ENCLOSURE 2

PRESENTATION

TO

AUXILIARY SYSTEMS BRANCH

ON CESSAR-F

JUNE 9

COMBUSTION ENGINEERING, INC.

AGENDA FOR MEETING

WITH

AUXILIARY SYSTEMS BRANCH

ON CESSAR-F

June 9, 1981 (Begin at 9:00 a.m.)

MORNING SESSION

* 3.4 Water Level (Flood) Design
* 3.5 Missile Protection
  3.6.1 Postulated Piping Failures In Flu ' Systems Outside of Containment
  4.6 Functional Design of Reactivity Control Systems

AFTERNOON SESSION

  5.2.5 Reactor Coolant Pressure Boundary Leakage Detection Systems
  5.4.11 Pressurizer Relief Tank
* 9.1.1 New Fuel Storage
* 9.1.2 Spent Fuel Storage Racks
* 9.1.3 Spent Fuel Pool Cooling and Cleanup System
  9.1.4 Fuel Handling System
* 9.2 Water System

June 10, 1981 (Begin at 9:00 a.m.)

* 9.3.1 Compressed Air Systems
* 9.3.3 Equipment andFloor Drainage System
* 9.4 Air Conditioning, Heating, Cooling, and Ventilation Systems
* 10.3 Main Steam Supply System
* 10.4.5 Circulating Water System
* 10.4.7 Condensate and Feedwater System
* 10.4.9 Auxiliary Feedwater System

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* These SAR sections are primarily outside of CESSAR-F scope. However, presentations will discuss interfaces with CESSAR-F systems, as related to these SAR sections.

CESSAR SECTION	SYSTEM
5.1.4	RCS - REACTOR COOLANT SYSTEM (PRIMARY AND SECONDARY)
5.4.7	SCS - SHUTDOWN COOLING SYSTEM
6B	IRS - IODINE REMOVAL SYSTEM
6A	CSS - CONTAINMENT SPRAY SYSTEM
6.3	SIS - SAFETY INJECTION SYSTEM
7.1&7.2	RPS - REACTOR PROTECTIVE SYSTEM
7.1&7.3	ESFAS - ENGINEERED SAFETY FEATURES ACTUATION SYSTEM
9.3	CVCS - CHEMICAL & VOLUME CONTROL SYSTEM

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.4.1 <u>FLOOD PROTECTION</u>

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.B.1

THE CONTAINMENT SHALL REMAIN FUNCTIONAL FOR THE FULL RANGE, PER GDC 2, OF NATURAL PHENOMENA (EARTHQUAKES, TORNADOES, TORNADO MISSILES, FLOODING CONDITIONS, HURRICANES, WINDS, SNOW, AND ICE) AND EXTERNAL ENVIRONMENTAL CONDITIONS.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.4.1

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3.B.1

THE LOCATION, ARRANGEMENT, AND INSTALLATION OF THE SHUTDOWN COOLING SYSTEM COMPONENTS SHALL BE SUCH THAT FLOODS (AND TSUNAMI AND SEICHES FOR APPLICABLE SITES) OR THE EFFECTS THEREOF WILL NOT PREVENT THEM FROM PERFORMING THEIR SAFETY FUNCTIONS.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.4.1

SYSTEM: IRS, CSS, SIS

CESSAR-F SECTION:

App. 6B 7.2
App. 6A 7.2
6.3.1.3.B.1

DESIGN PROVISIONS SHALL BE INCORPORATED SUCH THAT (SYSTEM) COMPONENTS ARE CAPABLE OF FUNCTIONING IN THE EVENT OF THE MAXIMUM PROBABLE FLOOD OR OTHER NATURAL PHENOMENON DEFINED IN GDC 2.

CESSAR-F INTERFACE REQUIRE' 'NTS

SAR SECTION: 3.4.1

SYSTEM: RPS, ESFAS

CESSAR-F SECTION:

7.1.3.2 PROTECTION FROM NATURAL PHENOMENA

REFER TO SECTION 3.1.2. CESSAR LICENSING 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

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.4.1

SYSTEM: CVCS

CESSAR-F SECTION:

9.3.4.6.B.1

THE LOCATION, ARRANGEMENT, AND INSTALLATION OF THE RWT, CHARGING PUMP GRAVITY FEED PIPING, CHARGING PUMPS, CHARGING PUMP DISCHARGE PIPING, THE LETDOWN LINE BETWEEN THE RCS AND LETDOWN CONTAINMENT ISOLATION VALVES, AND SAFETY INJECTION SYSTEMS (SIS) TRAINS SUCTION PIPING SHALL BE SUCH THAT FLOODS (AND TSUNAMI AND SEICHES FOR APPLICABLE SITES) OR THE EFFECTS THEREOF WILL NOT PREVENT THEM FROM PERFORMING THEIR FUNCTIONS. THE SEVERITY OF THE ABOVE NATURAL PHENOMENA TO BE CONSIDERED, AS WELL AS THE COMBINATION OF THE EFFECTS OF THESE NATURAL PHENOMENA WITH THE DESIGN CONDITIONS OF ANSI N18.2-1973, SHALL MEET THE REQUIREMENTS OF CRITERION 2 OF 10CFR50, APPENDIX A.

PLANT MISSILES

(CESSAR 3.5)

MISSILE SELECTION

- ROTATING EQUIPMENT
- PRESSURIZED COMPONENTS

MISSILE PROTECTION

MISSILE BARRIER DESIGN

CESSAR SECTION 3.5

PLANT MISSILES

3.5.1.1 OUTSIDE CONTAINMENT

ROTATING MACHINERY

- PUMPS
- MOTORS

PRESSURIZED COMPONENTS

- VALVES
- VESSELS

3.5.1.2 INSIDE CONTAINMENT

PRETENSIONED STUDS/NUTS

CEDM

SRV

INSTRUMENTS

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.1.1 <u>INTERNALLY GENERATED MISSILES</u>

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.D.2

A CONTAINMENT STRUCTURE SHALL BE PROVIDED TO PROTECT THE RCS FROM LOSS OF FUNCTION DUE TO MISSILES GENERATED OUTSIDE THE CONTAINMENT, INCLUDING THOSE RESULTING FROM EQUIPMENT FAILURE, AND WEATHER INDUCED FORCES SUCH AS TORNADOES AND HURRICANES.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.1

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3.D

1. FOR THE PORTION OF THE SCS LOCATED INSIDE CONTAINMENT, APPROPRIATE MISSILE BARRIER DESIGN PROCEDURES SHALL BE USED TO INSURE THAT THE IMPACT OF ANY POTENTIAL MISSILE WILL NOT LEAD TO A LOSS-OF-COOLANT ACCIDENT OR PRECLUDE THE SYSTEM FROM CARRYING OUT ITS SPECIFIED SAFETY FUNCTIONS.
2. FOR THE PORTION OF THE SCS LOCATED OUTSIDE CONTAINMENT, APPROPRIATE DESIGN PROCEDURES (E.G., PROPER TURBINE ORIENTATION, PHYSICAL SEPARATION, OR MISSILE BARRIERS) SHALL BE USED TO INSURE THAT THE IMPACT OF ANY POTENTIAL MISSILE DOES NOT PREVENT THE SYSTEM OR EQUIPMENT FROM CARRYING OUT ITS SPECIFIED SAFETY FUNCTIONS.
3. APPROPRIATE DESIGN PROCEDURES SHALL BE USED TO INSURE THAT THE IMPACT OF ANY POTENTIAL MISSILE DOES NOT PREVENT THE CONDUCT OF A SAFE PLANT SHUTDOWN, OR PREVENT THE PLANT FORM REMAINING IN A SAFE SHUTDOWN CONDITION.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.1

SYSTEM: IRS, CSS, SIS

CESSAR-F SECTION:

APP. 6B 7.4
APP. 6A 7.4
6.3.1.3.D.1

THE SYSTEM SHALL BE PROTECTED FROM MISSILES IN ACCORDANCE WITH THE MISSILE BARRIER DESIGN INTERFACE REQUIREMENTS OF CESSAR SECTION 3.5.3.1.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.1.1 AND 3.5.1.2

SYSTEM: CVCS

CESSAR-F SECTION:

9.3.4.6.D

THE PORTION OF THE CVCS PROTECTED FROM PIPE FAILURE (SEE 9.3.4.6.C) SHALL ALSO BE PROTECTED FROM LOSS OF FUNCTION FROM THE EFFECTS OF MISSILES IN ACCORDANCE WITH THE MISSILE BARRIER DESIGN INTERFACE REQUIREMENT OF SECTION 3.5.3.1.

9.3.4.6.C

THE LETDOWN SUBSYSTEM (FROM THE RCS COOLANT SYSTEM), CHARGING SYSTEM (FROM VALVE CH-118 THROUGH THE CHARGING PUMPS TO RCS TO CH523), AUXILIARY SPRAY, HIGH PRESSURE SAFETY INJECTION HEADER, AND DRAIN HEADER ISOLATION VALVES (CH-329, 332, 336?) AND BORIC ACID ADDITION SYSTEM (INCLUDING BOTH OF THE REFUELING WATER TANK GRAVITY FEED CONNECTIONS TO THE CHARGING PUMP SUCTION HEADER) THE CONNECTIONS FROM THE REFUELING WATER TANK TO THE SUCTION OF THE SAFETY INJECTION SYSTEM PUMPS, AND THE REFUELING WATER TANK AND SPENT FUEL POOL CONNECTIONS TO THE CHARGING PUMP SUCTION HEADER VIA THE BORIC ACID MAKEUP PUMPS AND VALVE CH-514 SHALL BE PROTECTED FROM LOSS OF FUNCTION FROM THE EFFECTS OF PIPE RUPTURE, SUCH AS PIPE WHIP, JET IMPINGEMENT, JET REACTION, PRESSURIZATION, OR FLOODING.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.1.2

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.C.6

THE CONTAINMENT, INCLUDING PENETRATIONS, SHALL NOT BE SUBJECT TO LOSS OF FUNCTION FROM DYNAMIC EFFECTS (E.G., MISSILES, PIPE REACTIONS, FLUID REACTION FORCES) RESULTING FROM FAILURE OF RCS EQUIPMENT OR PIPING WITHIN THE CONTAINMENT.

5.1.4.D.1

THE RCS, WHICH IS A POTENTIAL SOURCE OF MISSILES, SHALL TO THE EXTENT POSSIBLE, BE EITHER SURROUNDED BY BARRIERS OR RESTRAINED TO PREVENT MISSILES FROM REACHING OTHER PARTS OF THE RCS, THE CONTAINMENT LINES, THE SECONDARY STEAM AND FEEDWATER PIPING OR THE ENGINEERING SAFEGUARDS SYSTEMS. SEE SECTION 3.5 FOR ADDITIONAL DISCUSSION OF MISSILES.

TABLE 3.5-1

(Sheet 1 of 2)

KINETIC ENERGY OF POTENTIAL MISSILES

Item[1]	Initial Kinetic Energy (ft-lb)	Weight (lb)	Impact Section
1. Reactor Vessel			
Closure Head Nut	1,706	100	Annular Ring, OD = 10-2/16" ID = 6.9"
Closure Heat Nut and Stud	5,226	577	Solid Circle, 6-3/4" Diameter
Control Rod Drive Assembly	57,600	1100	Solid Circle, 10" Diameter
2. Steam Generator			
Primary Manway Stud and Nut	71	4-1/4	Solid Circle, 1-1/2" Diameter
Secondary Handhole Stud and Nut	7	1.15	Solid Circle, 3/4" Diameter
Secondary Manway Stud	7	3.36	Solid Circle, 1-1/4" Diameter
3. Pressurizer			
Safety Valve With Flange	89,200	550	Solid Circle, 2" Diameter
Safety Valve Flange Bolt	15	3.7	Solid Circle, 1-14" Diameter
Lower Temperature Element	288	3	Edge of Solid Disk 2-3/4" Diameter and 1/2" Thick
Manway Stud and Nut	71	4-1/4	Solid Circle, 1-1/2" Diameter
4. Main Coolant Pump and Piping			
Temperature Nozzle with RTD Assembly	1,095	8	Edge of Solid Disk 2-3/4" Diameter anu 1/2" Thick
Surge and Spray Piping Thermal Wells with RTD Assembly	277	3-3/4	Edge of Solid Disc 2-3/4" Diameter and 1/2" Thick

(1) All materials are steel.

(continued)

TABLE 3.5-1 (Cont'd.) (Sheet 2 of 2)

KINETIC ENERGY OF POTENTIAL MISSILES

Item	Initial Kinetic Energy (ft-lb)	Weight (lb)	Impact Section
Main Coolant Pump Thermal Well with RTD	1,095	8	Edge of Solid Disk 2-3/4" Diameter and 1/2" Thick
Shutdown Cooling Valve Stem	3,340	85	Solid Circle, 2-1/2" Diameter

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.1.4 MISSILES GENERATED BY NATURAL PHENOMENA

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.B.1

THE CONTAINMENT SHALL REMAIN FUNCTIONAL FOR THE FULL RANGE, PER GDC 2, OF NATURAL PHENOMENA (EARTHQUAKES, TORNADOES, TORNADO MISSILES, FLOODING CONDITIONS, HURRICANES, WINDS, SNOW, AND ICE) AND EXTERNAL ENVIRONMENTAL CONDITIONS.

5.1.4.D.2

A CONTAINMENT STRUCTURE SHALL BE PROVIDED TO PROTECT THE RCS FROM LOSS OF FUNCTION DUE TO MISSILES GENERATED OUTSIDE THE CONTAINMENT, INCLUDING THOSE RESULTING FROM EQUIPMENT FAILURE, AND WEATHER INDUCED FORCES SUCH AS TORNADOES AND HURRICANES.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.1.4

SYSTEM: CVCS

CESSAR-F SECTION:

9.3.4.6.B.2

THE LOCATION, ARRANGEMENT AND INSTALLATION OF THE RWT, CHARGING PUMP GRAVITY FEED PIPING, CHARGING PUMPS, CHARGING PUMP DISCHARGE PIPING, THE LETDOWN LINE BETWEEN THE RCS AND LETDOWN CONTAINMENT ISOLATION VALVES, AND SIS TRAINS SUCTION PIPING SHALL BE SUCH THAT WINDS AND TORNADOES OR THE EFFECTS THEROF WILL NOT PREVENT THEM FROM PERFORMING THEIR FUNCTIONS. THE SEVERITY OF THE WINDS AND TORNADOES TO BE CONSIDERED, AS WELL AS THE COMBINATION OF THE EFFECTS OF THESE NATURAL PHENOMENA WITH THE DESIGN CONDITIONS OF ANSI N18.2-1973, SHALL MEET THE REQUIREMENTS OF CRITERION 2 OF 10CFR50, APPENDIX A.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.2 SYSTEMS TO BE PROTECTED

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.C.6

THE CONTAINMENT, INCLUDING PENETRATIONS, SHALL NOT BE SUBJECT TO LOSS OF FUNCTION FROM DYNAMIC EFFECTS (E.G., MISSILES, PIPE REACTIONS, FLUID REACTION FORCES) RESULTING FROM FAILURE OF RCS EQUIPMENT OR PIPING WITHIN THE CONTAINMENT.

5.1.4.D.1

THE RCS, WHICH IS A POTENTIAL SOURCE OF MISSILES, SHALL TO THE EXTENT POSSIBLE, BE EITHER SURROUNDED BY BARRIERS OR RESTRAINED TO PREVENT MISSILES FROM REACHING OTHER PARTS OF THE RCS, THE CONTAINMENT LINES, THE SECONDARY STEAM AND FEEDWATER PIPING OR THE ENGINEERED SAFEGUARDS SYSTEMS. SEE SECTION 3.5 FOR ADDITIONAL DISCUSSION OF MISSILES.

5.1.4.B.1

THE CONTAINMENT SHALL REMAIN FUNCTIONAL FOR THE FULL RANGE, PER GDC 2, OF NATURAL PHENOMENA (EARTHQUAKES, TORNADOES, TORNADO MISSILES, FLOODING CONDITIONS, HURRICANES, WINDS, SNOW, AND ICE) AND EXTERNAL ENVIRONMENTAL CONDITIONS.

5.1.4.F.1

THE PROVISIONS OF GENERAL DESIGN CRITERIA 54 AND 57 FOR CONTAINMENT ISOLATION VALVES SHALL BE MET.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.2

SYSTEM: RPS, ESFAS

CESSAR-F SECTION:

7.1.3.4 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.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.5.2

SYSTEM: CVCS

CESSAR-F SECTION:

9.3.4.6.D

THE PORTION OF THE CVCS PROTECTED FROM PIPE FAILURE (SEE 9.3.4.6.C) SHALL ALSO BE PROTECTED FROM LOSS OF FUNCTION FROM THE EFFECTS OF MISSILES IN ACCORDANCE WITH THE MISSILE BARRIER DESIGN INTERFACE REQUIREMENT OF SECTION 3.5.3.1.

9.3.4.6.C

THE LETDOWN SUBSYSTEM (FROM THE RCS COOLANT SYSTEM), CHARGING SYSTEM (FROM VALVE CH-118 THROUGH THE CHARGING PUMPS TO RCS TO CH523), AUXILIARY SPRAY, HIGH PRESSURE SAFETY INJECTION HEADER, AND DRAIN HEADER ISOLATION VALVES (CH-329, 332, 3367) AND BORIC ACID ADDITION SYSTEM (INCLUDING BOTH OF THE REFUELING WATER TANK GRAVITY FEED CONNECTIONS TO THE CHARGING PUMP SUCTION HEADER) THE CONNECTIONS FROM THE REFUELING WATER TANK TO THE SUCTION OF THE SAFETY INJECTION SYSTEM PUMPS, AND THEREFUELING WATER TANK AND SPENT FUEL POOL CONNECTIONS TO THE CHARGING PUMP SUCTION HEADER VIA THE BORIC ACID MAKEUP PUMPS AND VALVE CH-514 SHALL BE PROTECTED FROM LOSS OF FUNCTION FROM THE EFFECTS OF PIPE RUPTURE, SUCH AS PIPE WHIP, JET IMPINGEMENT, JET REACTION, PRESSURIZATION, OR FLOODING.

PIPE BREAKS

(CESSAR 3.6)

3.6.1 PIPE BREAKS OUTSIDE CONTAINMENT

1. BREAKS REQUIRED IN:
   - ·HIGH ENERGY PIPING
   - ·MODERATE ENERGY PIPING
2. ALL PIPING IN APPLICANTS SCOPE

3.6.2 PIPE BREAKS INSIDE CONTAINMENT

1. RCS PIPE BREAKS PER CENPD-168A
2. ALL OTHER PIPING IN APPLICANTS SCOPE

SAR SECTION: 3.6 PROTECTION AGAINST DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED RUPTURE OF PIPING

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.B.3

THE VALVES, PIPING, AND ASSOCIATED SUPPORTS OF THE FEEDWATER SYSTEM FROM AND INCLUDING THE MAIN FEEDWATER ISOLATION VALVES (MFIV'S) TO THE STEAM GENERATOR FEED NOZZLES SHALL BE SEISMIC CATEGORY 1 AND DESIGNED TO ASME B&PV CODE SECTION III, CLASS 2 REQUIREMENTS.

5.1.4.B.4

ALL COMPONENTS AND PIPING OF THE EMERGENCY FEEDWATER SYSTEM BETWEEN THE STEAM GENERATORS AND THE CONTAINMENT ISOLATION VALVES SHALL BE SEISMIC CATEGORY I AND DESIGNED TO ASME B&PV CODE SECTION III, CLASS 2 REQUIREMENTS.

5.1.4.B.5

ALL COMPONENTS, PIPING AND ASSOCIATED SUPPORTS IN THE CONDENSATE STORAGE FACILITIES FOR EMERGENCY FEEDWATER SHALL BE SEISMIC CATEGORY I AND DESIGNED IN ACCORDANCE WITH ASME B&PV CODE SECTION III, CLASS 3.

5.1.4.B.6

ALL COMPONENTS AND PIPING ASSOCIATED WITH STEAM GENERATOR BLOWDOWN BETWEEN THE STEAM GENERATOR AND THE CONTAINMENT ISOLATION VALVES SHALL BE SEISMIC CATEGORY I AND DESIGNED TO ASME B&PV CODE SECTION III, CLASS 2 REQUIREMENTS.

SAR SECTION: 3.6 (CONT'D) PROTECTION AGAINST DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED RUPTURE OF PIPING

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.E.3

REDUNDANT FEEDWATER SYSTEM ISOLATION VALVES IN EACH FEEDWATER LINE MEETING THE SINGLE FAILURE CRITERIA SHALL BE PROVIDED IN PIPING INTERCONNECTING THE STEAM GENERATORS TO PRECLUDE BLOWDOWN OF BOTH STEAM GENERATORS FOLLOWING A PIPE RUPTURE.

SAR SECTION: 3.6 (CONT'D) PROTECTION AGAINST DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED RUPTURE OF PIPING

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.C

1. THE FOLLOWING VALVES SHALL BE PROTECTED AGAINST INTERNALLY GENERATED MISSILES OR THE EFFECTS RESULTING FROM A HIGH ENERGY PIPE RUPTURE (E.G., PIPE WHIP, JET IMPINGEMENT AND STEAM ENVIRONMENT) SUCH THAT THESE EVENTS WILL NOT PREVENT THE VALVES FROM PERFORMING THEIR REQUISITE SAFETY FUNCTIONS.

   A. MSIV'S

   B. SECONDARY SAFETY VALVES

   C. ATMOSPHERIC DUMP VALVES (ADV'S)

   D. MSIV BYPASS VALVES.

   E. MFIV'S.

   F. BLOWDOWN ISOLATION VALVES.

2. PIPE WHIP STOPS SHALL BE PROVIDED FOR THE RCS PIPING. (SEE SECTION 3.9.1.4).

SAR SECTION: 3.6 (CONT'D) PROJECTION AGAINST DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED RUPTURE OF PIPING

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.C (CONT'D)

A POSTULATED DOUBLE-ENDED SEVERANCE OF THE LARGEST REACTOR COOLANT PIPE OR, (2) A COMPLETE BLOWDOWN OF THE UNISOLATED STEAM SYSTEM THROUGH ANY RUPTURE OF THE STEAM LINE PIPING, UP TO AND INCLUDING A POSTULATED DOUBLE-ENDED SEVERENCE OF THE LARGEST MAIN STEAM LINE PIPE, ASSUMING A SEQUENCE OF EVENTS FOR EITHER CASE WHICH LEADS TO THE PEAK TRANSIENT ACCUMULATION OF ENERGY IN THE BUILDING ATMOSPHERE. TO MEET THIS END, A SPECTRUM OF LOSS-OF-COOLANT ACCIDENTS (LOCA) AND MAIN STEAM LINE BREAKS (MSLB) HAVE BEEN ANALYZED. THEY SHALL BE USED BY THE APPLICANT TO ESTABLISH THE DESIGN PRESSURE AND TEMPERATURE OF THE CONTAINMENT. (REFER TO SECTIONS 6.2.1.3 AND 6.2.1.4).

B. TAKE INTO ACCOUNT ALL CREDIBLE POST-BLOWDOWN ENERGY ADDITIONS TO THE CONTAINMENT ATMOSPHERE, SUCH AS CORE RESISUAL HEAT, THIN AND THICK STRUCTURAL METAL STORED ENERGY, STEAM GENERATOR REVERSE HEAT TRANSFER, METAL-WATER REACTIONS AND OTHER POSSIBLE CHEMICAL REACTIONS RESULTING FROM A LOSS-OF-COOLANT ACCIDENT.

8. COMPARTMENTS WITHIN THE CONTAINMENT INCLUDING THE REACTOR VESSEL CAVITY SHALL BE DESIGNED FOR THE MAXIMUM PRESSURE DIFFERENTIAL BETWEEN THE COMPARTMENT AND THE REMAINDER OF THE CONTAINMENT BASED ON THE MAXIMUM RCS PIPE BREAK THAT CAN OCCUR IN THE COMPARTMENT AS DEFINED IN SECTION 3.6.

SAR SECTION: 3.6 (CONT'D) PROTECTION AGAINST DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED RUPTURE OF PIPING

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.C (CONT'D)

3. THE MSIV'S SHALL BE SUPPORTED SUCH THAT THE VALVE BODY AND ACTUATOR WILL NOT BE DISTORTED OR DISPLACED AS A RESULT OF PIPE BREAK THRUST LOADINGS TO SUCH A DEGREE THAT THE VALVE CANNOT CLOSE.

4. FEEDWATER PIPING SHALL BE ROUTED, PROTECTED AND RESTRAINED SUCH THAT IN THE CASE OF A RUPTURE OF A FEEDWATER LINE OR ANY OTHER SYSTEM PIPELINE, A SINGLE FAILURE CRITERIA WILL NOT BE EXCEEDED WITH REGARD TO SAFE SHUTDOWN OF THE PLANT.

5. A CONTAINMENT SHALL BE PROVIDED TO LIMIT THE RELEASE OF ENERGY AND RADIOACTIVITY TO THE ENVIRONS IN THE EVENT OF A RUPTURE OF THE RCS AND TO PROTECT THE PUBLIC HEALTH AND SAFETY.

6. THE CONTAINMENT, INCLUDING PENETRATIONS, SHALL NOT BE SUBJECT TO LOSS OF FUNCTION FROM DYNAMIC EFFECTS (E.G., MISSILES, PIPE REACTIONS, FLUID REACTION FORCES) RESULTING FROM FAILURE OF RCS EQUIPMENT OR PIPING WITHIN THE CONTAINMENT.

7. THE DESIGN PRESSURE AND TEMPERATURE OF THE CONTAINMENT SHALL, AS A MINIMUM,

   A. BE EQUAL TO THE PEAK PRESSURE AND TEMPERATURE RESULTING FROM EITHER (1) COMPLETE BLOWDOWN OF THE REACTOR COOLANT THROUGH ANY RUPTURE OF THE RCS PIPING, UP TO AND INCLUDING

SAR SECTION: 3.6 (CONT'D) PROTECTION AGAINST DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED RUPTURE OF PIPING

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.F.2

THE FEEDWATER SYSTEM PIPING, EMERGENCY FEEDWATER SYSTEM PIPING, AND MAIN STEAM PIPING AND ALL OF THEIR ASSOCIATED SUPPORTS AND RESTRAINTS SHALL BE DESIGNED SO THAT A SINGLE ADVERSE EVENT, SUCH AS A RUPTURED FEEDWATER LINE, EMERGENCY FEEDWATER LINE, MAIN STEAM LINE INSIDE CONTAINMENT, OR A CLOSED ISOLATION VALVE CAN OCCUR WITHOUT:

A. INITIATING A LOSS-OF-COOLANT INCIDENT.

B. CAUSING FAILURE OF OTHER STEAM GENERATOR'S SAFETY CLASS STEAM AND FEEDWATER LINES, MISV'S, SAFETY VALVES, MFIV'S BLOWDOWN LINE ISOLATION VALVES, OR ADV'S.

C. REDUCING THE CAPABILITY OF ANY OF THE ENGINEERED SAFETY FEATURES SYSTEMS OR THE PLANT PROTECTIVE SYSTEM.

D. TRANSMITTING EXCESSIVE LOADS TO THE CONTAINMENT PRESSURE BOUNDARY.

E COMPROMISING THE FUNCTION OF THE PLANT CONTROL ROOM.

F. PRECLUDING ORDERLY COOLDOWN OF THE RCS.

SAR SECTION: 3.6 (CONT'D) PROTECTION AGAINST DYNAMIC EFFECTS ASSOCIATED WITH POSTULATED RUPTURE OF PIPING

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.F.10

THE ABILITY OF THE EMERGENCY FEEDWATER SYSTEM TO PERFORM ITS DESIGN FUNCTION CONSIDERING A POWER SUPPLY FAILURE, A SINGLE ACTIVE OR PASSIVE MECHANICAL COMPONENT FAILURE, A SINGLE ACTIVE OR PASSIVE FAILURE OF AN ELECTRICAL COMPONENT, OR THE EFFECTS OF A HIGH OR MODERATE ENERGY PIPE RUPTURE SHALL BE DEMONSTRATED.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.6

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3.C

1. PIPE BREAK CONSIDERATIONS

THE SHUTDOWN COOLING SYSTEM BOTH INSIDE AND OUTSIDE CONTAINMENT SHALL BE PROTECTED FROM THE EFFECTS OF POSTULATED HIGH AND MODERATE ENERGY PIPE RUPTURE.

2. PIPE LEAKAGE CONSIDERATIONS

NO LIMITED LEAKAGE PASSIVE FAILURE OR THE EFFECTS THEREOF (SUCH AS FLOODING, SPRAY IMPINGEMENT, STEAM, TEMPERATURE, PRESSURE, RADIATION, OR LOSS OF NPSH) IN A CONNECTING SYSTEM (E.G., SAFETY INJECTION SYSTEM OR CONTAINMENT SPRAY SYSTEM) SHALL PRECLUDE THE AVAILABILITY OF MINIMUM ACCEPTABLE SHUTDOWN COOLING CAPABILITY. MINIMUM ACCEPTABLE SHUTDOWN COOLING CAPABILITY IS DEFINED AS THAT PROVIDED BY ONE LPSI PUMP AND ITS ASSOCIATED HEAT EXCHANGER TRAIN.

ALL SCS INSTRUMENTS AND ASSOCIATED INSTRUMENT LINES, ROOT VALVES, AND ISOLATION VALVES, SHALL BE DESIGNED TO MAINTAIN PRESSURE BOUNDARY INTEGRITY FOLLOWING A SEISMIC EVENT.

SAR SECTION: 3.6

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3C (CONT'D)

3. DESIGN REQUIREMENTS

FOR ALL PARTS OF THE SCS APPROPRIATE DESIGN PROCEDURES SHALL BE EMPLOYED TO ENSURE THAT A POSTULATED PIPE FAILURE DOES NOT RESULT IN A LOSS OF FUNCTION OF THE SCS.

A. PROTECTION OF THE SCS FROM THE CONSEQUENCES OF A POSTULATED PIPE FAILURE SHALL BE BY (1) SEPARATION VIA PHYSICAL PLANT LAYOUT, (2) PIPE RESTRAINTS, (3) PROTECTIVE STRUCTURES, (4) WATERTIGHT ROOMS, (5) ISOLATION CAPABILITY, OR (6) OTHER SUITABLE MEANS.

B. ISOLATION VALVES (SYSTEM AND/OR CONTAINMENT) USED TO CONTAIN LEAKAGE SHALL BE PROTECTED FROM THE ADVERSE EFFECTS OF A PIPE FAILURE WHICH MIGHT PRECLUDE THEIR OPERATION WHEN REQUIRED.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.6

SYSTEM: IRS, CSS, SIS

CESSAR-F SECTION:

APP. 6B 7.3
APP. 6A 7.3
6.3.1.3.C

1. THE MAXIMUM EXPECTED LEAKAGE FROM A MODERATE ENERGY PIPE RUPTURE POSTULATED DURING NORMAL PLANT CONDITIONS IN THE SYSTEM SHALL BE AS DEFINED BY THE METHODS OF SECTION 3.6. ISOLATION VALVES USED TO CONTAIN LEAKAGE SHALL BE PROTECTED FROM THE ADVERSE EFFECTS OF A HIGH OR MODERATE ENERGY PIPE RUPTURE WHICH MIGHT PRECLUDE THEIR OPERATION WHEN REQUIRED.

2. NO LIMITED LEAKAGE PASSIVE FAILURE OR THE EFFECTS THEREOF (SUCH AS FLOODING, SPRAY IMPINGEMENT, STEAM, TEMPERATURE, PRESSURE, RADIATION,LOSS OF NPSH, OR LOSS OF RECIRCULATION WATER INVENTORY), IN THE SYSTEM DURING THE RECIRCULATION MODE SHALL PRECLUDE THE AVAILABILITY OF MINIMUM ACCEPTABLE RECIRCULATION CAPABILITY (MINIMUM ACCEPTABLE CAPABILITY IS DEFINED AS THAT WHICH IS PROVIDED BY THE OPERATION OF ONE SUBSYSTEM).

3. THE SYSTEM SHALL BE PROTECTED FROM THE EFFECTS OF PIPE RUPTURE.

4. THE SYSTEM SHALL BE PROTECTED FROM THE EFFECTS OF PIPE WHIP.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 3.6

SYSTEM: RPS, ESFAS

CESSAR-F SECTION:

7.1.3.3 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.

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.

CESSAR - FSAR SECTION 4.6

FUNCTIONAL DESIGN OF REACTIVITY CONTROL SYSTEMS

SYSTEM 8C INCLUDES 3 REACTIVITY CONTROL SYSTEMS:

1. CONTROL ELEMENT DRIVE MECHANISMS
2. SAFETY INJECTION SYSTEM
3. CHEMICAL AND VOLUME CONTROL SYSTEM

CESSAR - FSAR SECTION 4.6

CHEMICAL AND VOLUME CONTROL SYSTEM FUNCTIONAL DESCRIPTION

REFERENCE CESSAR - FSAR SECTION 9.3.4.1.3 REACTIVITY CONTROL FUNCTIONS:

1. CONTROL BORON CONCENTRATION FOR OPTIMUM CEA POSITION
2. CONTINUOUSLY MONITOR RCS BORON CONCENTRATION AND SPECIFIC RADIOACTIVITY
3. RECEIVE, STORE, AND SEPARATE BORATED WASTE WATER FOR REUSE
4. SOURCE OF BORATED WATER FOR SAFETY INJECTION SYSTEM

CESSAR - FSAR SECTION 4.6
APPLICABLE CVCS GENERAL DESIGN CRITERIA

1. CRITERIA 20	-	PROTECTION SYSTEM FUNCTIONS
REFERENCE		CESSAR - FSAR SECTIONS 9.3.4.3.1, 9.3.4.3.2
2. CRITERIA 21	-	PROTECTION SYSTEM RELIABILITY AND TESTABILITY
REFERENCE		CESSAR - FSAR SECTION 9.3.4.3.1
3. CRITERIA 23	-	PROTECTION SYSTEM FAILURE MODES
REFERENCE		CESSAR - FSAR SECTION 9.3.4.3.7
4. CRITERIA 25	-	PROTECTION SYSTEM REQUIREMENTS FOR REACTIVITY CONTROL MALFUNCTIONS
REFERENCE		CESSAR - FSAR SECTION 4.3.1.7

CESSAR - FSAR SECTION 4.6
APPLICABLE CVCS GENERAL DESIGN CRITERIA

5. CRITERIA 26	-	REACTIVITY CONTROL SYSTEM REDUNDANCY AND CAPABILITY
REFERENCE		CESSAR - FSAR SECTIONS 4.3.1.10, 9.3.4.6
6. CRITERIA 27	-	COMBINED REACTIVITY CONTROL SYSTEMS CAPABILITY
REFERENCE		CESSAR - FSAR SECTIONS 4.3.1.10, 9.3.4.6
7. CRITERIA 28	-	REACTIVITY LIMITS
REFERENCE		CESSAR - FSAR SECTIONS 4.3.1.7 , 9.3.4.6

FUNCTIONAL DESIGN OF THE
CONTROL ELEMENT DRIVE MECHANISM
REACTIVITY CONTROL SYSTEM

INFORMATION ON CRDS

(89 REQ'D - EXTRA'S FOR Pu RELOADS)

THE CRDS CONSIST OF ~~91~~ 97 CEDMs MOUNTED ON THE REACTOR HEAD.
MADE UP OF 7 MAJOR SUB ASSEMBLIES. (SEE ATTACHED OUTLINE DWG.)

EVALUATION OF CRDS

THE SAFETY FUNCTION OF THE CRDS IS TO DROP CEAs INTO REACTOR CORE WHEN DE-ENERGIZED

SINGLE FAILURE

A FAILURE MODE EFFECTS ANALYSIS OF THE RPS IS PRESENTED IN SECTION 7.2.

ALL CEDMs ARE INDEPENDENT OF ONE ANOTHER.

SUFFICIENT SHUTDOWN MARGIN IS ALWAYS MAINTAINED EVEN IN THE EVENT OF FAILURE OF ANY SINGLE CEDM.

ISOLATION OF THE CRDS FROM OTHER EQUIPMENT

THE INTERFACE BETWEEN CEDMs AND CEDM CONTROL SYSTEM IS AT THE CEDMCS POWER SWITCHES, WHICH PROVIDES ISOLATION OF THE MOTIVE POWER FROM THE LOW VOLTAGE LOGIC CONTROL SIGNAL.

INTERFACE BETWEEN THE CEDMs AND THE CEAs INVOLVES NO NON-ESSENTIAL ELEMENTS, THUS NO ISOLATION IS REQUIRED.

PROTECTION FROM COMMON MODE FAILURE DUE TO PIPE BREAKS IS DESCRIBED IN THE APPLICANT'S SAR.

CRD COOLING SYSTEM

FORCED AIR AT 700 SCFM MIN. AND 120°F MAXIMUM INTERFACE REQUIREMENT.

NO LOSS OF SAFETY FUNCTION IF COOLING SYSTEM FAILS.

TESTING AND VERIFICATION OF CRDS

DESIGN PERFORMANCE VERIFICATION (SECTION 3.9)

- ACCELERATED LIFE TESTS USING 450 #
- DROP TESTS WITH MINIMUM WEIGHT UNDER SIMULATED SEISMIC DEFLECTIONS.
- FULL FLOW TESTING WITH PROTOTYPICAL COMPONENTS.
- AIR COOLING TESTS (NORMAL-LOSS OF)
- WITHDRAWAL AND INSERTION FORCE VERIFICATION.

INSTALLATION VERIFICATION TESTS ON EACH CRD

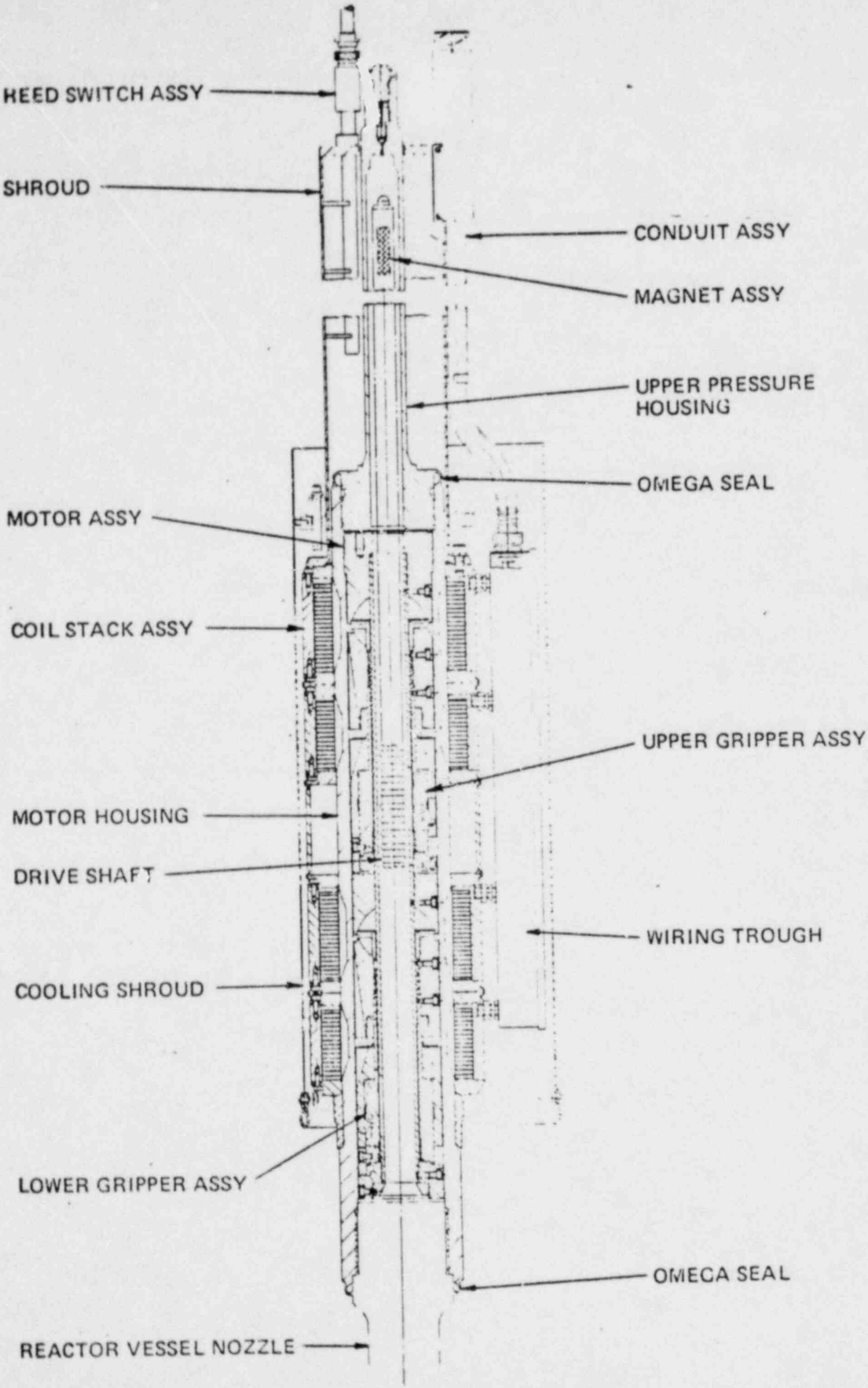
- PRE-CORE COIL TEMPERATURE TESTS
- PRE-CORE CEDM OPERATIONS
- POST-CORE ROD DROP TESTS
- POST-CORE CEDM OPERATION VERIFICATION
  - COIL CURRENT
  - SPEED
  - ROD POSITION INDICATION

SURVEILLANCE TESTS

1. OPERABILITY TEST AT LEAST 5 INCH MOTION EVERY 31 DAYS.
2. DROP TESTS PERFORMED EVERY 18 MONTHS, OR AFTER HEAD REMOVAL.

COMBINED PERFORMANCE OF THE REACTIVITY CONTROL SYSTEMS

CRDS WILL PERFORM SAFETY FUNCTIONS UNDER REQUIRED ACCIDENTS LISTED IN TABLE 4.6-1


REED SWITCH ASSY
SHROUD
CONDUIT ASSY
MAGNET ASSY
UPPER PRESSURE HOUSING
OMEGA SEAL
MOTOR ASSY
COIL STACK ASSY
UPPER GRIPPER ASSY
MOTOR HOUSING
DRIVE SHAFT
WIRING TROUGH
COOLING SHROUD
LOWER GRIPPER ASSY
OMEGA SEAL
REACTOR VESSEL NOZZLE

CESSAR - FSAR SECTION 5.2.5

REACTOR COOLANT PRESSURE BOUNDARY
LEAKAGE DETECTION SYSTEMS

CRITERIA:	GENERAL DESIGN CRITERIA 30
	REGULATORY GUIDE 1.45
CLASSIFICATION:	UNIDENTIFIED
	IDENTIFIED

CESSAR - FSAR SECTION 5.2.5

DETECTION METHODS

- DETECTION METHODS IN APPLICANTS SCOPE
- INTERFACE REQUIREMENTS STATED IN SECTION 5.1.4
    A. SECONDARY SIDE OF STEAM GENERATORS
    B. COMPONENT COOLING WATER
    C. APPLICANT COMPONENT AND CONSTRUCTION PROCEDURE LIMITS

KNOWN SOURCE	10 GPM
UNKNOWN SOURCE	1 GPM
SECONDARY SIDE	1 GPM

CESSAR - FSAR SECTION 5.2.5

UNIDENTIFIED LEAKAGE:	MONITOR RCS MAKEUP WATER
IDENTIFIED:	RCS SAFETY VALVE TEMPERATURE
(INDICATIONS & ALARMS PROVIDED)	REACTOR COOLANT PUMP SEAL PRESSURE
	STEAM GENERATOR TUBES
	SAFETY INJECTION SYSTEM PRESSURE

CESSAR - FSAR SECTION 5.2.5

TECHNICAL SPECIFICATIONS

REFERENCE CESSAR - FSAR SECTION 16 3/4.4.5

LIMITING CONDITION:

1. NO PRESSURE BOUNDARY LEAKAGE
2. 1 GPM UNIDENTIFIED LEAKAGE
3. 1 GPM STEAM GENERATOR TUBE
4. 10 GPM IDENTIFIED LEAKAGE

ACTION:

1. PRESSURE BOUNDARY

   HOT STANDBY WITHIN 10 HOURS

   COLD SHUTDOWN WITHIN 30 HOURS

2. REACTOR COOLANT SYSTEM

   REDUCE LEAKAGE RATE WITHIN 4 HOURS

   HOT STANDBY WITHIN NEXT 6 HOURS

   COLD SHUTDOWN WITHIN NEXT 30 HOURS

SAR SECTION: 5.2.5 DETECTION OF LEAKAGE THROUGH REACTOR COOLANT PRESSURE BOUNDARY

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.H

1. MEANS SHALL BE PROVIDED FOR DETECTION OF REACTOR COOLANT LEAKAGE INTO THE SECONDARY SIDE OF THE STEAM GENERATORS AND COOLING WATER SYSTEMS ASSOCIATED WITH COMPONENTS CONTAINING REACTOR COOLANT.

2. APPLICANT SUPPLIED COMPONENT DESIGNS AND RCS CONSTRUCTION PROCEDURES SHALL ENSURE THAT RCS LEAKAGE FROM KNOWN SOURCES WILL NOT EXCEED 10 GPM; FROM STEAM GENERATOR TUBES WILL NOT EXCEED 1.0 GPM; AND FROM UNKNOWN SOURCES WILL NOT EXCEED 1 GPM, TO MINIMIZE IN-PLANT AIRBORNE AND SURFACE ACTIVITY LEVELS AND ACTIVITY RELEASES TO THE ENVIRONS AT SYSTEM NORMAL OPERATING TEMPERATURE AND PRESSURE.

5.1.4.P.4

SYSTEMS SHALL BE PROVIDED FOR THE DETECTION OF REACTOR COOLANT LEAKAGE FROM UNIDENTIFIED SOURCES.

CESSAR - FSAR SECTION 5.4.11
PRESSURIZER RELIEF TANK

SYSTEM 80 NSSS PRESSURIZER RELIEVES TO THE REACTOR DRAIN TANK

RDT FUNCTIONAL DESCRIPTION REFERENCE CESSAR-FSAR SECTION 9.3.4.2.2

1. QUENCH PRESSURIZER SAFETY RELIEF
2. RECEIVE SHUTDOWN COOLING/SAFETY INJECTION RELIEF
3. RECEIVE DRAINS FROM CONTAINMENT COMPONENTS
4. RECEIVE RCS DRAINS

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 5.4.11 PRESSURIZER RELIEF DISCHARGE SYSTEM

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.0.1

EACH PRIMARY SAFETY VALVE INLET LINE SHALL BE DESIGNED TO PASS 125 PERCENT OF THE MINIMUM REQUIRED SAFETY VALVE CAPACITY OF 460,000 LB/HR WITH A MAXIMUM PRESSURE DROP OF 50 PSI. THIS PRESSURE DROP OF 50 PSI IS FOR PIPING AND NOZZLE LOSSES. (PRESSURE LOSS FACTOR FOR PRESSURIZER NOZZLE IS K - 0.23 BASED ON 6" SCHEDULE 160 PIPE.)

5.1.4.0.2

EACH PRIMARY SAFETY VALVE DISCHARGE LINE SHALL BE DESIGNED TO PASS 125 PERCENT OF THE MINIMUM REQUIRED SAFETY VALVE CAPACITY WITH A MAXIMUM VALVE BACK PRESSURE OF 500 PSIG AT THE SAFETY VALVE DISCHARGE DURING BLOWDOWN, ASSUMING THE DISCHARGE TANK IS AT 132 PSIG. THE MINIMUM REQUIRED FLOW RATE FOR EACH SAFETY VALVE IS 460,000 LB/HR. FOR THE COMMON DISCHARGE LINE, THE MINIMUM SAFETY VALVE FLOW IS 1,840,000 LB/HR (TOTAL FLOW OF FOUR VALVES). DISCHARGE TANK DESIGN PRESSURE IS 130 PSIG. MAXIMUM PRESSURE OF 132 PSIG IS CALCULATED FROM RUPTURE DISK BURST PRESSURE OF 120 PSIG PLUS 10% TOLERANCE.

SECTION 9.1.1

NEW FUEL STORAGE

1. NO EQUIPMENT IN C-E SCOPE OF SUPPLY.

2. SEE APPLICANTS SAR FOR STORAGE EQUIPMENT AND SYSTEMS.

3. INTERFACES:

   CESSAR 4.2.5

   C-1 THE FUEL SHALL BE PROTECTED FROM THE EFFECTS OF PIPE WHIP WHILE IN STORAGE.

   E-1-A THE NEW FUEL STORAGE RACKS SHALL BE DESIGNED SUCH THAT FUEL ASSEMBLIES WILL NOT BE INSERTED IN OTHER THAN PRESCRIBED LOCATIONS.

   E-1-B ADEQUATE MARGIN TO CRITICALITY SHALL BE PROVIDED FOR FULL RACK LOADINGS OF FUEL ASSEMBLIES HAVING A MECHANICAL DESIGN SIMILAR TO THAT DESCRIBED IN CHAPTER 4.0 AND ENRICHMENTS UP TO 3.7 w/o U-235.

   E-1-C THE DEGREE OF SUBCRITICALITY PROVIDED SHALL BE CONSISTENT WITH THE REQUIREMENTS OF ANSI STANDARD N18.2, SECTION 5.7.4.1.

   P-2 AN OVERHEAD CRANE SHALL BE PROVIDED IN THE NEW FUEL STORAGE AREA TO FACILITATE HANDLING OF NEW FUEL.

   A. THE CRANE CAPACITY SHALL BE AT LEAST 1 TON TO ACCOMMODATE THE WEIGHT OF A FUEL ASSEMBLY.

   B. A VERTICAL HOISTING SPEED OF 6 FEET/MINUTE OR LESS SHALL BE PROVIDED.

   C. THE CRANE LOAD SHALL BE CAPABLE OF BEING LIMITED TO PREVENT THE HOIST LOAD FROM EXCEEDING 5000 POUNDS WHEN HANDLING FUEL ASSEMBLIES.

SECTION 9.1.2

SPENT FUEL STORAGE

1. NO EQUIPMENT IN C-E SCOPE OF SUPPLY.
2. SEE APPLICANTS SAR.
3. INTERFACES

   CESSAR 4.2.5

   B-2 THE SPENT FUEL POOL SHALL BE A SEISMIC CATETORY I STRUCURE.

   B-3 THE LOAD BEARING MEMBERS OF THE SPENT FUEL STORAGE RACKS SHALL WITHSTAND THE FORCES INDUCED BY THE SSE VERTICAL AND HORIZONTAL SEISMIC LOADINGS. THESE FORCES SHALL BE ASSUMED AS ACTING SIMULTANEOUSLY IN CONJUNCTION WITH THE COMBINED DEADWEIGHT AND LIVE LOADS WITHOUT EXCEEDING MINIMUM MATERIAL YIELD STRESSES AS SPECIFIED BY ASTM.

   B-4 THE SPENT FUEL STORAGE RACKS SHALL BE SEISMIC CATEGORY I.

   C-1 THE FUEL SHALL BE PROTECTED FROM THE EFFECTS OF PIPE WHIP WHILE IN STORAGE.

   C-3 SPENT FUEL SHALL BE PROTECTED FROM THE EFFECTS OF PIPE RUPTURE.

   D-2 THE FUEL SHALL BE PROTECTED FROM THE EFFECTS OF MISSILES WHILE IN STORAGE.

   G-2 DRAINS, PERMANENTLY CONNECTED SYSTEMS, AND OTHER FEATURES OF THE SPENT FUEL POOL SHALL BE DESIGNED SO THAT NEITHER MALOPERATION NOR FAILURE CAN RESULT IN LOSS OF COOLANT THAT WOULD UNCOVER THE STORED FUEL.

   G-3 SPENT FUEL POOL COOLING SHALL BE CAPABLE OF REMOVING THE DECAY HEAT GENERATED FROM 1 COMPLETE CORE OF SPENT FUEL PLACED IN THE POOL 7 DAYS AFTER SHUTDOWN IN ADDITION TO 1/3 OF A COMPLETED CORE THAT HAS BEEN IN THE POOL 90 DAYS AFTER SHUTDOWN.

   H-1 LOW WATER LEVEL ALARMS SHALL BE PROVIDED FOR THE REFUELING POOL AND THE SPENT FUEL POOL.

SAR SECTION: 9.1.3 SPENT FUEL POOL COOLING AND CLEANUP SYSTEM

SYSTEM: CVCS

CESSAR-F SECTION:

9.3.4.6.P.2

THE SPENT FUEL POOL SHALL PROVIDE AN ALTERNATE SOURCE OF BORATED WATER TO THE CVCS.

A. A VOLUME OF 33,500 GALLONS SHALL BE AVAILABLE TO ACHIEVE COLD SHUTDOWN AT THE END OF CORE LIFE (5 PERCENT SUBCRITICALITY WITH RODS) ASSUMING 4000 PPM BORON WITHIN THE FUEL POOL.

B. THE BORIC ACID MAKEUP PUMPS SHALL BE ABLE TO TAKE SUCTION FROM THE SPENT FUEL POOL.

SECTION 9.1.4 FUEL HANDLING SYSTEMS

SYSTEM COMPLIES WITH THE REQUIREMENTS AND STANDARDS AS FOLLOWS:

1. GDC-2 -- NATURAL PHENOMENA
   TRANSFER TUBE BLIND FLANGE - ONLY SAFETY RELATED ITEM WITHIN CONTAINMENT.
2. GDC-5 -- BLIND FLANGE NOT SHARED.
3. REGULATORY GUIDE 1.29 -- BLIND FLANGE WILL REMAIN FUNCTIONAL FOLLOWING SSE-FUEL HANDLING EQUIPMENT-SEISMIC ANALYSIS PERFORMED TO INSURE EQUIPMENT DOES NOT FALL OVER OR FALL INTO POOL.
4. ANSI STANDARDS:
   A. ANSI/ANS57.1(1980) 'DESIGN REQUIREMENTS FOR PWR REACTOR FUEL HANDLING SYSTEMS.'
   B. C6.1 TERMINAL MARKINGS FOR ELECTRICAL APPARATUS
   C. C19 INDUSTRIAL CONTROL APPARATUS
   D. C50 ROTATING ELECTRIC MACHINERY
   E. N101.4 Q/A FOR PROTECTIVE COATING
5. STANDARDS:
   A. CMMA SPEC. NO. 70 CRANE MANUFACTURING ASSOCIATION OF AMERICA
   B. AISC - MANUAL OF STEEL CONSTRUCTION
   C. NFPA - NATIONAL ELECTRIC CODE
   D. NEMA
      1. INDUSTRIAL CONTROLS
      2. WC-5 FLAME TESTING
      3. MG-1 MOTORS AND GENERATORS
      4. MG-2 SAFETY STANDARDS-CONSTRUCTION OF MOTORS AND GENERATORS
   E. ASA STANDARD B46.1, 1962, SURFACE TEXTURE
   F. ASTM STANDARDS 1976
   G. LIBRARY OF CONGRESS #65-22067 'THE HUMAN BODY IN EQUIPMENT DESIGN'
   H. HMI 100-74 ELECTRIC WIRE ROPE STANDARDS
   I. U6 SPEC. 44 FR-1 VERTICAL FLAME TEST
   J. REGULATORY GUIDE 1.122 FLOOR DESIGN RESPONSE SPECTRA
   K. OSHA
6. HOIST INFORMATION:
   5:1 SAFETY FACTOR ON ULTIMATE
   125% LOAD TEST

<u>CESSAR SCOPE OF SUPPLY</u>

1. REFUELING MACHINE
   A. UNDERWATER TV
   B. DRY SIPPING EQUIPMENT
2. TRANSFER SYSTEM
   A. TRANSFER CARRIAGE
   B. UPENDER
   C. HYDRAULIC POWER PACKAGE
3. TRANSFER TUBE BLIND FLANGE*
4. CEA CHANGE PLATFORM
5. FUEL HANDLING TOOLS
6. RV HEAD LIFTING RIG
7. INTERNALS HANDLING EQUIPMENT
8. SPENT FUEL HANDLING MACHINE
9. NEW FUEL ELEVATOR
10. TRANSPORT CONTAINER
11. REFUELING POOL SEAL
12. ICI AND CEA CUTTERS
13. CEA EXTENSION SHAFT TOOL

* SAFETY RELATED

DESIGN BASIS

- FUEL HANDLING EQUIPMENT DESIGNED FOR HANDLING AND STORAGE OF FUEL ASSEMBLY & CEA'S
- ALSO INCLUDED IS EQUIPMENT FOR HANDLING THE RV HEAD & REACTOR INTERNALS
- F.H. EQUIPMENT HAS AS APPROPRIATE PROTECTIVE DEVICES TO MINIMIZE MISHANDLING WHICH COULD RESULT IN FUEL CLADDING DAMAGE WITH THE POTENTIAL RELEASE OF FISSION PRODUCTS
- FUEL IS HANDLED AND STORED UNDERWATER 1) REMOVE DECAY HEAT 2) RAD PROTECTION WITH VISIBILITY
- EQUIPMENT IS DESIGNED TO INDUSTRY STANDARDS - AND IS NOT SAFETY RELATED
- EQUIPMENT IS DESIGNED NOT TO FAIL AND FALL INTO THE POOL UNDER SEISMIC CONDIDIONS
  * SEISMIC ANALYSIS IS PERFORMED USING ENVELOPE SEISMIC RESPONSE SPECTRA
  * DEAD LOAD, LIVE LOAD & SSE SEISMIC LOAD IS COMBINED IN CALCULATING STRESSES
  * MATERIAL YIELD & ULTIMATE STRENGTH VALUES TAKEN FROM ASTM STANDARDS 1976
- GRAPPLES ARE MECHANICALLY INTERLOCKED AGAINST INADVERTENT OPENING
- POSITIVE MECHANICAL STOPS ARE PROVIDED TO INSURE ADEQUATE WATER COVERAGE
- LOAD INDICATING DEVICES WITH AUTOMATIC ELECTRICAL CUT-OUT TO PROTECT FROM OVERLOADS
- EQUIPMENT ASSUMES SAFE CONDITION IN THE EVENT OF POWER LOSS
- MANUAL MOTION IS POSSIBLE TO ALLOW COMPLETION OF OPERATION IN THE EVENT OF A POWER LOSS
- ELECTRICAL INTERLOCKS ARE NOT UTILIZED TO PREVENT CRITICALITY OR RADIATION EXPOSURE
  * MECHANICAL RESTRAINTS, PHYSICAL BARRIERS, HOIST STALL TORQUE LIMIT POSSIBLITY OF FUEL DAMAGE

SYSTEM ESSENTIALLY THE SAME AS S.C.E. EXCEPT FOR THE ALL-RODS-OUT CONCEPT AND THEREFORE THE:

1. UGS STRUCTURE LIFT RIG WHICH REMOVES THE CEA'S WITH THE UGS
2. REQUIREMENT FOR A CEA CHANGE PLATFORM VICE A CEA CHANGE MECHANISM

TESTING - ACCEPTANCE TESTING AT VENDOR'S FACILITY PRIOR TO SITE DELIVERY

- PRE-OPERATIONAL TESTING AT SITE PRIOR TO USE
- ALIGNMENT FIXTURES AND TEST DEVICES PROVIDED
- DUMMY FUEL BUNDLE PROVIDED

TRAINING- TECHNICAL MANUAL ADEQUATE FOR OPERATOR TRAINING

NUREG-0612

CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS

HEAVY LOAD - ANY LOAD THAT WEIGHS MORE THAN THE COMBINED WEIGHT OF A SINGLE SPENT FUEL ASSEMBLY AND ITS ASSOCIATED HANDLING TOOLS.

C-E SCOPE	1. HEAD LIFT	2. UGS/CSB LIFT	3. S.F. CASK
	1. HEAD LIFT RIG	2. UGS/CSB LIFT RIG	3. NONE

LIFTING DEVICE REFERENCE NUREG-0612 APPENDIX E REF. 3

ANSI N14.6-1978 ". . . SPECIAL LIFTING DEVICES"

C-E DESIGNS COMPLY, WITH THE FOLLOWING EXCEPTIONS:

SECTION ~~3.1.1-5~~ 5.2.1 TESTING -- TEST LOAD OF 150%.
C-E SPECIFIES 125% FOR LOAD TEST WHICH IS IN ACCORDANCE WITH:

1. SRP 9.1.4-13, ITEM 4, PARAGRAPH B.
2. REGULATORY GUIDE 1.104
3. ANSI B30.2 2-2.2.2
4. OSHA, TITLE 29, PART 1910, PARAGRAPH 1910.179 "RATED LOAD TEST"

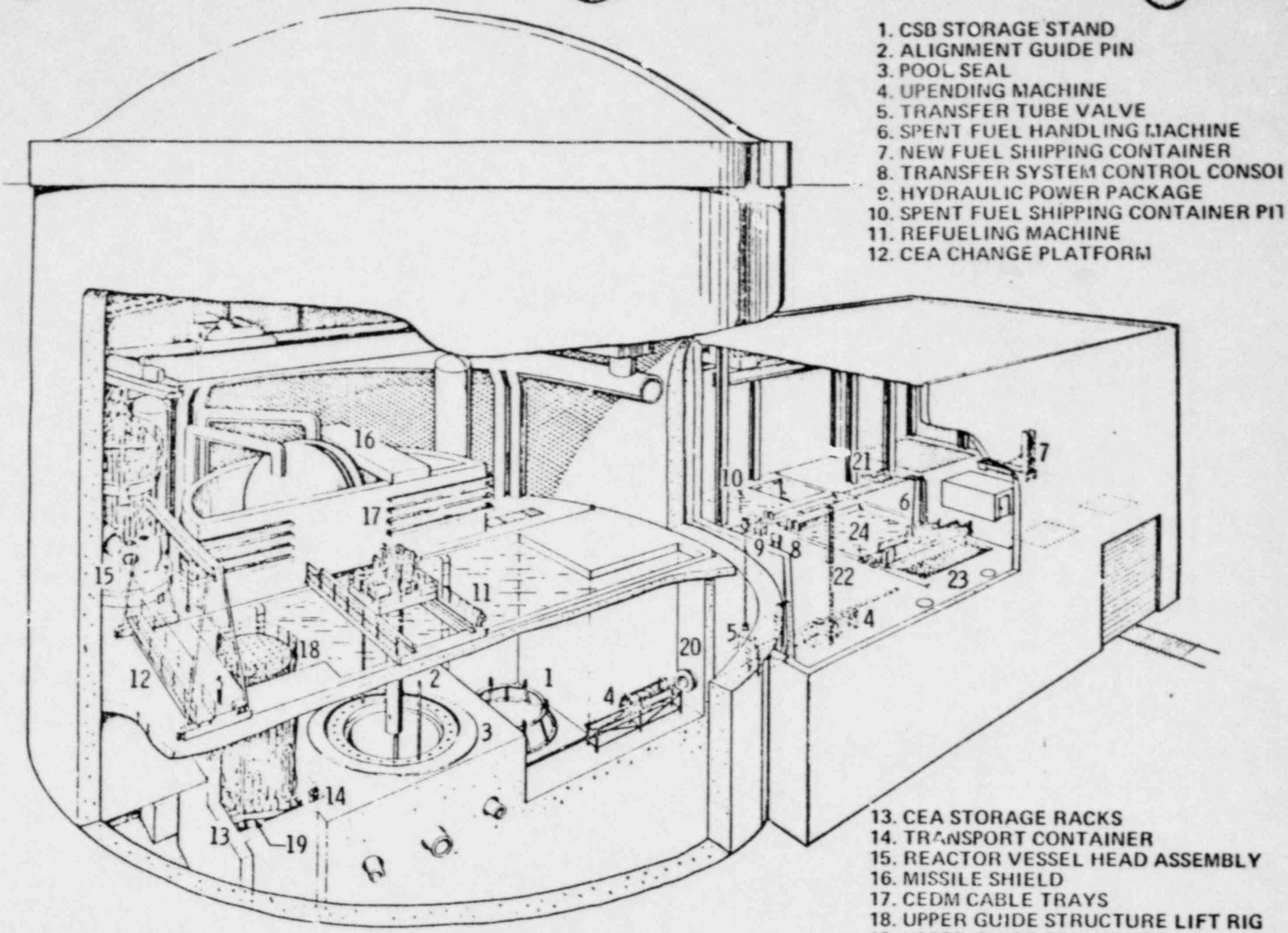
SECTION 3.2.1.1 --- STRESS DESIGN FACTOR 3:1 ON Ys
C-E SPECIFIES 2:1 UTILIZATION OF .6 Ys IS IN ACCORDANCE WITH:

1. AISC SECTION 1.5
2. ASME ARTICLE 17-2211

OTHER REFERENCES IN NUREG 0612

ANSI B30.2-67 CRANES >1 TON (APPLICANTS SCOPE)

ANSI B30.9-71 SLINGS (CHAINS, ROPE & SYNETHETIC) (NOT APPLICABLE)



1. CSB STORAGE STAND
2. ALIGNMENT GUIDE PIN
3. POOL SEAL
4. UPENDING MACHINE
5. TRANSFER TUBE VALVE
6. SPENT FUEL HANDLING MACHINE
7. NEW FUEL SHIPPING CONTAINER
8. TRANSFER SYSTEM CONTROL CONSOI
9. HYDRAULIC POWER PACKAGE
10. SPENT FUEL SHIPPING CONTAINER PIT
11. REFUELING MACHINE
12. CEA CHANGE PLATFORM
13. CEA STORAGE RACKS
14. TRANSPORT CONTAINER
15. REACTOR VESSEL HEAD ASSEMBLY
16. MISSILE SHIELD
17. CEDM CABLE TRAYS
18. UPPER GUIDE STRUCTURE LIFT RIG
19. UPPER GUIDE STRUCTURE
20. FUEL TRANSFER TUBE
21. TRANSFER SYSTEM WINCH
22. NEW FUEL ELEVATOR
23. NEW FUEL STORAGE

C-E SYSTEM 80

TYPICAL
FUEL HANDLING EQUIPMENT ARRANGEMENT

Figure 9.1-1

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.2.2 COOLING SYSTEM FOR REACTOR AUXILIARIES

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.G

1. A COMPONENT COOLING SYSTEM (CCS) SHALL PROVIDE COOLING WATER TO EACH RCP AS SHOWN IN FIGURE 5.1.2-2.

2. RCP HEAT LOAD AND FLOW DATA PRESENTED IN TABLE 5.1.4-1 SHALL BE UTILIZED IN THE DESIGN OF THE COOLING WATER SYSTEM.

3. THE MAXIMUM AND MINIMUM TEMPERATURE OF THE COMPONENT COOLING WATER DURING NORMAL OPERATION SHALL BE 105°F AND 65°F RESPECTIVELY.

5.1.4.H.1

MEANS SHALL BE PROVIDED FOR DETECTION OF REACTOR COOLANT LEAKAGE INTO THE SECONDARY SIDE OF THE STEAM GENERATORS AND COOLING WATER SYSTEMS ASSOCIATED WITH COMPONENTS CONTAINING REACTOR COOLANT.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.2.2

SYSTEM: CSS

CESSAR-F SECTION:

APP. 6A 7.16.3

COOLING WATER SHALL BE PROVIDED TO EACH SHUTDOWN COOLING HEAT EXCHANGER TO TRANSFER HEAT FROM THE SUMP FLUID DURING THE RECIRCULATION MODE.

THE COOLING WATER SUPPLIED TO EACH SHUTDOWN COOLING HEAT EXCHANGER SHALL BE PROVIDED AT A FLOWRATE OF 11,000 GPM.

COOLING WATER FLOW SHALL BE ESTABLISHED TO THE SHUTDOWN COOLING HEAT EXCHANGER PRIOR TO OR SIMULTANEOUSLY WITH THE START OF RECIRCULATION.

THE COOLING WATER TEMPERATURE TO THE INLET OF THE HEAT EXCHANGERS SHALL BE WITHIN THE LIMITS OF 65-120°F DURING A LOCA.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.2.2

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3.P.2

A. THE COOLING WATER SYSTEM DESIGN SHALL BE SUCH THAT COOLING WATER CONSISTENT WITH THE REQUIREMENTS OF B. BELOW IS AVAILABLE TO SUPPLY THE SHUTDOWN COOLING HEAT EXCHANGERS WHEN AN IRRADIATED CORE IS PRESENT IN THE REACTOR VESSEL OR THE SPENT FUEL POOL.

B. COOLING WATER SHALL BE SUPPLIED AT THE FOLLOWING TEMPERATURES AND BE ABLE TO REMOVE THE HEAT LOADS LISTED FOR THE GIVEN CONDITIONS

SHUTDOWN COOLING HEAT EXCHANGERS

SITUATION	COOLING WATER INLET TEMPERATURE	DESIGN HEAT LOAD (MILLION BTU/HOUR) (INCLUDES BOTH HEAT EXCHANGERS)
POST-LOCA	65 - 120°F	290
SHUTDOWN COOLING:		
3-½ HOURS AFTER SHUTDOWN	65 - 120°F	247
27-½ HOURS AFTER SHUTDOWN	65 - 105°F	87.6

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.2.2

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3 P.2 (CONT'D)

C. FOR ALL CONDITIONS, COOLING WATER SHALL BE SUPPLIED AS FOLLOWS:

PARAMETER	REQUIRED VALUE PER HEAT EXCHANGER
NORMAL ALLOWABLE DELIVERY PRESSURE	100 PSIG
MAXIMUM ALLOWABLE DELIVERY PRESSURE	150 PSIG
REQUIRED FLOWRATE	11,000 GPM
MAXIMUM ALLOWABLE FLOWRATE	13.000 GPM

D. COOLING WATER PIPING SUPPLYING THE SHUTDOWN COOLING HEAT EXCHANGERS SHALL BE DESIGNED AND FABRICATED IN ACCORDANCE WITH ASME B&PVC, SECTION III, CLASS 3, AS A MINIMUM, AND SHALL BE DESIGNED AS SEISMIC CATEGORY I, SAFETY CLASS 3, AS A MINIMUM.

E. THE COOLING WATER SYSTEM WHICH SERVICES THE SCS SHALL BE DESIGNED WITH SUFFICIENT REDUNDANCY AND DIVERSITY SUCH THAT ONE SCS HEAT EXCHANGER TRAIN WILL ALWAYS BE SUPPLIED COOLING WATER.

F. THE COOLING WATER SYSTEM WHICH SERVICES THE SCS SHALL BE DESIGNED CONSISTENT WITH THE COOLING WATER CHEMISTRY.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.2.2

SYSTEM: CVCS

CESSAR-F SECTION:

TABLE 9.3-4

LETDOWN HEAT EXCHANGER

FLUID	COMPONENT COOLING WATER
DESIGN PRESSURE	150 PSIG
DESIGN TEMPERATURE	250°F
NORMAL FLOW	870 GPM
DESIGN FLOW	1500 GPM
PRESSURE LOSS	15 PSID @ 1500 GPM & 105°F

BORIC ACID CONCENTRATOR

COOLING WATER FLOW	700 GPM (MAXIMUM)

GAS STRIPPER

COOLING WATER FLOW	700 GPM (OPERATIONAL & MAXIMUM)

REF: NUREG-0737

SYSTEM 80 - RCPUMPS

INCIDENT: LOSS OF AC POWER
(LOSS OF CCW & SIW TO PUMP SEALS)

INTERRUPTION: 2 HOURS (PUMP ON HOT STANDBY)

ACTION REQUIRED: RESTORE SEAL INJECTION WATER (SIW) BY FURNISHING EMERGENCY POWER TO CHARGING PUMPS.

EFFECTS:

PUMP SEALS - NO LOSS OF FUNCTION

PUMP BEARINGS - NOT AFFECTED, PUMP SHUTDOWN

CESSAR-F INTERFACE
REQUIREMENT: SECTION 9.3.4.6

SYSTEM 80 - RCPUMPS

INCIDENT: LOSS OF SEAL INJECTION WATER (SIW)
COMPONENT COOLING WATER (CCW) AVAILABLE
PUMP OPERATING

INTERRUPTION: NO LIMIT (24 HOURS MAXIMUM DESIREABLE)

ACTION REQUIRED: RESTORE SIW WITHIN 24 HOURS

EFFECTS:

PUMP SEALS - NO LOSS OF FUNCTION, CCW PROTECTS SEALS

PUMP BEARING - NO AFFECT ON PUMP COASTDOWN, CCW PROTECTS BEARING

CESSAR-F INTERFACE
REQUIREMENT: CENPD-201-A

SYSTEM 80 - RCPUMPS

INCIDENT: Loss of component cooling water (CCW) SEAL INJECTION WATER (SIW) AVAILABLE

INTERRUPTION: 30 MINUTES (PUMP OPERATING)

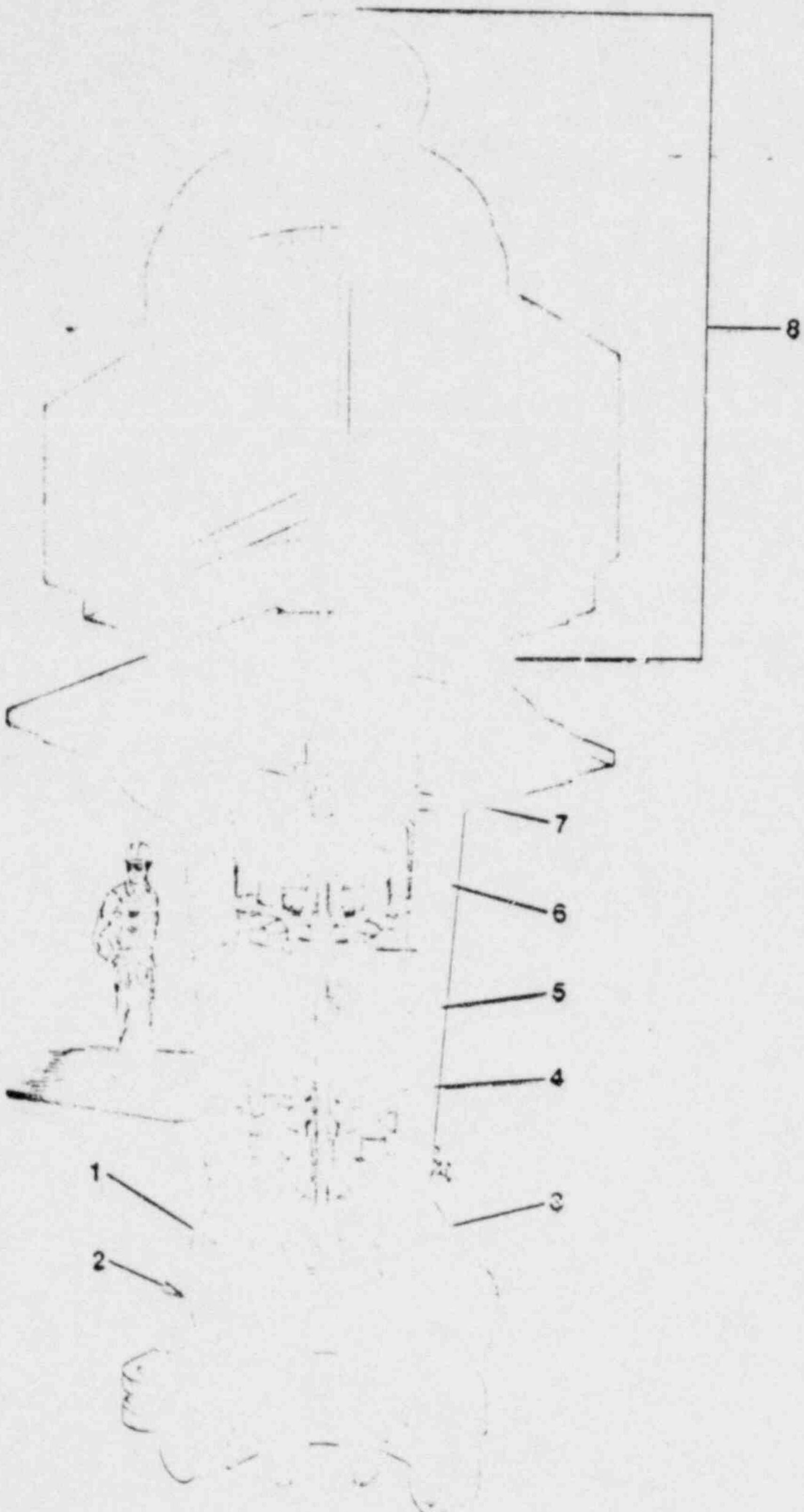
ACTION REQUIRED: TRIP RCPUMPS AND INITIATE A PLANT SHUTDOWN IF CCW CAN NOT BE RESTORED WITHIN 30 MINUTES

EFFECTS:

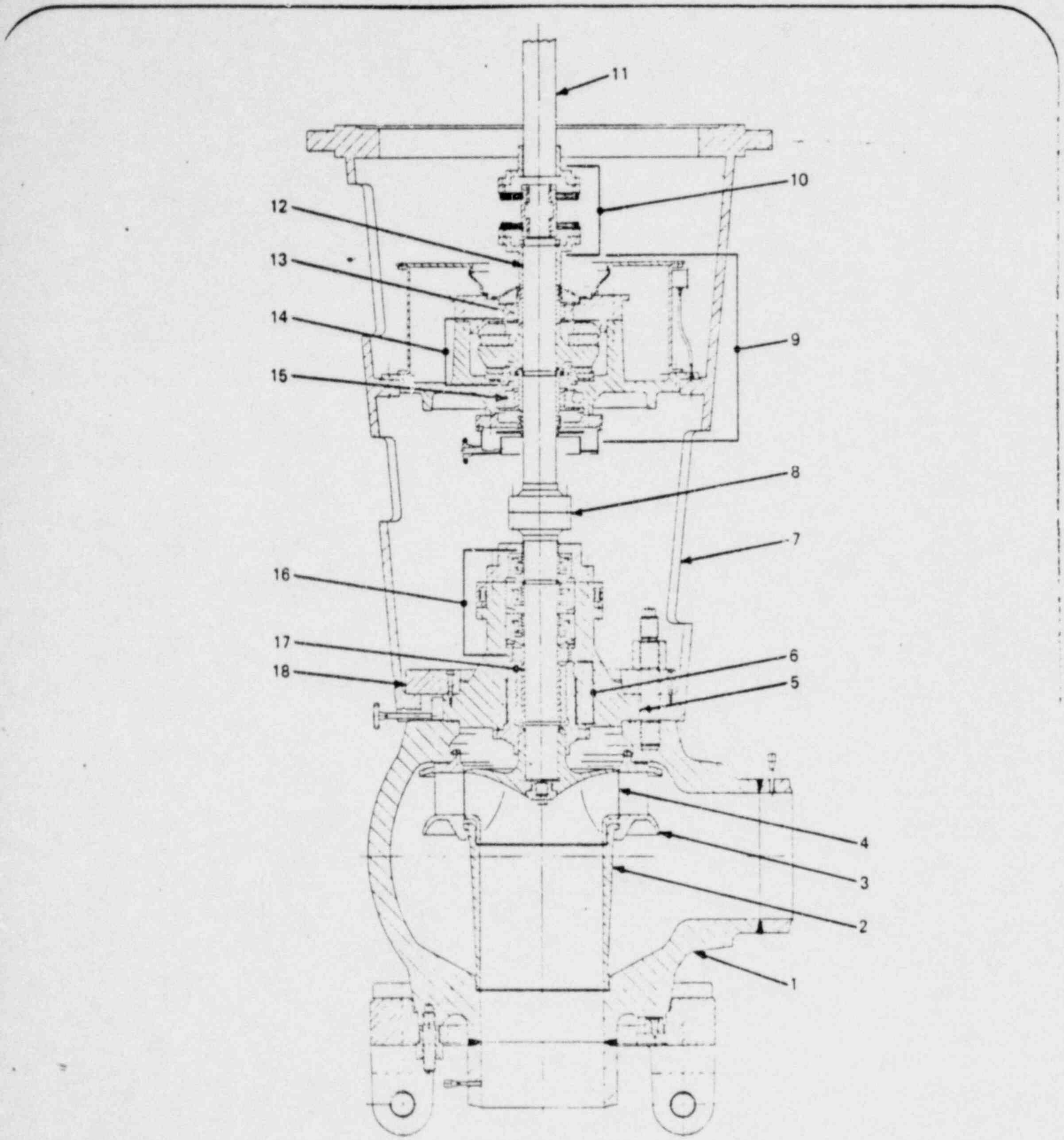
PUMP SEALS _ NO LOSS OF FUNCTION, SIW PROTECTS SEALS

PUMP BEARINGS - NO AFFECT ON PUMP COASTDOWN

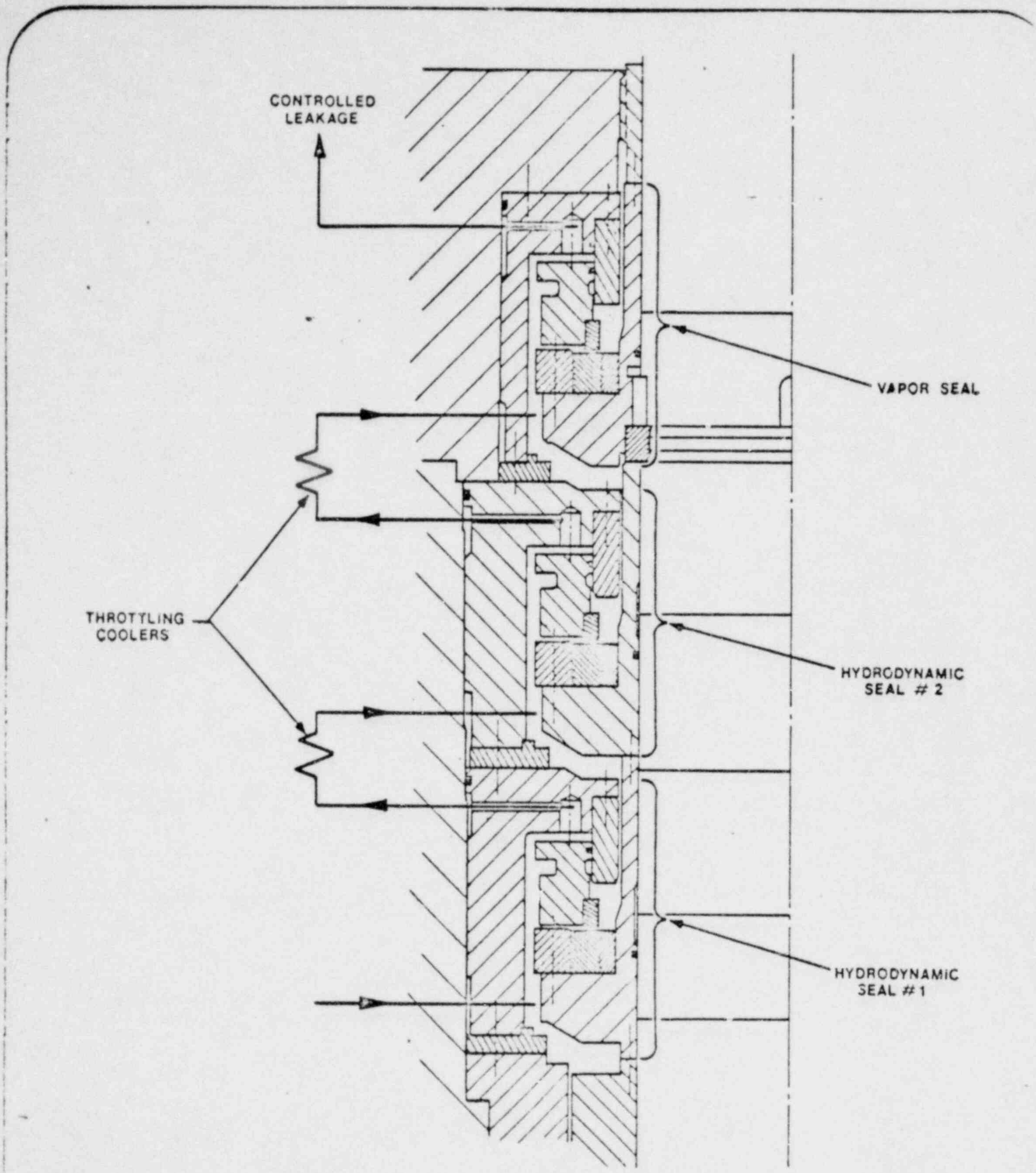
CESSAR-F INTERFACE REQUIREMENT: SECTIONS 5.4.1.2, 5.4.1.3 & CENPD-201-A



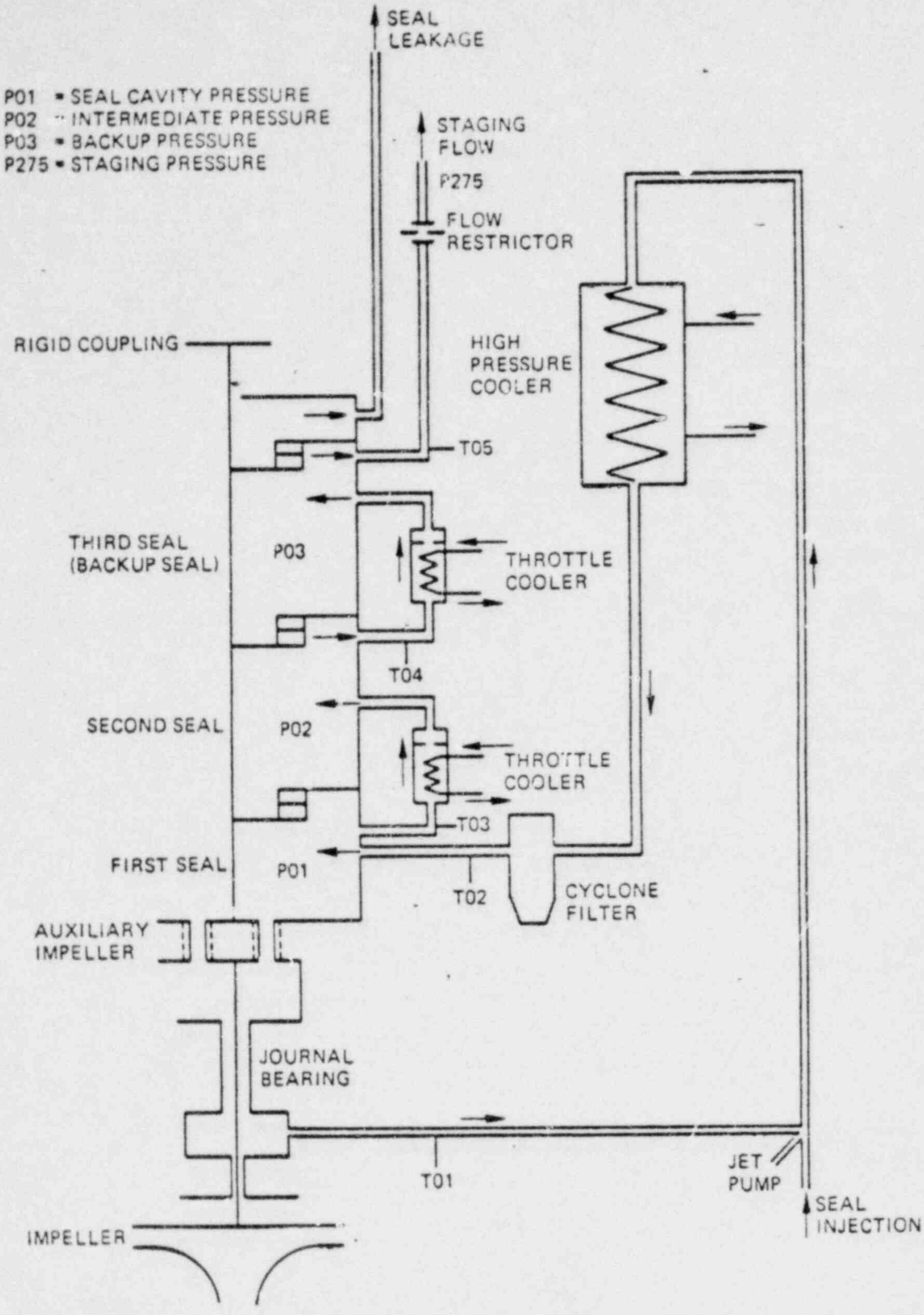
GENERAL ARRANGEMENT C-E KSB REACTOR COOLANT PUMP
FIGURE 1



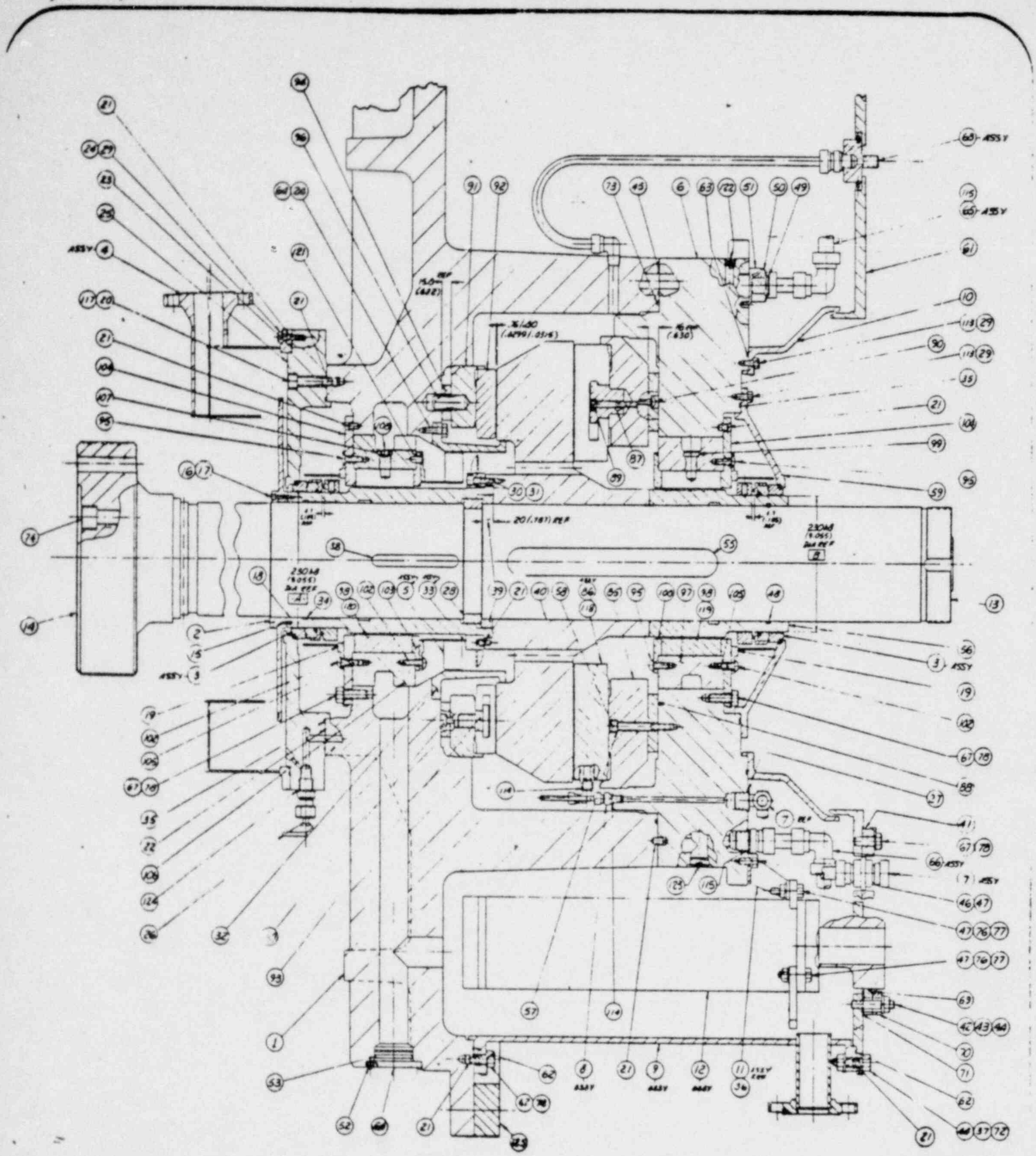
C-E KSB REACTOR COOLANT PUMP
COMPONENT LOCATIONS
FIGURE 2



HYDRODYNAMIC SHAFT SEAL ASSEMBLY
FIGURE 3



FLOW DIAGRAM FOR HYDRODYNAMIC
SHAFT SEAL SYSTEM
FIGURE 4



THRUST BEARING ASSEMBLY
FIG. 5

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.2.3 DEMINERALIZED WATER MAKEUP SYSTEM

SYSTEM: CVCS

CESSAR-F SECTION:

NOTE

TABLE 9.2-1 CORRECT TYPO REFERENCE IN FSAR

PRIMARY AND SECONDARY

MAKEUP WATER LIMITS

pH*	6.0 TO 8.0
CONDUCTIVITY	LESS THAN 2 µMHOS
CHLORIDE	LESS THAN 0.15 PPM Cl
FLUORIDE	LESS THAN 0.10 PPM F
SUSPENDED SOLIDS	LESS THAN 0.5 PPM
GASEOUS**	NON-DEAERATED/DEAERATED
SILICA (SiO_2)***	LESS THAN 0.01 PPM

*IF WATER CONTAINS CO_2, THE pH SPECIFICATION MAY BE LOWERED TO 5.8 TO COMPENSATE FOR CO_2 ABSORPTION.

**DEAERATION GIVES CONSERVATISM TO MAKEUP WATER SYSTEM DESIGN BUT IT IS NOT CONSIDERED NECESSARY.

***PERTAINS TO SECONDARY MAKEUP WATER ONLY.

SAR SECTION: 9.2.6

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.F.2 (CONT'D)

D. TRANSMITTING EXCESSIVE LOADS TO THE CONTAINMENT PRESSURE BOUNDARY.

E. COMPROMISING THE FUNCTION OF THE PLANT CONTROL ROOM.

F. PRECLUDING ORDERLY COOLDOWN OF THE RCS.

5.1.4.F.9

NO SINGLE ACTIVE OR PASSIVE COMPONENT FAILURE, SINGLE PASSIVE OR ACTIVE ELECTRICAL COMPONENT FAILURE, OR POWER SUPPLY FAILURE SHALL PRECLUDE ADEQUATE OPERATION OF THE EMERGENCY FEEDWATER SYSTEM, SUCH AS THE FOLLOWING EVENTS:

A. LOSS OF NORMAL FEEDWATER WITH OR WITHOUT A CONCURRENT LOSS OF NORMAL ONSITE OR OFFSITE AC POWER.

B. MINOR SECONDARY SYSTEM PIPE BREAKS WITH OR WITHOUT A CONCURRENT LOSS OF NORMAL ONSITE OR OFFSITE AC POWER.

C. STEAM GENERATOR TUBE RUPTURE WITH OR WITHOUT A CONCURRENT LOSS OF NORMAL ONSITE OR OFFSITE AC POWER.

SAR SECTION: 9.2.6

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.F.9 (CONT'D)

D. MAJOR SECONDARY SYSTEM PIPE BREAKS WITH OR WITHOUT A CONCURRENT LOSS OF NORMAL ONSITE OR OFFSITE AC POWER.

E. SMALL LOCA WITH OR WITHOUT A CONCURRENT LOSS OF NORMAL ONSITE OR OFFSITE AC POWER.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.3.3 EQUIPMENT AND FLOOR DRAINAGE SYSTEM

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.B.1

THE CONTAINMENT SHALL REMAIN FUNCTIONAL FOR THE FULL RANGE, PER GDC 2, OF THE NATURAL PHENOMENA (EARTHQUAKES, TORNADOES, TORNADO MISSILES, FLOODING CONDITIONS, HURRICANES, WINDS, SNOW, AND ICE) AND EXTERNAL ENVIRONMENTAL CONDITIONS.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.3.3

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3.C
5.4.7.1.3.M.9
5.4.7.1.3.P.1.G

NO LIMITED LEAKAGE PASSIVE FAILURE OR THE EFFECTS THEREOF (SUCH AS FLOODING, SPRAY IMPINGEMENT, STEAM, TEMPERATURE, PRESSURE, RADIATION, OR LOSS OF NPSH) IN A CONNECTING SYSTEM (E.G., SAFETY INJECTION SYSTEM OR CONTAINMENT SPRAY SYSTEM) SHALL PRECLUDE THE AVAILABILITY OF MINIMUM ACCEPTABLE SHUTDOWN COOLING CAPABILITY. MINIMUM ACCEPTABLE SHUTDOWN COOLING CAPABILITY IS DEFINED AS THAT PROVIDED BY ONE LPSI PUMP AND ITS ASSOCIATED HEAT EXCHANGER TRAIN.

PROTECTION OF THE SCS FROM THE CONSEQUENCES OF A POSTULATED PIPE FAILURE SHALL BE BY (1) SEPARATION VIA PHYSICAL PLANT LAYOUT, (2) PIPE RESTRAINTS, (3) PROTECTIVE STRUCTURES, (4) WATER-TIGHT ROOMS, (5) ISOLATION CAPABILITY, OR (6) OTHER SUITABLE MEANS.

IN THE EVENT OF A LIMITED LEAKAGE PASSIVE FAILURE IN ONE SCS TRAIN DURING LONG TERM COOLING, PERSONNEL ACCESS TO THE INTACT TRAIN SHALL BE POSSIBLE.

THE FIRE PROTECTION SYSTEM PIPING DESIGN AND ARRANGEMENT SHALL BE SUCH AS TO ASSURE THAT THE FUNCTIONAL AND STRUCTURAL INTEGRITY OF THE SHUTDOWN COOLING SYSTEM IS ADEQUATELY PROTECTED AGAINST THE EFFECTS OF PIPE WHIP, JET IMPINGEMENT, AND ENVIRONMENTAL EFFECTS RESULTING FROM POSTULATED PIPING RUPTURES IN THE FIRE PROTECTION SYSTEM.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.3.3

SYSTEM: IRS, CSS, SIS

CESSAR-F SECTION:

APP. 6B 7.3.1
APP. 6A 7.3.1
6.3.1.3.C
APP. 6B 7.16.4F
APP. 6A 7.16.4.F
6.3.1.3.M.7
APP. 6B 7.13.6
APP. 6A 7.13.6
6.3.1.3.P.4.F
APP. 6B 7.14
APP. 6A 7.14
6.3.1.3.N

THE MAXIMUM EXPECTED LEAKAGE FROM A MODERATE ENERGY PIPE RUPTURE POSTULATED DURING NORMAL PLANT CONDITIONS IN THE (SYSTEM) SHALL BE AS DEFINED BY THE METHODS OF SECTION 3.6.

NO LIMITED LEAKAGE PASSIVE FAILURE OR THE EFFECTS THEREOF (SUCH AS FLOODING, SPRAY IMPINGEMENT, STEAM, TEMPERATURE, PRESSURE, RADIATION, LOSS OF NPSH, OR LOSS OF RECIRCULATION WATER INVENTORY), IN THE (SYSTEM) DURING THE RECIRCULATION MODE SHALL PRECLUDE THE AVAILABILITY OF MINIMUM ACCEPTABLE RECIRCULATION CAPABILITY (MINIMUM ACCEPTABLE CAPABILITY IS DEFINED AS THAT WHICH IS PROVIDED BY THE OPERATION OF ONE SUBSYSTEM).

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.3.3

SYSTEM: IRS, CSS, SIS

CESSAR-F SECTION:

(SEE PREVIOUS SLIDE)

IN THE EVENT OF A LIMITED LEAKAGE PASSIVE FAILURE IN ONE (SYSTEM) TRAIN DURING RECIRCULATION, PERSONNEL ACCESS TO THE INTACT TRAIN SHALL BE POSSIBLE.

CARE SHOULD BE EXERCISED TO ENSURE FIRE PROTECTION SYSTEMS ARE DESIGNED TO ASSURE THAT THEIR RUPTURE OR INADVERTENT OPERATION DOES NOT SIGNIFICANTLY IMPAIR THE CAPABILITY OF SAFETY RELATED STRUCTURES, SYSTEMS, AND COMPONENTS.

SIS, CSS: (SYSTEM) LEAKAGE TO THE SAFEGUARDS ROOM WILL NORMALLY DRAIN TO THE ROOM SUMP. PROVISIONS SHALL BE PROVIDED TO ACCEPT THE MAXIMUM LEAKAGE RATES LISTED BELOW:

A. (SYSTEM) PUMP SEALS:	100 CC/HR/PUMP
B. VALVES	
BACKSEAT LEAKAGE	10 CC/HR/INCH SEAT DIAMETER
ACROSS THE VALVE SEAT:	10 CC/HR/INCH OF NOMINAL VALVE SIZE

ALL LEAKAGES SHALL BE TREATED AS RADIOACTIVE WASTE WITH A LOW DISSOLVED SOLIDS AND ORGANIC CONTENT.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.3.3

SYSTEM: IRS, CSS, SIS

CESSAR-F SECTION:

(SEE PREVIOUS SLIDE)

THE IRS COMPONENTS ARE DESIGNED FOR ZERO EXTERNAL LEAKAGE. IN THE UNLIKELY EVENT THAT LEAKAGE SHOULD OCCUR, PROVISIONS SHALL BE PROVIDED TO ACCEPT THE MAXIMUM LEAKAGE RATES LISTED BELOW FOR PURPOSES OF ROOM SUMP DESIGN.

A.	SCAP SEALS	100 CC/HR/PUMP
B.	VALVES	
	BACKSEAT LEAKAGE:	10 CC/HR/INCH SEAT DIAMETER/VALVE
	ACROSS THE VALVE SEAT:	10 CC/HR/INCH OF NOMINAL VALVE SIZE/VALVE

ALL LEAKAGES SHALL BE TREATED AS POTENTIALLY TOXIC WASTE WITH A LOW DISSOLVED SOLIDS AND ORGANIC CONTENT.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS

SYSTEM: RCS

CESSAR-F SECTION:

5.1.4.0

1. FOR THE APPLICANT SUPPLIED NSSS COMPONENTS ONE OF THE FOLLOWING OPTIONS SHALL BE FOLLOWED.

   A. DEMONSTRATION OF OTHER ENVIRONMENTAL QUALIFICATION ENVELOPES FOR ANY OR ALL OF THESE BUILDINGS NOT TO EXCEED THE QUALIFICATION ENVELOPES OF SECTION 3.11.

   B. EXCLUSION OF SPECIFIC COMPONENTS FROM EXTREME ENVIRONMENTAL CONDITIONS BY SUITABLE PHYSICAL SEPARATIONS OR ENVIRONMENTAL CONTROL SYSTEM TECHNIQUES.

   C. USE OF THE SAME ENVIRONMENTAL QUALIFICATION CONDITIONS BEING EMPLOYED BY C-E SUPPLIED NSSS COMPONENTS.

2. THE CONTAINMENT PRESSURE AND TEMPERATURE TRANSIENTS RESULTING FROM THE LOCA SHALL MEET CRITERIA SPECIFIED IN SECTION 6.2.1.5.

3. A CONTAINMENT VENTILATION SYSTEM SHALL BE PROVIDED TO HANDLE THE TOTAL RCS HEAT LOSSES TO CONTAINMENT. TABLE 5.1.4-2 LISTS THE HEAT LOADS FROM NSSS SUPPORT STRUCTURES TO CONTAINMENT. TABLE 5.1.4-3 LISTS TYPICAL LOADS THROUGH THE NSSS INSULATION TO CONTAINMENT. THESE VALUES WILL BE CONFIRMED BY EACH APPLICANT SINCE THE FINAL VALUE DEPENDS ON SYSTEM INSULATION EFFICIENCY.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.4

SYSTEM: SCS

CESSAR-F SECTION:

5.4.7.1.3.Q

1. THE PROPER OPERATING ENVIRONMENTAL CONDITIONS FOR THE EQUIPMENT OF ONE TRAIN OF THE SCS SHALL BE MAINTAINED INDEPENDENTLY OF THE ENVIRONMENT OF THE OTHER TRAIN OF THE SCS, E.G., FAILURE OR ISOLATION OF THE VENTILATION CAPABILILITY TO ONE TRAIN OF THE SCS SHALL NOT CAUSE THE ENVIRONMENTAL LIMITS OF THE OTHER SCS TRAIN TO BE EXCEEDED.

2. THE AUXILIARY BUILDING VENTILATION SYSTEM SHALL CONTROL AMBIENT AIR CONDITIONS IN THE PROXIMITY OF ALL C-E SUPPLIED MOTOR DRIVEN OR DIAPHRAGM OPERATED EQUIPMENT IN THE SCS IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 3.11.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.4

SYSTEM: IRS, CSS, SIS

CESSAR-F SECTION:

APP. 6B 7.7
APP. 6A 7.7
6.3.1.3.Q

EACH (SYSTEM) SAFEGUARDS TRAIN SHALL BE PROVIDED WITH AN INDEPENDENT ENVIRONMENTAL CONTROL SYSTEM SUCH THAT THE SAFETY RELATED EQUIPMENT IN EACH TRAIN OPERATES WITHIN THE ENVIRONMENTAL DESIGN LIMITS SPECIFIED IN SECTION 3.11.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.4

SYSTEM: RPS, ESFA

CESSAR-F SECTION:

7.1.3.7 THERMAL LIMITATIONS

THE SAFETY-RELATED EQUIPMENT SHALL BE LOCATED SO AS NOT TO VIOLATE THE TEMPERATURE AND HUMIDITY LIMITS OF SECTION 3.11.

7.1.3.17 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.

CESSAR-F INTERFACE REQUIREMENTS

SAR SECTION: 9.4

SYSTEM: CVCS

CESSAR-F SECTION:

9.3.4.1.2.1

THE ENVIRONMENTAL DESIGN CONDITIONS OF THE CVCS COMPONENTS ARE GIVEN IN SECTION 3.11.

STEAM SUPPLY AND FEEDWATER SYSTEMS

10.3 MAIN STEAM SUPPLY

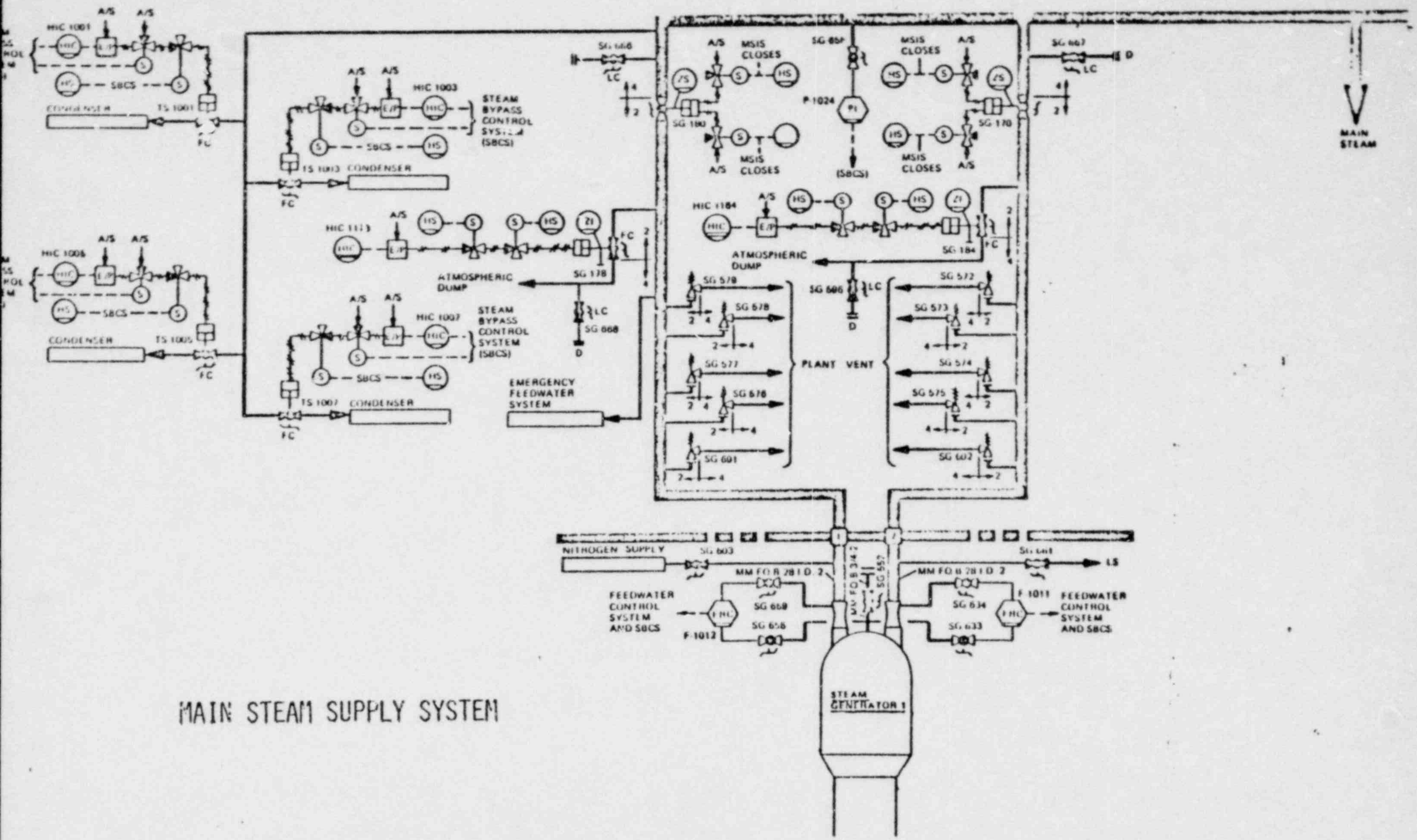
- CE SCOPE - FLOW DIAGRAM
- CONFIGURATION
- ISOLATION
- ATMOSPHERIC DUMP VALVES
- SAFETY VALVES
- SINGLE FAILURE

10.4.7 MAIN FEEDWATER SYSTEM

- CE SCOPE - FLOW DIAGRAM
- CONFIGURATION
- ISOLATION
- WATERHAMMER

10.4.9 EMERGENCY FEEDWATER SYSTEM

- CE SCOPE
- CONFIGURATION REQUIREMENTS
- FLOW REQUIREMENTS



MAIN STEAM SUPPLY SYSTEM

B. PROTECTION

2. The steam piping and associated supports from the steam generators up to and including the Main Steam Isolation Valves (MSIV's) and any auxiliary steam supply systems up to the isolation valves which connect upstream of the MSIV's shall be seismic category I and designed to ASME B&PV Code, Section III, Class 2 requirements.

M. ARRANGEMENT

7. Following a secondary line break, either all steam paths downstream of the MISV's shall be shown to be isolated by their respective control systems following a MSIS actuation signal, or the results of a blowdown through a non-isolated path shall be shown to be acceptable. An acceptable maximum steam flow from a non-isolated steam path is 10% of the main steam rate (MSR) (1.9×10^6 lb/hr @ 1000 psia saturated steam). It is not required that the control systems for downstream valves nor the downstream valves themselves be designed to IEEE 279 and IEEE 308 or ASME Code, Section III and Seismic Category I criteria respectively.

8. The MSIV's for each steam generator shall be arranged such that a maximum of 2000 cubic feet (total for two steam lines per steam generator) is contained in the piping between each steam generator and its associated MSIV's. This volume shall include all lines off of the main steam line up to their isolation valves.

9. The main steam lines shall be arranged such that a maximum of 14,000 cubic feet is contained between the MSIV's and the turbine stop valves. This volume shall include all lines off of the main steam line up to their isolation valves.

10. The main steam lines shall be headered together prior to the turbine stop valves but not upstream of the MSIV's, and a cross-connect line shall be provided which will maintain steam generator pressure differences within the following limits for all normal and upset conditions.

    a. 0-15% power operation pressure difference to be 1 psi.

    b. 15-100% power operation pressure difference to be 3 psi.

11. No automatically actuated valves shall be located upstream of the MSIV's except as required for supply to steam driven emergency feedwater pumps. Provisions shall be made to prevent blowdown of both steam generators through the emergency feedwater supply headers in the event of a steamline break. The maximum allowable flow rate per valve is 1.9×10^6 lb/hr.

12. There shall be no isolation valves in the main steam lines between the steam generators and the secondary relief valves.

13. The main steam safety valves shall be arranged such that any condensate in the line between the safety valves and main steam line drains back to the main steam line.

14. All valves in the main steam line outside of containment up to and including the MSIV's shall be located as close as practical to the containment wall.

ISOLATION

I. OPERATIONAL/CONTROLS

1. A power-operated MSIV capable of establishing shutoff under conditions of design pressure, design temperature, and flow conditions resulting from a break just upstream or downstream shall be provided in each main steam line outside of containment.

2. Capability for controlling MSIV position shall be provided in the control room and remote from the control room.

3. The MSIV and MSIV bypass valve shall be either a fail close valve or a valve that is shown by the applicant to close upon receipt of a MSIS.

4. The full open to close stroke time of each MSIV and MSIV bypass valve shall be 5 seconds or less upon receipt of an MSIS.

G. THERMAL LIMITATIONS

10. Each MSIV leak flow shall not exceed 0.001 percent of nominal flow at 1270 psia in the forward direction and shall not exceed 0.1 percent of nominal flow at 1270 psia in the reverse direction.

11. No single MSIV bypass valve or bypass valve line shall have a capacity greater than 1.9×10^6 lb/hr of saturated steam at 1000 psia.

12. No single turbine bypass valve shall have a capacity greater than 1.9×10^6 lb/hr at 1000 psia.

ATMOSPHERIC DUMP VALVES

G. THERMAL LIMITATIONS

4. Power operated atmospheric dump valves shall be provided in each of the four main steam lines to allow cooldown of the steam generators when the main steam line isolation valves are closed, or when the main condenser is not available as a heat sink. Each ADV shall be capable of holding the plant at hot standby dissipating core decay and reactor coolant pump heat, and allowing controlled cooldown from hot standby to Shutdown Cooling System initiation conditions. Each valve shall be sized to allow a rupture, which renders one steam generator unavailable for heat removal, concurrent with a loss of normal A.C. power and single failure of one of the remaining two ADV's. To accomplish the above, each ADV shall have sufficient capacity to meet the saturated steam flow conditions in Figure 5.1.4-1. Also no single valve shall have a maximum capacity greater than 1.9×10^6 lb/hr. at 1000 psia.

I. OPERATIONAL/CONTROLS

5. The ADV's shall be fail close and shall be capable of being remote manually positioned to control the plant cooldown rate.

6. The ADV's shall be provided with manual operators such that the valves may be hand operated from the control room and remote shutdown panel in the event of a loss of normal power supply.

7. In the combined event of either a steam line break or steam generator tube rupture and the loss of power operation of the ADV's, personnel access to the manual operators of the intact valves on the other steam generator shall be possible.

P. RELATED SERVICE

5. If air-operated ADV's are used, a safety related control air system shall be provided to supply air to the ADV actuators should the normal air supply fail to be available.

6. Air for the ADV and MFIV pneumatic valve operator shall be clean, dry and oil-free. The air shall be delivered at the point of use under system full flow conditions at a pressure of 70 psig minimum to 105 psig maximum. Pneumatic lines and fittings shall have a minimum design pressure of 150 psig.

SAFETY VALVES

O. OVERPRESSURE PROTECTION

3. Each main steam line shall be provided with ASME Code, spring-loaded secondary safety valves between the containment and the isolation valves.

4. The total relieving capacity of the secondary safety valves shall be equally divided between the main steam lines.

5. The total secondary safety valve capacity shall be sufficient to pass 19×10^6 lb/hr at the maximum valve set pressure.

6. The maximum steam flow per secondary safety valve shall be no greater than 1.9×10^6 lbs/hr at 1000 psia.

7. Secondary safety valve set pressure shall be calculated in accordance with Article NC-7000 of ASME Section III, which requires that the following be considered:

   a. A maximum allowable set pressure of 110% steam generator design pressure (1270 psia) which equals 1397 psia.

   b. A valve accumulation of 3%

   c. A valve set pressure error of $\pm$ 1%

   d. Incorportation of the ΔP between the steam generator nozzles and the safety valves.

8. The design pressure, temperature, and flow rating of the main steam piping and valves shall be greater than or at least equal to the design pressure, temperature, and flow rating of the steam generator secondary side.

F. INDEPENDENCE

2. The feedwater system piping, Emergency Feedwater System piping, and main steam piping and all of their associated supports and restraints shall be designed so that a single adverse event, such as a ruptured feedwater line, emergency feedwater line, main steam line inside containment, or a closed isolation valve can occur without:

    a. Initiating a Loss-of-Coolant incident.

    b. Causing failure of the other steam generator's safety class steam and feedwater lines, MSIV's, safety valves, MFIV's blowdown line isolation valves, or ADV's.

    c. Reducing the capability of any of the Engineered Safety Features systems or the Plant Protective System.

    d. Transmitting excessive loads to the containment pressure boundary.

    e. Compromising the function of the plant control room.

    f. Precluding orderly cooldown of the RCS.

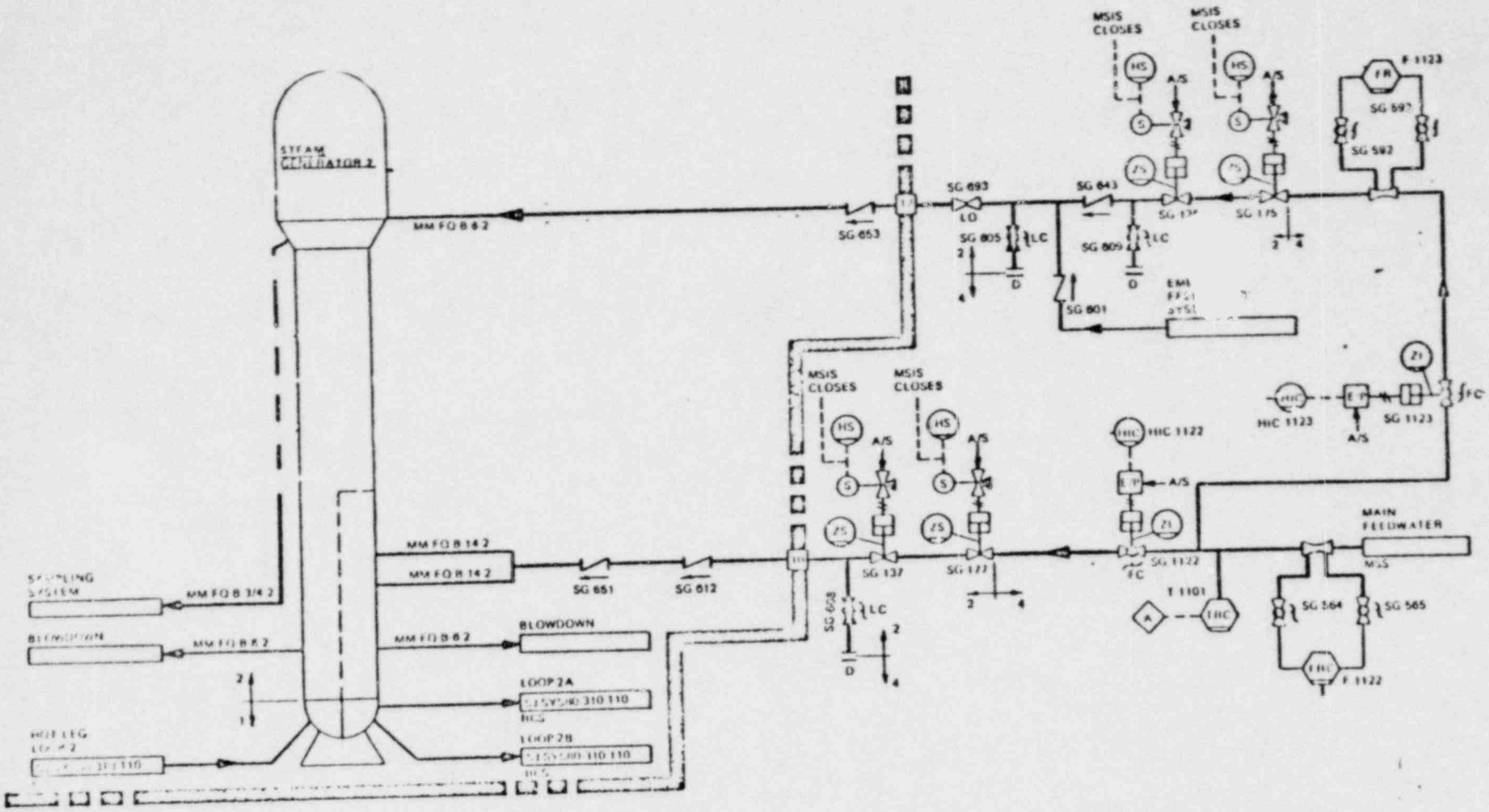
3. An electrical or mechanical malfunction of one solenoid shall not prevent a MSIV from closing.

4. No single failure in the control circuits shall prevent closure of the MSIV bypass valves.

5. The MSIV bypass valve control circuits shall be designed, or precautions shall be taken, such that no single electrical failure would result in the spurious motion of the valves.

6. The ADV control circuits shall be designed or precautions taken, such that no single electrical failure would result in the opening of valves with a total combined capacity greater than 1.9×10^5 lb/hr at 1000 psia.

7. No single failure in the control circuits shall prevent operation of at least one ADV on each steam generator.



MAIN FEEDWATER SYSTEM

MFWS CONFIGURATION

C. PROTECTION

3. The valves, piping, and associated supports of the Feedwater System from and including the Main Feedwater Isolation Valves (MFIV's) to the steam generator feed nozzles shall be Seismic Category I and designed to ASME B&PV Code Section III, Class 2 requirements.

4. Feedwater piping shall be routed, protected, and restrained such that in the case of a rupture of a feedwater line or any other system pipeline, a single failure criteria will not be exceeded with regard to safe shutdown of the plant.

M. ARRANGEMENT

15. A 90° or 45° elbow facing downward shall be attached to each feedwater nozzle. Such a precaution will aid in the prevention of water hammer.

16. The MFIV's shall be located outside of the containment building as close to the containment wall as possible.

17. The MFIV's for each steam generator shall be arranged such that a maximum of 500 cubic feet of fluid is contained in the piping between each steam generator and its associated isolation valves. This volume shall also include the volumes between the redundant MFIV's. This volume shall include the volumes up to their respective isolation valves of all lines off of the main feedwater lines downstream of the MFIV's for which a mechanism exists for getting the fluid into the main feedwater line (e.g., gravity, flow or flushing).

18. The Emergency Feedwater System connection shall be located in the downcomer feedwater line between the MFIV's and the steam generator downcomer nozzle. Emergency feedwater flow shall be directed to the downcomer nozzle only. A safety Class 2 check valve shall be located in the main feedwater piping upstream of this interface to prevent back flow of emergency feedwater to other portions of the Main Feedwater System.

ISOLATION

I. OPERATIONAL/CONTROLS

9. Redundant feedwater system isolation valving shall be provided in both the economizer feedlines and the downcomer feedlines such that the following criteria are met when the effects of single failure criteria are imposed:

   a. Complete termination of forward feedwater flow is assumed within 5 seconds after receipt of an MSIS.

   b. Abrupt complete termination of reverse feedwater flow with the existance of a reverse flow condition. Check valves are considered to be an acceptable means of achieving the above.

10. The economizer and downcomer feedwater line isolation valves (MFIV's) in each main feedwater line shall be remote-operated and be capable of maintaining leak rate of less than 1000 cc/hr under the main feedwater line pressure, temperature and flow resulting from the transient conditions associated with a pipe break on either side of the valves.

F. INDEPENDENCE

8. Each MFIV actuator shall be physically and electrically independent of the other such that failure of one will not cause failure of the other.

G. THERMAL LIMITATIONS

13. The total reverse leak rate of feedwater check valves to each steam generator shall not exceed 1000 cc/hr.

DESIGN FEATURES TO PREVENT WATERHAMMER IN THE STEAM GENERATOR SPARGER

1. 90° DOWNWARD SLOPING ELBOW OFF THE FEEDNOZZLE.
2. "J" TUBES OR TEES.
3. LOOP SEAL.

WATERHAMMER PREVENTIVE FEATURES
IN THE ECONOMIZER DESIGN

1. ECONOMIZER NOZZLE LOCATION.
2. INTERFACE REQUIREMENTS.
3. CONTROL FEATURES.
4. INTERNAL DESIGN FEATURES.

EFWS - CONFIGURATION REQUIREMENTS

F. INDEPENDENCE

9. No single active or passive component failure, single passive or active electrical component failure, or power supply failure shall preclude adequate operation of the Emergency Feedwater System, such as the following events:

   a. Loss of normal feedwater with or without a concurrent loss of normal onsite or offsite AC power.

   b. Minor secondary system pipe breaks with or without a concurrent loss of normal onsite or offsite AC power.

   c. Steam generator tube rupture with or without a concurrent loss of normal onsite or offsite AC power.

   d. Major secondary system pipe breaks with or without a concurrent loss of normal onsite or offsite AC power.

   e. Small LOCA with or without a concurrent loss of normal onsite or offsite AC power.

10. The ability of the Emergency Feedwater System to perform its design function considering a power supply failure, a single active or passive mechanical component failure, a single active or passive failure of an electrical component, or the effects of a high or moderate energy pipe rupture shall be demonstrated.

11. The Emergency Feedwater System shall provide double isolation from the Main Feedwater System during plant conditions when the Emergency Feedwater System is not required.

I. OPERATIONAL CONTROLS

11. The Emergency Feedwater System shall be controllable in a post-accident environment from either the control room or a remote shutdown station.

RATE (MANUAL)

12. The Emergency Feedwater System shall be controllable such that post accident operation will not result in overfilling the intact steam generator(s).

13. If the Emergency Feedwater System is used as an auxiliary feedwater system, the emergency feedwater pumps shall be designed for operation when steam generator pressure is negligible and not result in damage to the pumps or effect the ability of the system to deliver the required emergency feedwater flow. Such a condition can exist during startup or shutdown operation subsequent to an EFAS which starts the emergency feedwater pumps and fully opens the system isolation and control valves.

EFWS - FLOW REQUIREMENTS

G. THERMAL LIMITATIONS

5. Following the events stated in Section 5.1.4.F.9, the emergency feedwater system shall maintain adequate inventory in the steam generator(s) for residual heat removal and be capable of the following:

   a. Maintaining the NSSS at hot standby with or without normal offsite and normal onsite power available.

   b. Facilitating NSSS cooldown at the maximum administratively controlled rate of 75°F/hr. from hot standby to shutdown cooling initiation with or without normal offsite or onsite power available. (The Shutdown Cooling System becomes available for plant cooldown when the RCS temperature and pressure are reduced to approximately 350°F and 400 psia.)

6. The Emergency Feedwater System shall be available to deliver flow to the steam generator(s) automatically upon receipt of an EFAS as follows:

   a. Within 10 seconds when normal offsite or normal onsite power is available.

   b. Within 45 seconds when both normal onsite and normal offsite power are not available.

7. The required emergency feedwater flow, based on residual heat removal requirements is 875 gpm delivered to the steam generator(s) downcomer feedwater nozzle. Maximum expected steady state steam generator pressure at the downcomer nozzle is approximately 1275 psia.

8. Emergency feedwater temperature shall be at least 40F and no greater than 180F.

9. A minimum of 300,000 gallons of secondary quality makeup water as defined in Section 10.3.4 shall be available to the Emergency Feedwater System for delivery to the intact steam generator(s).

B. PROTECTION

4. All components and piping of the Emergency Feedwater System between the steam generators and the containment isolation valves shall be Seismic Category I and designed to ASME B&PV Code Section III, Class 2 requirements.