IMPULSE LINES FEEDING PRESSURE, TEMPERATURE, LEVEL OR OTHER SIGNALS TO TWO OR MORE CONTROL SYSTEMS.	

4. ADDITIONAL ITEMS OF CONCERN

ICSB CONCERN	DESIGN FEATURE
222.04 (CONT'D)	
4) PROVIDE JUSTIFICATION THAT ANY SIMULTANEOUS MALFUNCTIONS OF THE CONTROL SYSTEMS IDENTIFIED IN (2) AND (3) RESULTING FROM FAILURES OR MALFUNCTIONS OF THE APPLICABLE COMMON POWER SOURCE OR SENSOR ARE BOUNDED BY THE ANALYSES IN CHAPTER 15 AND WOULD NOT REQUIRE ACTION OR RESPONSE BEYOND THE CAPABILITY OF OPERATORS OR SAFETY SYSTEMS.	IN REVIEW (CONT'D)

5.
BACKGROUND INFORMATION

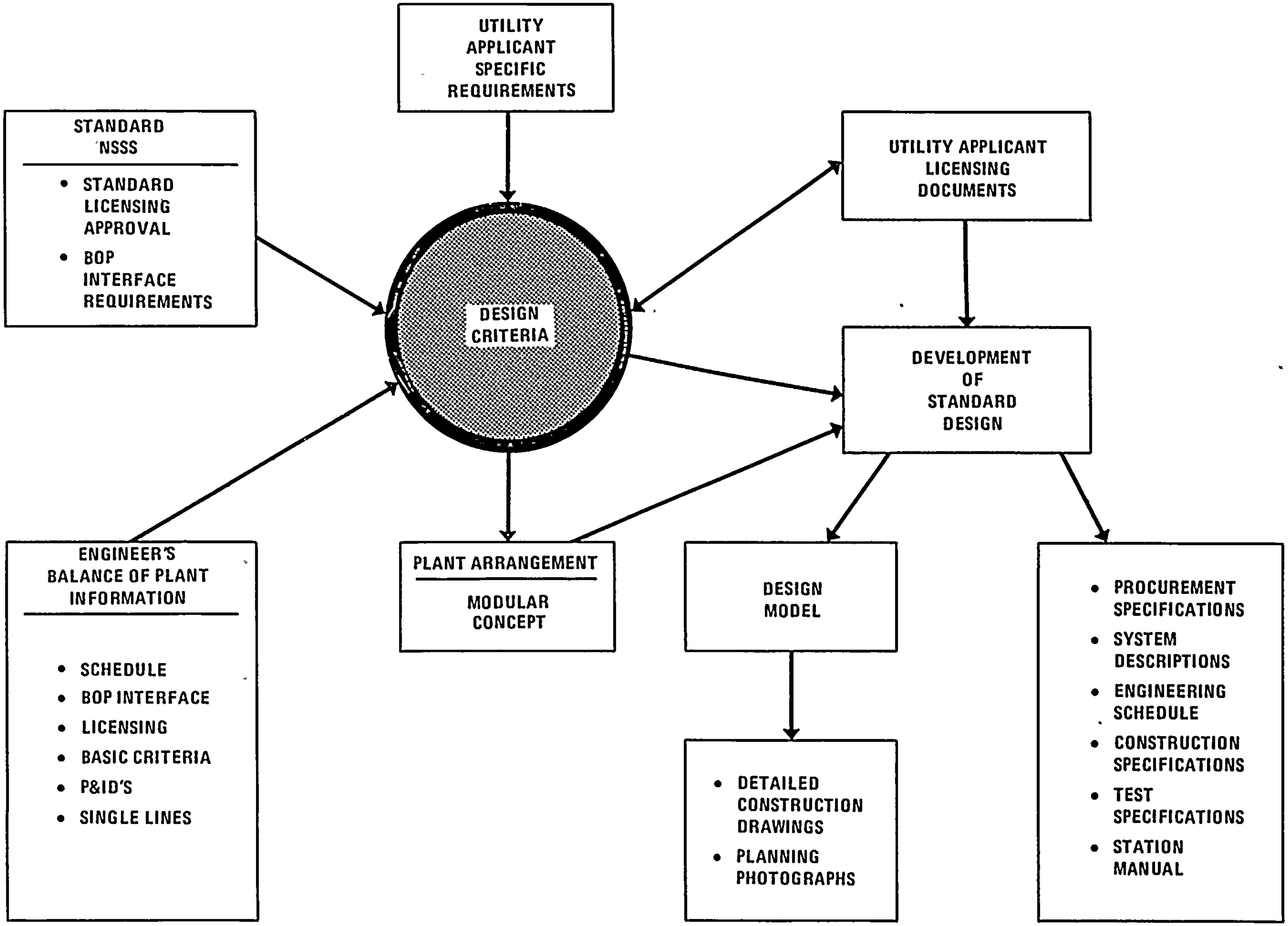
EXHIBIT 5-i

PVNGS DESIGN DEVELOPMENT

THE PVNGS DESIGN DEVELOPMENT, REPRESENTED IN FIGURE B-1, IS CENTERED AROUND THE DESIGN CRITERIA, WHICH ACT AS THE HUB OF THE DESIGN. THESE CRITERIA ARE REVIEWED AND APPROVED BY THE OWNER AND ESTABLISH THE SCOPE OF THE SYSTEM. THEY ARE ASSEMBLED IN THREE VOLUMES ENTITLED "DESIGN CRITERIA MANUAL - PALO VERDE UNITS 1, 2 AND 3" AND REFLECT ALL THE DESIGN CRITERIA FOR THE PLANT. THIS IS A DYNAMIC DOCUMENT THAT IS UPDATED AS NEW CRITERIA ARE INCORPORATED INTO THE PLANT DESIGN. AS SHOWN IN FIGURE B-1, A SERIES OF DOCUMENTS ESTABLISH THE CRITERIA, INCLUDING UTILITY OR OWNER-APPLICANT'S SPECIFIC REQUIREMENTS, STANDARD NSSS SYSTEM 80 LICENSING AND BALANCE OF PLANT (BOP) INTERFACE REQUIREMENTS, AND THE ENGINEER'S BOP INFORMATION (SCHEDULE, INTERFACES, LICENSING, BASIC CRITERIA, P&IDS, AND SINGLE LINE DRAWINGS). THESE ALL SERVE AS INPUT TO THE DESIGN CRITERIA HUB, WHICH BY AN ITERATIVE PROCESS RESULTS IN APPLICANT LICENSING DOCUMENTS, DEVELOPMENT OF THE MODULAR PLANT ARRANGEMENT AND THE STANDARD DESIGN, AND FEEDBACK FROM THE REGULATORS. FROM THIS, PROCUREMENT SPECIFICATIONS, SYSTEM DESCRIPTIONS, SCHEDULES, CONSTRUCTION SPECIFICATIONS, TEST SPECIFICATIONS, AND THE STATION MANUAL ARE DEVELOPED. THE PLANT ARRANGEMENT IS ALSO DERIVED FROM THE DESIGN CRITERIA, AS REPRESENTED BY A THREE-QUARTER INCH TO THE FOOT SCALE MODEL OF THE PVNGS POWER BLOCK. THE MODEL IS USED TO DERIVE DETAILED CONSTRUCTION DRAWINGS AND PLANNING PHOTOGRAPHS.

IN SUMMARY, ONE SET OF DOCUMENTS ESTABLISH THE CRITERIA. FROM THIS SET, DESCRIPTIONS ARE PUT INTO LICENSING DOCUMENTS AND KEPT CURRENT BY CONTINUING REVIEW. MULTI-DISCIPLINE REVIEWS ARE CARRIED OUT WHERE DIFFERENT DISCIPLINES GET TOGETHER AT THE MODEL AND ANALYZE THE SYSTEMS, ASSESSING THE DESIGN, SAFETY, SEPARATION AND ALL CRITERIA, TO ENSURE THAT THE SYSTEM MEETS THE ESTABLISHED CRITERIA. THIS PROCESS GENERALLY TAKES TWO TO THREE YEARS TO ASSURE THAT THE DESIGN IS CORRECT AND REFLECTS ALL THE REQUIREMENTS.

EXHIBIT 5-1



PVNGS DESIGN DEVELOPMENT

FIGURE 5-1

RESPONSE TO IE BULLETIN 79-27

(Ref: Response to Class IE AC Power Systems Design Review Board Open Item #10)

ACTION #10

Provide the results of Bechtel's review of NRC IE Bulletin 79-27 relating to the design of PVNGS. Has Bechtel looked at conditions brought about by the failure of a non-Class IE bus? (pages 165-175)

RESPONSE

IE Bulletin 79-27 addressed three review areas. These were:

1. Review the Class 1-E and non-Class 1-E buses supplying power to safety and non-safety related instrumentation and control systems which could affect the ability to achieve a cold shutdown condition using existing procedures or procedures developed under item 2 below. For each bus:

   a) identify and review the alarm and/or indication provided in the control room to alert the operator to the loss of power to the bus;

   b) identify the instrument and control system loads connected to the bus and evaluate the effects of loss of power to these loads including the ability to achieve a cold shutdown condition;

   c) describe any proposed design modifications resulting from these reviews and evaluations, and your proposed schedule for implementing those modifications.

2. Prepare emergency procedures or review existing ones that will be used by control room operators, including procedures required to achieve a cold shutdown condition, upon loss of power to each Class 1-E and non-Class 1-E bus supplying power to safety and non-safety related instrument and control systems. The emergency procedures should include:

   a) the diagnostics/alarms/indicators/symptom resulting from the review and evaluation conducted per item 1 above;

b) the use oʟ alternate indication and/or coɩ...ol circuits which may be powered from other non-Class 1-E or Class 1-E instrumentaton and control buses;

c) methods for restoring power to the bus.

Describe any proposed design modifications or administrative controls to be implemented resulting from these procedures, and your proposed schedule for implementing the changes.

3. Re-review IE Circular No. 79-02, Failure of 120 Volt Vital AC Power Supplies, dated January 11, 1979, to include both Class 1-E and non-Class 1-E safety related power supply inverters. Based on a review of operating experience and your re-review of IE Circular No. 79-02, describe any proposed design modifications or administrative controls to be implemented as a result of the re-review.

EVALUATION OF DESIGN

In general, our review has determined that the PVNGS design consists of two ungrounded non-Class IE 120 Vac instrument distribution panels E-NNN-D11 and E-NNN-D12 and four ungrounded vital (Class IE) 120 Vac instrument distribution panels E-PNA-D25, E-PNB-D26, E-PND-D27, and E-PND-D28.

Each ungrounded non-Class IE Vac instrument distribution panel is normally supplied from a 480 Vac non-Class IE motor control center through a voltage regulator-transformer to a transfer switch. A back-up source is provided from a 480 Vac Class IE motor control center through a Class IE voltage regulator-transformer as an isolation device to the transfer switch. The transfer switch automatically transfers, upon loss of power on the normal source, to the back-up source. Manual transfer is required to return to the normal source. The distribution panel is fed from the transfer switch through a panel feeder breaker. Distribution to the instrument cabinets is through branch circuit breakers.

Each ungrounded vital (Class IE) 120 Vac instrument distribution panel is normally supplied from a 125 Vdc Class IE control center through an inverter to a manual transfer switch. A back-up source is provided from a 480 Vac non-Class IE motor control center through a voltage regulatortransformer to the manual transfer switch. The distribution panel is fed from the transfer switch through a panel feeder breaker.

Our specific response to item 1.a is that an alarm for each non-Class IE instrument distribution panel is provided to the operator in the control room. Annunciation will occur on the following:

- o Normal source undervoltage
- o Back-up source undervoltage
- o Ground detection
- o Overload tripping of the panel feeder breaker
- o Overload tripping of any branch circuit breaker

An alarm is provided for each Class IE instrument distribution panel and an alarm for each Class IE inverter and transfer switch. Annunciation will occur on the following:

o Inverter output or input breaker tripped

o Overload o Inverter output voltage low or high

o Input dc voltage low

o Loss of synchronize

o Transfer switch not on normal source

o Inverter fan failure

o Distribution panel undervoltage

o Ground detection

o Overload tripping of the panel feeder breaker

For item 1.b, the instrument and control system loads connected to each instrument distribution panel are provided as noted on Table 1.

Those specific instrument parameters and controls detailed in CESSAR 7.4.1.1.10.7 as being required to achieve cold shutdown are listed below. Instrument loop displays and controls available to the control room operator and the instrument distribution panel supply are identified.

TABLE 1

120 VAC UNGROUNDED INSTRUMENT DISTRIBUTION PANEL INSTRUMENT AND CONTROL SYSTEM LOADS

E-PNA-D25	E-PNB-D26	E-PNC-D27	E-PND-D28	E-NNN-D11	E-NNN-D12
o ESFAS Aux. Relay Cab. J-SAA-C01 o Process Protective Instr. Cab. A-1 J-SBA-C02A o Supplementary Protect. Sys. J-SBA-C04 o Radiation Monitors J-SQA-RU-29, 31 & 33 o Remote Shutdown Panel o BOP Analog Instr. Cab. J-ZJA-C02A & B o Aux. Prot. Cab. J-SAA-C03 o Plant Prot. Sys. (PPS) J-SBA-C01 o Process Prot. Instr. Cab. A-2 J-SBA-C02B o BOP ESFAS & Load Sequencer J-SAA-C02A o MOV Position Indicators o Containment Hydrogen Analyzer J-HPA-E01 o Chlorine Detector J-HJA-E01	o ESFAS Aux. Relay Cab. J-SAA-C01 o Process Protective Instr. Cab. B-2 J-SBB-C02B o Supplementary Protec. Sys. J-SBB-C04 o Radiation Monitors J-SQB-RU-1, 30, 32, & 34 o Remote Shutdown Panel o BOP Analog Instr. Cab. J-ZJB-C02A o Aux. Prot. Cab. J-SAB-C03 o Plant Prot. Sys. (PPS) J-SBB-C01 o Process Protective Instr. Cab. B-1 J-SBB-C02A o BOP ESFAS & Load Sequencer J-SAB-C02B o MOV Position Indicators o Containment Hydrogen Analyzer J-HPB-E02 o Chlorine Detector J-HJB-E01	o ESFAS Aux. Relay Cab. J-SAB-C01 o Supplementary Protect. Sys. J-SBC-C04 o CEDMCS Aux. Cab. C5 J-SFC-C01 o Aux. Prot. Cab. J-SAC-C03 o Plant Prot. Sys. (PPS) J-SBC-C01 o Process Protective Instr. Cab. C J-SBC-C02A o MOV Position Indicators	o ESFAS Aux. Relay Cab. J-SAB-C01 o Supplementary Protect. Sys. J-SBD-C04 o CEDMCS Aux. Cab. C6 J-SFD-C01 o Aux. Prot. Cab. J-SAD-C03 o Plant Prot. Sys. (PPS) J-SBD-C01 o Process Protective Instr. Cab. D J-SBD-C02A o MOV Position Indicators	o RCS-2 & CVCS-2 Process Instr. J-ZJN-C01B&D o SIS/RCP-1 Process Instr. J-ZJN-C01F o NSSS Rad. Mon. Cab. J-SQN-C02 (Process & Gas Stripper Eff. Rad. Mon., Reactor Power Cutback, Boronometer, S/U S/U & Control Ch. 2) o BOP Analog Instr. Cab. J-ZJN-C02B&D o BOP Analog Instr. Cab. J-ZJN-C02F o Radwaste Instr. Cab. J-ZRN-C01 & C02 o CEDMCS (incl. core mimic) o NSSS Control Sys. J-SFN-C03 (FWCS-1 & 2 & SBCS) o MICDS #1 o Reactor Trip Swgr Current Monitor C o Loose Parts & Vibration Mon. o Gen. Pyrolysate Collector	o RCS-1 & CVCS-1 Process Instr. J-ZJN-C01A & C o NSSS Rad. Mon. Cab. J-SQN-C02 (MICD Amp., CEA Display, S/U & Control Ch. 1) o CVCS-3 & SIS/RCP-2 Process Instr. J-ZJN-C01E & G o BOP Analog Instr. Cab. J-ZJN-C02A & C & -C07 o BOP Analog Instr. Cab. J-ZJN-C02E & G o Fuel Pool Instr. J-PCN-E02 o CEDMCS o NSSS Control Sys. J-SFN-C03 (RRS, SBCS permissives, & AMI setpoint display) o MICDS #2 o Reactor Trip Swgr Current Monitor D

Exhibit 5-5

Parameter or Control	Class IE Instrument Distribution Panels				Non-Class IE Instrument Distribution Panels	
	E-PNA-D25	E-PNB-D26	E-PND-D27	E-PND-D28	E-NNN-D11	E-NNN-D12
Neutron log power	J-SEA JI-1A	J-SEB- JI-1B	J-SEC- JI-1C	J-SED-- JI-1D	-	-
Hot leg temperature	J-RCA- TI-112HA & TR-112HA	J-RCB- TI-112HB	J-RCC- TI-112HC	J-RCD- TI-112HD	-	J-RCN- TI-111X & TI-111X
Pressurizer pressure	J-RCA- PI-102A & PR-102A	J-RCB- PI-102B	J-RCC- PI-102C	J-RCD- PI-102D	-	J-RCN- PIK-110 & PR-100
Pressurizer level	J-RCA- LI-110X & LR-110X	J-RCB- LI-110Y	-	-	J-RCN- LIC-110 LR-110 & LI-113	-
SG pressure	J-SGA- PI-1013A PI-1023A & PR-1013A	J-SGB- PI-1013B & PI-1023B	J-SGC- PI-1013C & PI-1023C	J-SGD- PI-1013D & PI-1023D	-	-
SG level	J-SGA- LI-1113A & LR-1113A	J-SGB- LI-1113B	J-SGC- LI-1113C	J-SGD- LI-1113D	J-SGN- LR-1111 (narrow range)	-
[illegible]T level	J-CHA- LI-203A	J-CHB- LI-203B & LI-201	J-CHC- LI-203C	J-CHD- LI-203D	-	J-CHN- LI-200
Charging flow	J-CHA- FI-212	-	-	-	-	-
Charging pressure	-	J-CHB- PI-212	-	-	-	-
SIT pressure	J-SIA- PI-331 & PI-333	J-SIB- PI-311 & PI-313	-	-	J-SIN- PI-332	J-SIN- PI-312
LPSI pump flow	J-SIA- FI-306	J-SIB- FO-307	-	-	-	-
Shutdown cooling heat exchanger diff. temp.	J-SIA- TR-351 & TR-303X	J-SIB- TR-352 & TR-303Y	-	-	-	-
Atmospheric dump valve control	J-SGA- HIC-179A & HIC-184A	J-SGB- HIC-178A & HIC-185A	-	-	-	-

Exhibit 5-6

Motor operated valves, pumps, pressurizer heaters and .lenoids required to achieve cold shutdown are powered from buses other than the instrument distribution panels.

In response to item 1.c, we have determined that loss of a single instrument distribution panel, Class IE or non-IE, will cause a loss of some of the indicators and recorders available to the control room operator. The affected indicators, which employ a gas-discharge display, will extinguish on the loss of the instrument distribution panel. This failure mode is distinguishable and will not offer confusing information to the operator. In addition, the instrumentation and control systems lost will generate alarms and actuation of some equipment as the loop output contacts fail to their deenergized states. In the non-IE instrument loops affecting safe shutdown circuits, i.e. pressurizer level control of the pressurizer backup heaters, selector switches are provided on the main control panel to enable the operator to provide control from the unaffected control loop. No control action generated by the loss of an instrument distribution panel will prevent the operator from controlling the required safe shutdown equipment or interfere with the safe shutdown functions. Upon detection of loss of an instrument distribution panel, adequate instrumentation and control functions from the list provided above will be available to the operator to enable the operator to achieve a cold shutdown condition. No design modifications are proposed.

Item 2 - Response to be provided by APS.

IE Circular No. 79-02, Failure of 120 Volt Vital AC Power Supplies has been re-reviewed in consideration of item 3 to include both Class IE and non-Class IE instrument distribution panel supplied. For the Class IE inverters, the PVNGS design precludes the possibility of a transient causing a failure of a Class IE inverter by utilizing a battery source in parallel with a dc charger. The battery source serves to eliminate any undervoltage transients that the charger may experience. The non-Class IE instrument distribution panels are not supplied through inverters. Both the normal and back-up supplies are fed from 480 Vac through a voltage regulator-transformer. The transfer switch will automatically transfer, upon loss of power on the normal source, to the back-up source. Manual transfer is required to return to the normal source. The switch is also equipped with a mechanical handle which bypasses electric circuitry and can switch to either source. No design modifications are proposed.

ENCLOSURE B
OPEN Item No. 10

ARIZONA PUBLIC SERVICE COMPANY
COMPANY CORRESPONDENCE

November 5, 1980
PVNGS-M80-RWK/JGS-51

TO: John Allen
Sta. # 3003

FROM: R.W. Kramer
Sta. # 4015
Ext. # 6314

SUBJECT: NRC IE Bulletin NO 79-27.
Loss of Non-Class IE Instrumentation And Control Power System
Bus During Operation

File: 055-026

The following is in response to Item 2 of NRC IE Bulletin 79-27.

Emergency procedures that will be used by control room operators, including procedures required to achieve a cold shutdown condition, upon loss of power to each Class IE and non-Class IE bus supplying power to safety and non-safety related instruments and control systems will be prepared and then reviewed at least three months prior to the operating license. The procedures will include the following information.

a. The diagnostics/alarms/indicators/symtom resulting from the review and evaluation conducted per item 1 of IE Bulletin No. 79-27.

b. The use of alternate indication and/or control circuits which may be powered from other non-Class IE or Class IE instrumentation and control buses.

c. Methods for restoring power to the bus.

A description of any proposed design modifications or administrative controls to be implemented resulting from these procedures, and the proposed schedule for implementing the changes will also be provided.

If any further assistance is required on this matter contact Jerry Self at Extension 6315.

R.W. Kramer, Support Services Manager (Acting)
PVNGS

JGS/jr

cc: G.C. Andognini
E.E. Van Brunt
F.W. Hartley
W.F. Quinn
R.R. Clifford

Exhibit 5-8