ABB

ASEA BROWN BOVERI

June 4, 1993
LD-93-086

Docket No. 52-002

Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Additional System 80+™ Submittal #2 Design Descriptions and ITAAC

Reference: Letter LD-93-083, C. B. Brinkman (ABB-CE) to NRC, dated May 28, 1993

Dear Sirs:

Submittal #2 of the System 80+ Design Descriptions and associated ITAAC (Inspections, Tests, Analyses and Acceptance Criteria) was transmitted by the Reference. Enclosed are additional Submittal #2 Design Descriptions and ITAAC which are submitted for review and approval.

ABB-CE has initiated an Integrated Review of the CESSAR-DC and Design Descriptions/ITAAC to ensure consistency among and within these documents. It is possible that changes to the enclosed material may be necessary should the review uncover any inconsistencies. It is our intention to incorporate such changes in our final amendment targeted for June 30, 1993.

Please feel free to query us as the staff evaluates this submittal. You may contact me or Mr. John Rec at (203) 285-2861 for assistance in this matter.

Very truly yours,

G. D. Hess for

C. B. Brinkman
Acting Director
Nuclear Systems Licensing

gdh/lw
Enclosure: As Stated

cc: T. Boyce (NRC)
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D032 /1

2.4.1 SAFETY DEPRESSURIZATION SYSTEM

Design Description

The Safety Depressurization System (SDS) is a safety-related system composed of two subsystems. The reactor coolant gas vent subsystem (RCGVS) provides a means to vent steam and non-condensible gases from the pressurizer (PZR) and the reactor vessel upper head (RVUH). The rapid depressurization subsystem (RDS) provides a means to rapidly depressurize the RCS by venting the PZR.

The SDS is located inside Containment.

The Basic Configuration of the SDS is as shown on Figure 2.4.1-1.

The SDS consists of two redundant RDS piping trains from the pressurizer to the in-containment refueling water storage tank (IRWST), and two RCGVS piping trains, one from the pressurizer and one from the RVUH, which discharge to either the reactor drain tank (RDT) or the IRWST.

The RCGVS venting capacity will depressurize the RCS following design basis events.

The RDS depressurization capacity, in conjunction with safety injection system (SIS) operation, will prevent uncovering the core during a total loss of feedwater (TLOFW).

The ASME Code Section III Class for the SDS pressure retaining components shown on Figure 2.4.1-1 is as depicted on the figure.

The safety-related equipment shown on Figure 2.4.1-1 is qualified Seismic Category I.

Displays of the SDS instrumentation shown on Figure 2.4.1-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to open and close those power-operated valves shown on Figure 2.4.1-1. SDS alarms shown on Figure 2.4.1-1 are provided in the MCR.

Within the RDS, in one mechanical train, each isolation valve is powered from a different Class 1E bus within its Class 1E Division, and in the other mechanical train, each isolation valve is powered from a different Class 1E bus in the other Class 1E Division. Within the RCGVS, in the pressurizer vent train and in the RVUH vent

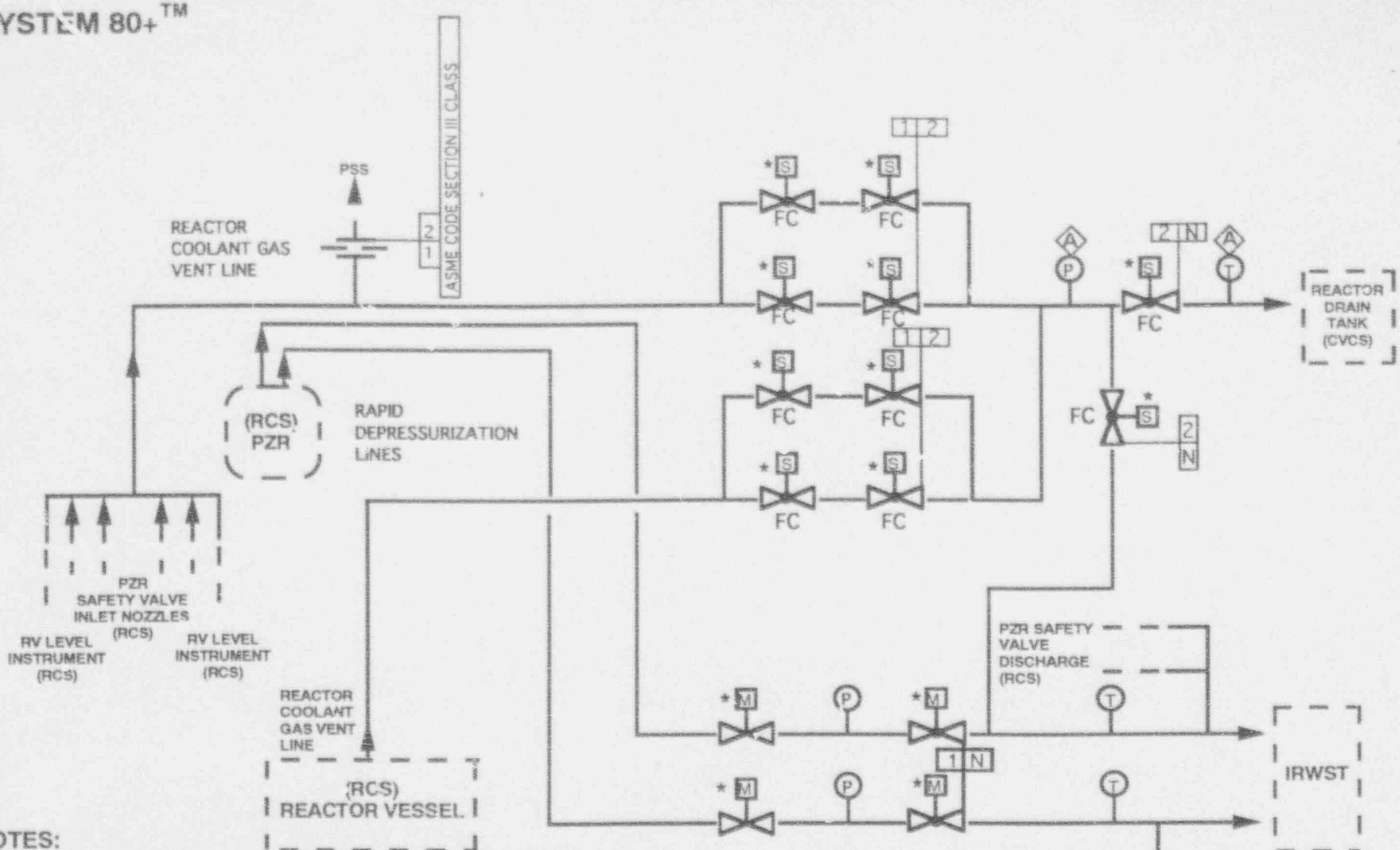
train, each isolation valve in one branch line is powered from a different Class 1E bus within its Class 1E Division, and each isolation valve in the other branch line is powered from a different Class 1E bus in the other Class 1E Division. The isolation valve to the RDT and the cross-connect valve between discharge lines to the RDT and the IRWST are powered from different Class 1E Divisions.

Within the RCGVS in the pressurizer vent train and in the RVUH vent train, the two branch lines with isolation valves are physically separated.

Valves with response positions indicated on Figure 2.4.1-1 change position to that indicated on the figure upon loss of motive power.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.4.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Safety Depressurization System.



NOTES:

1. ALL COMPONENTS SHOWN ARE INSIDE CONTAINMENT.
2. THE ASME CODE SECTION III CLASS 1 PRESSURE RETAINING COMPONENTS SHOWN ARE SAFETY RELATED. ALL VALVES SHOWN ARE POWERED FROM THEIR RESPECTIVE CLASS 1E BUS, AS NOTED IN THE DESIGN DESCRIPTION.
3. * :EQUIPMENT FOR WHICH PARAGRAPH NUMBER 3 OF THE "VERIFICATION FOR BASIC CONFIGURATION FOR SYSTEMS" SECTION OF THE GENERAL PROVISIONS (SECTION 1.2) APPLIES.

FIGURE 2.4.1-1
SAFETY DEPRESSURIZATION SYSTEM

TABLE 2.4.1-1

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the SDS is as shown on Figure 2.4.1-1.	1. Inspection of the as-built SDS configuration will be conducted.	1. For the components and equipment shown on Figure 2.4.1-1, the as-built SDS conforms with the Basic Configuration.
2. The RCGVS venting capacity will depressurize the RCS following design basis events.	2. Tests to determine RCS depressurization rate will be performed. Analyses will be performed to convert the test results to a depressurization rate at an RCS starting pressure.	2. The RCGVS depressurizes the RCS at a rate of at least [0.9] psi per second at an initial pressurizer pressure of [2250] psia.
3. The RDS depressurization capacity, in conjunction with SIS operation, will prevent uncovering the core during a total loss of feedwater.	Inspection of construction records and vendor records for the valves in each RDS train will be performed. Analysis of total loss of feedwater will be performed, using the as-built system characteristics.	3. A single RDS train in conjunction with two of four safety injection (SI) pumps, prevents core uncovery following a TLOFW if feed and bleed is initiated immediately following the opening of pressurizer safety valves. The two RDS trains have sufficient total flow capacity with all SI pumps operating to prevent core uncovery following a TLOFW if feed and bleed is delayed up to 30 minutes from the time pressurizer safety valves lift.

TABLE 2.4.1-1 (Continued)

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. The ASME Code Section III SDS components shown on Figure 2.4.1-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	4. A pressure test will be conducted on those components of the SDS required to be pressure tested by ASME Code Section III.	4. The results of the pressure test of ASME Code Section III portions of the SDS conform with the pressure testing criteria in ASME Code Section III.
5.a) Displays of the SDS instrumentation shown on Figure 2.4.1-1 exist in the MCR or can be retrieved there.	5.a) Inspection for the existence or retrievability in the MCR of instrumentation displays will be performed.	5.a) Displays of the instrumentation shown on Figure 2.4.1-1 exist in the MCR or can be retrieved there.
5.b) Controls exist in the MCR to open and close those power operated valves shown on Figure 2.4.1-1.	5.b) Tests will be performed using the SDS controls in the MCR.	5.b) SDS controls in the MCR operate to open and close those power operated valves shown on Figure 2.4.1-1.
5.c) SDS alarms shown on Figure 2.4.1-1 are provided in the MCR.	5.c) Tests of the SDS alarms shown on Figure 2.4.1-1 will be performed using signals simulating alarm conditions.	5.c) The SDS alarms shown on Figure 2.4.1-1 actuate in response to signals simulating alarm conditions.

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a) Within the RDS, in one mechanical train, each isolation valve is powered from a different Class 1E bus within its Class 1E Division, and in the other mechanical train, each isolation value is powered from a different Class 1E bus in the other Class 1E Division.	6.a) Tests will be performed on the RDS valves by providing a test signal in only one Class 1E bus at a time.	6.a) A test signal exists only at the RDS valves powered from the Class 1E bus under test.
6.b) Within the RCGVS, in the pressurizer vent train and in the RVUH vent train, each isolation valve in one branch line is powered from a different Class 1E bus within its Class 1E Division, and each isolation valve in the other branch line is powered from a different Class 1E bus in the other Class 1E Division.	6.b) Tests will be performed on the RCGVS valves by providing a test signal in only one Class 1E bus at a time.	6.b) A test signal exists only at the RCGVS valves powered from the Class 1E bus under test.
6.c) The isolation valve to the RDT and the cross-connect valve between discharge lines to the RDT and IRWST are powered from different Class 1E Divisions.	6.c) Tests will be performed on the RCGVS valves by providing a test signal in only one Class 1E Division at a time.	6.c) A test signal exists only at the RCGVS valves powered from the Class 1E Division under test.

TABLE 2.4.1-1 (Continued)

SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. Within the RCGVS, in the pressurizer vent train, and in the RVUH vent train, the two branch lines with isolation valves are physically separated.	7. Inspections of as-built mechanical trains will be performed.	7. Within the RCGVS, in the pressurizer vent train, and in the RVUH vent train, the two branch lines are separated within Containment by spatial arrangement or barriers.
8. Motor Operated Valves (MOVs) having an active safety function will open and/or close under differential pressure or fluid flow conditions and under temperature conditions.	8. Tests will be performed to open and/or close MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	8. Each MOV having an active safety function opens and/or closes.
9. Valves with response positions indicated on Figure 2.4.1-1 change position to that indicated on the Figure upon loss of motive power.	9. A test of loss of motive power to these valves will be performed.	9. These valves change position to the position indicated on Figure 2.4.1-1 upon loss of motive power.

2.7.17 CONTROL COMPLEX VENTILATION SYSTEM

Design Description

The Control Complex Ventilation System (CCVS) maintains environmental conditions within the control complex areas in the nuclear island (NI) structures.

The CCVS consists of (a) the Main Control Room Air Conditioning System (MCRACS) and the Technical Support Center Air Conditioning System (TSCACS), and (b) the balance of the control complex air conditioning systems.

a) The Basic Configuration of the MCRACS and the TSCACS is as shown on Figure 2.7.17-1. The safety-related components of the MCRACS and the TSCACS are as indicated on the figure.

The MCRACS consists of two Divisions. Each Division has an outside air intake, dampers, a filtration unit, air conditioning with fan, ducting, instrumentation, and controls.

The TSCACS receives outside air from the MCRACS air intake ducts and has a filtration unit and an air conditioning unit.

Each outside air intake has a minimum of two redundant isolation dampers, at least one detector to detect the products of combustion, radiation detection instrumentation, toxic gas detection instrumentation (included if a toxic gas hazard exits), and a tornado damper.

The air intake isolation dampers close upon receipt of a signal indicating the detection of smoke or toxic gas, if a toxic gas hazard exists. The smoke and toxic gas isolation signals can be manually overridden to open the isolation dampers from the MCR.

Upon detection of radiation in the outside air intakes, the air intake isolation dampers in the air intake having the higher radiation level close automatically. The air intake isolation dampers in the other air intake line remain open. After initial actuation of the air intake isolation dampers, the air intake isolation dampers realign automatically, such that the air intake having the lower radiation level opens before the isolation dampers in the air intake line having a higher radiation level close. The air intake isolation dampers can be manually controlled from the MCR.

Each MCR filtration unit and the TSC filtration unit removes particulate matter and iodine.

The MCR is maintained at a positive pressure with respect to the outside atmosphere.

The TSC can be pressurized with respect to the outside atmosphere.

The designated MCR filtration unit starts automatically and the MCR air conditioning units start or continue to operate, if running, on receipt of a safety injection actuation signal (SIAS) or a high radiation signal. In addition, the dampers in the MCR circulation lines and the bypass lines reposition to establish the flow path through the MCR filtration units.

b) The Basic Configuration of the balance of the CCVS is as shown on Figures 2.7.17-2 and 2.7.17-3. The safety-related portions of the balance of the CCVS are as shown on the figures.

The CCVS serves the following safety-related areas: essential electrical equipment rooms, vital instrumentation and equipment rooms, battery rooms, and the remote shutdown panel room.

The CCVS serves the following non-safety related areas: the operation support center, non-essential electrical rooms, computer rooms and non-safety battery rooms.

Each battery room has an exhaust fan taking suction near the battery room ceiling. Hydrogen detection devices are installed in the battery rooms.

The CCVS equipment shown on Figures 2.7.17-1, 2.7.17-2, and 2.7.17-3 is qualified seismic Category I except as noted on the figures.

Safety-related components of the CCVS are Class 1E. The Class 1E loads shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3 are powered from their respective Class 1E Division. The two MCRACS air intake isolation dampers in a Division are powered from different Class 1E buses.

The active components of the two mechanical Divisions of the CCVS are physically separated.

Displays of the CCVS instrumentation indications shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3 exist in the MCR or can be retrieved there.

Controls exist in the MCR to start and stop the MCR filtration units and air conditioning units, and the TSC filtration unit and air conditioning units, and to open and close those power operated isolation dampers shown on Figure 2.7.17-1.

Components with response positions indicated on Figure 2.7.17-1 change position to that indicated on the figure upon loss of motive power.

The leakage through MCRACS intake ductwork is less than the maximum allowable for the associated design.

Inspections, Tests, Analyses and Acceptance Criteria:

Table 2.7.17-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Control Complex Ventilation System.

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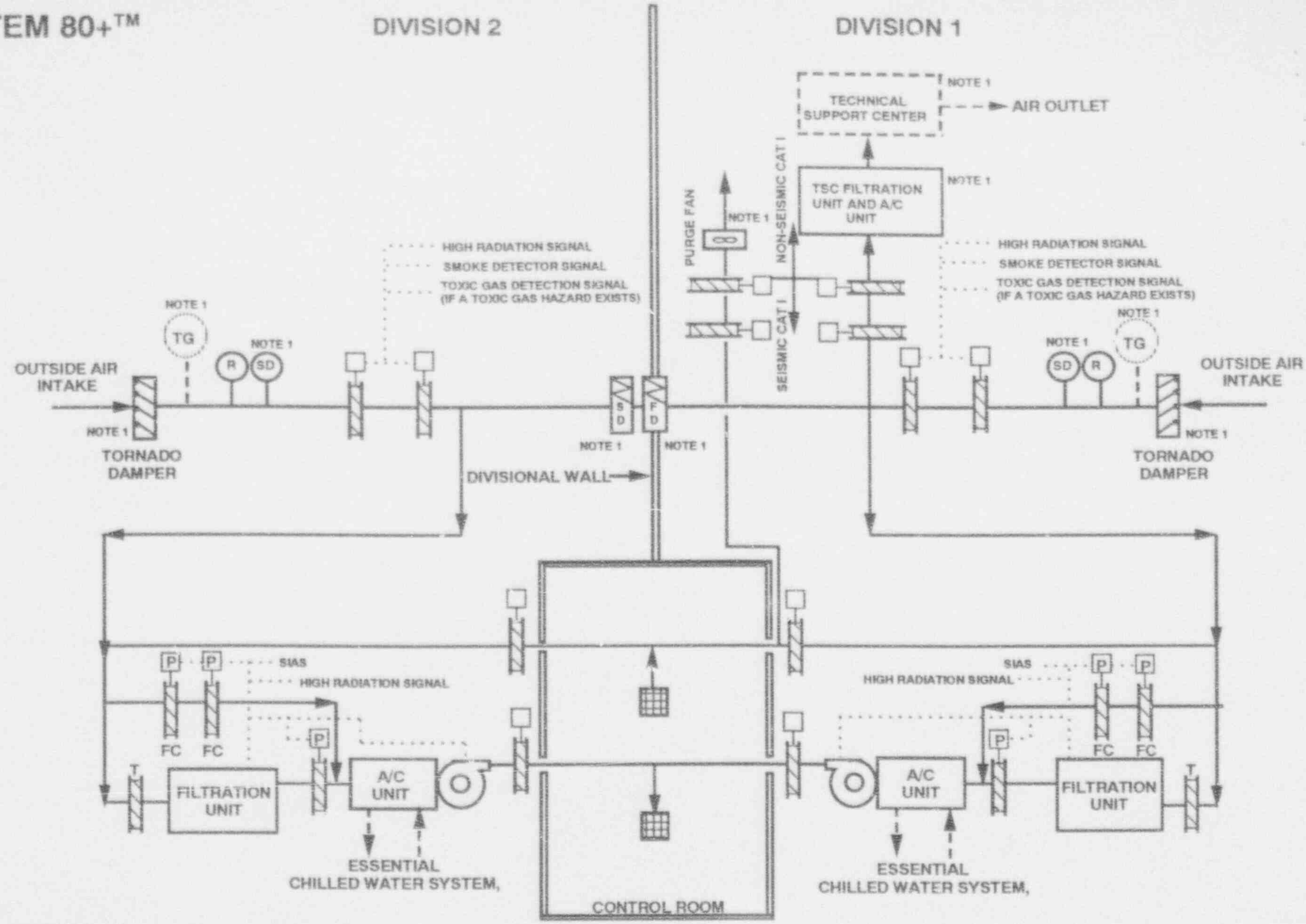

NOTES:

1. NON-SAFETY RELATED COMPONENTS.
2. SAFETY-RELATED ELECTRICAL EQUIPMENT IS CLASS 1E.

FIGURE 2.7.17-1
CONTROL COMPLEX VENTILATION SYSTEM

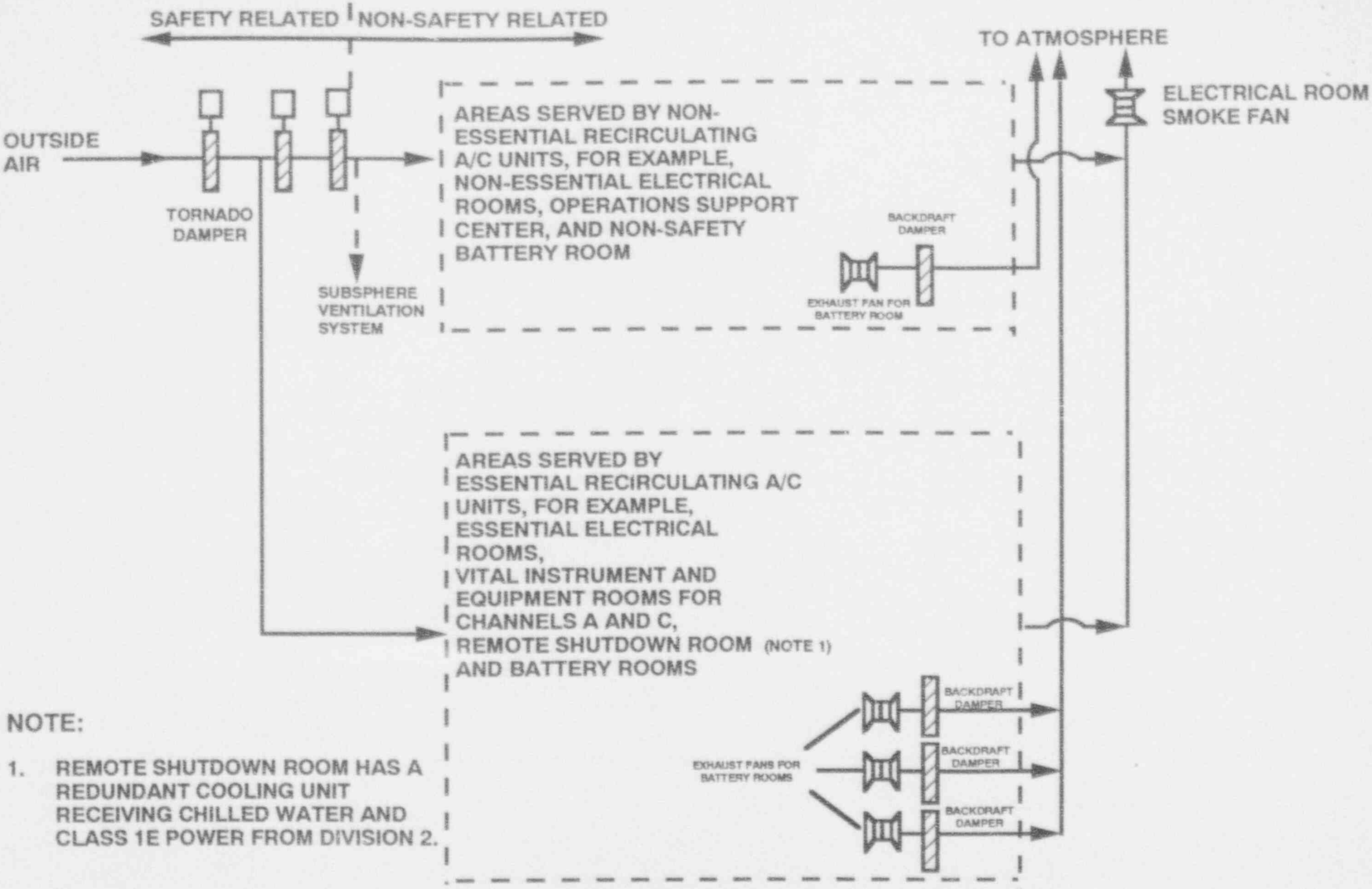

FIGURE 2.7.17-2
BALANCE OF CONTROL COMPLEX VENTILATION SYSTEM
(DIVISION 1)

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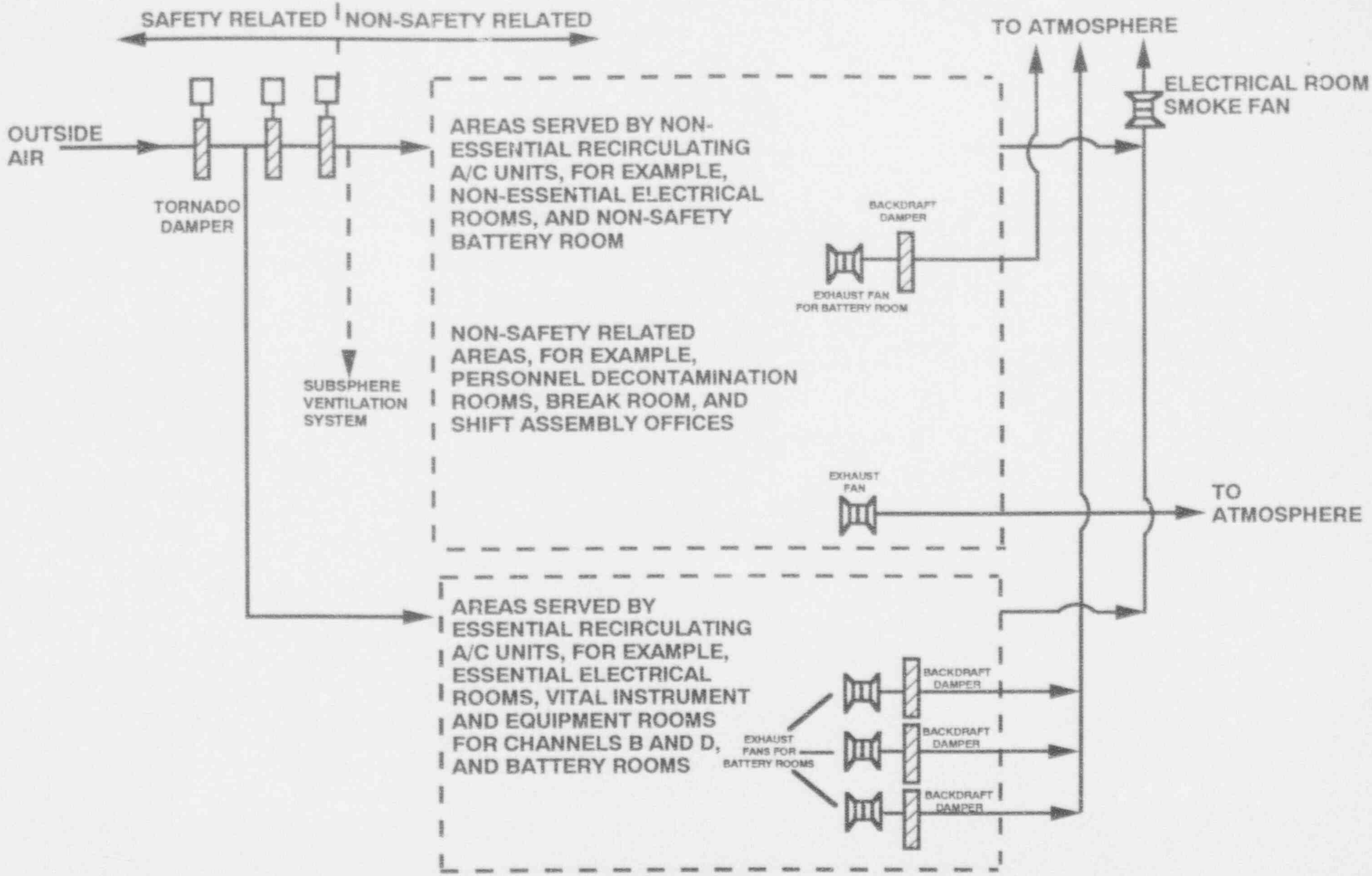

FIGURE 2.7.17-3
BALANCE OF CONTROL COMPLEX VENTILATION SYSTEM
(DIVISION 2)

TABLE 2.7.17-1

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the MCRACS and TSCACS are as shown on Figure 2.7.17-1.	1. Inspection of the as-built MCRACS and TSCACS configuration will be conducted.	1. For the components and equipment shown on Figure 2.7.17-1, the as-built MCRACS and TSCACS conform with the Basic Configuration.
2. The Basic Configuration of the balance of the CCVS is as shown on Figures 2.7.17-2 and 2.7.17-3.	2. Inspection of the balance of the as-built CCVS will be performed.	2. For the components and equipment shown on Figures 2.7.17-2 and 2.7.17-3, the balance of the as-built CCVS conforms with the Basic Configuration.
3. The CCVS maintains the environment in the control complex areas in the nuclear island structures.	3. Tests will be performed on the CCVS to measure room temperatures and analyses will be performed to convert test data to limit temperatures.	3. The CCVS controls the temperature to: 3.a) less than 85°F in the MCR. 3.b) between 60°F and 90°F in the battery rooms. 3.c) less than or equal to 104°F in mechanical equipment rooms. 3.d) less than or equal to 85°F in other areas of the control complex.
4.a) The MCR outside air intake isolation dampers close upon receipt of a signal indicating the detection of smoke.	4.a) Tests will be conducted on each MCR outside air intake isolation damper using a signal that simulates the detection of smoke in the associated air intake.	4.a) Each isolation damper closes upon receipt of a signal associated with its air intake.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.b) The MCR outside air intake isolation dampers close upon detection of toxic gas if a toxic gas hazard exists.	4.b) Analysis of toxic gas detector response time to generate closure signal to the MCR air intake isolation dampers, intake air flow velocity and damper closure times will be performed. Tests of toxic gas detector response time and dampers' closure times will be performed.	4.b) MCR air intake isolation dampers close prior to detected toxic gas reaching the dampers.
4.c) Toxic gas and smoke isolation signals can be manually overridden to open the isolation dampers from the MCR.	4.c) Tests will be performed to simulate toxic gas and smoke isolation signals and verify that the isolation dampers may be manually opened from the MCR.	4.c) With simulated toxic gas or smoke damper isolation signal present, isolation dampers may be manually opened from the MCR.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Upon detection of radiation in the outside air intakes, the air intake isolation dampers in the air intake having the higher radiation level close automatically. The air intake isolation dampers in the other air intake line remain open. After initial actuation of the air intake isolation dampers, the air intake isolation dampers realign automatically, such that the air intake having the lower radiation level opens before the isolation dampers in the air intake line having a higher radiation level close. The air intake isolation dampers can be manually controlled from the MCR.	5. Tests will be performed on the MCRACS isolation dampers using signals that simulate radiation levels in the outside air intakes.	5. Upon detection of radiation in the outside air intakes, the air intake isolation dampers in the air intake having the higher radiation level close automatically. The air intake isolation dampers in the other air intake line remain open. After initial actuation of the air intake isolation dampers, the air intake isolation dampers realign automatically, such that the air intake having the lower radiation level opens before the isolation dampers in the air intake line having a higher radiation level close. The air intake isolation dampers can be manually controlled from the MCR.
6. Each MCR filtration unit and the TSC filtration unit removes particulate matter and iodine.	6. Tests and analysis will be performed on each MCR filtration unit and the TSC filtration unit to determine filter efficiencies.	6. The MCR and TSC filter efficiencies are greater than or equal to 95% for elemental and organic iodine 99% for particulate matter greater than 0.3 micron.
7. The MCR is maintained at a positive with respect to the outside atmosphere.	7. Tests and analysis will be performed on the MCRACS.	7. The MCR is pressurized to at least 0.125 inches of water gauge relative to the outside atmosphere with outside air supply no more than 2000 CFM.

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. The TSC can be pressurized with respect to the outside atmosphere.	8. Tests will be performed on the TSC.	9. The TSC can be maintained at a positive pressure with respect to the outside atmosphere.
9. The designated MCR filtration unit starts automatically and the MCR air conditioning unit starts or continues to operate, if running, receipt of a safety injection actuation signal (SIAS) or high radiation signal. In addition, the dampers in the MCR circulation lines and the bypass lines reposition to establish the flow path through the MCR filtration units.	9. Tests will be performed on the MCR filtration units, fans, and dampers using a signal that simulates a safety injection actuation signal (SIAS). The test will be repeated for a signal that simulates a high radiation signal.	9. The MCR filtration units and fans start on receipt of a signal that simulates a SIAS,or a signal that simulates high radiation,and dampers reposition to establish the flow path through the MCR filtration units.
10.a) Each battery room has an exhaust fan taking suction near the battery room ceiling.	10.a) Inspection of the battery rooms will be performed.	10.a) An exhaust fan is installed in each battery room, and its suction duct is located near the ceiling.
11.a) Hydrogen detection devices are installed in the battery rooms.	11.a) Inspection for hydrogen detection devices in the battery rooms will be performed.	11.a) Hydrogen detection devices are installed.
11.b) The two MCRACS air intake isolation dampers in a Division are powered from different Class 1E buses.	11.b) Tests will be performed on the air intake isolation dampers in each MCRACS Division by providing a test signal in only one Class 1E bus at a time.	11.b) Within the MCRACS Division, a test signal exists only at the air intake isolation damper powered from the Class 1E bus under test.

TABLE 2.7.17-1 (Continued)

CONTROL COMPLEX VENTILATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12. The active components of the two mechanical divisions of the CCVS are physically separated.	12. Inspections of as-built mechanical separations will be conducted.	12. The active components of the two CCVS Divisions are separated by a Divisional Wall.
13.a) The CCVS instrumentation indications shown in Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3 exist in the MCR or can be retrieved there.	13.a) Inspection for the existence or retrieveability in the MCR of instrumentation indications will be conducted.	13.a) The instrumentation indications shown in Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3 exist in the MCR or can be retrieved there.
13.b) Controls exist in the MCR to start and stop the MCR filtration units and the TSC filtration unit, and to open and close the isolation dampers shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3.	13.b) Tests will be performed using the CCVS controls in the MCR.	13.b) CCVS controls in the MCR operate to start and stop the MCR filtration units and the TSC filtration unit and to open and close the isolation dampers shown on Figures 2.7.17-1, 2.7.17-2 and 2.7.17-3.
14. Components with response positions indicated on Figure 2.7.17-1 change position to that indicated on the figure upon loss of motive power.	14. A test of loss of motive power to these components will be performed.	14. These components change position to the position indicated on Figure 2.7.17-1 on loss of motive power.
15. The leakage through MCR intake ductwork is less than the maximum allowable for the associated design.	15. The ductwork will be pressure tested for leakage.	15. The results of leak rate tests demonstrate that the leakage through ductwork is less than the maximum allowable for the associated design.

2.8.8 EMERGENCY FEEDWATER SYSTEM

Design Description

The Emergency Feedwater System (EFWS) supplies feedwater to the steam generators for events resulting in loss of normal feedwater and requiring heat removal through the steam generators.

The EFWS is located within the nuclear island (NI) structures.

The Basic Configuration of the EFWS is as shown on Figure 2.8.8-1. The EFWS is safety-related as noted on the Figure.

The EFWS consists of two mechanical Divisions, each with an emergency feedwater storage tank (EFWST), two EFW pumps, a cavitating flow-limiting venturi, valves, piping, instrumentation and controls. The EFW pumps in each Division are powered by diverse drivers.

A gravity-fed non-safety grade source of condensate makeup is provided to either EFWST.

The flow recirculation line from each EFW pump discharge back to its associated EFWST provides required EFW pump minimum flow and permits testing each EFW pump at full flow.

Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the steam generators, against steam generator feedwater nozzle pressures up to main steam safety valve lift pressure.

The cavitating flow-limiting venturis limit emergency feedwater flow to each SG with both EFW pumps running in the Division against steam generator pressures down to 0 psig.

Each EFWST has a volume above the EFW pump suction line penetrations to permit plant cooldown to shutdown cooling entry conditions following the most limiting design basis event.

The ASME Code Section III Class for the EFWS pressure retaining components shown on Figure 2.8.8-1 is as depicted on the Figure.

The safety-related equipment shown on Figure 2.8.8-1 is qualified Seismic Category I.

Displays of the EFWS instrumentation shown on Figure 2.8.8-1 exist in the main control room (MCR) or can be retrieved there.

Controls exist in the MCR to start and stop the EFW pumps, and to open and close those power operated valves shown on Figure 2.8.8-1.

Alarms shown on Figure 2.8.8-1 are provided in the MCR.

Water is supplied to each EFW pump at a pressure greater than the pump's required net positive suction head (NPSH).

Within a mechanical Division, the following components are powered from their respective Class 1E Division:

the motor-driven EFW pump,

the two motor-operated valves in the motor-driven EFW pump's discharge line, and

process instrumentation in the motor-driven EFW pump's suction and discharge lines.

Within a mechanical Division, the following components are powered from a Class 1E Division different from the Class 1E Division powering the motor-driven EFW pump:

the turbine-driven EFW pump electrical controls,

the two motor-operated valves in the turbine-driven EFW pump's discharge line,

the motor-operated valve and electrical controls for the pneumatic valve and hydraulic valve in the turbine-driven EFW pump's steam supply line, and

process instrumentation in the turbine-driven EFW pump's suction and discharge lines.

In each EFW pump's discharge line, each of the two motor-operated valves is powered from a different Class 1E bus in the same Class 1E Division.

The two mechanical Divisions of the EFWS are physically separated except for the cross-connect lines between EFWSTs and between Divisional EFW pump discharge lines.

The EFWS is actuated by an emergency feedwater actuation signal (EFAS) from the engineered safety features actuation system (ESFAS) or by an alternate feedwater actuation signal (AFAS) from the alternate protection system (APS). The EFAS or AFAS for each steam generator starts the EFW motor driven pump, opens the steam supply valve to the turbine driver, which starts the turbine driven EFW pump, and opens the two steam generator isolation valves and the two EFW flow control valves in the actuated EFWS Division. The engineered safety features component control system (ESF-CCS) includes logic to close the isolation valves and flow control valves when SG water level has risen above a high level setpoint, and to re-open those valves when SG water level drops below a low level setpoint.

Valves with response positions indicated on Figure 2.8.8-1 change position to that indicated on the figure upon loss of motive power.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.8-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Emergency Feedwater System.

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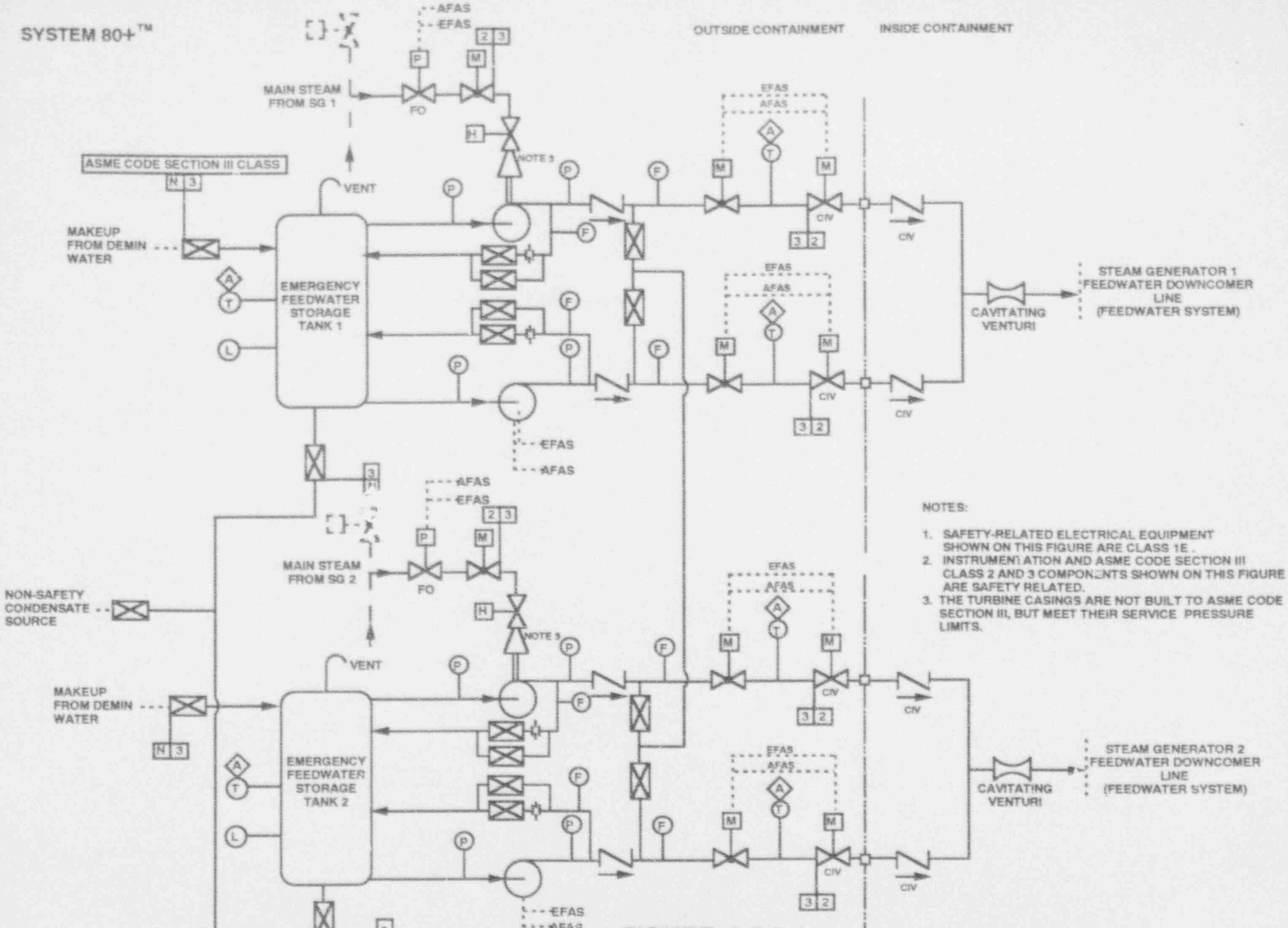

FIGURE 2.8.8-1
EMERGENCY FEEDWATER SYSTEM

DWATER SYSTEM

lyses, and Acceptance Criteria

	Inspections, Tests, Analyses	Acceptance Criteria
	1. Inspection of the as-built EFWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.8-1, the as-built EFWS conforms with the Basic Configuration.
source of rovided to either	2. Tests of the non-safety grade source of condensate makeup to the EFWSTs will be performed by manually aligning the makeup source to each EFWST with the EFWST at a low water level. Water level will be observed.	2. The water level increases in the EFWST being fed from the makeup source.
3. The flow recirculation line from each EFW pump discharge back to its associated EFWST provides required EFW pump minimum flow and permits testing each EFW pump at full flow.	3. Tests of each EFW pump in the minimum flow and the full flow test modes will be conducted with flow directed to the EFWST through the pump's recirculation lines.	3. Minimum recirculation flow meets or exceeds the pump vendor's required minimum flow. Full flow from each pump (at least 500 gpm) is returned to the EFWST.
4.a) Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the steam generator(s) against a steam generator feedwater nozzle pressure up to main steam safety valve lift pressure.	4.a) Tests of each EFW pump will be performed to determine system flow vs. steam generator pressure. Analyses will be performed to convert the test results to the design conditions.	4.a) Each EFW pump delivers at least 500 gpm to the steam generator(s) against a steam generator feedwater nozzle pressure of 1217 psia.
4.b) The cavitating flow-limiting venturis limit maximum flow to each SG with both pumps in the Division running against a steam generator pressure of 0 [illegible]	4.b) Tests will be performed with both pumps in a Division running. Analyses will be used to convert the test results to the conditions of the Design Commitment.	4.b) The maximum flow to each SG is 800 gpm with both pumps running against a steam generator pressure of 0 psig.

TABLE 2.8.8-1

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Basic Configuration of the EFWS is as shown on Figure 2.8.8-1.	1. Inspection of the as-built EFWS configuration will be conducted.	1. For the components and equipment shown on Figure 2.8.8-1, the as-built EFWS conforms with the Basic Configuration.
2. A gravity-fed non-safety grade source of condensate makeup is provided to either EFWST.	2. Tests of the non-safety grade source of condensate makeup to the EFWSTs will be performed by manually aligning the makeup source to each EFWST with the EFWST at a low water level. Water level will be observed.	2. The water level increases in the EFWST being fed from the makeup source.
3. The flow recirculation line from each EFW pump discharge back to its associated EFWST provides required EFW pump minimum flow and permits testing each EFW pump at full flow.	3. Tests of each EFW pump in the minimum flow and the full flow test modes will be conducted with flow directed to the EFWST through the pump's recirculation lines.	3. Minimum recirculation flow meets or exceeds the pump vendor's required minimum flow. Full flow from each pump (at least 500 gpm) is returned to the EFWST.
4.a) Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the steam generator(s) against a steam generator feedwater nozzle pressure up to main steam safety valve lift pressure.	4.a) Tests of each EFW pump will be performed to determine system flow vs. steam generator pressure. Analyses will be performed to convert the test results to the design conditions.	4.a) Each EFW pump delivers at least 500 gpm to the steam generator(s) against a steam generator feedwater nozzle pressure of 1217 psia.
4.b) The cavitating flow-limiting venturis limit maximum flow to each SG with both pumps in the Division running against a steam generator pressure of 0 psig.	4.b) Tests will be performed with both pumps in a Division running. Analyses will be used to convert the test results to the conditions of the Design Commitment.	4.b) The maximum flow to each SG is 800 gpm with both pumps running against a steam generator pressure of 0 psig.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Each emergency feedwater storage tank has a volume above the EFW pump suction line penetrations to permit plant cooldown to shutdown cooling entry conditions following the most limiting design basis event.	5. Inspection of the EFWSTs will be performed and the internal volume of each tank available for emergency feed-water will be determined.	5. The internal volume above the EFW pump suction line penetrations of each EFWST is at least 350,000 gallons.
6. The ASME Code Section III EFW components shown on Figure 2.8.8-1 retain their pressure boundary integrity under internal pressures that will be experienced during service.	6. A pressure test will be conducted on those components of the EFW required to be pressure tested by ASME Code Section III.	6. The results of the pressure test of ASME Code Section III components of the EFW conform with the pressure testing criteria in ASME Code Section III.
7.a) Displays of the EFW instrumentation shown on Figure 2.8.8-1 exist in the MCR or can be retrieved there.	7.a) Inspection for the existence or retrieveability in the MCR of instrumentation displays will be performed.	7.a) Displays of the instrumentation shown on Figure 2.8.8-1 exist in the MCR or can be retrieved there.
7.b) Controls exist in the MCR to start and stop the EFW pumps, and to open and close those power operated valves shown on Figure 2.8.8-1.	7.b) Tests will be performed using the EFW controls in the MCR.	7.b) EFW controls in the MCR operate to start and stop the EFW pumps, and to open and close those power operated valves shown on Figure 2.8.8-1.
7.c) EFWS alarms shown on Figure 2.8.8-1 are provided in the MCR.	7.c) Tests of the EFWS alarms shown on Figure 2.8.8-1 will be performed using signals simulating alarm conditions.	7.c) The EFWS alarms shown on Figure 2.8.8-1 actuate in the MCR.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Water is supplied to each EFW pump at a pressure greater than the pump's required net positive suction head (NPSH).	8. Tests to measure EFW pump suction pressure will be performed. Inspections and analyses to determine NPSH available to each pump will be performed based on test data and as-built data.	8. The available NPSH exceeds each EFW pump's required NPSH.
9.a) Within a mechanical Division, the following components are powered from their respective Class 1E Division: the motor-driven EFW pump, the two motor-operated valves in the motor-driven EFW pump's discharge line, and process instrumentation in the motor-driven pump's suction and discharge lines.	9.a) Tests will be performed on the EFW by providing a test signal in only one Class 1E Division at a time.	9.a) Within the EFW, a test signal exists only at the equipment powered from the Class 1E Division under test.
9.b) Within a mechanical Division, the following components are powered from a Class 1E Division different from the Class 1E Division powering the motor-driven EFW pump: the turbine-driven EFW pump electrical controls, the two motor-operated valves in the turbine-driven EFW pump's discharge line,	9.b) Tests will be performed on the EFW by providing a test signal in only one Class 1E Division at a time.	9.b) Within the EFW, a test signal exists only at the equipment powered from the Class 1E Division under test.

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
The motor-operated valve and electrical controls for the pneumatic valve and hydraulic valve in the turbine-driven EFW pump's steam supply line, and process instrumentation in the turbine-driven EFW pump's suction and discharge lines.		
9.c) In each EFW pump's discharge line, each of the two motor-operated valves is powered from a different Class 1E bus in the same Class 1E Division.	9.c) Tests will be performed on the EFW motor-operated valves in each EFW pump discharge line by providing a test signal in only one Class 1E bus at a time.	9.c) A test signal exists only at the EFW motor-operated valve powered from the Class 1E bus under test.
10. The two mechanical Divisions of the EFW are physically separated, except for the cross-connect lines between EFWSTs and between Divisional EFW pump discharge lines.	10. Inspection of as-built mechanical Divisions will be performed.	10. The two mechanical Divisions of the EFW are separated by a Divisional wall or a fire barrier except for the cross-connect lines between Divisional EFW pump discharge lines. Within containment, the EFWS Divisions are separated by spatial arrangement or barriers.
11.a) The EFWS is actuated by an emergency feedwater actuation signal (EFAS) or an alternate feedwater actuation signal (AFAS).	11.a) Testing will be performed by generating a signal simulating an EFAS for its corresponding steam generator. The test will be repeated using a signal simulating an AFAS.	11.a) The motor-driven and turbine-driven pumps start, and the steam generator isolation and flow control valves open, in the Division receiving the signal simulating an EFAS. The same components actuate in response to a signal simulating an AFAS.

TABLE 2.8.8-1 (Continued)

EMERGENCY FEEDWATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11.b) The ESF-CCS includes logic to close the isolation valves and flow control valves when SG water level has risen above a high level setpoint, and to re-open those valves when SG water level drops below a low level setpoint.	11.b) Tests of each EFWS Division will be performed using signals simulating high and low SG water level.	11.b) A signal simulating high SG water level signal closes the SG isolation valves and the flow control valves in its associated Division. A signal simulating low SG water level signal opens the SG isolation valves and the flow control valves in its associated Division.
12. Motor Operated Valves (MOVs) having an active safety function will open and/or close under differential pressure or fluid flow conditions and under temperature conditions.	12. Tests will be performed to open and/or close MOVs having an active safety function under preoperational differential pressure or fluid flow conditions and under temperature conditions.	12. Each MOV having an active safety function opens and/or closes.
13. Check valves shown on Figure 2.8.8-1 will open and/or close under system pressure, fluid flow conditions, or temperature conditions.	13. Tests will be performed to open and/or close check valves shown on Figure 2.8.8-1 under system preoperational pressure, fluid flow conditions, or temperature conditions.	13. Each check valve shown on Figure 2.8.8-1 opens and/or closes.
14. Valves with response positions indicated on Figure 2.8.8-1 change position to that indicated on the Figure upon loss of motive power.	14. A test of loss of motive power to these valves will be performed.	14. These valves change position to the position indicated on Figure 2.8.8-1 on loss of motive power.