ABB
ASEA BROWN BOVERI

February 1, 1993
LD-93-014

Docket 52-002

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

SUBJECT: SYSTEM 80+ Draft ITAAC Submittal

REFERENCE ABB-CE Letter LD-93-012, C. B. Brinkman (ABB-CE) to NRC, dated January 28, 1993

Dear Sirs:

The Reference provided draft SYSTEM 80+ Certified Design Descriptions and associated ITAAC (Inspections, Tests, Analyses and Acceptance Criteria) and stated that a package comprising the remainder of the initial submittal would be transmitted on or about February 1, 1993. Accordingly, additional Certified Design Descriptions and ITAAC are enclosed.

The enclosed packages contain the same elements and reflect the same incorporation of industry guidance as the Reference submittal.

Should you have questions on the enclosed material, please contact me or Mr. John Rec (203-285-2861) or Mr. George Hess (203-285-5218).

Very truly yours,
COMBUSTION ENGINEERING, INC.

C. B. Brinkman
Acting Director
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1.3.6 CORE SUPPORT AND REACTOR VESSEL INTERNAL STRUCTURES

Design Description

The Reactor Vessel Core Support Structures are safety related systems consisting of the Core Support Barrel assembly and Upper Guide Structure assemblies. The core support structures support the fuel assemblies and provide a flow path within the Reactor Pressure Vessel.

Reactor Vessel Internal Structures are all structures within the reactor pressure vessel except the Core Support Structures, fuel, control element assemblies and instrumentation.

The Core Support Barrel (CSB) assembly is suspended from the reactor vessel flange. The CSB assembly provides support and location positioning for the fuel assembly lower end fittings. The CSB assembly contains internal structures that provide an instrumentation guide path from the lower vessel and hydraulic flow paths through the vessel from the inlet nozzles to the upper end of the fuel assemblies.

The Upper Guide Structure (UGS) assembly is supported from the CSB upper flange and extends into the CSB assembly to engage the top of the fuel assemblies. The UGS assembly provides an insertion path for the control element assemblies. The UGS assembly contains internal structures which provide a guide path and lateral support for the upper portion of the control element assemblies and extension shafts in the reactor vessel upper plenum region. The UGS assembly also provides guide paths for heated junction thermocouple assemblies.

A general conceptual illustration of both structures is shown in Figure 1.3.6-1.

The Core Support Barrel and Upper Guide Structure assemblies are fabricated in accordance with ASME Code Class NF requirements and the Seismic Category I classification.

The Reactor Vessel Core support structures and internal structures withstand the effects of flow induced vibration.

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.3.6-1 specifies the inspections, tests, analyses and associated acceptance criteria for the Core Support and Reactor Vessel Internal Structures.

TABLE 1.3.6-1

CORE SUPPORT & REACTOR VESSEL INTERNAL STRUCTURES AND CONTROL ELEMENT DRIVE MECHANISMS
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration of the Reactor Vessel Core Support Structures is shown in Figure 1.3.6-1	1. Inspection of the as-built Reactor Vessel Core Support Structures will be performed.	1. The as-built configuration of the Reactor Vessel Core Support Structures is in accordance with Figure 1.3.6-1 for the components and equipment shown.
2. The Reactor Vessel Core Support Structures and internal structures withstand the effects of flow induced vibration.	2. Tests will be performed to subject the Reactor Vessel Core Support Structure to flow induced vibration. Visual inspection will be performed on the Reactor Vessel Core Support Structure.	2. The reactor vessel core support structures have no visible signs of damage, loose parts, or excessive wear.

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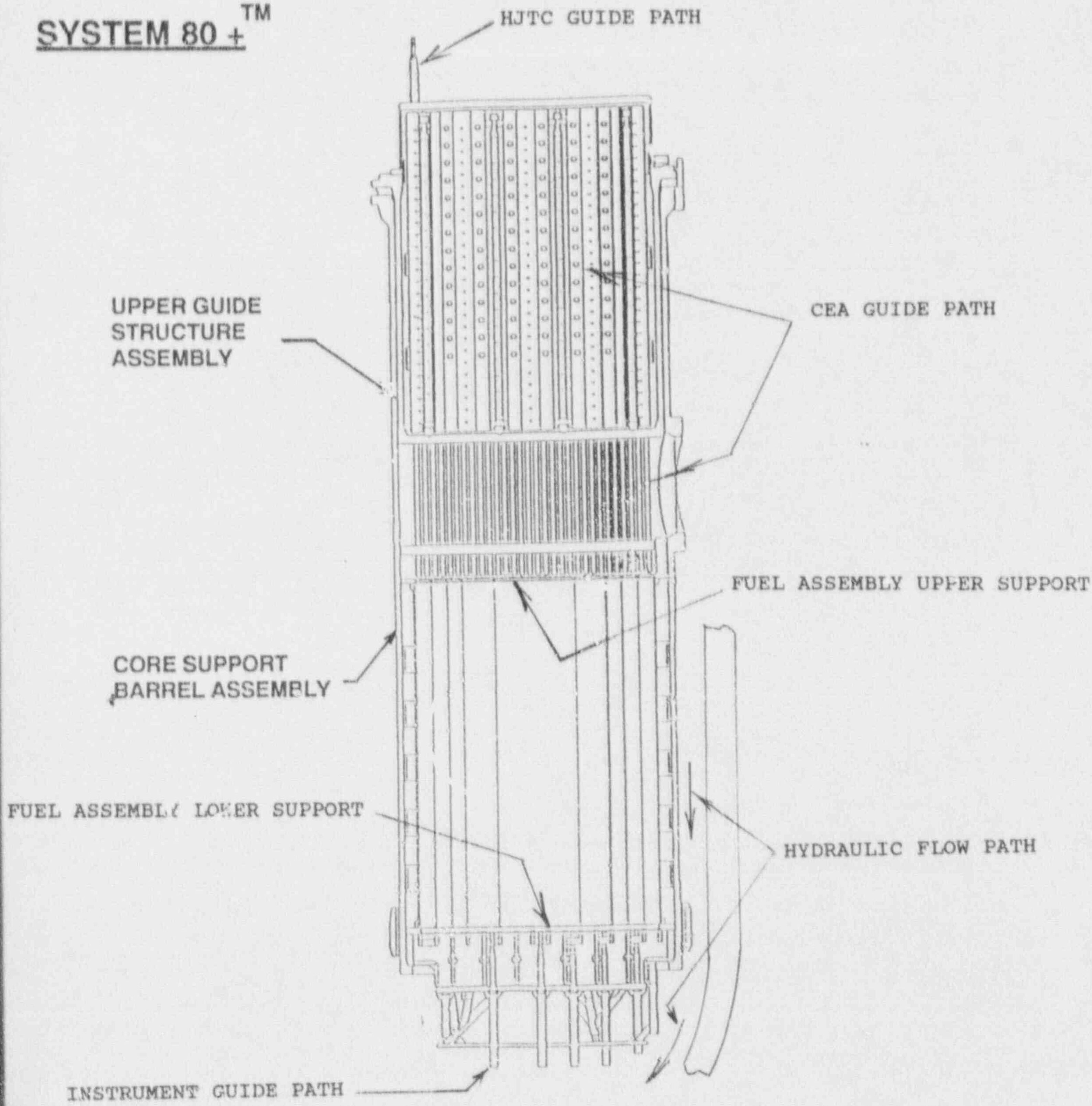


FIGURE 1.3.6-1
REACTOR VESSEL CORE SUPPORT STRUCTURES

1.3.6 CORE SUPPORT AND REACTOR VESSEL INTERNAL STRUCTURES ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   The supporting material would include a description of the CVAP Program which demonstrates compliance with Regulatory Guide 1.20 for a non-prototype Category I program.

   See CESSAR-DC Sections 3.9.2.4 and 3.9.3

2. Relationship of CS and RVIS ITAAC to the Safety Analysis

   None

3. Relationship of CS and RVIS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to CS and RVIS ITAAC

   None

1.3.7 IN-CORE INSTRUMENT GUIDE TUBES

Design Description

The In-core Instrument guide tubes, supports, seal housing and seal table are classified as safety related. A general conceptual illustration of the ICI guide tubes, seal housing, supports and seal table is shown in Figure 1.3.7-1.

The in-core instrument (ICI) guide tubes serve as a guide path and provide support for the self-powered in-core detector assemblies. The ICI guide tubes connect to the bottom of the reactor vessel and terminate in a seal housing assembly, located at the seal table. The reactor coolant pressure boundaries for the guide tubes and seal housings are along their entire length. Pressure retaining seals are installed between the seal housing and the in-core instrument, at the seal housing.

The ICI supports support the ICI guide tubes while also providing tube to tube spacing. The seal table supports the guide tubing and seals the ICI chase from water ingress during refueling.

The ICI guide tubes and seal housing are constructed in accordance with ASME Code, Section III, Class 1 requirements. The ICI supports and seal table are constructed in accordance with ASME Code, Section III, Class 1 requirements. Components designated as ASME Code Class (x) are classified Seismic Category 1.

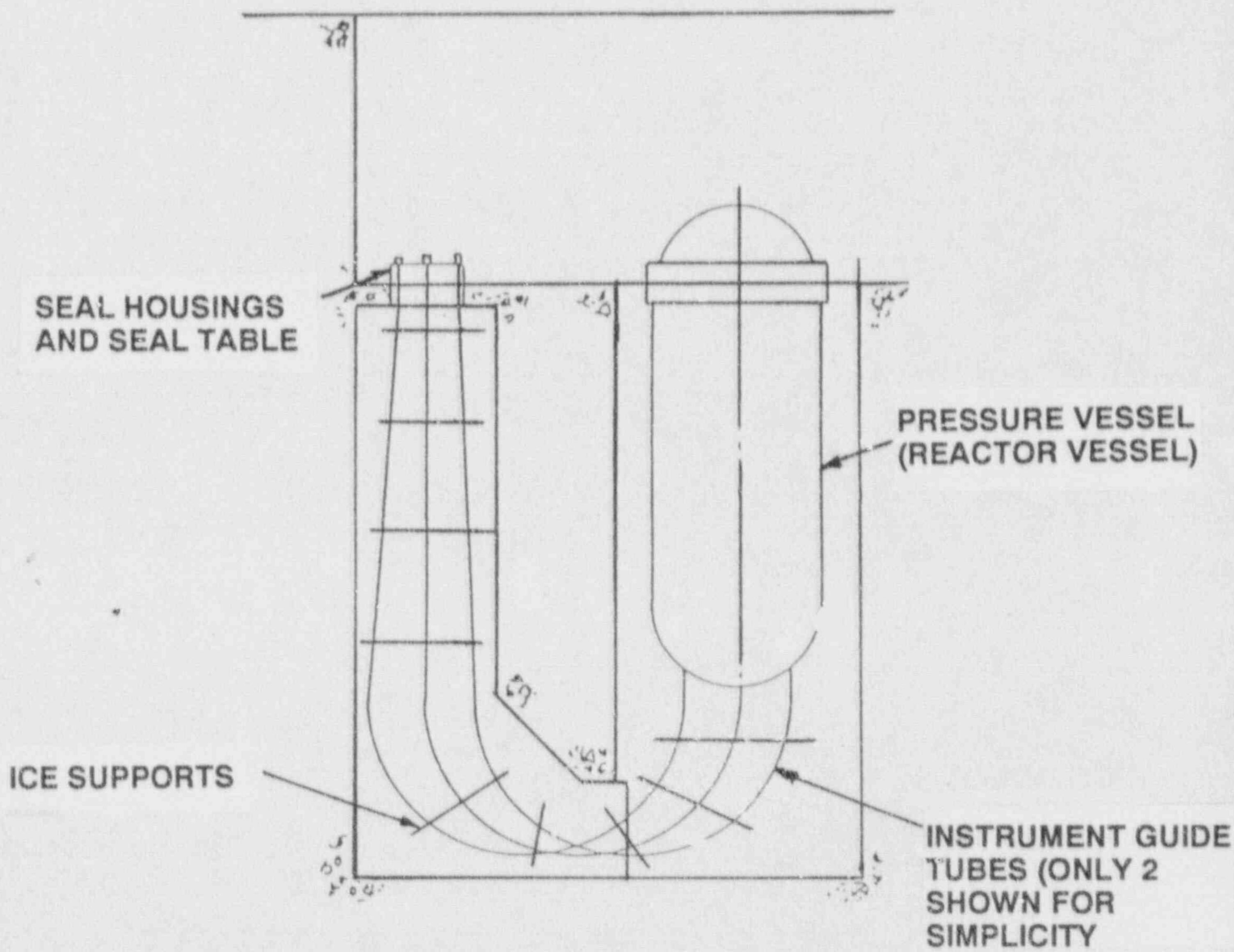
Inspection, Test, Analyses and Acceptances Criteria

Table 1.3.7-1 specifies the inspections, tests, analyses and associated acceptance criteria for the ICI guide tubes.

TABLE 1.3.7-1

IN-CORE INSTRUMENT GUIDE TUBES
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration for the ICI guide tubes, supports, seal housing and seal table is shown in Figure 1.3.7-1.	1. Inspections of the as-built system configuration will be performed.	1. The as-built configuration of the ICI guide tubes, supports, seal housing and seal table is in accordance with Figure 1.3.7-1, for the components and equipment shown.
2. ASME Code portions of the ICI guide tubes and seal housing retain their integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those portions of the ICI guide tubes and seal housing required to be pressure tested by the ASME Code.	2. The results of the pressure test of ASME Code portions of the ICI guide tubes and seal housing conform with the requirements in the ASME Code, Section III.



NOTE:
ICI TUBES, SUPPORTS, SEAL HOUSING AND SEAL TABLE ARE ASME CODE CLASS 1 COMPONENTS

SYSTEM 80+™	IN-CORE INSTRUMENT GUIDE TUBES	FIGURE 1.3.7-1

1.4.4 CONTROL ELEMENT DRIVE MECHANISM PRESSURE BOUNDARY

Design Description

The Control Element Drive Mechanism (CEDM) pressure housings are part of the reactor coolant system pressure boundary and are therefore, safety related.

The CEDM pressure housings are mounted on nozzles located at the top of the reactor vessel closure head. They consist of an upper pressure housing and a motor housing. A general conceptual illustration of the CEDM pressure boundary is shown in Figure 1.4.4-1.

These CEDM housings are fabricated in accordance with ASME Code, Section III, Class 1 for vessels and are classified Seismic Category I.

The materials in contact with the reactor coolant used in the CEDM are corrosion resistant. Pressure boundary components meet the requirements of Sections II, III and IX of the ASME Boiler and Pressure Vessel Code and Code Case N-4-11 (for the motor housing assembly).

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.4.4-1 specifies the inspections, tests, analyses and associated acceptance criteria for the Control Element Drive Mechanism pressure housings.

TABLE 1.4.4-1

CONTROL ELEMENT DRIVE MECHANISM PRESSURE BOUNDARY
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration of the CEDM pressure boundary is shown in Figure 1.4.4-1.	1. Inspection of the as-built CEDM configuration will be performed.	1. The as-built configuration of the CEDM is in accordance with Figure 1.4.4-1, for the components and equipment shown.
2. The CEDM pressure retaining components retain their integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted as required by the ASME Code.	2. The pressure retaining components of the CEDMs meet the ASME Code specified physical examination criteria for ASME Code Section III, Class 1 vessel requirements.

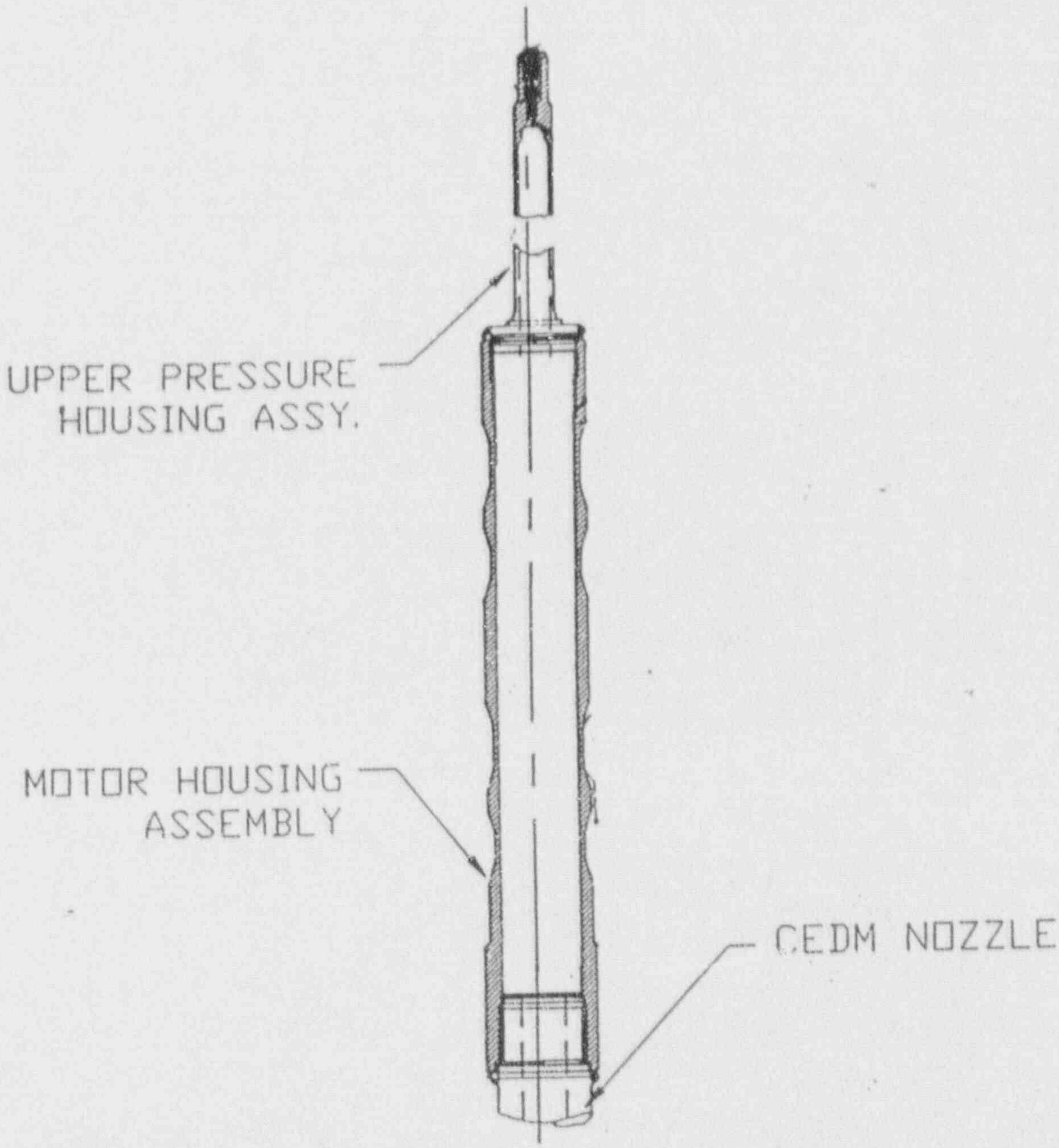


FIGURE 1.4.4-1
CONTROL ELEMENT DRIVE MECHANISM
PRESSURE BOUNDARY

1.4.4 CONTROL ELEMENT DRIVE MECHANISM PRESSURE BOUNDARY ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 4.5.1

2. Relationship of CEDM PRESSURE BOUNDARY ITAAC to the Safety Analysis

   None

3. Relationship of CEDM PRESSURE BOUNDARY ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to NUCLEAR DESIGN ITAAC

   See CESSAR-DC Section 14.2.12.1.37

1.6.2 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 non-condensible gases from the pressurizer (PZR) and the reactor vessel (RV). The rapid depressurization subsystem (RDS) provides a means to rapidly depressurize the RCS by venting the PZR.

The SDS consists of two separate redundant rapid depressurization piping trains from the pressurizer to the in-containment refueling water storage tank (IRWST), and two reactor coolant gas vent piping trains, one from the pressurizer to the reactor drain tank (RDT) and one from the RV to the RDT or IRWST. The RCGVS trains each have parallel branch lines with isolation valves. Figure 1.6.2-1 shows a simplified system configuration.

The RCGVS venting capacity is at least one-half of the RCS volume in one hour.

The SDS is built to the ASME Code Section III Class requirements shown on Figure 1.6.2-1. Components, piping and supports classified as ASME Code Class 1 or 2 are Seismic Category I. Equipment that is designated as safety-related is qualified for the environments where located.

Safety-related SDS valves for each division of the SDS are powered from their respective Classs 1E buses. A single failure will not prevent venting or rapid depressurizing of the RCS, nor prevent isolating a vent or rapid depressurization path.

SDS instrumentation indications and alarms shown on Figure 1.6.2-1 are provided in the control room. Controls are available in the control room to open and close SDS power-operated valves.

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.6.2-1 specifies the inspections, tests, analyses and associated acceptance criteria for the SDS.

TABLE 1.6.2-1

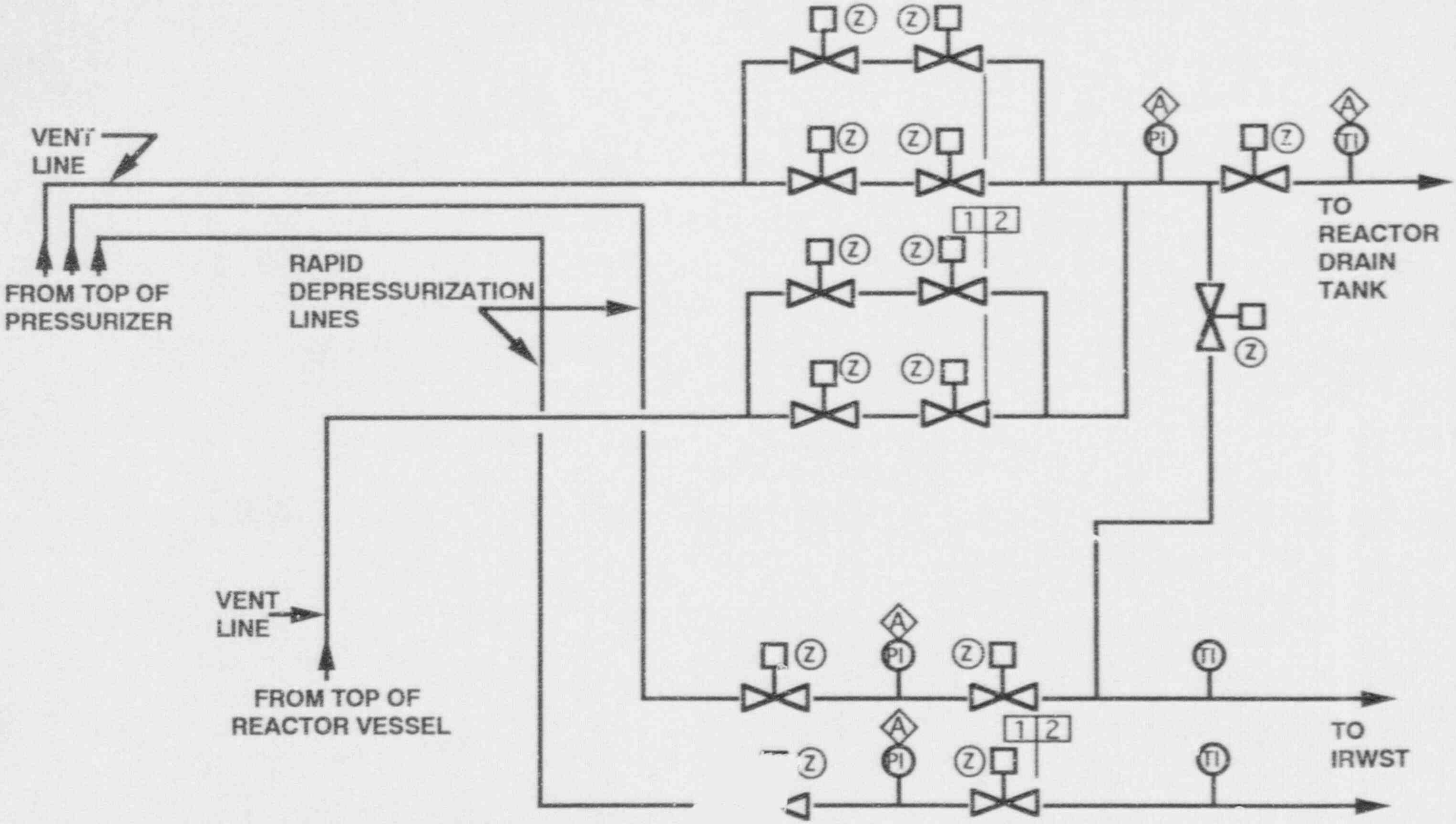
SAFETY DEPRESSURIZATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration of the SDS is shown in Figure 1.6.2-1.	1. Visual inspections of the as-built SDS configuration will be conducted.	1. The as-built configuration of the SDS is in accordance with Figure 1.6.2-1, for the components and equipment shown.
2. ASME Code portions of the SDS retain their integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those portions of the SDS required to be pressure tested by the ASME Code.	2. The results of the pressure test of ASME Code portions of the SDS conform with the requirements in the ASME Code Section III.
3. The SDS provides means to vent non-condensible gases from the RV and PZR.	3. Tests of venting flow paths from the RV and PZR will be performed. Each path will be tested individually.	3. Venting flow paths for RV and PZR pass flow with valves open.
4. The total SDS reactor coolant gas venting capacity is equal to or greater than one half of the RCS volume in one hour.	4. Tests to determine reactor coolant gas vent subsystem flow rate using each RCGVS flow path will be performed. Analyses will be performed to convert the test results to a RCS starting pressure.	4. The Certified Design Commitment is met.

TABLE 1.6.2-1 (Continued)

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

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Safety-related SDS valves described in the Design Description for each division of the SDS are powered from their respective Class 1E busses. A single failure will not prevent venting or rapid depressurizing the RCS, nor prevent isolating a vent or rapid depressurization path.	5. A test of the power availability to the safety-related components will be conducted with power supplied from the permanently installed electrical power buses.	5.a) The RCGVS reactor vessel vent valves are powered from separate Class 1E power system buses. b) The RCGVS pressurizer vent valves are powered from separate Class 1E power busses. c) The RDS valves in a RDS line are powered from different Class 1E power buses than other RDS lines.
6. SDS instrumentation indications and alarms shown on Figure 1.6.2-1 are available in the Control Room. Controls are available in the control room for SDS remote-operated valves.	6. Inspection of the Control Room for the availability of instrumentation indications and alarms identified in the Certified Design Commitment will be performed. Tests will be performed using the SDS controls in the Control Room.	6. The instrumentation indications and alarms shown on Figure 1.6.2-1 exists or can be retrieved in the Control Room. SDS valves can be opened and closed from the Control Room.



NOTES:
- SHOWN IN NORMAL PLANT OPERATION
- ALL ITEMS SHOWN EXCEPT INDICATIONS & ALARMS ARE INSIDE THE CONTAINMENT BUILDING
- IRWST: IN CONTAINMENT REFUELING WATER STORAGE TANK

FIGURE 1.6.2-1
SYSTEM 80+ SAFETY DEPRESSURIZATION SYSTEM

1.6.2 SAFETY DEPRESSURIZATION SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   SDS Description: CESSAR-DC Section 6.7

2. Relationship of SDS ITAAC to the Safety Analysis

   None

3. Relationship of SDS ITAAC to PRA

   1) The RCGVS has vent valves to vent the pressurizer and the head of the reactor vessel.

   2) The vent paths from the pressurizer and reactor vessel discharge to the reactor drain tank.

   3) The vent valves are arranged so that a single failure will not prevent venting of the pressurizer or the reactor vessel.

   4) The vent valves are powered from the Class 1E power system.

   5) Venting of the pressurizer and the reactor vessel can be initiated from the control room.

   6) The Rapid Depressurization System (RDS) or Bleed System has two separate and redundant trains.

   7) Each train of the RDS has two bleed valves in series.

   8) The bleed valves are powered from separate Class 1E buses.

   9) The RDS discharges to the In-Containment Refueling Water Storage Tank (IRWST).

   10) The RDS is manually initiated from the control room.

4. CESSAR-DC Chapter 14 Tests Applicable to SDS ITAAC

   Test Description: CESSAR-DC Section 14.2.12.1.39

1.6.5 SAFETY INJECTION SYSTEM

Design Description

The safety injection system (SIS) is a safety-related system which injects borated water into the reactor vessel to provide core cooling and reactivity control in response to a loss-of-coolant-accident (LOCA) and other events which reduce RCS coolant inventory.

The SIS consists of active and passive injection subsystems, in two separate divisions. The active portion of the SIS consists of four mechanically separated trains, each consisting of a safety injection (SI) pump and associated valves. Each SI pump is provided with a separate suction line from the in-containment refueling water storage tank (IRWST) and a separate discharge line to a direct vessel injection (DVI) nozzle on the reactor vessel. The passive portion consists of four identical pressurized safety injection tanks (SITs), described below. Each SIT discharge line is connected to its associated SI pump discharge line. Figure 1.6.5-1 shows basic system components and their configuration.

The SIS is automatically initiated by a safety injection actuation signal (SIAS). An SIAS starts all four SI pumps and opens all four SI header isolation valves. The SIS can also be manually initiated from the Control Room. SIS indications are provided in the control room to monitor system actuation and operation. Long-term cooling for LOCAs is accomplished by manually realigning the SI pumps for simultaneous hot leg injection and DVI nozzle injection.

The SITs contain borated water pressurized by a nitrogen cover gas. When RCS pressure falls below SIT pressure, water flows from the SIT into the reactor vessel. A remotely operated isolation valve in each SIT discharge line is administratively controlled open. Each SIT isolation valve receives an open signal upon a SIAS. Two remotely operated vent valves are connected to each SIT to lower SIT pressure.

The SIS fluid volumes, flow rates and delivery times provide the SIS with the capacity to deliver coolant to the reactor vessel to cool the core during design basis events. The SIS arrangement provides net positive suction head (NPSH) greater than the pump's required NPSH for the expected fluid temperature conditions during SIS operation. Each SIS pump has a minimum flow recirculation line to the IRWST.

Each SIS division is powered from its associated Class 1E bus.

Power is supplied to the SIS hot leg injection valves such that a single electrical failure cannot cause spurious initiation of hot leg injection flow, nor can a single electrical failure prevent initiation of flow through at least one hot leg injection line.

The SIS is built to the ASME Code Section III (ASME Code) requirements shown in Figure 1.6.5-1. Components, piping and supports classified as ASME Code Class 1, 2, or 3 are Seismic Category I.

SIS equipment that is designated as safety-related is qualified for the environment where located.

Outside of containment, piping trains and containment penetrations for redundant SIS lines (IRWST to pump suction, pump discharge to RCS, SIT discharge to RCS) are physically separated.

The SIS permits system testing at design flow during reactor power operation.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.6.5-1 specifies the inspections, tests, analyses and associated acceptance criteria for the SIS.

TABLE 1.6.5-1

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

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration for the safety injection system (SIS) is shown in Figure 1.6.5-1.	1. Visual inspections of the as-built system configuration will be conducted.	1. The as-built SIS configuration is in accordance with Figure 1.6.5-1.
2. The ASME Code portions of the SIS retain their integrity under internal pressures that will be experienced under service.	2. A pressure test will be conducted on those portions of the SIS required to be hyrdostatically tested by the ASME Code.	2. The results of the pressure test of the ASME Code portions of the SIS conform with the requirements in the ASME Code, Section III.
3.a) A safety injection actuation signal (SIAS) actuates the SIS.	3.a) Testing will be performed by generating a simulated SIAS.	3.a) A SIAS starts the SI pumps and opens the SI header isolation valves and safety injection tank (SIT) isolation valves.
b) The SIS can be manually actuated from the control room.	b) Tests will be performed to manually operate the SI pumps and remote-operated injection valves from the control room.	b) The SI pumps can be started and stopped from the Control Room. The SI header isolation valves and the SIT isolation valves can be opened and closed from the Control Room.
4. Safety-related components described in the Design Description for the SIS are powered from Class 1E busses.	4. A test of the power availability to the safety related components of the SIS will be conducted with power supplied from the permanently installed electric power busses.	4. Safety-related components described in the Design Description for the SIS receive electrical power from Class 1E busses.

TABLE 1.6.5-1 (Continued)

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

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
		4.a) Each SIS division receives power from the Class 1E bus for that division.
		b) Each SIS pump motor receives Class 1E power from a separate Class 1E bus.
		c) The SIS pump control circuits and electrically powered valves for a given train are powered from the same Class 1E bus which provides motive power to the pump motor.
		d) The two SIS pumps in each division are cooled by the associated CCWS division.
5. SIS fluid volumes, flow rates and delivery times provides the SIS with the capacity to deliver coolant to the reactor vessel to cool the core during design basis events.	5.a) SIS functional testing will be performed. Analysis will be performed to convert the test results from the test conditions to the design conditions.	a) Each SI division has a pump-developed pressure differential of 1600 to 2040 psid at the vendor's specified minimum flow rate, and injects 980 to 1232 gpm of borated water into the reactor vessel at atmospheric pressure.
	b) SIS testing will be performed using a simulated safety injection actuation signal.	b) The SIS initiates and begins to deliver flow to the reactor vessel within 40 seconds following receipt of a SIAS.

TABLE 1.6.5-1 (Continued)

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

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	5.c) SIS functional tests will be performed to open the SIT isolation valves using a simulated SIAS with the SITs pressurized and the RCS depressurized. Analysis will be performed to convert the test results from the test conditions to the design conditions.	5.c) SIT isolation valves open on SIAS and the pressurized SITs discharge water to the depressurized RCS. K of the discharge line from the SIT to the reactor vessel = [later] (based on a cross-sectional area of [later]ft ^{2})
	d) Tests will be performed with the system manually aligned for simultaneous DVI and hot leg injection.	d) The SIS injects 980 to 1232 gpm through a hot leg injection line with the RCS at 0 psig by manually realigning one or more SI pumps for hot leg injection.
6. Available NPSH meets or exceeds required pump NPSH for conditions under which the pump must operate.	6. Tests to measure SIS pump suction pressure will be performed. An analysis to determine NPSH available to each SI pump will be prepared based on as-built data.	6. Minimum pump NPSH available, as determined by the analysis, exceeds the pump vendor's NPSH requirements.
7. Outside of containment, piping trains and containment penetrations for redundant SIS lines (IRWST to pump suction, pump discharge to RCS, and SIT discharge to RCS) are physically separated.	7. Walkdown inspections will be performed to verify physical separation of piping trains and containment penetrations for the SIS redundant lines (IRWST to pump suction, pump discharge to RCS, and SIT discharge to RCS).	7. Outside containment, four quadrant building walls separate the SIS piping trains and piping lines (IRWST to pump suction, pump discharge to RCS, and SIT discharge to RCS). Containment penetrations of a SIS train are not located in the same quadrant as any other SIS train.

TABLE 1.6.5-1 (Continued)

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

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. The SIS permits flow system testing and design flow during plant operation.	8. Functional tests with the SIS at design flow will be performed by manually aligning SI flow to the IRWST and manually starting each SI pump.	8. Each SIS pump develops a head of at least [ ] feet when tested at a design flow of at least 815 gpm to the IRWST through each test line.
9. Each SIS pump has a minimum flow recirculation path to the IRWST.	9. The as-built system configuration and installation will be inspected and minimum flow recirculation measured.	9. Minimum flow recirculation rate meets or exceeds the pump vendor's requirements.
10. The safety injection tanks can be depressurized by venting.	10. Tests will be performed with the SITs pressurized and the associated SIT isolation valve shut. Each SIT vent valve will be opened from the control room. This test will be performed for 4 SITs and 8 vent valves.	10. The SIT vent valves can be opened from the control room and the SIT pressure decreases while the SIT is being vented.

NOTE:
ONE OF TWO DIVISIONS SHOWN.

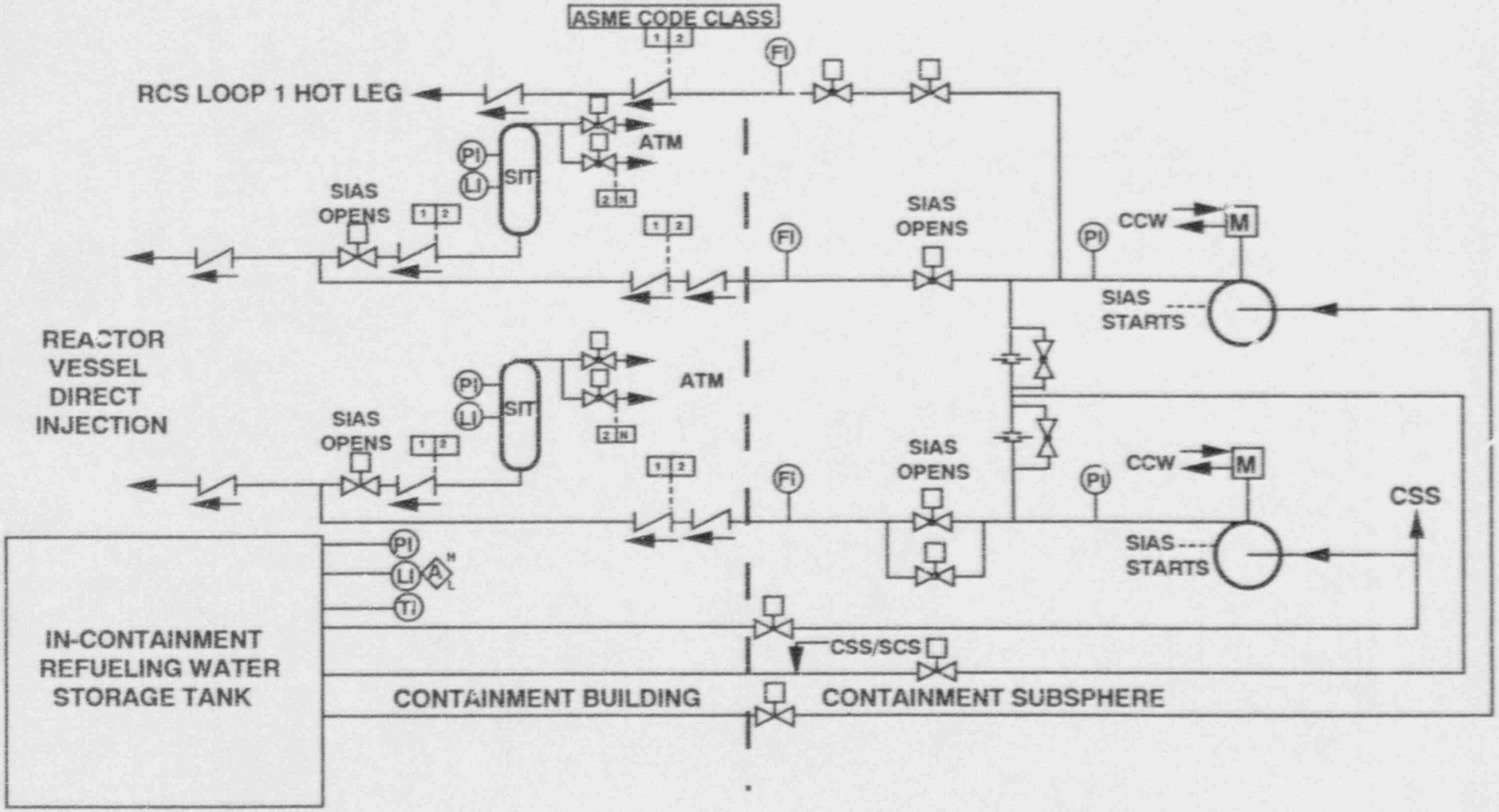


FIGURE 1.6.5-1
SAFETY INJECTION SYSTEM

1.6.5 SAFETY INJECTION SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

The ITAAC test to confirm SIS actuation on a SIAS will be conducted with the SIS in the normal standby lineup, except that the four SIT isolation valves will be closed prior to generating a manual SIAS. The test may be conducted by sequentially testing individual component actuation when the SIAS output relays are energized (i.e., the signal and/or power leads to the other components may be lifted).

The ITAAC test to determine system flow will be conducted by operating one SI pump at a time. Each pump will be tested in two flow configurations: First, flow will be aligned to the IRWST through the recirculation line and the associated SI header isolation and hot leg injection valves will be shut. Second, flow will be aligned to the reactor vessel with the vessel head removed and the hot leg injection valves shut. For both tests, the minimum flow line will be open. The analysis to convert the test results will correct for inaccuracy of the instruments used to measure flow, and the difference between reactor vessel backpressure during the test and atmospheric pressure.

The ITAAC test to confirm SIT discharge to the reactor vessel will be conducted for each SIT. The SIT will be pressurized to at least ___ psi greater than reactor vessel pressure. The associated SIT isolation valve will be opened and the time to discharge the contents of the SIT to the reactor vessel will be measured. The rate of SIT discharge and the pressure differential between the SIT and the reactor vessel will be used in an analysis to calculate the effective flow resistance of the line between the SIT and RV then convert the results to the K-factor assumed in the safety analysis.

The ITAAC to confirm SIS component arrangement and sizing will include the following: a) IRWST volume above the SI pump suction penetrations in containment is not less than 495,000 gallons; b) SIT internal volume is not less than 2406 cubic feet per tank; c) SIT discharge nozzle outlet elevation above the reactor vessel direct vessel injection nozzle centerline is 0 to 25 feet.

The ITAAC to confirm hot leg injection flow rate will be conducted for the two SI pumps which can inject to the hot leg.

The ITAAC to confirm adequate pump NPSH will include a test with the following conditions: suction will be taken from the IRWST (with the containment spray pump which shares the suction line with the SI pumps also running, recirculating to the IRWST). Correct the measured suction head for the IRWST minimum level and the maximum IRWST fluid temperature following a design basis event, and containment at atmospheric pressure.

The ITAAC for SI pump minimum flow will include a test of operation at minimum flow until the temperature of the recirculation fluid stabilizes.

See CESSAR-DC Section 6.3 for a discussion of the SIS.

2. Relationship of SIS ITAAC to the Safety Analysis

1. **Basis:** Flow rate to a reactor vessel direct vessel injection nozzle from one SI pump, with RCS at 0 psig = 980 gpm to 1232 gpm.

   ITAAC: ITAAC 5 confirms the safety injection flow rate with the RCS at 0 psig.

2. **Basis:** Each SI division has a pump-developed differential pressure of 1600 to 2040 psid at the pump vendor's specified minimum recirculation flow rate.

   ITAAC: ITAAC 5 confirms the differential pressure developed by each SI pump at minimum recirculation flow.

3. **Basis:** Maximum delay time for safety injection actuation following SIAS = 40 seconds.

   ITAAC: ITAAC 5 confirms the safety injection actuation time.

4. **Basis:** Total number of safety injection tanks = 4.

   ITAAC: ITAAC 1 confirms the SIS configuration with 4 SITs.

5. **Basis:** SIT discharge line K factor to Reactor Vessel = 4.5 to 30 (based on a reference area of 0.6827 square feet).

   ITAAC: ITAAC 5 confirms the K factor of the SIT discharge line to the reactor vessel.

3. Relationship of SIS ITAAC to PRA

1) The Safety Injection System (SIS) has four redundant trains arranged in two independent divisions.

2) The two SIS divisions are completely physically separated from each other outside containment.

3) Each SIS train consists of one SIS pump and its associated valves, piping, and instrumentation.

4) Each SIS division receives Class 1E power from the Class 1E bus for that division.

5) Each SIS pump motor receives Class 1E power from a separate Class 1E bus.

6) The SIS pump control circuits for a given train are powered from the Class 1E bus associated with the Class 1E bus which provides motive power to the pump motor.

7) The motor operated valves associated with a given SIS train receive Class 1E power from Motor Control Centers powered from the Class 1E bus which provides power to the SIS pump motor in that train.

8) Each SIS pump train has an independent suction line connection to the IRWST.

9) The two SIS pumps in each division are cooled by the associated CCWS division.

10) The Engineered Safety Features Actuation System (ESFAS) sends a Safety Injection Actuation Signal (SIAS) to start the SIS pumps and open the SIS valves.

11) Installed instrumentation provides the capability to monitor the performance of the system and the major components from the control room.

4. CESSAR-DC Chapter 14 Tests Applicable to SIS ITAAC

See CESSAR-DC Section 14.2.12.1.22, .23, .61.

1.6.6 CONTAINMENT ISOLATION SYSTEM

Design Description

The Containment Isolation System is a safety-related system that provides the means to close valves in fluid system piping that passes through Containment penetrations.

The Containment Isolation System provides a double barrier at the containment penetrations.

Those valves required to close for containment integrity following a design basis event are closed automatically by an engineered safety features (ESF) actuation signal.

Fluid system lines which must remain open subsequent to a design basis event do not have containment isolation valves that are automatically closed by an ESF actuation signal. Each of these penetrations has a minimum of one manual remotely operated isolation valve outside containment.

Valves that receive an ESF actuation signal close within the time allocated to the function performed.

Redundant containment isolation devices which require electrical power are provided electrical power from different Class 1E buses. Redundant containment isolation device controls which require electrical power receive power from different Class 1E buses. Pneumatic valve operators for containment isolation valves have a failure position assigned by their required safety function.

A means to leak test containment is provided. The containment pressurization penetration used for leak rate testing consists of an inside containment blind flange and an outside containment manual isolation valve.

Containment isolation valves perform their safety related function in the environmental conditions in the areas in which they are located. Containment isolation valves and interconnecting piping are designed and constructed to ASME Code Class 2 and Seismic Category I requirements.

Isolation valves inside the containment are located between the crane wall and the inside containment wall. Structural steel and/or concrete structures or walls are provided as barriers for containment isolation devices outside containment.

The isolation arrangement of the fuel transfer tube consists of a transfer tube closure and a blind flange enclosing the transfer tube. The transfer tube closure and the blind flange provide the containment boundary.

The equipment hatch has a double seal arrangement which provides the containment boundary.

Electrical penetrations consist of sealed electrical penetration assemblies. Electrical penetrations are tested when containment is pressurized.

Instrumentation and control sensing lines which penetrate the containment are provided with containment isolation provisions.

Remotely operated containment isolation valves can be controlled and have position indication available in the Control Room.

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.6.6-1 specifies the inspections, tests, and/or associated acceptance criteria of the Containment Isolation System.

TABLE 1.6.6

CONTAINMENT ISOLATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Containment Isolation System provides a double barrier at the containment penetrations.	1. An inspection of as-built containment isolation and piping will be performed.	1. Each containment penetration is provided with at least two isolation devices; one device inside containment and one outside containment.
2. Those valves required to close for containment integrity following a design basis event are closed automatically by an engineered safety features (ESF) actuation signal.	2. A test of the isolation function will be performed using an actual or a simulated ESF signal.	2. Valves close automatically upon receipt of an ESF actuation signal (actual or simulated).
3. Fluid system lines which must remain open subsequent to a design basis event: a) do not have containment isolation valves that receive an ESF actuation signal. b) have penetrations with a minimum of one manual remotely operated isolation valve outside containment.	3. An inspection of as-built containment isolation valves and interconnecting piping will be performed.	3. Fluid system lines which must remain open: a) do not have containment isolation devices that receive an ESF actuation signal. b) are provided with a minimum of one manual remotely operated isolation valve outside containment.
4. Valves that receive an ESF actuation signal close within the time allocated to the function performed.	4. Testing of the closure times of automatically actuated containment isolation valves will be performed using actual or simulated ESF actuation signals.	4. Each valve closes within its allotted time upon receipt of an actual or simulated ESF actuation signal.

TABLE 1.6.6-1 (Continued)

CONTAINMENT ISOLATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. Pneumatic valve operators for containment isolation valves have failure position assigned by their required safety function.	5. Testing will be conducted to simulate loss of pneumatic conditions to observe the response of valves having an instrument air supply.	5. Each pneumatic valve operator positions its valve to its fail safe position.
6. Redundant containment isolation devices which require electrical power are provided electrical power from different Class 1E buses. Redundant containment isolation device controls which require electrical power receive power from different Class 1E buses.	6. A test of power availability to the containment isolation devices will be conducted with power supplied from the permanently installed electric power buses.	6. The Certified Design Commitment is met.
7.a) Containment isolation valves and interconnecting piping are designed and constructed to ASME Code Class 2.	7.a) An inspection of as-built containment isolation valves and interconnecting piping will be performed.	7.a) The pressure retaining components of the Containment Isolation System meet the ASME Code specified physical examination criteria for ASME Code Class 2 components.
b) ASME Code portions of the CIS retain their integrity under internal pressures that will be experienced during service.	b) A pressure test will be conducted on those portions of the CIS required to be pressure tested by the ASME code.	b) The results of the pressure test of ASME code portions of the CIS conform with the requirements in the ASME Code Section III.

TABLE 1.6.6-1 (Continued)

CONTAINMENT ISOLATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Isolation valves inside the containment are located between the crane wall and the inside containment wall.	8. An inspection of as-built containment isolation valves and interconnecting piping will be performed.	8. The Certified Design Commitment is met.
9. Structural steel and/or concrete structures or walls are provided as barriers for containment isolation devices outside containment.	9. An inspection of as-built containment isolation valves and interconnecting piping will be performed.	9. Structural steel and/or concrete structures or walls exist as barriers for containment isolation devices outside containment.
10. The isolation arrangement of the fuel transfer tube consists of a transfer tube closure and a blind flange enclosing the transfer tube.	10. An inspection of the as-built fuel transfer tube components will be performed.	10. The fuel transfer tube consists of a transfer tube closure valve and a blind flange.
11. The equipment hatch has a double seal arrangement which provides the containment boundary.	11. An inspection of the as-built equipment hatch components will be performed.	11. Two pressure seals are provided in each equipment hatch.
12. Electrical penetrations consist of sealed electrical penetration assemblies.	12. An inspection of the as-built electrical penetrations will be performed.	12. Gas-sealed or double o-ring sealed electrical penetration assemblies are installed.
13. Instrumentation and control sensing lines which penetrate the containment are provided with containment isolation provisions.	13. An inspection of the as-built instrumentation and control sensing line penetrations will be performed.	13. Instrumentation and control sensing lines which penetrate the containment have a minimum of two isolation devices installed.

TABLE 1.6.6-1 (Continued)

CONTAINMENT ISOLATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. Remotely operated containment isolation valves can be controlled and have position indication available in the control room.	14. Tests of containment isolation valve controls and position indications will be performed.	14. Remotely operated containment isolation valves can be opened and closed from the control room. Position indication for these valves exist or can be retrieved in the control room.

1.6.6 CONTAINMENT ISOLATION SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   Amplifying information on acceptance testing for containment isolation valves and actuators is provided in CESSAR-DC Table 6.2.4-1. Containment isolation valve arrangements are presented in more detail in CESSAR-DC Figure 6.2.4-1.

2. Relationship of Containment Isolation ITAAC to the Safety Analysis

   Although the safety analyses described in CESSAR-DC Chapter 15 make no direct reference to the Containment Isolation System, system function is an integral part of the SYSTEM 80+™ engineered safety features described in CESSAR-DC Chapter 6. The Containment Isolation System provides the means of isolating fluid systems that pass through containment penetrations such that any radioactivity that may be released into the containment following a postulated design basis accident will be confined. The safety related functions of the Containment Isolation System are fully described in CESSAR-DC Section 6.2.4; the safety evaluation of the system is presented in CESSAR-DC Section 6.2.4.3.

3. Relationship of Containment Isolation ITAAC to PRA

   Containment Isolation System configuration is as identified in CESSAR-DC Table 6.2.4-1, including signal, normal valve position, and fail position. Assume leak tightness of electrical penetrations will be at least as good as current industry electrical penetrations. For all penetrations, the sealant material will be chosen to have good high temperature stability. Assume containment equipment hatch, personnel airlocks, and fuel transfer tube flange will be of the seal-under-pressure design.

4. CESSAR-DC Chapter 14 Tests Applicable to SSWS ITAAC

   The following pre-operational tests are required of the Containment Isolation System:

Test Description	CESSAR-DC Section
Containment Isolation Valves (CIVs) Test	14.2.12.1.135

   Containment isolation valves are tested for leakage in accordance with 10 CFR Part 50, Appendix J. This test is designed to verify that the measured leakage through each containment penetration isolation valve, when summed with the total of all other Type B and C Leak Rate Tests, is within the limits stated in the Technical Specifications. In addition, each containment isolation valve test leakage is compared

against the leakage acceptance criteria for the particular valve, which is based on valve seat diameter in accordance with ASME Code OM Part 10.

In addition, each Containment Isolation Valve test leakage is compared against the leakage acceptance criteria for the particular valve, which is based on valve seat diameter in accordance with ASME Code OM Part 10.

Containment Isolation Valves Test 14.2.12.1.140

This test is designed to demonstrate that containment isolation valves can be operated manually and operate in response to automatic actuation, to verify that upon loss of actuating power, the valves fail as designed, and to verify that all valves operate in less than the time specified in the plant technical specification.

1.6.7 CONTAINMENT SPRAY SYSTEM

Design Description

The Containment Spray System (CSS) is a safety-related system which removes heat and iodine from the containment atmosphere and transfers the heat to the component cooling water system, following events which increase containment temperature and pressure. The CSS can also remove heat from the in-containment refueling water storage tank (IRWST). The CSS has two separate and redundant divisions. Each CSS division has the heat removal capacity to cool and depressurize the containment atmosphere, such that containment design temperature and pressure are not exceeded following a loss of coolant accident or main steam line break.

Each CSS division has a CSS pump, a CSS heat exchanger, valves, and connecting piping. Figure 1.6.7-1 shows a simplified system configuration.

The CSS is built to the ASME Code Section III class requirements shown on Figure 1.6.7-1. Components, piping, and supports classified as ASME Code Class 2 are Seismic Category I. Equipment that is designated as safety-related is qualified for the environments where located.

CSS instrumentation indications and alarms shown on Figure 1.6.7-1 are available in the control room. The CSS pumps are started upon receipt of a safety injection actuation signal (SIAS). The isolation valve to the CSS spray header and nozzles is opened upon receipt of a containment spray actuation signal (CSAS). Controls are available in the control room to start and stop the CSS pumps and open and close the remote-operated valves shown on Figure 1.6.7-1. Flow to the spray nozzles begins within [later] seconds after receipt of a CSAS.

The CSS header isolation valves are capable of opening against a differential pressure at least equal to the maximum CSS pump discharge pressure. Water is supplied to each CSS pump at a pressure greater than the net positive suction head (NPSH) required.

The CSS pump and the Shutdown Cooling System (SCS) pump in a division are connected by piping and valves such that one pump can perform the other's function. The piping and valves in the CSS/SCS pump suction cross-connect line permit flow in either direction.

Safety-related CSS components for each division are powered from their respective Class 1E bus.

A flow recirculation line around each CSS pump provides a minimum flow recirculation path. A piping line from downstream of the heat exchangers to the IRWST allows testing of the pumps at design flow during plant operation. The CSS limits maximum flow in each division.

Outside containment, the two mechanical divisions of the CSS are separated by the divisional barrier wall.

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.6.7-1 specifies the inspections, tests, analyses and associated acceptance criteria for the CSS.

TABLE 1.6.7-1

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration for the CSS is shown in Figure 1.6.7-1.	1. Visual inspections of the as-built CSS configuration will be performed.	1. The as-built configuration of the CSS is in accordance with Figure 1.6.7-1 for the components and equipment shown.
2. Water is supplied to each CSS pump at a pressure greater than the net positive suction head (NPSH) required.	2. Tests to measure CSS pump NPSH will be performed. An analysis to determine NPSH available to each pump will be prepared based on test data, and as-built data.	2. The calculated available NPSH exceeds CSS pump NPSH required by the vendor for the pump.
3. Safety-related CSS components for each division are powered from their respective Class 1E busses.	3. A test of the power availability to the components described in the Design Description for the CSS will be conducted with power supplied from the permanently installed electrical power buses.	3.a) The CSS pump motor in each division is powered from one of the two Class 1E buses for that division. Each CSS pump derives its control power from the same Class 1E bus that provides motive power to the CSS pumps.
		b) The CSS pump motor in each division is not powered from the same Class 1E bus as the SCS pump motor in that division.
		c) The motor power for CSS valves in a division is derived from the same Class 1E bus that provides power to the CSS pump motor for that division.

TABLE 1.6.7-1 (Continued)

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. CSS instrumentation indications and alarms shown on Figure 1.6.7-1 are available in the Control Room. Controls are available in the control room to start and stop the pumps, and open and close the CSS remotely-operated valves shown in Figure 1.6.7-1.	4. Inspection of the Control Room for the availability of the CSS instrumentation indications and alarms will be performed. Tests will be performed using the CSS controls in the Control Room.	4. The instrumentation indications and alarms shown on Figure 1.6.7-1 exist or can be retrieved in the Control Room. CSS controls operate as specified in the Certified Design Commitment.
5.a) Each CSS division has the heat removal capacity to cool the containment atmosphere such that containment design temperature and pressure are not exceeded following a LOCA or MSLB.	5.a) Tests of as-built CSS configuration to measure the containment spray flow at the discharge of the CSS pump will be performed.	5.a) Each CSS pump develops at least [ ] feet of head when the CSS flow through the CSS heat exchanger is at least 5000 gpm.
	b) Functional tests of the CSS will be performed using a simulated CSAS. The test results will be converted by analysis to a delay time for spray initiation.	b) Flow to the spray nozzles begins within [ ] seconds after receipt of a CSAS.
6. ASME Code portions of the CSS retain their integrity under internal pressures that will be experienced during service.	6. A pressure test will be conducted on those portions of the CSS required to be pressure tested by the ASME Code.	6. The results of the pressure test of ASME Code portions of the CSS conform with the requirements in the ASME Code Section III.
7. A piping line from downstream of the CSS heat exchangers to the IRWST allows testing of the CSS pumps at design flow during plant operation.	7. Tests of the as-installed CSS will be performed by manually aligning suction and discharge valves to the IRWST and starting the CSS pumps manually.	7. The CSS pumps can be tested at flow rates up to 5000 gpm each.

TABLE 1.6.7-1 (Continued)

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. The CSS pump and the SCS pump in a division are connected by piping and valves such that one pump can perform the other's function. The piping and valves in the CSS/SCS pump suction cross connect line permit flow in either direction.	8. An inspection of the as-built piping will be performed. Functional testing using the CSS/SCS suction cross-connect line and the discharge cross connect line will be performed.	8. The CSS and SCS pumps suctions and discharges are cross-connected by lines. The valve(s) in the SCS/CSS pump suction cross-connect lines are not check valves.
9. A flow recirculation line around each CSS pump provides a minimum flow recirculation path.	9. The as-built system configuration will be inspected and minimum flow recirculation rate verified by a minimum flow measurement test.	9. Minimum flow recirculation rate meets or exceeds the pump vendor's requirements.
10. The CSS limits the maximum flow in each division.	10. Functional tests will be performed with flow aligned to the IRWST. Records of the as-built spray header will be reviewed. Analyses will convert the test flow rates to the maximum expected flow rate.	10. The CSS maximum flow is less than or equal to 6500 gpm in each division.
11. The CSS header isolation valves are capable of opening against a differential pressure at least equal to the maximum CSS pump discharge pressure.	11. Test to open the CSS header isolation valve with the CSS pump operating will be performed. Each division will be tested.	11. The CSS header isolation valves open with the CSS pump operating.
12. The CSS pumps are started upon receipt of a SIAS.	12. Test will be performed using a simulated SIAS.	12. The CSS pumps start upon receiving a simulated SIAS.

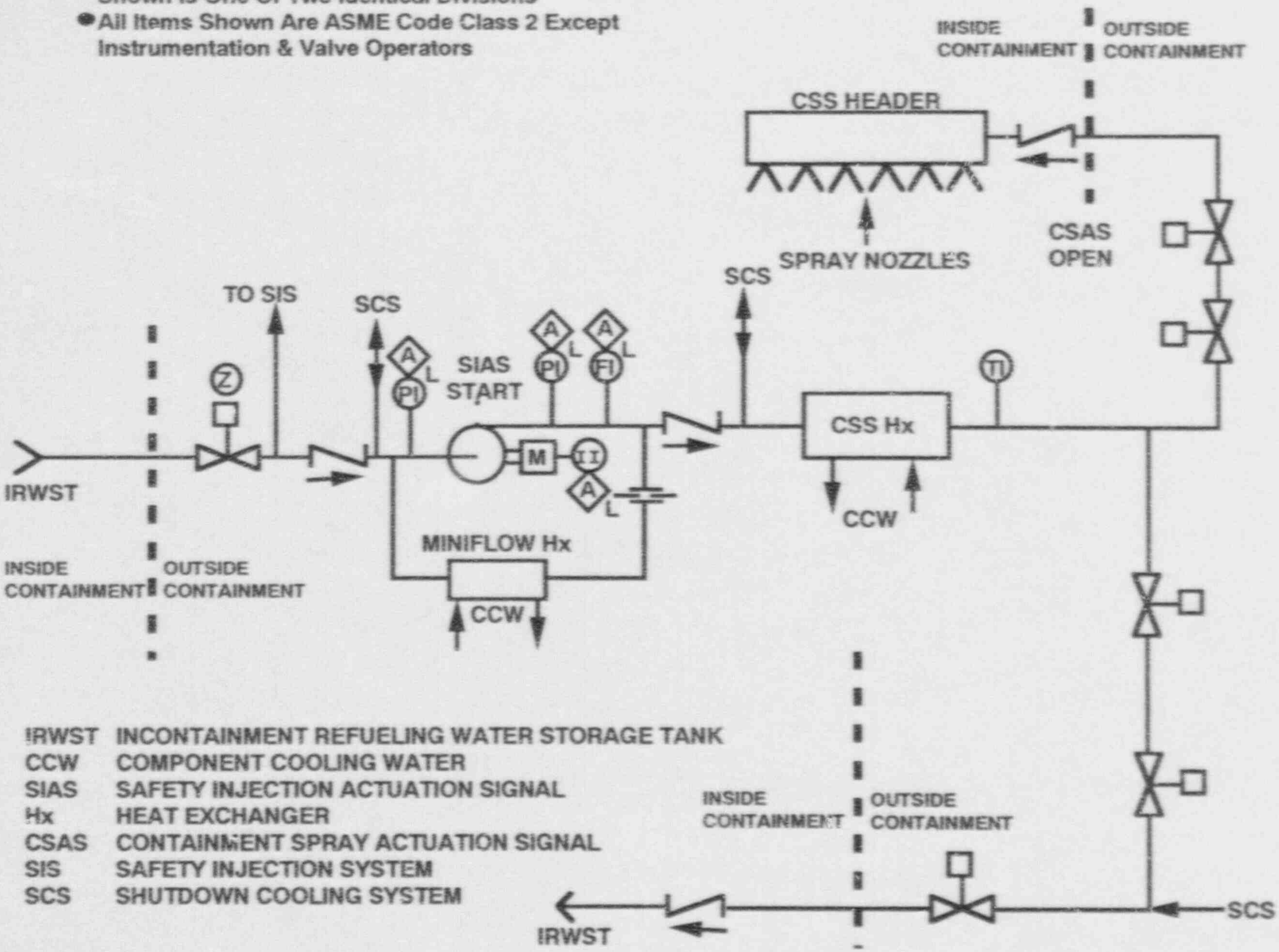
TABLE 1.6.7-1 (Continued)

CONTAINMENT SPRAY SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. The CSS isolation valve in each division to the CSS spray header and nozzles is opened upon receipt of a CSAS.	13. Test will be performed using a simulated SIAS.	13. The CSS isolation valve to the CSS spray header and nozzles opens upon receipt of a simulated CSAS.

Notes:

- Shown Is One Of Two Identical Divisions
- All Items Shown Are ASME Code Class 2 Except Instrumentation & Valve Operators



IRWST	INCONTAINMENT REFUELING WATER STORAGE TANK
CCW	COMPONENT COOLING WATER
SIAS	SAFETY INJECTION ACTUATION SIGNAL
Hx	HEAT EXCHANGER
CSAS	CONTAINMENT SPRAY ACTUATION SIGNAL
SIS	SAFETY INJECTION SYSTEM
SCS	SHUTDOWN COOLING SYSTEM

FIGURE 1.6.7-1
SYSTEM 80+ CONTAINMENT SPRAY SYSTEM

1.6.7 CONTAINMENT SPRAY SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

CSS Description: CESSAR-DC Section 6.5

2. Relationship of CSS ITAAC to the Safety Analysis

Basis: The CSS pumps are started on receipt of a SIAS

ITAAC: ITAAC 12 confirms that the CSS pumps are started on receipt of a SIAS.

Basis: The CSS isolation valve in each division to the spray header opens on receipt of a CSAS.

ITAAC: ITAAC 13 confirms that the CSS isolation valve in each division to the spray header opens on receipt of a CSAS.

3. Relationship of CSS ITAAC to PRA

1) The Containment Spray System (CSS) has two independent redundant divisions for supplying containment spray flow.

2) Each CSS division has one CSS pump and one CSS heat exchanger.

3) The CSS pump in each division is normally aligned to deliver flow from the IRWST to the Spray header for that division.

4) The CSS pump in each division can be manually aligned to back up the SCS pump in that division for shutdown cooling operation.

5) The crossover valve between the inlet to the CSS heat exchanger and the SCS heat exchanger in a given division is capable of passing flow in either direction.

6) The CSS pump and heat exchanger in each division can be aligned to discharge back to the IRWST to provide IRWST inventory cooling.

7) The CSS pump's NPSH is adequate to prevent pump cavitation and failure if the IRWST inventory is saturated.

8) Installed instrumentation provides the capability to monitor CSS flow rates and the performance of major components. This instrumentation provides positive indication that pumps have started and valves have actuated properly.

9) The CSS pump discharge line in each division has a mini-flow line back to the CSS suction to prevent damaging the CSS pump in that division by operating it against a closed line. The valves in this line are normally open.

10) The CSS interfaces with the CCWS to remove energy from the IRWST inventory.

11) The CSS pumps are automatically started by an SIAS from the ESFAS on high containment pressure or low PZR pressure. The CSAS is initiated by a coincident two-out-of-four high-high containment pressure condition. The CSS valves are automatically actuated by the same CSAS.

12) The CSS can be manually started for spray operation from the control room.

13) Installed instrumentation provides the capability to monitor the performance of the system and the major components from the control room.

4. CESSAR-DC Chapter 14 Tests Applicable to CSS ITAAC

Pre-operational Tests: CESSAR-DC Section 14.2.12.1.40

1.9.1.3 SPENT FUEL POOL COOLING AND CLEANUP SYSTEM

Design Description

The pool cooling and purification system (PCPS) removes heat generated by the stored spent fuel assemblies in the spent fuel pool water, and pumps spent fuel pool, refueling pool, and fuel transfer canal water through filters and ion exchangers.

The PCPS consists of a safety-related spent fuel pool cooling subsystem (SFPCS) and a non-safety related pool purification subsystem. The spent fuel pool cooling subsystem includes two redundant divisions, each with a pump, a heat exchanger, and associated valves, piping, controls, and instrumentation. Each division is provided with a separate suction line from, and a separate return line to, the spent fuel pool. A cross-connect line with manual isolation valves between the pump discharge lines is provided to allow either pump to be used with either heat exchanger. The pool purification subsystem is connected to suction lines from the refueling pool, spent fuel pool, and fuel transfer canal, and to return lines to the refueling pool and spent fuel pool. A makeup line from the chemical and volume control system (CVCS) supplies makeup water to the spent fuel pool. Figure 1.9.1.3-1 shows a simplified system configuration.

The PCPS has at least the capacity to remove heat generated in the spent fuel pool by the fuel assemblies of a full core offload plus ten years of irradiated fuel. For this heat load, the PCPS can maintain pool bulk temperature at or below 140 F with two cooling trains operating, and at or below 180 F with one train operating. Heat from the spent fuel pool is transferred to the component cooling water system (CCWS) in the spent fuel cooling heat exchangers.

The PCPS includes provisions to prevent gravity draining of the spent fuel pool and refueling pool: the spent fuel pool cooling suction connections are located at least 10 feet above the stored spent fuel, and anti-siphon devices are provided in the lines for spent fuel pool cooling return, spent fuel pool purification suction and return, and refueling pool purification suction and return.

Water is supplied to each spent fuel pool cooling pump at a pressure greater than the net positive suction head (NPSH) required.

The PCPS is built to ASME Code Section III Class requirements shown on Figure 1.9.1.3-1. Components, piping and supports classified as ASME Code Class 2 or 3 are Seismic Category I.

PCPS instrumentation indications and alarms shown on Figure 1.9.1.3-1 are available as noted on the figure. Controls are available in the control room to start and stop the spent fuel pool cooling pumps.

The spent fuel pool cooling pumps are supplied from the Class 1E electrical distribution busses.

The two mechanical divisions of the spent fuel pool cooling subsystem are physically separated except for the cross-connect line between divisional pump discharge lines.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.9.1.3-1 specifies the inspections, tests, and analyses and associated acceptance criteria for the PCPS.

TABLE 1.9.1.3-1

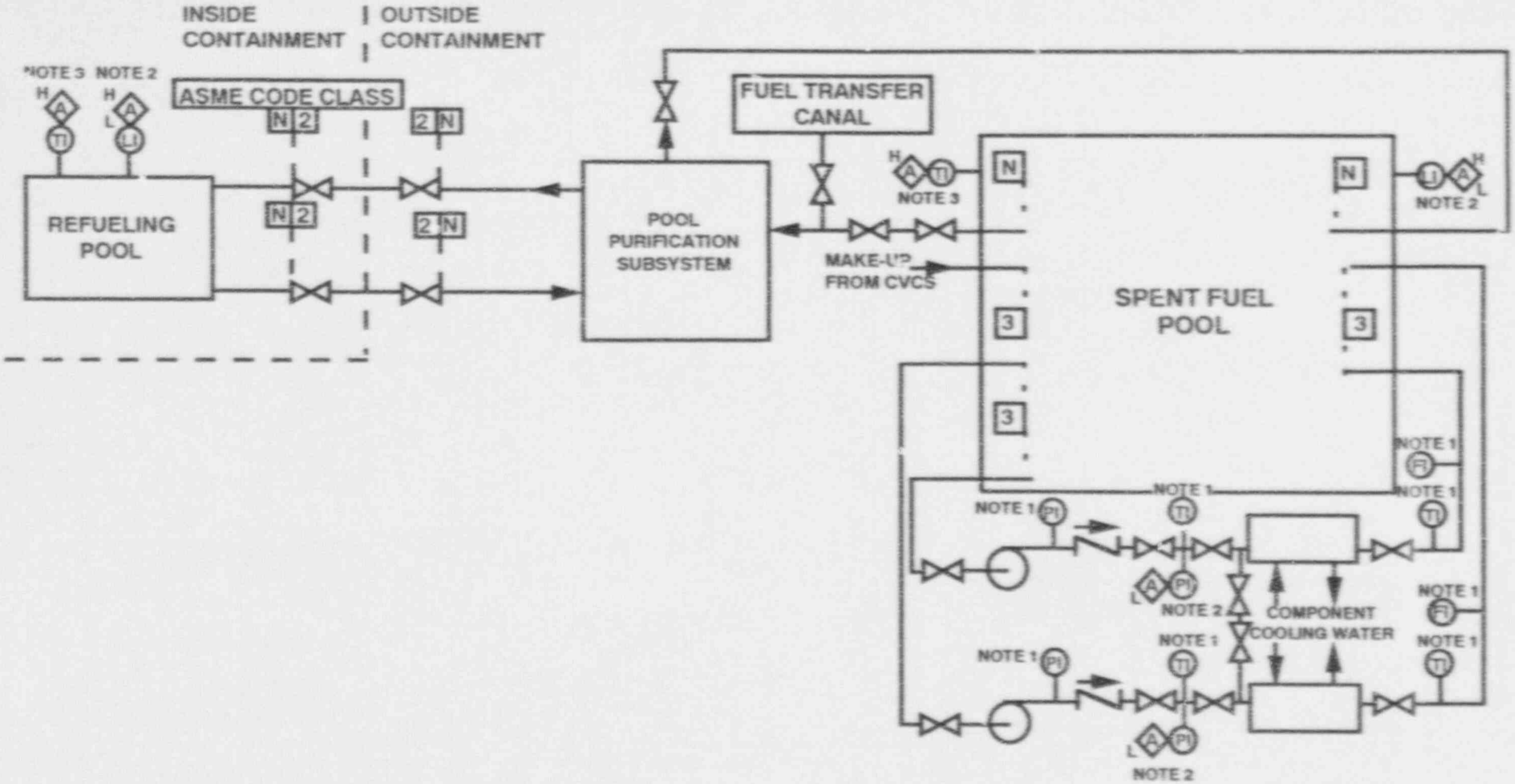
SPENT FUEL POOL COOLING AND CLEANUP SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration of the PCPS is shown in Figure 1.9.1.3-1.	1. Visual inspections of the as-built PCPS configuration will be performed.	1. The as-built PCPS configuration is in accordance with Figure 1.9.1.3-1, for the components and equipment shown.
2. ASME Code portions of the PCPS retain their integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those portions of the PCPS required to be pressure tested by the ASME Code.	2. The results of the pressure test of ASME Code portions of the PCPS conform with the requirements in the ASME Code Section III.
3. Water is supplied to each spent fuel pool cooling pump at a pressure greater than the net positive suction head (NPSH) required.	3. Tests to measure spent fuel pool cooling pump NPSH will be performed. An analysis to determine NPSH available to each pump will be prepared based on test data and as-built data.	3. The calculated available NPSH exceeds spent fuel pool cooling pump NPSH required by the vendor for the pump.
4. The spent fuel pool cooling pumps are powered from their respective Class 1E busses.	4. A test of the power availability to the SFPC pumps will be conducted with power supplied from the permanently installed electrical power buses.	4.a) Each SFPC pump is supplied electrical power from a Class 1E bus. b) The SFPC pumps are powered from separate Class 1E divisions.
5. The PCPS has the capacity to remove heat generated in the spent fuel pool by the fuel assemblies of a full core offload plus ten years of irradiated fuel.	5. Inspect the sizing calculations for the as-built spent fuel pool cooling heat exchangers and vendor pump performance data. Perform an analysis of heat removal capability using as-built data.	5. The PCPS will remove at least [later] million btu/hr from the spent fuel pool with both spent fuel pool cooling trains operating.

TABLE 1.9.1.3-1 (Continued)

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. The PCPS includes provisions to prevent gravity draining of the spent fuel pool and the refueling pool.	6. Inspect the PCPS suction and return line connections to the refueling pool and spent fuel pool.	6. Spent fuel pool cooling suction connections are located at least 10 feet above the top of the spent fuel. Anti-siphon devices are provided in the lines for spent fuel pool cooling return, spent fuel pool purification suction and return, and refueling pool suction and return.
7. PCPS instrumentation indications and alarms shown on Figure 1.9.1.3-1 are available as noted on the figure. Controls are available in the control room to start and stop the spent fuel pool cooling pumps.	7. Inspections for the availability of instrumentation indications and alarms identified in the Certified Design Commitment will be performed. Tests will be performed using the PCPS controls in the Control Room.	7. The instrumentation indications and alarms shown on Figure 1.9.1.3-1 exist or can be retrieved as noted on the figure. PCPS controls operate as specified in the Certified Design Commitment.
8. The two mechanical divisions of the spent fuel pool cooling subsystem are physically separated except for the cross-connect line between divisional pump discharge lines.	8. Inspections of PCPS divisional mechanical separations will be performed.	8. A structural wall separates the two spent fuel pool cooling subsystem mechanical divisions.



NOTES:

1. LOCAL INDICATION ONLY, NOT IN CONTROL ROOM
2. PRESSURE OR LEVEL SWITCH WITH ALARM IN CONTROL ROOM; NO CONTROL ROOM INDICATION
3. LOCAL INDICATION; CONTROL ROOM ALARM

FIGURE 1.9.1.3-1
POOL COOLING AND PURIFICATION SYSTEM

1.9.1.3 SPENT FUEL POOL COOLING and CLEANUP SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   PCPS Description: CESSAR-DC Section 9.1.3

2. Relationship of PCPS ITAAC to the Safety Analysis

   None

3. Relationship of PCPS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to PCPS ITAAC

   Test Description: CESSAR-DC Section 14.2.12.1.80

1.9.1.4 FUEL HANDLING SYSTEM

Design Description

The Fuel Handling System (FHS) is an integrated non-safety system of equipment and tools that handles and provides storage for fuel assemblies and control element assemblies.

The fuel handling system is comprised of a refueling machine (RM), a spent fuel handling machine (SFHM), a CEA change platform (CEACP), a fuel transfer system (FTS), a CEA elevator (CEAE), a new fuel elevator (NFE), a fuel building overhead crane (FBOC) and a containment polar crane (CPC).

The RM, SFHM, and CEACP hoists are provided with load-measuring devices and interlocks to interrupt hoisting if the load increases above an overload limit and to interrupt lowering if the load decreases below an underload limit. Interlocks are provided to limit travel. Positive mechanical stops are provided to limit upward movement of the hoists.

In the event of loss of electrical power, the RM and SFHM will not drop the fuel assembly. Manual drive mechanism are provided to permit completion of the handling cycles without power.

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.9.1.4-1 specifies the inspections, tests, analyses and associated acceptance criteria for the Fuel Handling System.

TABLE 1.9.1.4

FUEL HANDLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Fuel Handling System consists of a RM, SFHM, CEACP, FTS, CEAE, NFE, FBOC and CPC.	1. Inspection of the Fuel Handling System will be performed.	1. The items identified in the Certified Design Commitment exist.
2. The RM, SFHM and CEACP hoists are provided with load-measuring devices and interlocks to interrupt hoisting and lowering if load limits are reached.	2. Inspection of the RM, SFHM and CEACP hoists will be performed.	2. The load-measuring devices and interlocks identified in the Certified Design Commitment exist.
3. The RM, SFHM and CEACP hoists are provided with interlocks to limit upward hoist travel.	3. Inspection of the RM, SFHM and CEACP hoists will be performed.	3. The travel limit interlocks identified in the Certified Design Commitment exist.
4. The RM, SFHM and CEACP hoists are provided with mechanical stops to limit upward hoist travel.	4. Inspection of the RM, SFHM and CEACP hoists will be performed.	4. The mechanical stops identified in the Certified Design Commitment exist.
5. In the event of loss of electrical power, the RM and SFHM will not drop a full assembly.	5. The RM and SFHM will be tested by removing electrical power.	5. The grapple does not open.
6. The RM and SFHM have manual drive mechanisms to allow hoist operation and machine translation without electrical power.	6. The RM and SFHM hoists will be operated and the machines will be moved without electrical power.	6. The hoists operate and the machines move.

1.9.1.4 FUEL HANDLING SYSTEMS ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   See CESSAR-DC Section 9.1.4 for a FHS description.

2. Relationship of FHS ITAAC to the Safety Analysis

   None

3. Relationship of FHS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to FHS ITAAC

   CESSAR-DC Section 14.2.12.1.35

1.9.3 CONDENSATE STORAGE SYSTEM

Design Description

The Condensate Storage System is a non-safety system that provides a source of degasified condensate for makeup to the main condenser and is a source of startup feedwater used as makeup to the steam generators. A basic system configuration is shown in Figure 1.9.3-1.

The Condensate Storage System provides makeup or receives excess condensate as necessary via control valves modulated by the main condenser Hotwell Level Control System. The Condensate Storage System also serves to collect and store plant drains.

The system consists of a condensate storage tank, a condensate drain tank, and associated valves, piping, and controls. Pumps are provided for recycling water from the condensate storage tank back to the vacuum degasifier.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.9.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Condensate Storage System.

TABLE 1.9.3

CONDENSATE STORAGE SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic system configuration for the Condensate Storage System is shown in Figure 1.9.3-1.	1. Inspection of the as-built system configuration will be conducted.	1. The as-built configuration of the Condensate Storage System is in accordance with Figure 1.9.3-1 for the components and equipment shown.

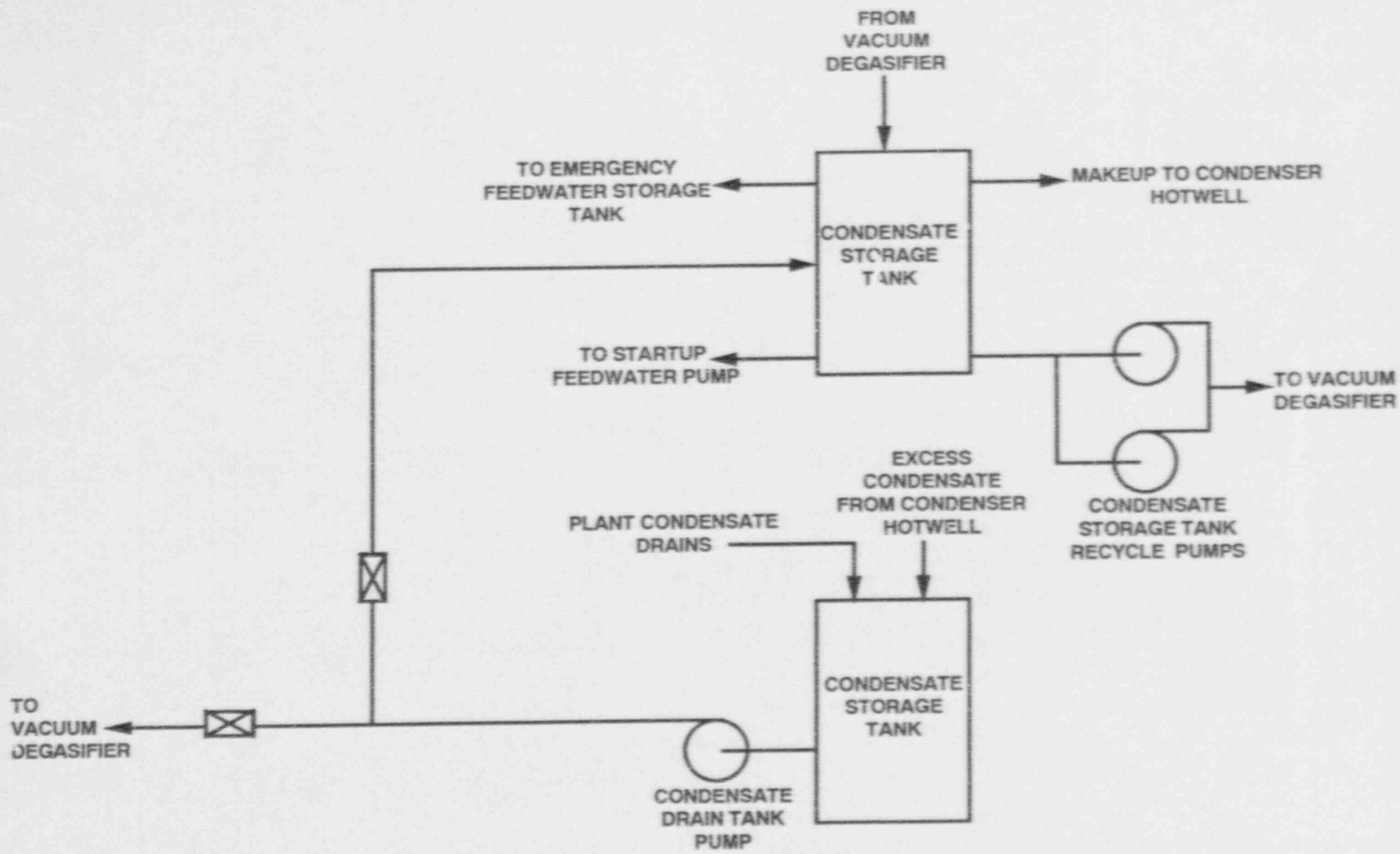


FIGURE 1.9.3-1
CONDENSATE STORAGE SYSTEM

1.9.3 CONDENSATE STORAGE SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 9.2.6

2. Relationship of CONDENSATE STORAGE SYSTEM ITAAC to the Safety Analysis

   None

3. Relationship of CONDENSATE STORAGE SYSTEM ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to CONDENSATE STORAGE SYSTEM ITAAC

   CESSAR-DC Section 14.2.12.1.82

1.9.4 REFUELING WATER SYSTEM

Design Description

There is no unique system designated the Refueling Water System. Components of other systems are used to fill and drain the refueling pool and to purify the refueling pool water as described below. Filling and draining the refueling pool and purifying the refueling pool water are not accident mitigation or safety functions.

The containment spray pumps fill the refueling pool by pumping water from the in-containment refueling water storage tank (IRWST) to the refueling pool.

The shutdown cooling pumps drain the refueling pool to the level of the reactor vessel flange by taking suction on the refueling pool via the operating shutdown cooling suction lines and discharging to the IRWST. Water in the refueling pool below the elevation of the reactor vessel flange is transferred to the IRWST by the Pool Cooling and Purification System.

The refueling pool water is purified by the Pool Cooling and Purification System.

Inspections, Tests, Analyses, and Acceptance Criteria

There are no inspections, tests, analyses or acceptance criteria associated with filling and draining the refueling pool. Inspections, tests, analyses and acceptance criteria for purification of refueling pool water by the Pool Cooling and Purification System are provided in Section 1.9.1.3.

1.9.4 REFUELING WATER SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   RWS Description: CESSAR-DC Section 9.2.7

2. Relationship of RWS ITAAC to the Safety Analysis

   None

3. Relationship of RWS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to RWS ITAAC

   Test Description: None

1.9.5 PROCESS SAMPLING SYSTEM

Design Description

The process sampling system (PSS) is a non-safety system and does not perform accident mitigation or safety functions. Portions of the system form part of the reactor coolant pressure boundary. The PSS collects and delivers samples from process systems to sample stations for analysis.

The PSS includes piping, heat exchangers, sample vessels, sample sinks or racks, analysis equipment and instrumentation. Figure 1.9.5-1 shows a simplified system configuration.

The PSS is built to the ASME Code Section III classifications shown on Figure 1.9.5-1. All piping and components classified ASME Code Class 2, or 3 are Seismic Category I.

Sample lines penetrating the containment boundary are provided with isolation valves which close on receipt of a containment isolation actuation signal (CIAS).

PPS instrumentation indications and alarms shown on Figure 1.9.5-1 are available in the Control Room. Controls are available in the Control Room to open and close the remotely-operated valves shown on Figure 1.9.5-1.

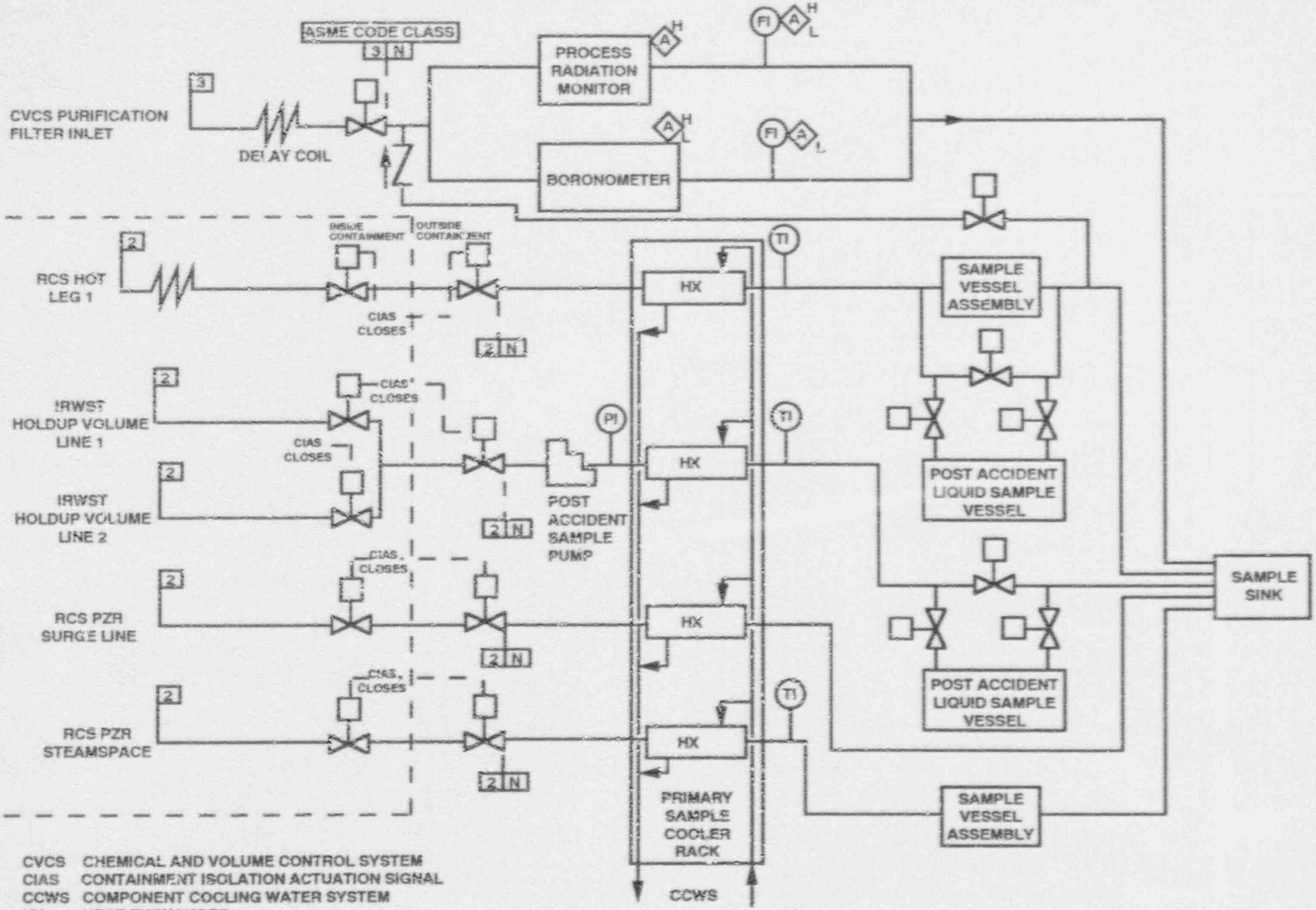
Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.9.5-1 specifies the inspections, tests, analyses and associated acceptance criteria for the PSS.

TABLE 1.9.5-1

PROCESS SAMPLING SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration for the PSS is shown in Figure 1.9.5-1.	1. Inspections of the as-built PSS configuration will be performed.	1. The as-built PSS configuration is in accordance with Figure 1.9.5-1, for the components and equipment shown.
2. ASME Code portions of the PSS retain their integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those portions of the PSS required to be pressure tested by the ASME Code.	2. The results of the pressure test of ASME Code portions of the PSS conform with the requirements in the ASME Code Section III.
3. Sample lines penetrating the containment are provided with isolation valves which close on receipt of a containment isolation actuation signal (CIAS).	3. Inspect as-built PSS configuration. Perform tests simulating a CIAS and observe the PSS containment isolation valves response.	3. The as-built PSS configuration includes isolation valves in the sample lines penetrating containment and the isolation valves close on receipt of a CIAS.
4. The PSS collects and delivers fluid samples from process systems to sample stations for analyses.	4. Tests will be performed to obtain fluid samples from the sample points shown on Figure 1.9.5-1.	4. Fluid samples can be obtained.
5. PSS instrumentation indications and alarms shown on Figure 1.9.5-1 are available in the Control Room. Controls are available in the Control Room to open and close the remotely-operated valves shown on Figure 1.9.5-1.	5. Inspection of the Control Room for the availability of instrumentation indications and alarms identified in the Certified Design Commitment will be performed. Tests will be performed using the PSS controls in the Control Room.	5. The instrumentation indications and alarms shown on Figure 1.9.5-1 exist or can be retreived in the Control Room. PSS controls operate as specified in the Certified Design Commitment.



CVCS CHEMICAL AND VOLUME CONTROL SYSTEM
CIAS CONTAINMENT ISOLATION ACTUATION SIGNAL
CCWS COMPONENT COOLING WATER SYSTEM
HX HEAT EXCHANGER
IRWST IN-CONTAINMENT REFUELING WATER STORAGE
PZR PRESSURIZER
RCS REACTOR COOLANT SYSTEM

FIGURE 1.9.5-1
PROCESS SAMPLING SYSTEM

1.9.5 PROCESS SAMPLING SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   PSS Description: CESSAR-DC Section 9.3.2

2. Relationship of PSS ITAAC to the Safety Analysis

   None

3. Relationship of PSS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to PSS ITAAC

   Test Description: CESSAR-DC Section 14.2.12.1.90

1.9.6 COMPRESSED AIR SYSTEMS

Design Description

The Compressed Air Systems (CAS) are non-safety related systems consisting of the Instrument Air System (IAS), the Station Air System (SAS), and the Breathing Air System (BAS). The Instrument Air System supplies compressed air to air-operated instrumentation, air-operated controls, and air-operated valves. The Station Air System supplies compressed air for air-operated tools, and for general use in the plant. The Breathing Air System supplies compressed air for breathing protection.

The IAS has four trains. Each train has an air intake filter/silencer, an air compressor, an air receiver, a dryer/filter train, and associated piping and valves. A basic configuration for the IAS is shown in Figure 1.9.6-1.

The SAS has two trains. Each SAS train has an air intake filter/silencer, and air compressor, an air receiver, an air dryer/filter, and associated piping and valves. A basic configuration for the SAS is shown in Figure 1.9.6-2.

The BAS has two trains. Each BAS train has an air intake filter/silencer, a breathing air compressor, an air receiver, a breathing air purifier, and associated piping and valves. A basic configuration for the BAS is shown in Figure 1.9.6-3.

Instrumentation is provided to monitor compressed air systems pressure and indications and alarms are available in the control room. Controls are provided to start and stop each CAS from the control room. The IAS is controlled automatically.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.9.6-1 specifies the inspections, tests, analyses and associated acceptance criteria for the CAS.

TABLE 1.9.6-1

COMPRESSED AIR SYSTEMS
Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration for the IAS is shown in Figure 1.9.6-1.	1. Inspections of the as-built system configuration will be performed.	1. The as-built configuration of the IAS is in accordance with Figure 1.9.6-1 for the components and equipment shown.
2. A basic configuration for the SAS is shown in Figure 1.9.6-2.	2. Inspections of the as-built system configuration will be performed.	2. The as-built configuration of the SAS is in accordance with Figures 1.9.6-2 for the components and equipment shown.
3. A basic configuration for the BAS is shown in Figure 1.9.6-3.	3. Inspections of the as-built system configuration will be performed.	3. The as-built configuration of the BAS is in accordance with Figures 1.9.6-3 for the components and equipment shown.
4. CAS instrumentation indications and alarms shown in Figures 1.9.6-1, 1.9.6-2, and 1.9.6-3 are available in the Control Room. Controls are available in the control room to start and stop each CAS. The IAS is automatically controlled.	4. Inspection of the Control Room for the availability of instrumentation indications and alarms identified in the Certified Design Commitment will be performed. Tests will be performed using the CAS controls in the Control Room.	4. The instrumentation indications and alarms shown in Figures 1.9.6-1, 1.9.6-2, and 1.9.6-3 exist in the Control Room. CAS controls operate as specified in the Certified Design Commitment.

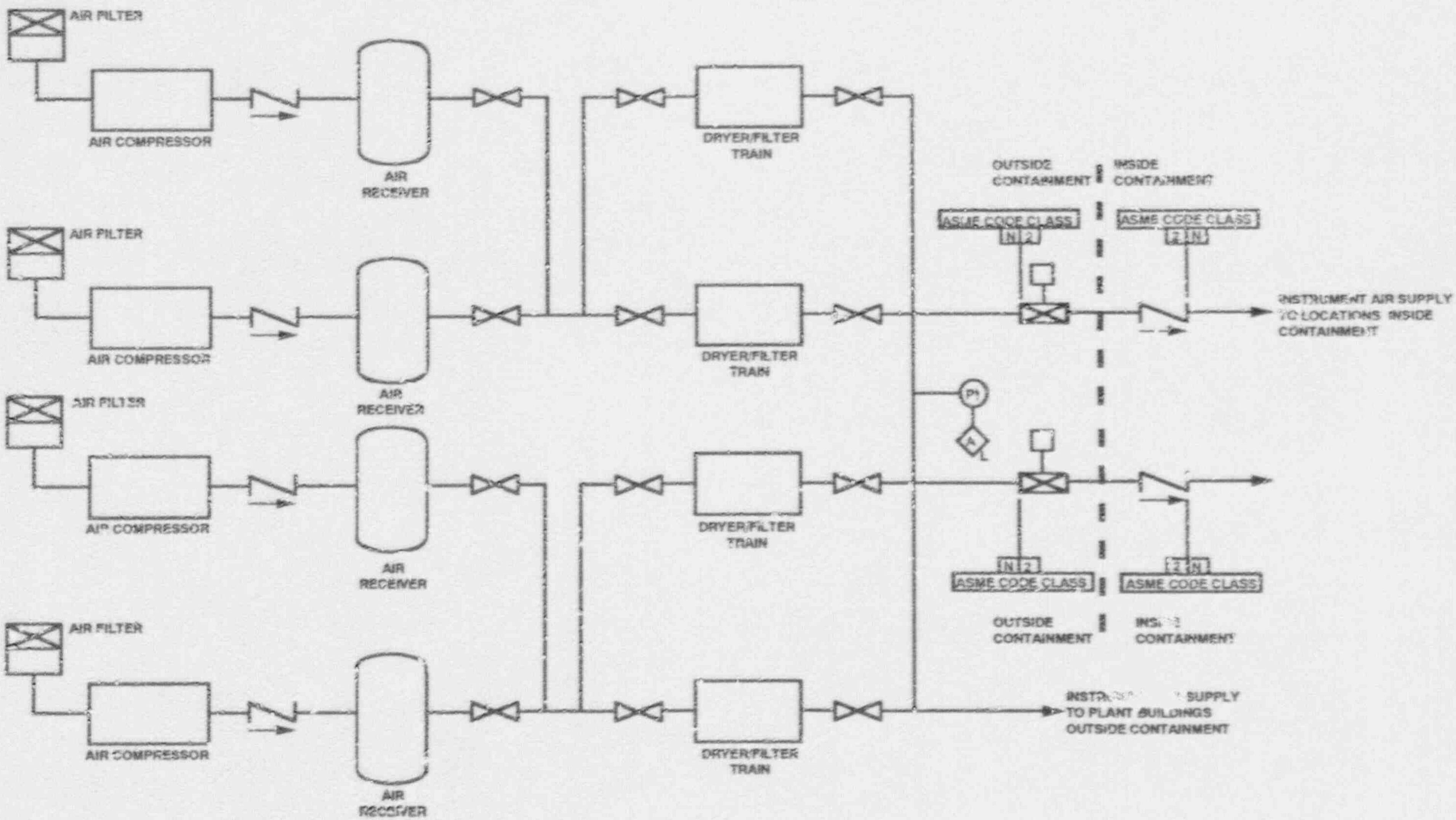


FIGURE 1.9.6-1
INSTRUMENT AIR SYSTEM

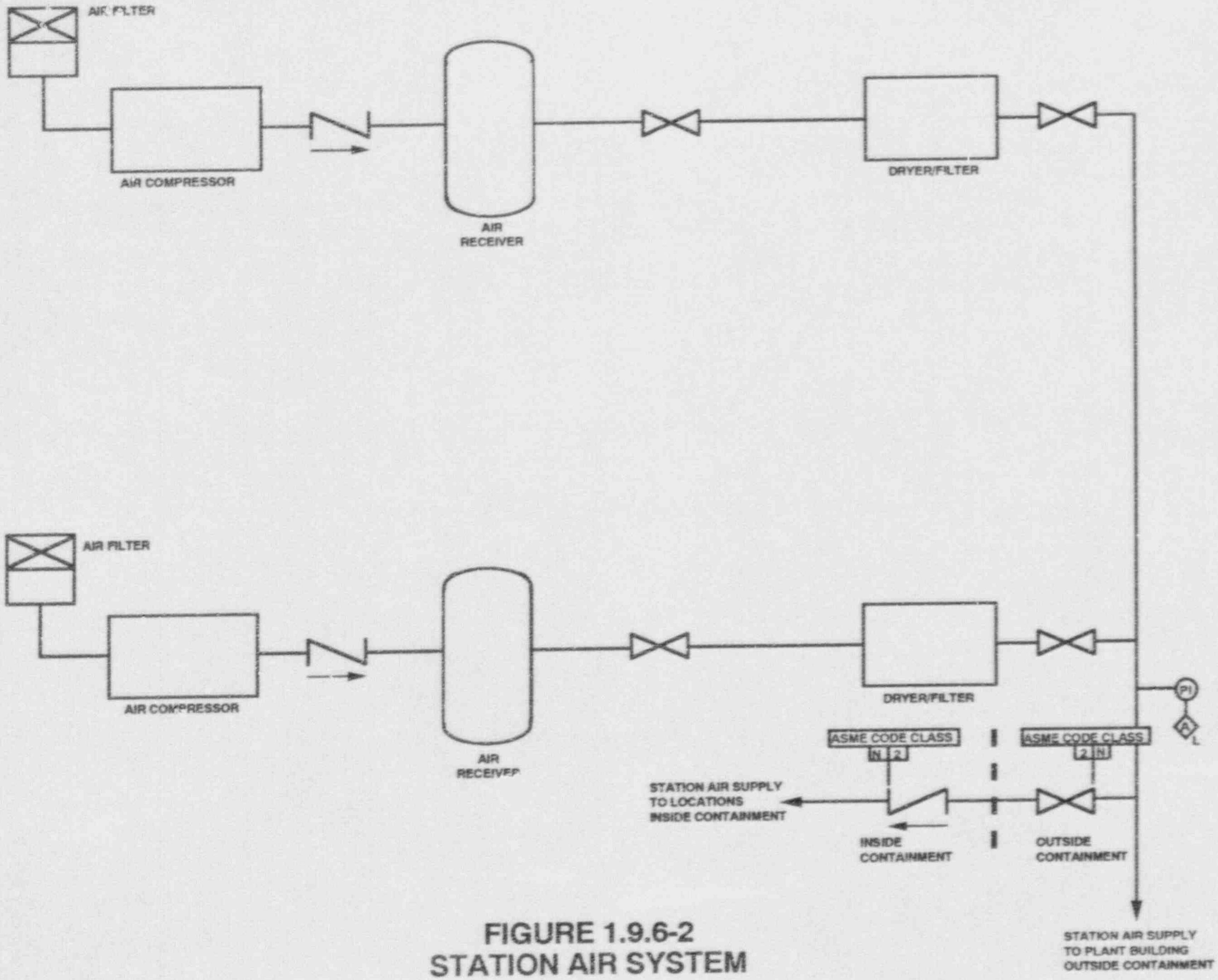


FIGURE 1.9.6-2
STATION AIR SYSTEM

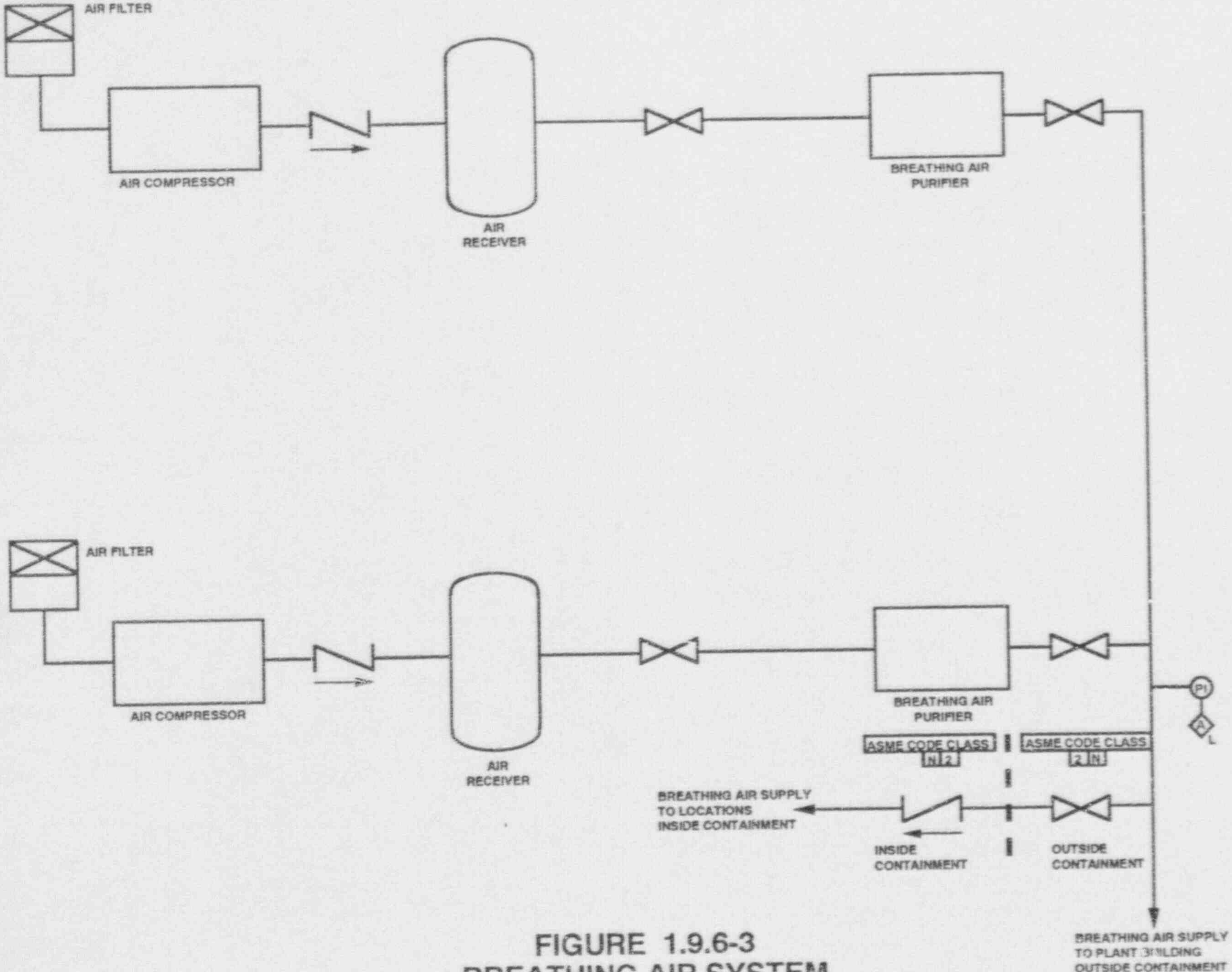


FIGURE 1.9.6-3
BREATHING AIR SYSTEM

1.9.6 COMPRESSED AIR SYSTEMS ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   Not Applicable

2. Relationship of CAS ITAAC to the Safety Analysis

   Not Applicable

3. Relationship of CAS ITAAC to PRA

   1) The Instrument Air System (IAS) has four parallel trains.

   2) Each train consists of an instrument air compressor, an air receiver, and an instrument air dryer connected in series.

   3) Sufficient instrumentation is provided in the control room to monitor and control the IAS.

   4) The instrument air compressors can be actuated automatically or manually.

   Not Applicable to Breathing Air System

   Not Applicable to Station Air System

4. CESSAR-DC Chapter 14 Tests Applicable to CAS ITAAC

   See CESSAR-DC Section 14.2.12.1.88

1.9.7 TURBINE BUILDING COOLING WATER SYSTEM

Design Description

The Turbine Building Cooling Water System (TBCWS) is a non-safety system that provides cooling water to the non-safety related turbine plant auxiliary system components.

The TBCWS is a single closed loop cooling water system. A basic system configuration of the TBCWS is shown in Figure 1.9.7-1. The TBCWS has two heat exchangers, two pumps, one surge tank, piping, valves, and controls.

The TBCWS transfers heat from turbine building auxiliary system components to the Turbine Building Service Water System (TBSWS).

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.9.7-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Building Cooling Water System.

TABLE 1.9.7

TURBINE BUILDING COOLING WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic system configuration for the Turbine Building Cooling Water System is shown in Figure 1.9.7-1.	1. Inspection of the as-built system configuration will be conducted.	1. The as-built configuration of the Turbine Building Cooling Water System is in accordance with Figure 1.9.7-1 for the components and equipment shown.

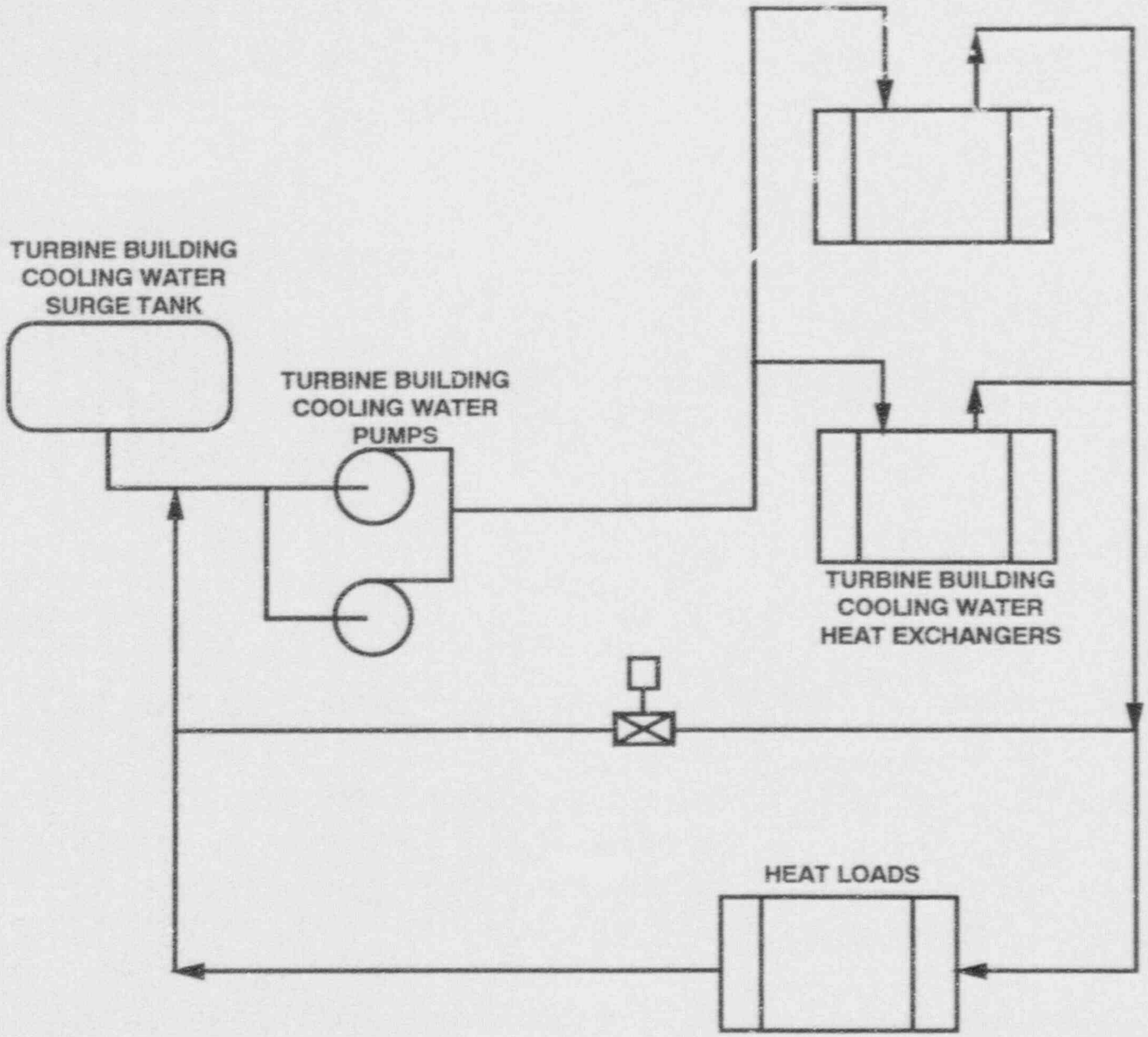


FIGURE 1.9.7-1
TURBINE BUILDING COOLING WATER SYSTEM

1.9.7 TBCWS ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 9.2.8

2. Relationship of TBCWS ITAAC to the Safety Analysis

   None

3. Relationship of TBCWS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to TBCWS ITAAC

   CESSAR-DC Section 14.2.12.1.81

1.9.9 TURBINE BUILDING SERVICE WATER SYSTEM

Design Description

The Turbine Building Service Water System (TBSWS) is a non-safety system that removes heat from the Turbine Building Cooling Water System (TBCWS) and transfers heat to the Condenser Circulating Water System.

The TBSWS consists of two pumps, with associated piping, valves, and controls. A basic configuration of the TBSWS is shown in Figure 1.9.9-1. The TBSWS pumps provide cooling water to the TBCWS heat exchangers.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.9.9-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Building Service Water System.

TABLE 1.9.9-1

TURBINE BUILDING SERVICE WATER SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic system configuration for the Turbine Building Service Water System is shown in Figure 1.9.9-1.	1. Inspection of the as-built system configuration will be conducted.	1. The as-built configuration of the Turbine Building Service Water System is in accordance with Figure 1.9.9-1 for the components and equipment shown.

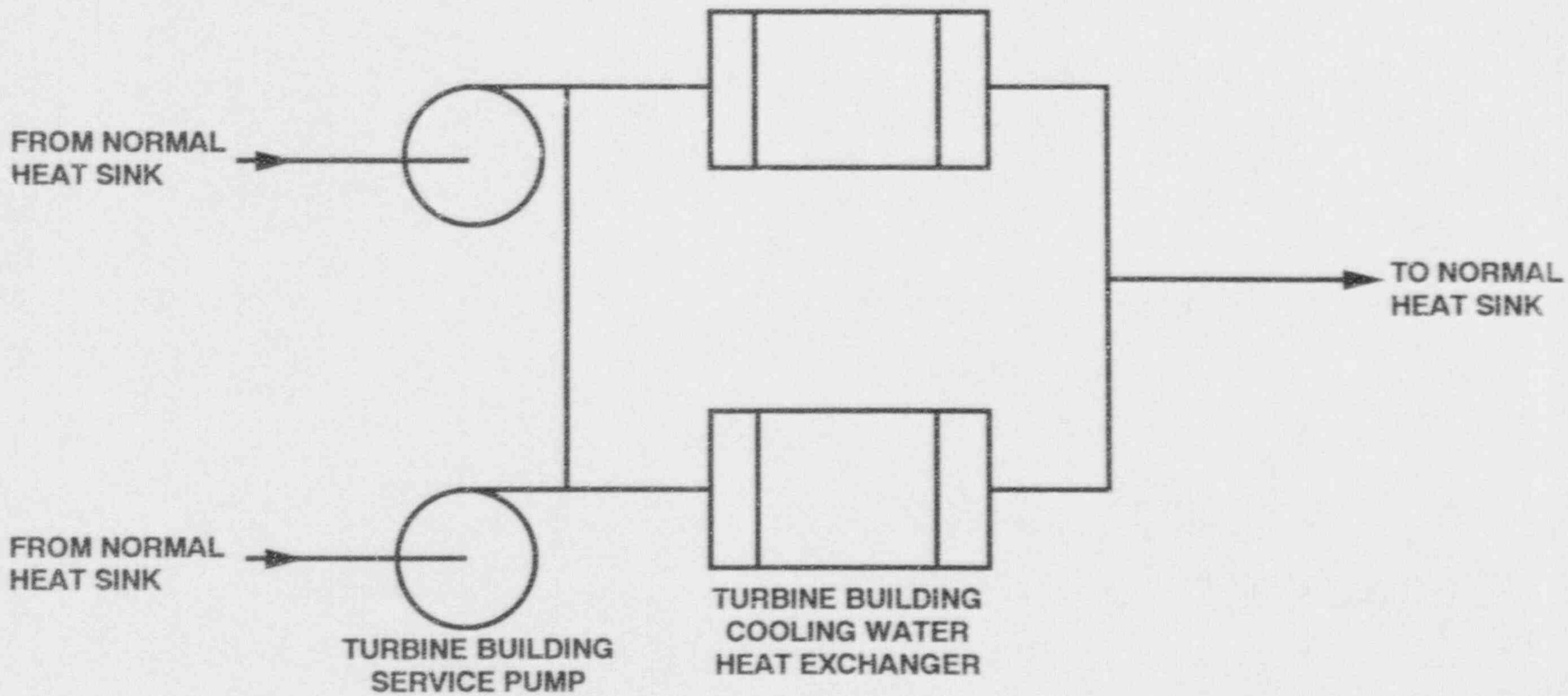


FIGURE 1.9.9-1
TURBINE BUILDING SERVICE WATER SYSTEM

1.9.9 TURBINE BUILDING SERVICE WATER SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 9.2.10

2. Relationship of TBSWS ITAAC to the Safety Analysis

   None

3. Relationship of TBSWS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to TBSWS ITAAC

   CESSAR-DC Section 14.2.1.12.83

1.9.23 COMPRESSED GAS SYSTEMS

Design Description

The compressed gas systems (CGS) are non-safety related and supply gases for equipment and instrumentation cooling, purging, diluting, inerting, and welding. The major items of equipment are the high pressure gas cylinders and pressure regulators to control the pressure and distribution of the various gases used in the plant.

The compressed gas systems are arranged into the following separate and isolated subsystems:

A. N_2 System

B. H_2 System

C. O_2 System

D. CO_2 System

E. Argon/Methane System

F. Acetylene System

G. Argon System

Bulk storage of gas cylinders is located in areas which contain no safety-related equipment.

Hazardous gases are not stored in close proximity to HVAC system fresh air in-takes, the control room, or the compressed air system in-takes.

Bulk storage of gas cylinders is outside the low trajectory turbine missile path.

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.9.23-1 specifies the inspections, tests, analyses and associated acceptance criteria for the compressed gas systems.

TABLE 1.9.23-1

COMPRESSED GAS SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Bulk storage of gas cylinders is located in areas which contain no safety-related structures, systems, and components.	1. Visual inspection of the as-built plant arrangement will be performed.	1. The bulk gas storage area contains no safety-related structures, systems, or components.
2. Hazardous gases are not stored in close proximity to a HVAC system fresh air in-take, the control room, or the compressed air system in-takes.	2. Visual inspection of the as-built arrangement will be performed to verify locations.	2. Hazardous gases are not in proximity to the specified locations.
3. Bulk storage of gas cylinders is outside the low trajectory turbine missile path.	3. Visual inspection of the as-built location of the high pressure gas cylinders will be performed	3. Storage locations of high pressure gas cylinders are outside the low trajectory turbine missile path.

1.9.23 COMPRESSED GAS SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   None

2. Relationship of CGS ITAAC to the Safety Analysis

   None

3. Relationship of CGS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to CGS ITAAC

   Refer to CESSAR-DC Section 14.2.12.1.89

1.9.25 POTABLE AND SANITARY WATER SYSTEMS

Design Description

The Potable and Sanitary Water Systems (PSWS) provide process water for general plant use.

The Potable and Sanitary Water Systems are not within the scope of the certified design. The site specific Potable and Sanitary Water Systems will meet the interface requirements defined below.

Interface Requirements

There are no interconnections between the Potable and Sanitary Water Systems and systems having the potential for containing radioactive material.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.9.25-1 specifies the inspections, tests, analyses and associated acceptance criteria for the Potable and Sanitary Water Systems.

TABLE 1.9.25-1

POTABLE AND SANITARY WATER SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. There are no interconnections between the Potable and Sanitary Water Systems and systems having the potential for containing radioactive material.	1. Inspections of the as-built system configuration will be performed.	1. The Certified Design Commitment is met.

1.9.25 POTABLE AND SANITARY WATER SYSTEMS

SUPPORTIVE INFORMATION

1. Amplifying Information

   N/A

2. Relationship of PSWS ITAAC to the Safety Analysis

   N/A

3. Relationship of PSWS ITAAC to PRA

   N/A

4. CESSAR-DC Chapter 14 Tests Applicable to PSWS ITAAC

   N/A

1.10.1.1 TURBINE GENERATOR

Design Description

The turbine generator is a non-safety system that converts the energy of the steam produced in the steam generators into mechanical shaft power and then into electrical energy.

Figure 1.10.1.1-1 shows the basic system configuration for the turbine generator. The flow of main steam is directed from the steam generators to the turbine through stop valves and control valves. After expanding through the turbine, which drives the main generator, exhaust steam is admitted to the main condenser.

Turbine generator functions are monitored and controlled automatically by the turbine control system. The Electro-Hydraulic Control (EHC) System provides overspeed protection, speed and load control, and trip of the turbine generator. The main steam stop and control valves close on receipt of a high first stage turbine pressure signal, a turbine trip signal, or overspeed trip.

The turbine generator has an electrical overspeed trip device and a diverse mechanical overspeed trip device.

The turbine generator placement and orientation ensures that the turbine missile low trajectory strike zones do not include safety related structures, systems, and components.

The Turbine Gland Sealing System (TGSS) is a non-safety subsystem that provides sealing steam at the annular openings where the turbine shaft emerges from the turbine shell casings and at various steam valve stems.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.10.1.1-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the turbine generator.

TABLE 1.10.1.1-1

TURBINE GENERATOR
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic system configuration for the turbine generator is shown in Figure 1.10.1.1-1.	1. Inspection of the as-built configuration will be conducted.	1. The as-built configuration of the turbine generator is in accordance with Figure 1.10.1.1-1 for the components and equipment shown.
2. The turbine generator has an electrical overspeed trip device and a diverse mechanical overspeed trip device.	2. Tests of the turbine generator overspeed trip devices will be conducted.	2. The results of the tests of the turbine generator overspeed trip devices show actuation occurs.
3. The placement and orientation of the turbine generator within the turbine generator building excludes safety-related structures, systems, and components from the calculated low trajectory turbine missile strike zones.	3. Inspection of the turbine generator placement and orientation, the as-built turbine building arrangement and the facility lay-out will be conducted to compare the location of safety-related structures, systems, and compon-ents with respect to calculated low trajectory missile strike zones.	3. Safety-related structures, systems, and components are not within the calculated low trajectory missile strike zones.

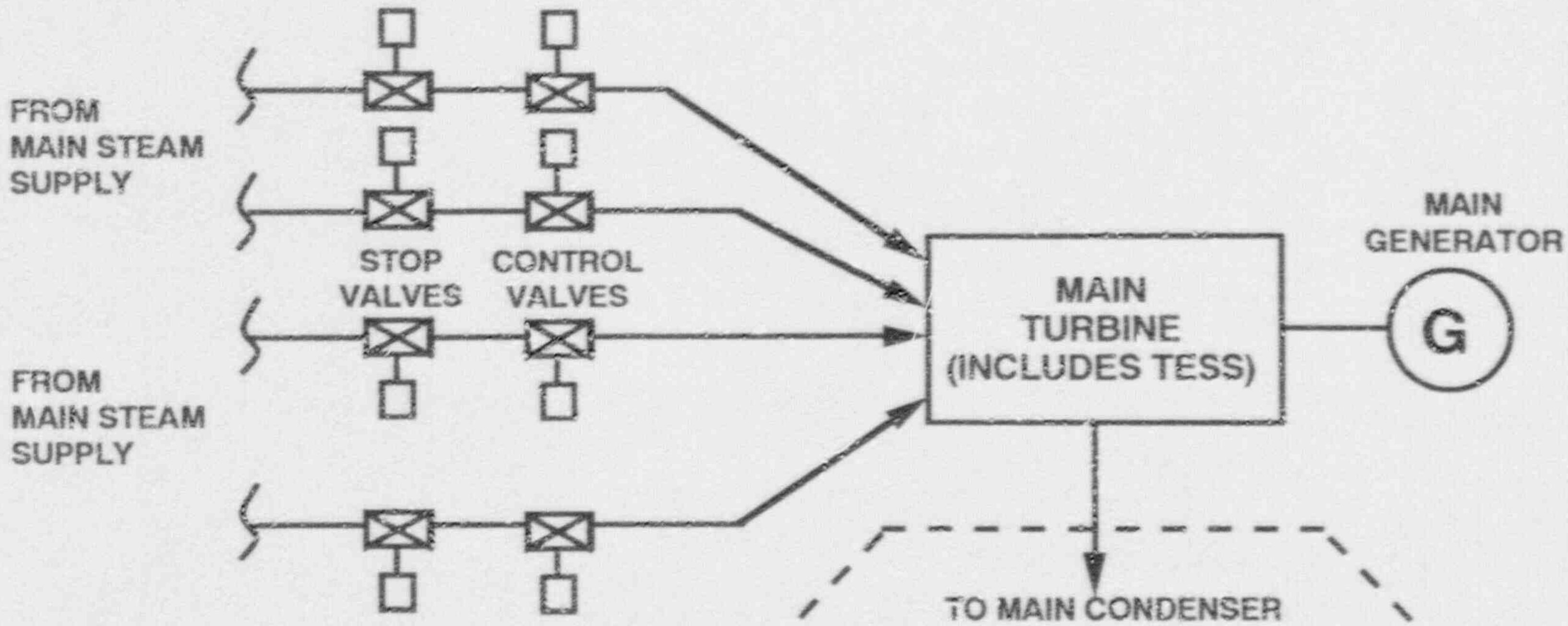


FIGURE 1.10.1.1-1
TURBINE GENERATOR

1.10.1.1 TURBINE GENERATOR ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 10.2

2. Relationship of TG ITAAC to the Safety Analysis

   None

3. Relationship of TG ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to TG ITAAC

   CESSAR-DC Section 14.2.1.12.72

1.10.1.3 MAIN CONDENSER

Design Description

The Main Condenser System is a non-safety system that converts the turbine exhaust steam to condensate so it can be pumped back through the Condensate and Feedwater systems to the steam generators. The main condenser also serves as a collection point for the following:

1. Feedwater heater drains and vents.
2. Condensate and Feedwater System makeup.
3. Miscellaneous auxiliary equipment vents and drains.

Figure 1.10.1.3-1 shows the basic system configuration for the main condenser.

The Condenser Circulating Water System and the exhaust steam path from the turbine interface with the main condenser.

The main condenser receives steam during the initial part of plant shutdown when main steam is bypassed to the condenser by the Turbine Bypass System.

The control equipment for this system is operating equipment, and is not required for safe shutdown of the reactor.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.10.1.3-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the main condenser.

TABLE 1.10.1.3

MAIN CONDENSER
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The basic system configuration for the main condenser is shown in Figure 1.10.1.3-1.	1. Inspection of the as-built configuration will be conducted.	1. The as-built configuration of the main condenser is in accordance with Figure 1.10.1.3-1, for the equipment and components shown.
2. A turbine trip signal is generated by signals from the condenser pressure instruments on loss of condenser vacuum.	2. Tests of the turbine trip signal from the main condenser pressure instruments using simulated loss of condenser vacuum signals will be conducted.	2. A turbine trip signal from the main condenser pressure instruments is activated on a simulated loss of condenser vacuum signal.

NOTE: ITAAC for the Main Condenser Evacuation System are separately addressed.

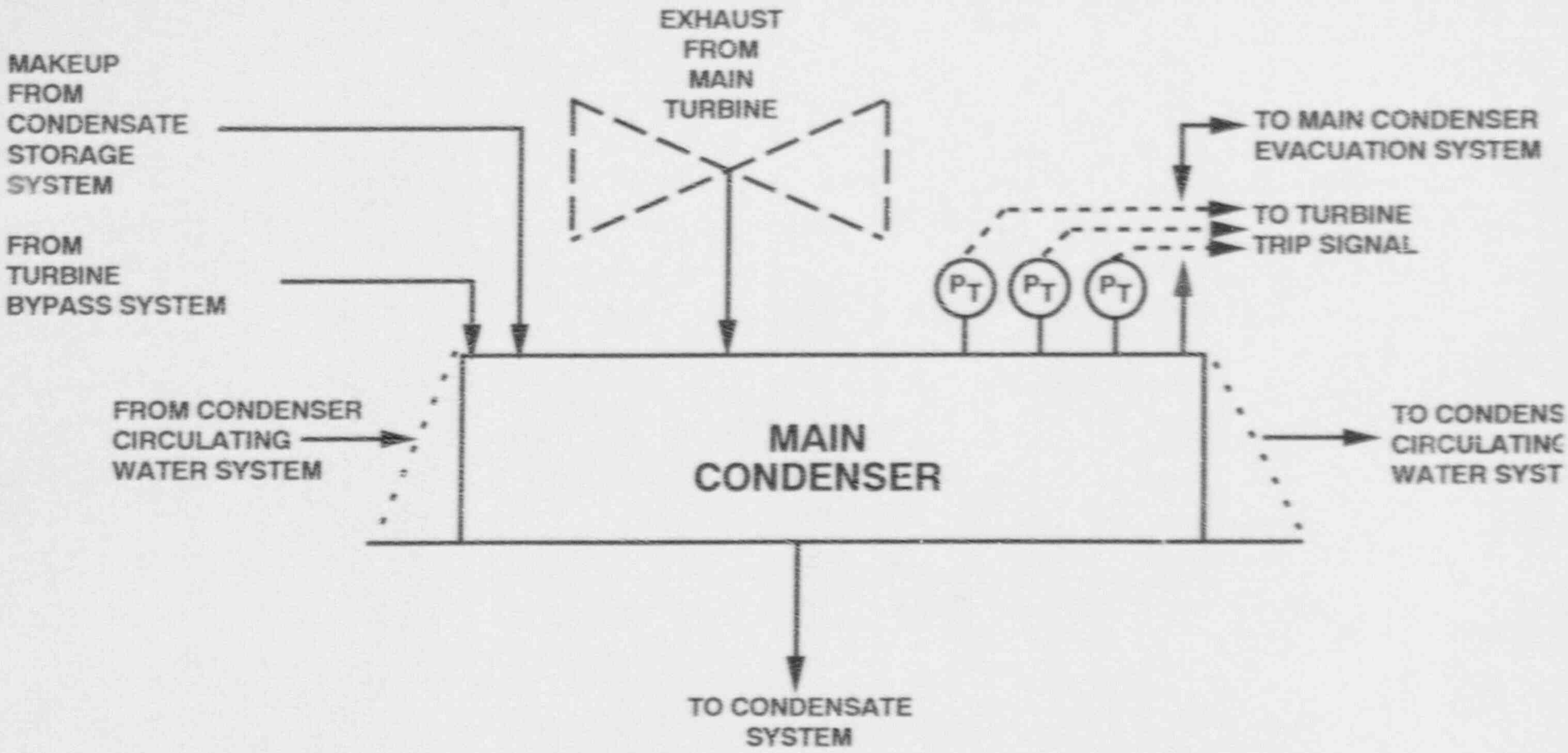


FIGURE 1.10.1.3-1
MAIN CONDENSER

1.10.1.3 MAIN CONDENSER ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 10.4.1

2. Relationship of MAIN CONDENSER ITAAC to the Safety Analysis

   None

3. Relationship of MAIN CONDENSER ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to MAIN CONDENSER ITAAC

   CESSAR-DC Section 14.2.12.1.69

1.10.1.4 MAIN CONDENSER EVACUATION SYSTEM

Design Description

The Main Condenser Evacuation System is a non-safety system that removes air and other noncondensable gases from the condenser. The system also maintains condenser vacuum for turbine operation during startup and normal operation.

The Main Condenser Evacuation System basic configuration is shown in Figure 1.10.1.4-1. The system consists of four skid-mounted vacuum pumps and associated piping and instrumentation. The vacuum pump air discharge is routed to the unit vent and monitored for radiation to detect steam generator primary-to-secondary tube leaks.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.10.1.4-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Main Condenser Evacuation System.

TABLE 1.10.1.4

MAIN CONDENSER EVACUATION SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic system configuration for the Main Condenser Evacuation System and radiation monitor placement is depicted in Figure 1.10.1.4-1.	1. Inspection of the as-built system configuration will be conducted.	1. The as-built configuration and radiation monitor placement in the Main Condenser Evacuation System is in accordance with Figure 1.10.1.4-1 for the components and equipment shown.

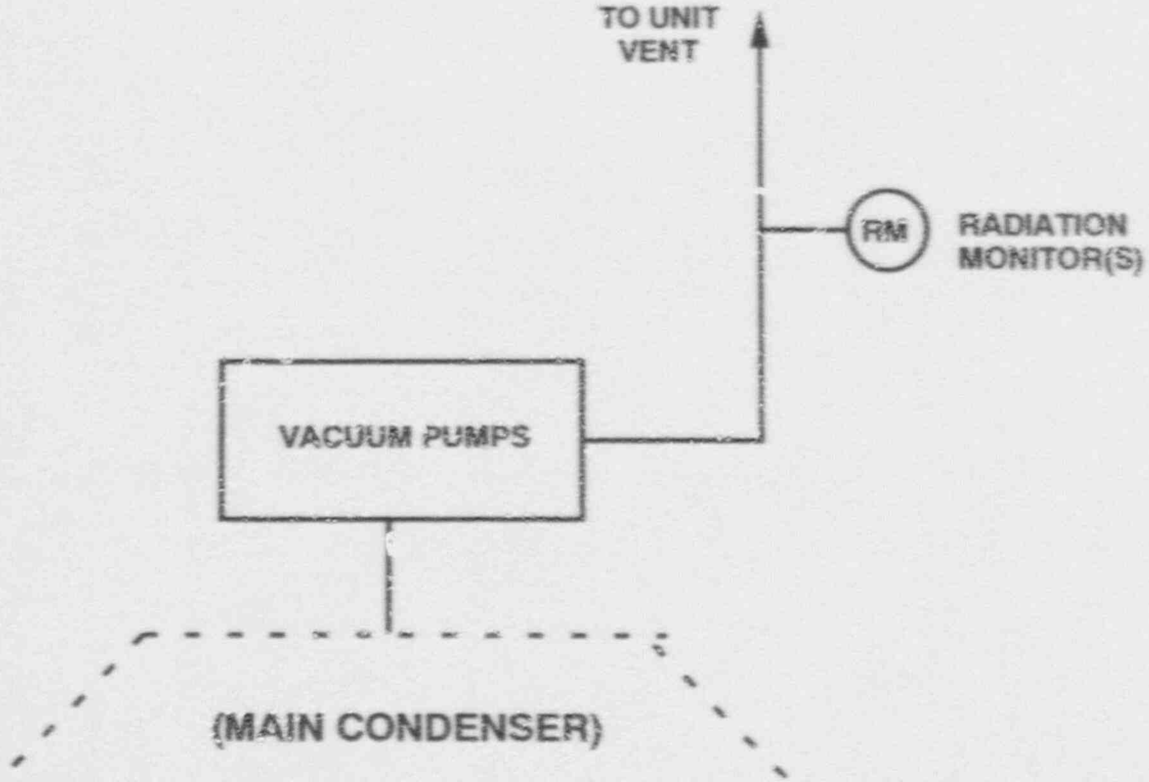


FIGURE 1.10.1.4-1
MAIN CONDENSER EVACUATION SYSTEM

1.10.1.4 MAIN CONDENSER EVACUATION SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 10.4.2

2. Relationship of CONDENSER CIRCULATING WATER SYSTEM ITAAC to the Safety Analysis

   None

3. Relationship of CONDENSER CIRCULATING WATER SYSTEM ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to CONDENSER CIRCULATING WATER SYSTEM ITAAC

   CESSAR-DC Section 14.2.12.1.69

1.10.1.5 TURBINE BYPASS SYSTEM

Design Description

The Turbine Bypass System is a non-safety system. For startup, shutdown, and during load shedding, the Turbine Bypass System provides the capability to take steam from the main steam header and discharge it directly to the main condenser, bypassing the turbine generator.

A basic system configuration is shown in Figure 1.10.1.5-1. The Turbine Bypass System consists of at least eight turbine bypass valves, and associated piping and controls.

The turbine bypass valves can be controlled automatically by the controls or remotely using controls in the control room.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.10.1.5-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Turbine Bypass System.

TABLE 1.10.1.5-1

TURBINE BYPASS SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic system configuration for the turbine bypass system is shown in Figure 1.10.1.5-1.	1. Inspection of the as-built system configuration will be conducted.	1. The as-built configuration of the turbine bypass system is in accordance with Figure 1.10.1.5-1 for the components and equipment shown.
2. The air operated turbine bypass valves open on receipt of a turbine bypass signal and close upon loss of air pressure to their operators.	2. A test will be conducted using a simulated turbine bypass signal and by causing loss of air pressure to the turbine bypass valve operators.	2. The turbine bypass valves open on receipt of a simulated turbine bypass signal and close with loss of air pressure to the operators.

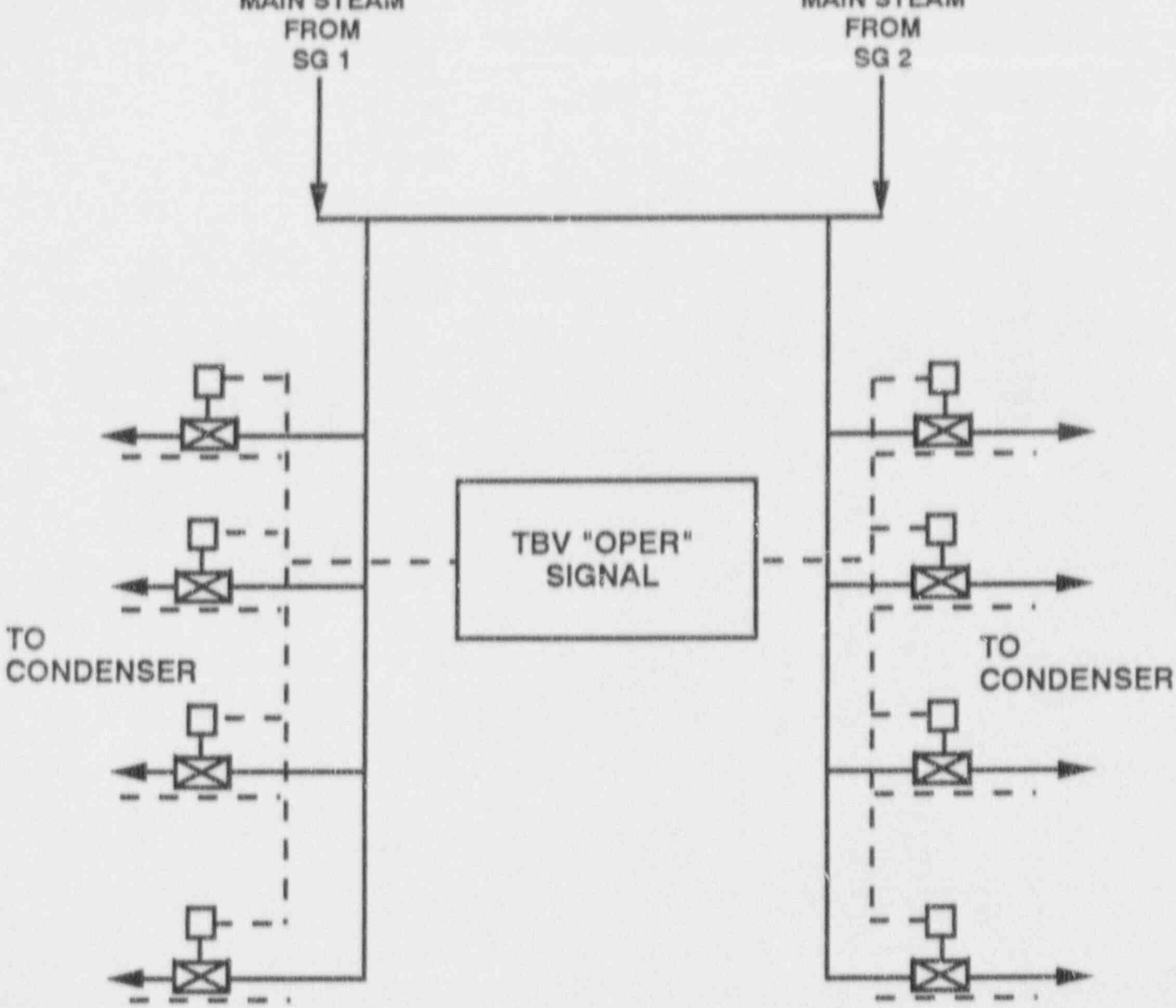


FIGURE 1.10.1.5-1
SIMPLIFIED SCHEMATIC OF THE TRUBINE BYPASS SYSTEM

1.10.1.5 TURBINE BYPASS SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 10.4.4

2. Relationship of CONDENSER CIRCULATING WATER SYSTEM ITAAC to the Safety Analysis

   None

3. Relationship of CONDENSER CIRCULATING WATER SYSTEM ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to CONDENSER CIRCULATING WATER SYSTEM ITAAC

   CESSAR-DC Section 14.2.12.1.31

1.10.2 CONDENSATE AND FEEDWATER SYSTEMS

Design Description

The Condensate and Feedwater Systems return condensate from the main condenser hotwells to the steam generators.

The basic system configuration is shown in Figure 1.10.2-1. Safety-related portions of the Feedwater System are built to the ASME Code Section III class requirements shown on Figure 1.10.2-1 and is qualified for the environment where located. Components, piping, and supports classified as ASME Code Class 2 are classified Seismic Category I.

The entire Condensate System is non-safety related. The Condensate System consists of three motor-driven condensate pumps, a gland seal condenser, low pressure heaters, associated piping, valves, and controls.

The Feedwater System consists of three motor-driven feedwater booster pumps, three motor-driven main feedwater pumps, high pressure feedwater heaters, associated piping, valves and controls.

Redundant feedwater isolation valves are provided. The feedwater isolation valves close automatically on receipt of a main steam isolation signal or when remotely actuated from the control room.

Feedwater control valves are provided to regulate the feedwater flow to each steam generator and to maintain steam generator level.

Feedwater flow does not exceed a specified maximum value.

Electrically-powered safety related components are powered from the class 1E buses.

Controls are available in the control room to start and stop the Condensate and Feedwater pumps, automatically and remotely control the feedwater control valves, and either automatically or remotely actuate the feedwater isolation valves.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.10.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the Condensate and Feedwater Systems.

TABLE 1.10.2-1

CONDENSATE AND FEEDWATER SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration for the safety-related portions of the Feedwater System is shown in Figure 1.10.2-1.	1. Inspections of the as-built system configuration will be conducted.	1. The as-built configuration of the safety related portions of the Feedwater System is in accordance with Figure 1.10.2-1. for the components and equipment shown.
2. ASME Code portions of the Feedwater System retain their integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those portions of the Feedwater System required to be pressure tested by the ASME Code.	2. The results of the pressure test of ASME Code portions of the Feedwater System conform with the requirements in the ASME Code, Section III.
3. Main feedwater isolation valves close on receipt of a main steam isolation signal.	3. Preoperational tests of feedwater isolation valves will be conducted using a simulated main steam isolation signal.	3. The main feedwater isolation valves close within 5 seconds of receipt of a simulated main steam isolation signal.
4. Safety-related electrical components are powered from the class 1E buses.	4. Inspection will be performed to verify the as-built configuration for power supply.	4. The as-built configuration for safety-related electrical components shows power supplied from class 1E buses.
5. Feedwater flow does not exceed a specified maximum value.	5. An analysis will be performed using as-built feedwater pump performance data to show that the specified maximum feedwater flow will not be exceeded.	5. The analyzed maximum feedwater flow under two pump runout conditions at 1000 psig steam generator pressure shall not exceed [later].

TABLE 1.10.2-1 (Continued)

CONDENSATE AND FEEDWATER SYSTEMS
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. The main feedwater isolation valves shut in the event of a loss of offsite power.	6. Tests will be performed to demonstrate that the main feedwater isolation valves shut upon a simulated loss of offsite power.	6. The main feedwater isolation valves shut when a simulated loss of offsite power is applied.
7. Controls are available in the control room to open and close the main feedwater isolation valves.	7. Tests will be performed using the main feedwater isolation valve controls in the control room.	7. The main feedwater isolation valves open and close in response to control signals from the control room.

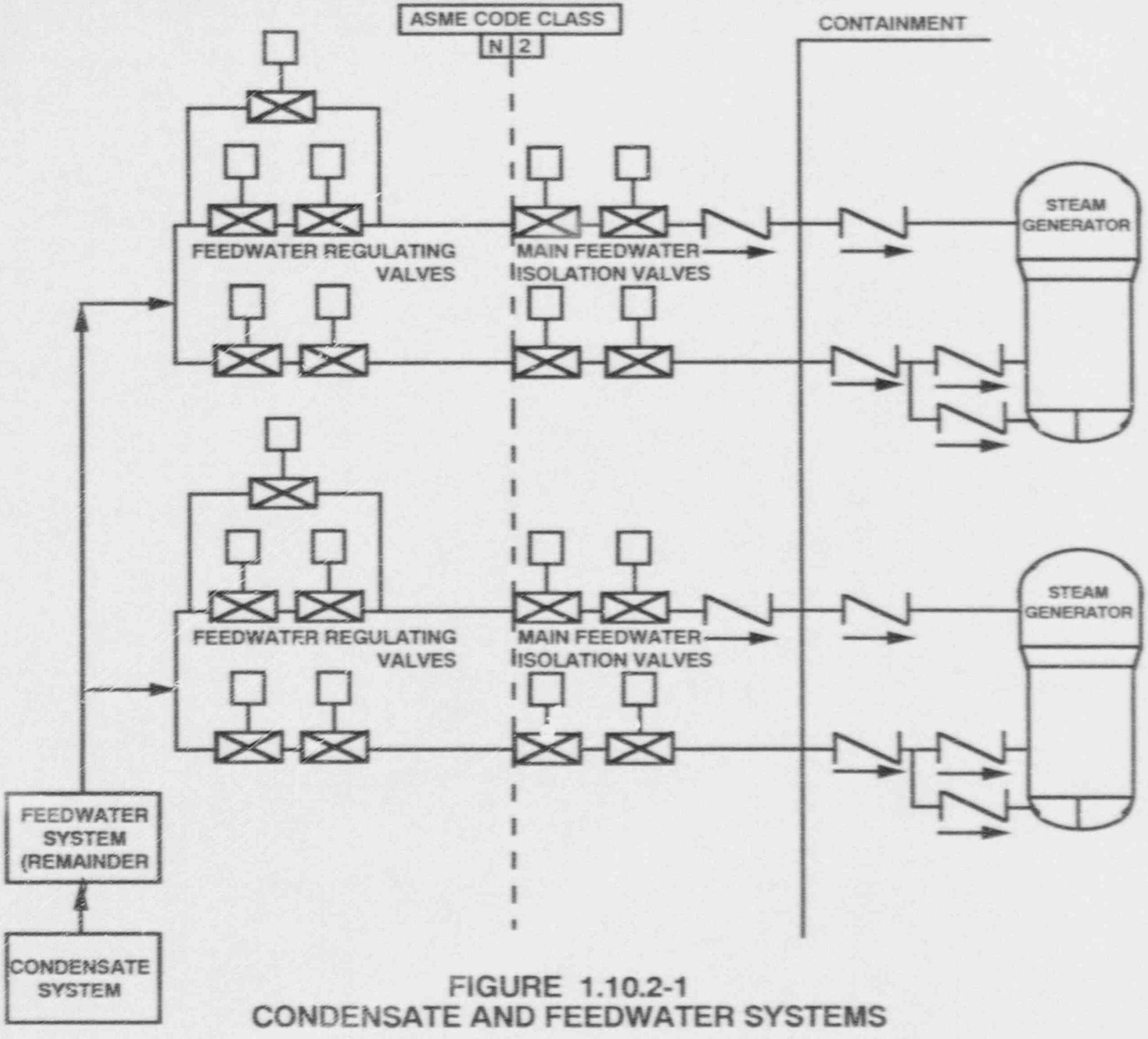


FIGURE 1.10.2-1
CONDENSATE AND FEEDWATER SYSTEMS

1.10.2 CONDENSATE AND FEEDWATER SYSTEMS ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   CESSAR-DC Section 10.4.7

2. Relationship of C&FS ITAAC to the Safety Analysis

   BASIS: Feedwater flow shall not exceed [later]

   ITAAC: ITAAC 5 acceptance criterion requires that feedwater flow not exceed [later]

   BASIS: The main feedwater isolation valves close within 5 seconds of receipt of a MSIS.

   ITAAC: ITAAC 3 confirms that the main feedwater isolation valves close within 5 seconds of receipt of a MSIS.

3. Relationship of C&FS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to C&FS ITAAC

   CESSAR-DC Section 14.2.12.1.70, .71

1.10.3 STEAM GENERATOR BLOWDOWN SYSTEM

Design Description

The steam generator blowdown system (SGBS) is a non-safety related system and is not required to perform accident mitigation or safety functions. The SGBS removes secondary coolant water containing non-volatile impurities from the steam generator and processes the blowdown fluid for re-use as condensate.

The SGBS consists of two blowdown lines from the secondary side of each steam generator. The blowdown fluid is directed to a flash tank from which steam is returned to the condenser or low pressure feedwater heaters. The liquid portion of the blowdown fluid passes to chemical processing equipment or the condensate system. Figure 1.10.3-1 shows a simplified system configuration.

Remote manual valves in the flash tank inlet piping control the blowdown flow rate. The normal rate control valve, the abnormal rate control valve, and the high capacity control valve are used to control the flow rates of blowdown fluid removed from the SGs.

The SGBS is built to the ASME Code Section III class requirements shown in Figure 1.10.3-1. ASME Code Class 2 components, piping, and supports are Seismic Category I.

SGBS blowdown lines penetrating containment are provided with two isolation valves which close upon receipt of a containment isolation actuation signal (CIAS), a main steam isolation signal (MSIS), an emergency feedwater actuation signal (EFAS), an alternate feedwater actuation signal (AFAS) or a safety injection actuation signal (SIAS).

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.10.3-1 specifies the inspections, tests, analyses and associated acceptance criteria for the SGBS.

TABLE 1.10.3-1

STEAM GENERATOR BLOWDOWN SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration of the SGBS is shown in Figure 1.10.3-1.	1. Inspections of the as-built SGBS configuration will be performed.	1. The as-built SGBS configuration is in accordance with Figure 1.10.3-1, for the components and equipment shown.
2. ASME Code portions of the SGBS retain their integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those portions of the SGBS required to be pressure tested by the ASME Code.	2. The results of the pressure test of ASME Code portions of the SGBS conform with the requirements in the ASME Code Section III.
3. SGBS lines penetrating containment contain valves which close upon receipt of a containment isolation actuation signal (CIAS), a main steam isolation signal (MSIS), an emergency feedwater actuation signal (EFAS), an alternate feedwater actuation signal (AFAS), or a safety injection actuation signal (SIAS).	3. Tests will be performed using a simulated CIAS, MSIS, EFAS, AFAS, and SIAS in individual tests. The SGBS containment isolation valves response to each signal will be observed.	3. SGBS containment isolation valves close upon receipt of a CIAS, MSIS, EFAS, AFAS, or SIAS.
4. Remote manual valves in the flash tank inlet piping control SG blowdown flow rates.	4. Tests will be performed to blow down the steam generator using the normal, abnormal, and high capacity control valves.	4. Blowdown fluid from each SG passes through the normal, abnormal, and high capacity control valves.

TABLE 1.10.3-1 (Continued)

STEAM GENERATOR BLOWDOWN SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. SGBS instrumentation indications and alarms shown on Figure 1.10.3-1 are available in the Control Room. Controls are available in the control room and open and close the remote-operated valves shown on Figure 1.10.3-1.	5. Inspection of the Control Room for the availability of instrumentation indications and alarms identified in the Certified Design Commitment will be performed. Tests will be performed using the SGBS controls in the Control Room.	5. The instrumentation indications and alarms shown on Figure 1.10.3-1 exist or can be retrieved in the Control Room. SGBS controls operate as specified in the Certified Design Commitment.

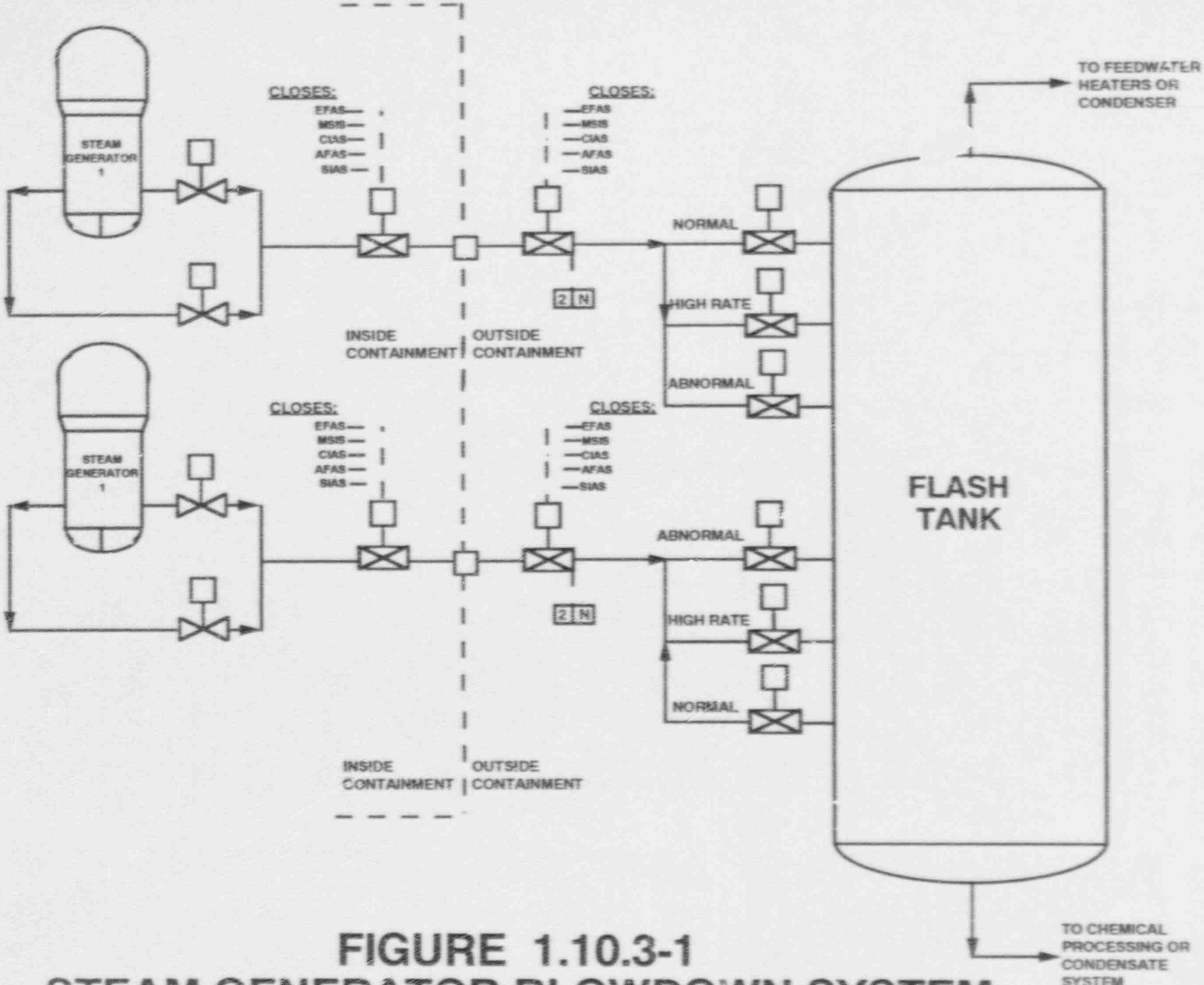


FIGURE 1.10.3-1
STEAM GENERATOR BLOWDOWN SYSTEM

1.10.3 STEAM GENERATOR BLOWDOWN SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   SGBS Description: CESSAR-DC Section 10.4.8

2. Relationship of SGBS ITAAC to the Safety Analysis

   1. **Basis:** The steam generator blowdown system (SGBS) is isolated on receipt of an emergency feedwater actuation signal (EFAS), main steam isolation signal (MSIS), or safety injection actuation signal (SIAS).

      ITAAC: ITAAC 3 confirms isolation of the blowdown lines on receipt of the signals listed above.

3. Relationship of SGBS ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to SGBS ITAAC

   Test Description: CESSAR-DC Section 14.2.12.1.68

1.11.1 LIQUID WASTE MANAGEMENT SYSTEM

Design Description

The Liquid Waste Management System (LWMS) is a non safety system which provides the capability to collect, segregate, store, process, sample, and monitor radioactive liquid waste. Piping from the containment condensate cooler to the LWMS penetrates containment and is provided with containment isolation valves.

The LWMS consists of subsystems which process radioactive liquid waste which is segregated into the following categories:

1. Equipment drain waste which includes, for example, degassed reactor grade radioactive liquid waste

2. Floor drain waste which includes, for example, non-reactor grade radioactive liquid waste

3. Detergent waste which includes, for example, laundry and hot shower waste liquids

4. Chemical waste which includes, for example, non-detergent liquid waste

The waste streams are not interconnected prior to collection and processing. The LWMS is not intended to process post-accident sources of liquid wastes. Therefore, valves on the LWMS radioactive inlet flow streams can be closed in post-accident conditions by manual action.

The equipment drain waste subsystem provides for filtration, decontamination, batch sampling, and recirculation capability for further processing. A general conceptual illustration of the equipment drain waste subsystem is shown in Figure 1.11.1-1

The floor drain waste subsystem provides for filtration, decontamination, batch sampling, and recirculation capability for further processing. A general conceptual illustration of the floor drain waste subsystem is shown in Figure 1.11.1-2.

The floor drain waste subsystem has the additional capability for oil/crud removal, flocculent addition to collection tanks, and pH adjustment of liquid waste systems.

The chemical waste subsystem has the capability for pH adjustment through chemical addition to the collection tank, filtration, batch sampling, and recirculation to the floor drain waste subsystem for further processing. A general conceptual illustration of the chemical waste subsystem is shown in Figure 1.11.1-3.

The detergent waste subsystem has the capability for filtration, decontamination by demineralizes, batch sampling, and recirculation to the floor drain subsystem for further processing. A general conceptual illustration of the detergent waste subsystem is shown in Figure 1.11.1-4.

This LWMS has collection and storage capacity to process the maximum expected liquid waste volumes, based on anticipated peak daily inputs produced during plant operation, refueling, plant shutdowns, maintenance, and startup operations.

LWMS sample or waste monitor tanks have volumes equivalent or greater than their associated collection tanks. The steam generator drain tank provides surge capacity only and has no associated sample tank or waste monitor tank. In addition, condensate collected in the containment cooler condensate tank is not radioactive, therefore no sample or dedicated waste monitor tank is provided. The LWMS has the capability to divert flows within the LWMS for additional processing. The LWMS has the provision to batch-sample each collection tank prior to processing. The LWMS has the capability to connect additional demineralizers, by the provision of mobile disconnects.

The LWMS processes radioactive liquid waste so that the concentration of the liquid effluents at the unrestricted discharge point is within the limits specified in 10CFR20, Appendix B, Table II.

The release of processed liquid waste from the LWMS to unrestricted areas can only be initiated by manual action. Instrumentation and controls to monitor and control LWMS parameters and discharge are provided in the control room as depicted in Figures 1.11.1-1 through 1.11.1-6. This LWMS can batch-sample and monitor processed liquid waste prior to release to the environment. A radiation monitor is located upstream of the plant discharge. Liquid effluents discharge to unrestricted areas is terminated automatically when the limits of 10CFR20, Appendix B, Table II will be exceeded.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.11.1-1 specifies the inspections, tests and/or analyses and their associated acceptance criteria for the LWMS.

TABLE 1.11.1-1

LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Basic configurations of the LWMS subsystems are shown in Figures 1.11.1-1 through 1.11.1-6.	1. Inspection of the as-built LWMS configuration will be performed.	1. The as-built LWMS subsystem configuration for the components shown are in accordance with Figures 1.11.1-1 through 1.11.1-6 for the components and equipment shown.
a) The LWMS has the capability to connect additional demineralizers, by the provision of mobile disconnects.		a) Mobile disconnects are provided.
b) The LWMS has the provision to batch sample each collection tank prior to processing.		b) A batch sample point is provided for each collection tank.
2. Each LWMS subsystem described in the Design Description has process flow and storage capacity to process the anticipated daily input produced during plant operation, refueling, plant shutdowns, maintenance, and startup operations.	2. An analysis will be performed based on as-built plant data and site specific information (i.e., dilution flow available) to determine the flow and system component capacity required to process anticipated daily inputs. Based on the results of the analysis, inspections and pre-operational tests of process flows and storage capacities of as-built LWMS subsystems will be performed.	2. The LWMS subsystems process flows and storage capacities can process the anticipated daily input produced during plant operation, refueling, plant shutdowns, maintenance, and startup operations.

TABLE 1.11.1-1 (Continued)

LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. The LWMS processes radioactive liquid waste so that the concentration of radioactive isotopes in liquid effluents ate the discharge point is within the limits specified in 10CFR20, Appendix B, Table II.	3. Analysis of as-built LWMS performance data will be performed.	3. The Certified Design Commitment is met.
4. The LWMS can batch sample and monitor processed liquid waste effluent batches prior to release to the environment.	4. Inspection of as-built LWMS subsystems will be performed.	4.a) Sampling capabilities exist for: 1) Each collection tank prior to processing. 2) Each waste monitor and sample tank upstream of the plant unrestricted discharge point. b) Radiation monitoring equipment is located upstream of the plant unrestricted discharge point.
5.a) Radioactive liquid wastes are segregated into: 1) Equipment drain waste 2) Floor drain wastes 3) Detergent wastes 4) Chemical wastes	5. Inspections of as-built systems will be performed.	5.a) Radioactive wastes are segregated into four waste streams: 1) Equipment drain waste 2) Floor drain waste 3) Detergent waste 4) Chemical waste

TABLE 1.11.1-1 (Continued)

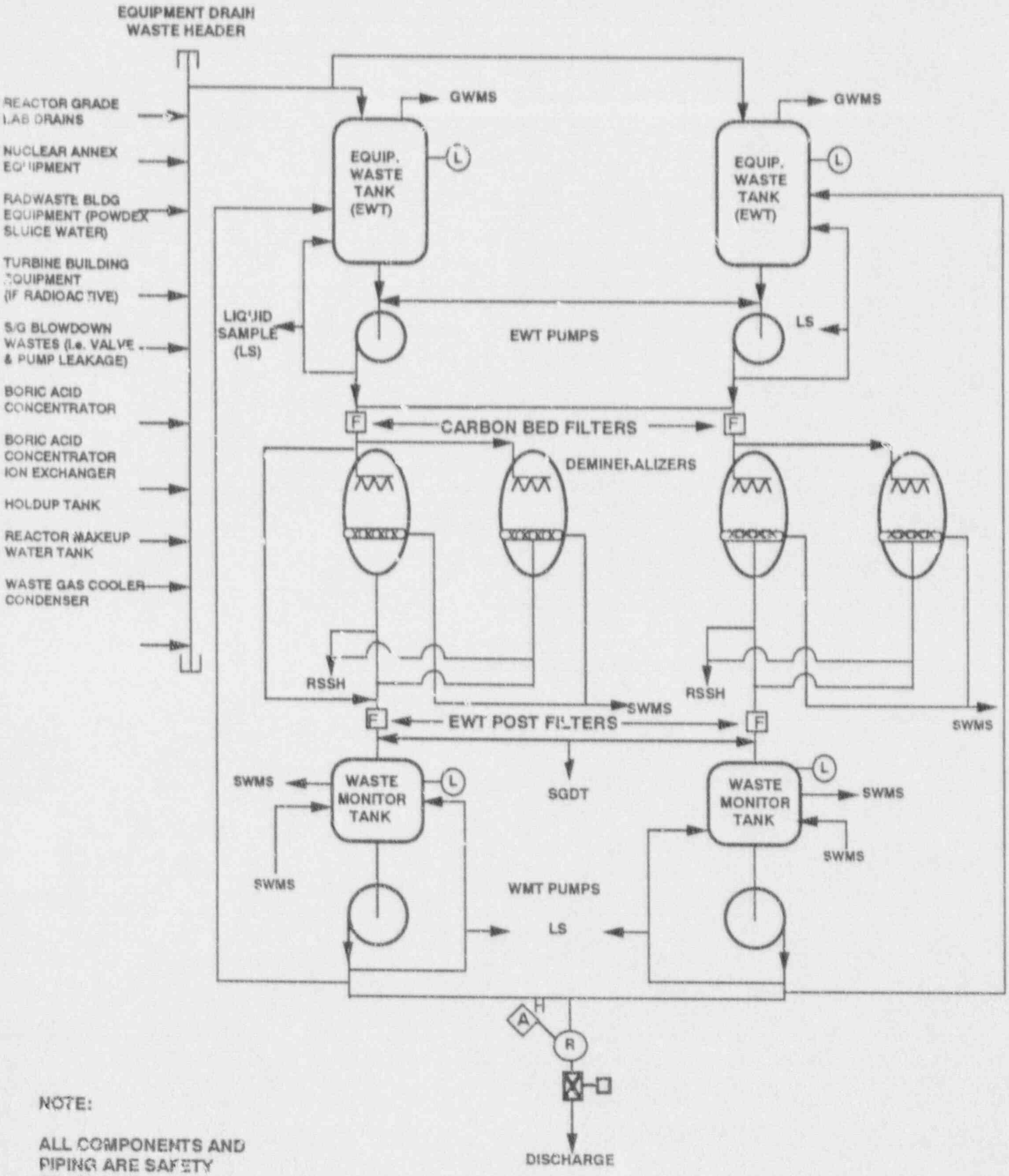
LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.b) The equipment drain, the floor drain, the detergent, and the chemical waste streams are not interconnected prior to collection and processing.		5.b) The four waste streams are not interconnected prior to collection and processing.
6. The instrument indications and alarms shown in Figures 1.11.1-1 through 1.11.1-6 are available in the control room. Control to close valves on the LWMS inlet waste flows are provided.	6. Inspection of the control room instrumentation indications and alarms in the Certified Design Commitment will be performed. Test will be performed using the LWMS controls in the control room.	6.a) The LWMS instrumentation indications and controls shown in Figures 1.11.1-1 through 1.11.1-6 exist or can be retrieved in the control room. b) Valves on the LWMS subsystems inlet waste flows can be closed with controls located in the control room.
7. Release of processed liquid waste to unrestricted areas can be initiated only by manual action.	7. Tests of LWMS subsystem controls will be performed.	7. Release of liquid effluents to unrestricted areas can be initiated only by manual action.
8. Liquid effluent discharge to unrestricted areas is terminated automatically when the limits of 10CFR20, Appendix B, Table II will be exceeded.	8. Test of the as-built LWMS subsystems using signals that simulate exceedence of limits will be performed.	8. Liquid wastes discharge to unrestricted areas is terminated automatically in response to signals that simulate exceedence of limits.

TABLE 1.11.1-1 (Continued)

LIQUID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.b) The equipment drain, the floor drain, the detergent, and the chemical waste streams are not interconnected prior to collection and processing.		5.b) The four waste streams are not interconnected prior to collection and processing.
6. The instrument indications and alarms shown in Figures 1.11.1-1 through 1.11.1-6 are available in the control room. Control to close valves on the LWMS inlet waste flows are provided.	6. Inspection of the control room instrumentation indications and alarms in the Certified Design Commitment will be performed. Test will be performed using the LWMS controls in the control room.	6.a) The LWMS instrumentation indications and controls shown in Figures 1.11.1-1 through 1.11.1-6 exist or can be retrieved in the control room. b) Valves on the LWMS subsystems inlet waste flows can be closed with controls located in the control room.
7. Release of processed liquid waste to unrestricted areas can be initiated only by manual action.	7. Tests of LWMS subsystem controls will be performed.	7. Release of liquid effluents to unrestricted areas can be initiated only by manual action.
8. Liquid effluent discharge to unrestricted areas is terminated automatically when the limits of 10CFR20, Appendix B, Table II will be exceeded.	8. Test of the as-built LWMS subsystems using signals that simulate exceedence of limits will be performed.	8. Liquid wastes discharge to unrestricted areas is terminated automatically in response to signals that simulate exceedence of limits.

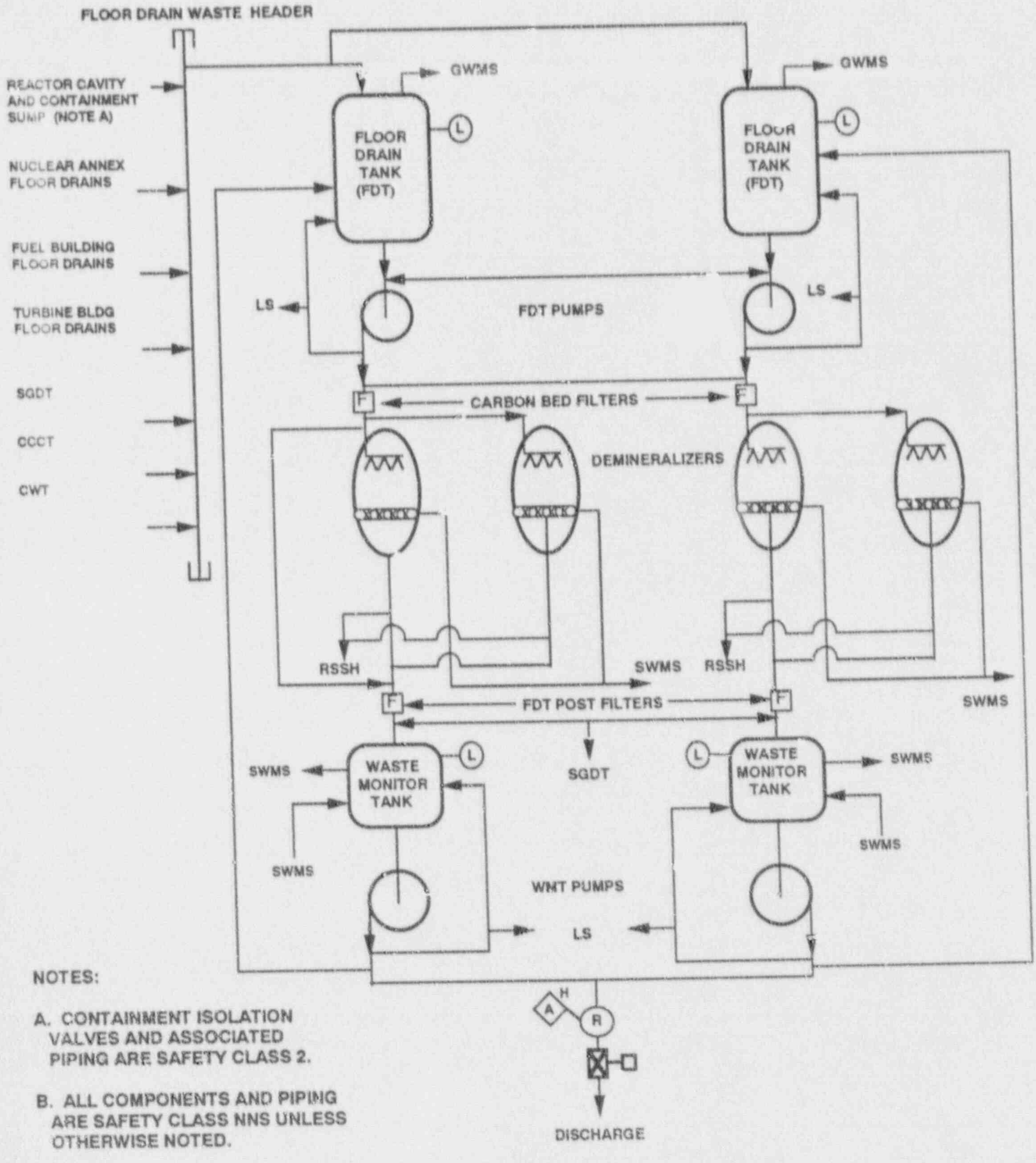


NOTE:

ALL COMPONENTS AND PIPING ARE SAFETY CLASS NNS.

FIGURE 1.11.1-1

LIQUID WASTE MANAGEMENT SYSTEM



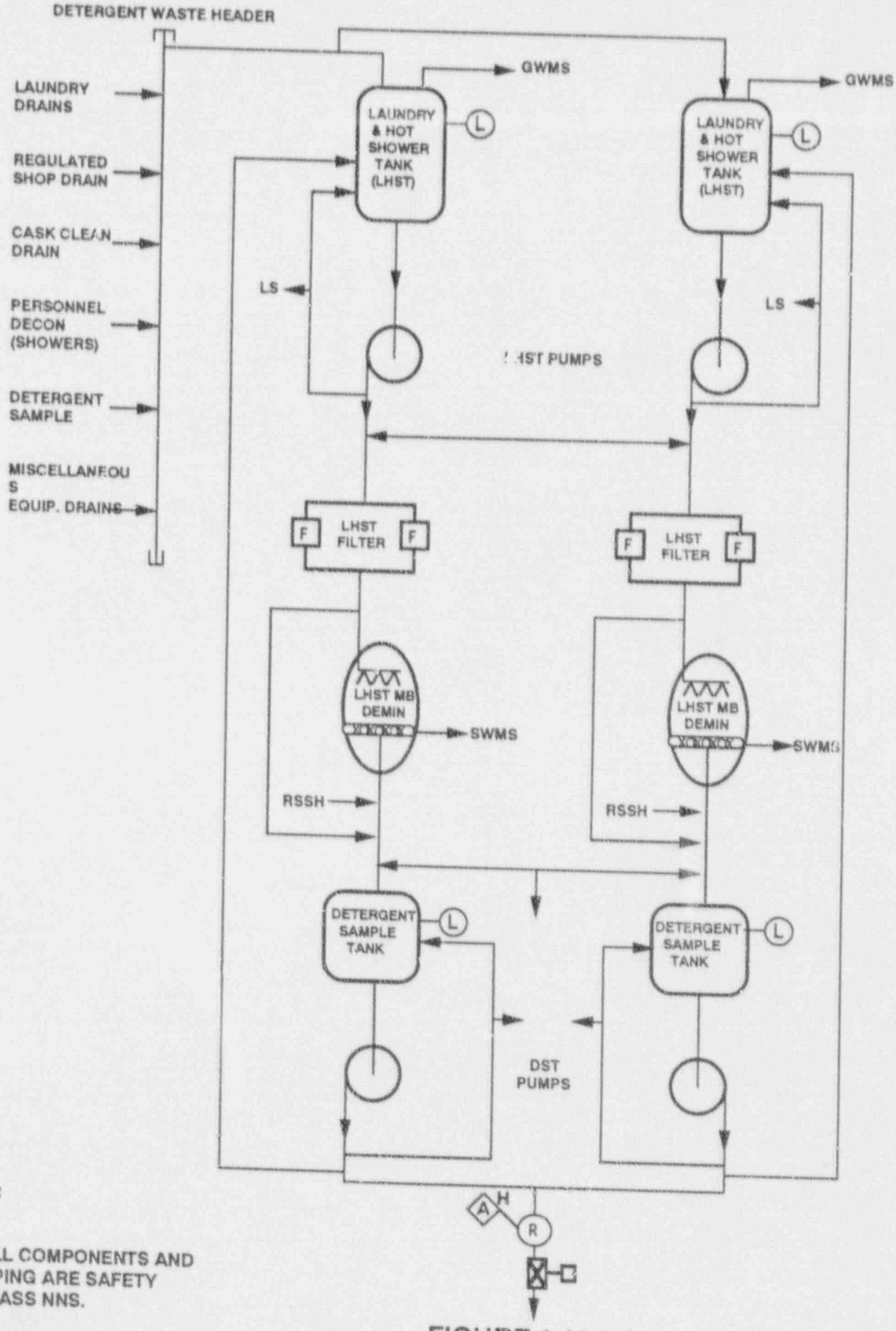
NOTES:

A. CONTAINMENT ISOLATION VALVES AND ASSOCIATED PIPING ARE SAFETY CLASS 2.

B. ALL COMPONENTS AND PIPING ARE SAFETY CLASS NNS UNLESS OTHERWISE NOTED.

FIGURE 1.11.1-2

LIQUID WASTE MANAGEMENT SYSTEM



NOTE:

A. ALL COMPONENTS AND PIPING ARE SAFETY CLASS NNS.

FIGURE 1.11.1-3

LIQUID WASTE MANAGEMENT SYSTEM

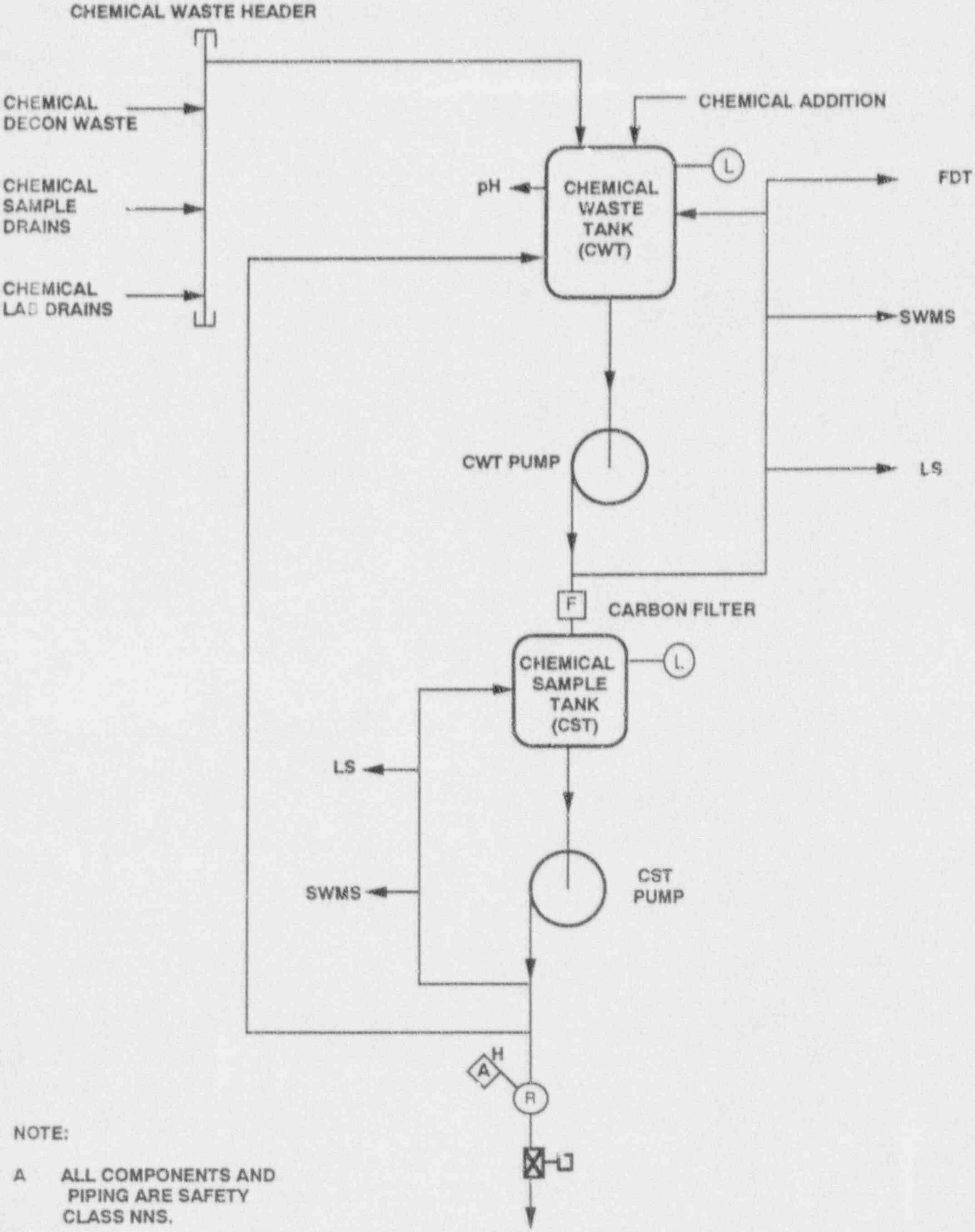
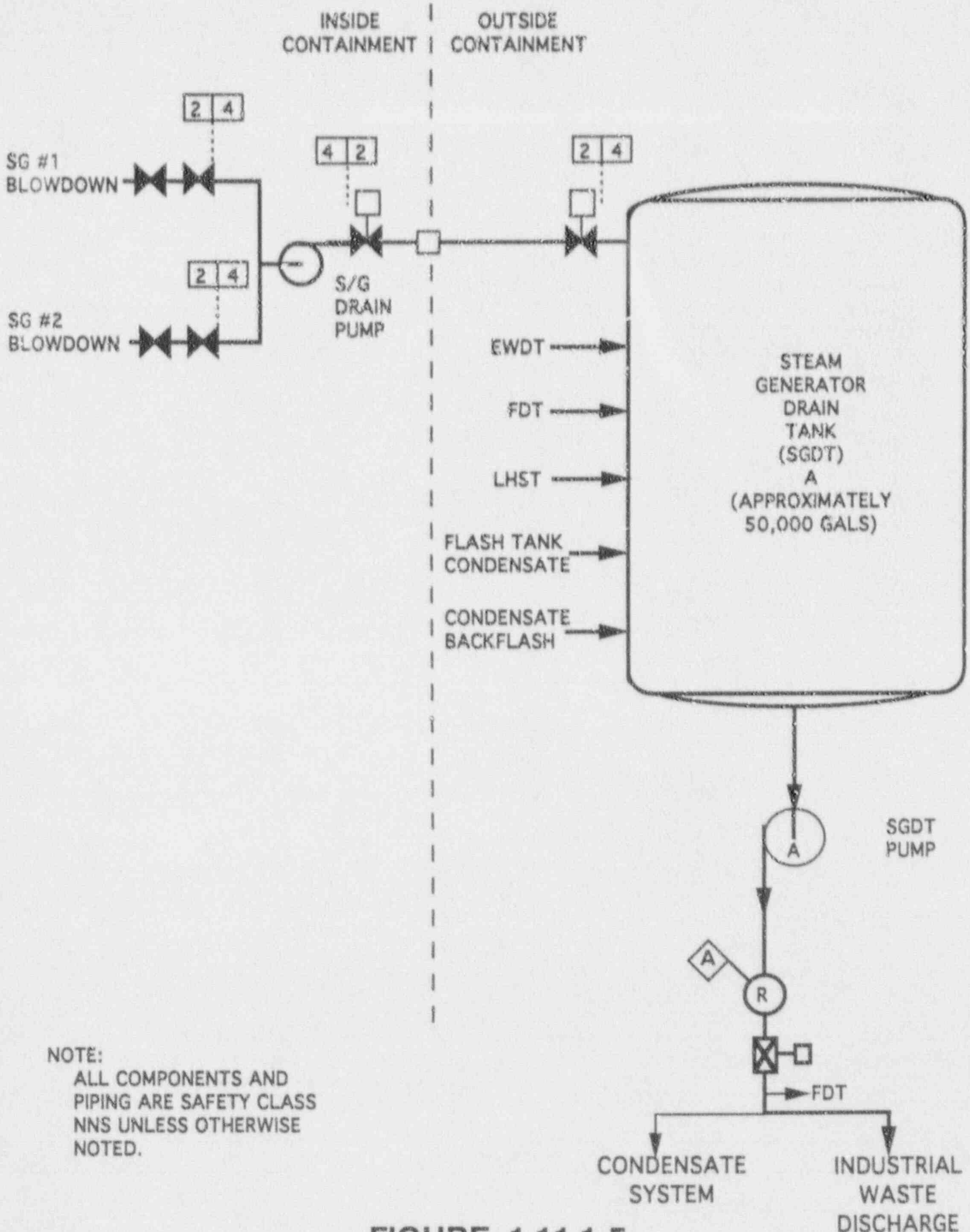


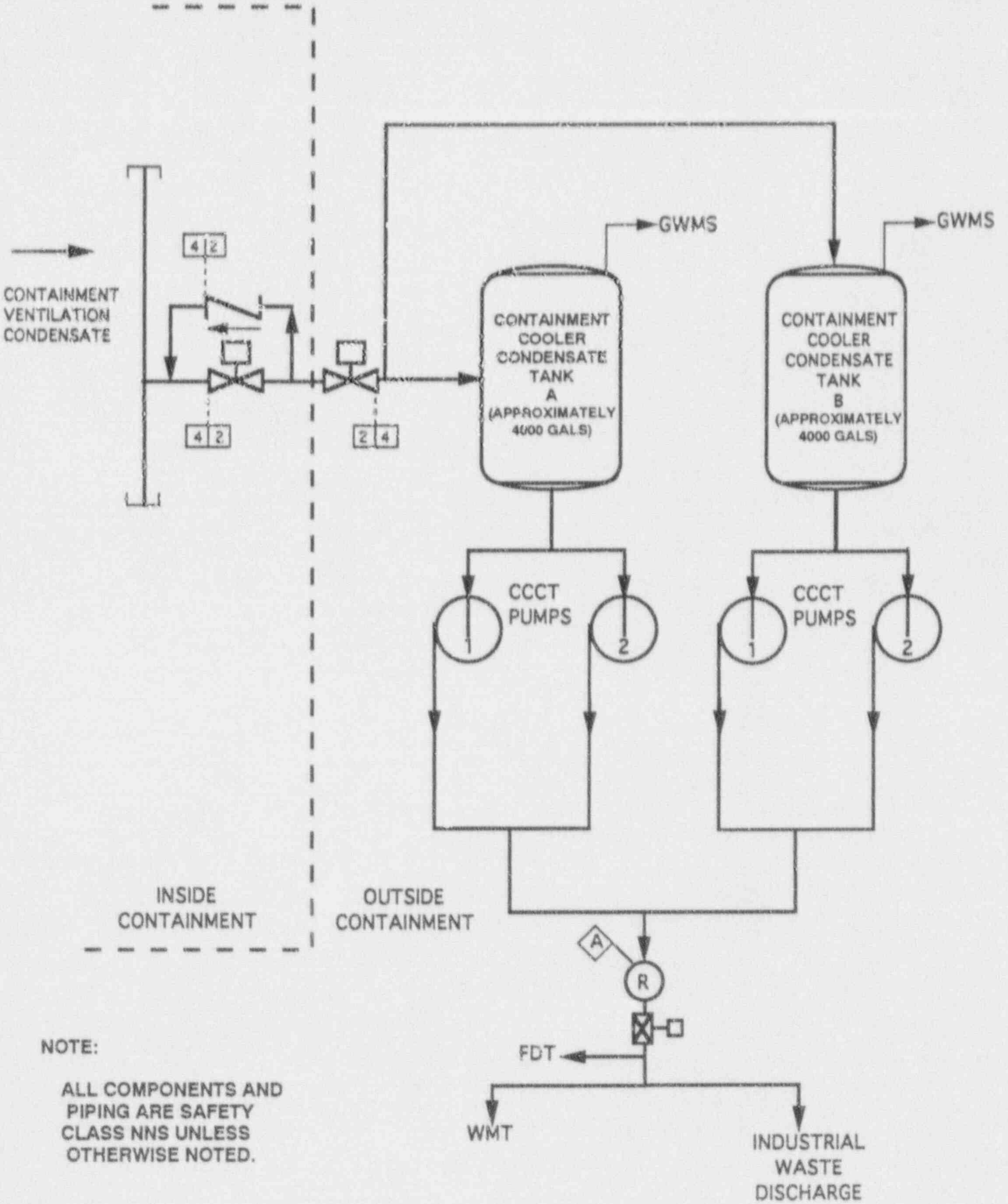
FIGURE 1.11.1-4

LIQUID WASTE MANAGEMENT SYSTEM



NOTE:
ALL COMPONENTS AND PIPING ARE SAFETY CLASS NNS UNLESS OTHERWISE NOTED.

FIGURE 1.11.1-5
LIQUID WASTE MANAGEMENT SYSTEM



NOTE:

ALL COMPONENTS AND PIPING ARE SAFETY CLASS NNS UNLESS OTHERWISE NOTED.

FIGURE 1.11.1-6
LIQUID WASTE MANAGEMENT SYSTEM

1.11.1 LIQUID WASTE MANAGEMENT SYSTEM

SUPPORTIVE INFORMATION

1. Amplifying Information

ITAAC 2

The process flow and storage capacity depends on the waste generated in the as-built plant. This can not be estimated until detailed design is complete. Plant specific information, such as the following, is required to verify the Liquid Waste Management System is designed with sufficient storage and process flow capacity:

a) Typical characteristic leakage rates for as-built components in plant, such as pumps and valves.

b) Number of components which may contribute to total liquid waste generated due to leakage.

c) Operating procedures, developed by the COL Applicant, for decontamination of equipment during all modes of operations.

d) Maintenance procedures, developed by the COL Applicant, for flushing of components.

An analysis will be performed based on:

a) as-built expected flow inputs to each Liquid Waste Management System subsystem,

b) radionuclide concentrations of each influent flow stream,

c) dilution flow (a site specific parameter) available a the liquid plant discharge point

to determine the flow and component capacity required to process anticipated daily inputs and demonstrate compliance with 10CFR20, Appendix B, Table II limits.

ITAAC 3

CESSAR-DC, Section 11.2 revised per DSER open item 11.2-1, provides a description of the methodology to verify compliance with 10 CFR 20, Appendix B limits. Included in the analysis are the following assumptions:

a) Minimum decontamination factor for all radioisotopes, except noble gases and tritium, is 1000. This assumes the LWMS demineralizers are connected in series and the system is designed with the capability to provide additional decontamination capability per ITAAC 1.b.

b) Minimum dilution flow is 100 scfs.

ITAACs 4, 7, and 8

This criteria ensures compliance with 10CFR50, Appendix A (General Design Criteria 60 and 64) which specify the requirement for a controlled monitored release pathway.

In addition 10CFR50, Appendix I, which specifies maintaining general public exposure ALARA due to radioactive liquid effluents, is an important design objective which must be met to verify compliance with 40CFR190 (an acceptance criteria in the Radiation Protection ITAAC). 40CFR190 specifies a limit for exposure to the general public (i.e., 25 mrem whole body, 75 mrem thyroid, 25 mrem any other organ) due to direct and scattered radiation, as well as radioactive effluents from a uranium fuel cycle. Although a failure to comply with 10CFR50, Appendix I would not result in automatic shutdown of a facility, a detailed report describing why the limits were exceeded and action to be taken would be required. However, a pattern of noncompliance could result in a civil penalty based on failure to control radioactive effluent releases in accordance with 10CFR50, Appendix A (GDC 60) and would reflect unfavorably on the design of a radioactive waste management system.

To verify compliance with 10CFR50, Appendix I, an analysis using Regulatory Guide 1.109 methodology would be performed. The following site specific information would be required to perform the analysis:

a) land use survey, such a location of nearest food pathways (e.g., nearest potable water source, garden, cow, goat, etc.)

b) Dilution flow or volume available.

2. Relationship of the Liquid Waste Management System ITAAC to the Safety Analysis

Section 15.7.2, "Liquid Waste Management System Leak or Failure", of the CESSAR-DC is addressed in Section 11.2. It is assumed that the Radwaste Facility is physically connected to the Nuclear Annex; therefore, a LWMS leak or failure would be contained and there would not be an uncontrolled release to the environment.

3. Relationship of Liquid Waste Management System ITAAC to PRA

   N/A

4. CESSAR-DC Chapter 14 Tests Applicable to Liquid Waste Management System ITAAC

1.11.3 SOLID WASTE MANAGEMENT SYSTEM

Design Description

The Solid Waste Management System (SWMS) is a non safety system which provides the capability to collect, segregate, store, process, sample, and monitor radioactive solid waste.

Solid waste is segregated into the following categories:

a. Wet solid waste (WSW) which is a mixture of water and suspended solids or slurries (e.g., spent bead, filter sludge, tank backwash)

b. Dry solid waste (DSW) which is solid waste containing no free liquid (i.e., compactible and non-compactible waste)

Each category of waste is processed by an independent subsystem.

The WSW subsystem has collection and storage capacity to process at least two batches from the maximum expected solid waste inputs during normal and anticipated operational occurrences, which include refueling, plant shutdowns, maintenance, and startup activities.

The wet solid waste (WSW) subsystem has the provision for solidification by dewatering or binding agents in the shipping container.

The WSW subsystem is provided with low and high activity spent resin storage tanks. These tanks are provided with station air for the pneumatic transfer of resin from the tanks to the shipping container for dewatering. A general conceptual illustration of the WSW subsystem is shown in Figure 1.11.3-1.

The dry solid waste (DSW) subsystem has the provisions for sorting and compaction of compactible waste, as well as placement of non-compactible waste, such as spent filters, into shipping containers for disposal. The compactor has an air filtration system. This filtration system is exhausted to the Radwaste Ventilation System, which is a monitored release pathway. A general conceptual illustration of the DSW subsystem is shown in Figure 1.11.3-2.

Radioactive liquid waste, removed during the dewatering process, and radioactive gaseous waste from SWMS components are routed back to the Liquid Waste Management System (LWMS) and the Gaseous Waste Management System (GWMS), respectively. The spent resin storage tanks are provided with screens, and filters are provided downstream of the spent resin tanks to minimize inadvertent discharge of resin beads to the Liquid Waste Management System (LWMS).

Inspections, Tests, Analyses, and Acceptance Criteria

Table 1.11.3-1 specifies the inspections, tests, analyses and acceptance criteria for the SWMS.

TABLE 1.11.3-1

SOLID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. A basic configuration for the SWMS is shown in Figures 1.11.3-1 and 1.11.3-2.	1. Inspection of the DSW System will be performed.	1. The as-built configuration of the SWMS is in accordance with Figures 1.11.3-1 and 1.33.3-2 for the components and equipment shown.
2.a) The WSW has collection and storage capacity to process at least two batches of WSW from the maximum anticipated source during normal operation and refueling, plant shutdowns, maintenance, startup activities.	2.a) Inspection of the as-built WSW and the DSW systems will be performed. An analysis will be performed to calculate systems volumes based on anticipated peak inputs.	2.a) The WSW volumes provide collection and storage capacity for at least two days of calculated wet waste generation.
b) The DSW has provisions for storing, sorting, and compacting as well as placement of non-compactable waste in shipping containers.	b) An inspection of the DSW system will be performed.	b) DSW storage, sorting, and compaction equipment is provided.
3. The SWMS provides for controlled monitored releases by the following:	3. Inspection of the as-built SWMS configuration will be performed.	3.a) An air filtration system is provided on the DSW compactor.
a) Provision of an air filtration system on DSW compactor exhausted to the Radwaste Building Ventilation System.		

TABLE 1.11.3-1 (Continued)

SOLID WASTE MANAGEMENT SYSTEM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3.b) Provision of connections to GWMS and LWMS to route liquid and gaseous waste for further processing.		3.b) Connections to GWMS and LWMS is provided to route liquid and gaseous waste for further processing.
c) Provision of screens in the spent resin storage tanks.		c) Non-clogging wire screens in the spent resin storage tanks are provided.
d) Provision of filters downstream of the spent resin storage tanks.		d) Filters are provided downstream of the spent resin storage tanks.

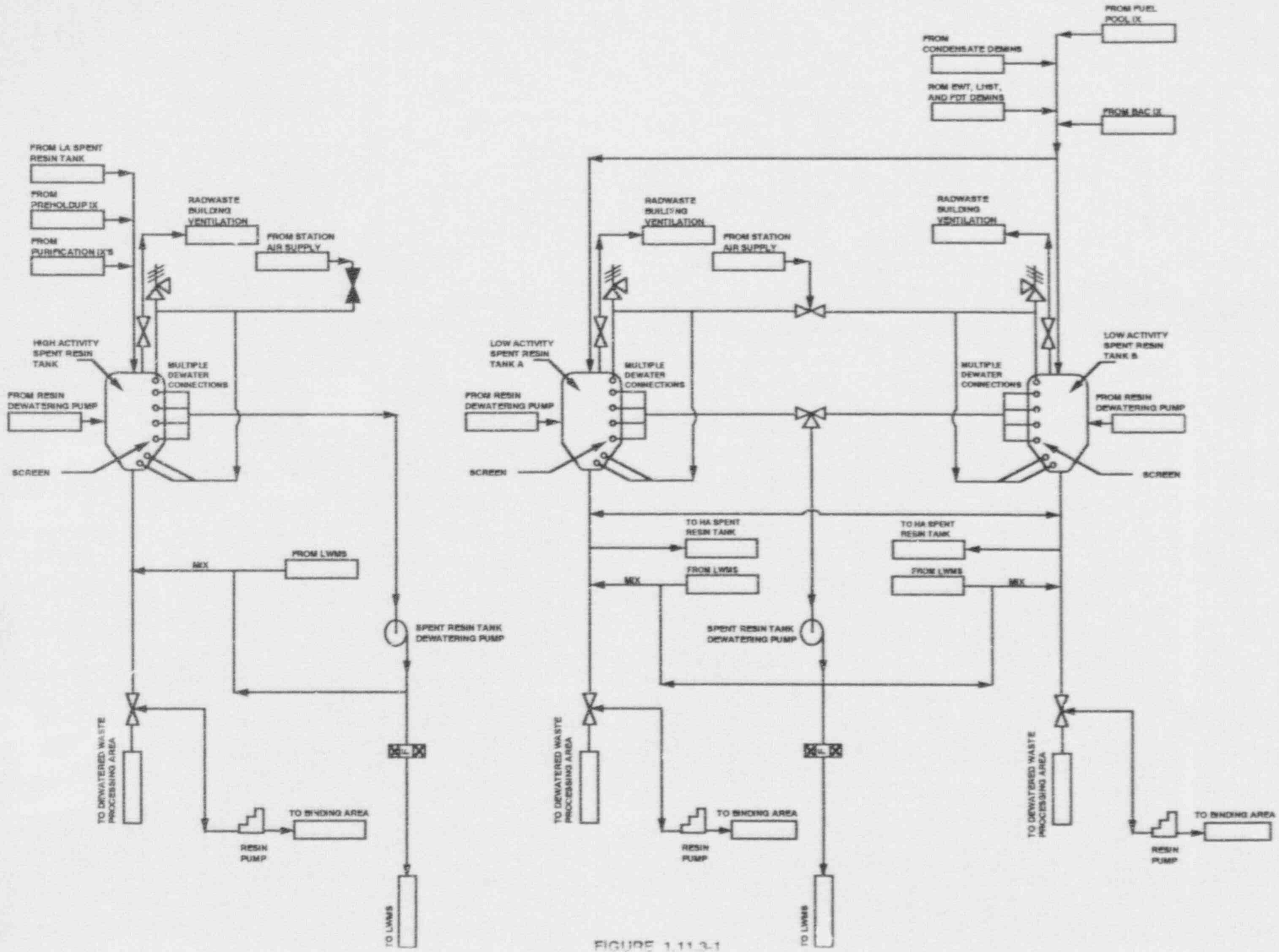


FIGURE 1.11.3-1
WET SOLID WASTE SUBSYSTEM

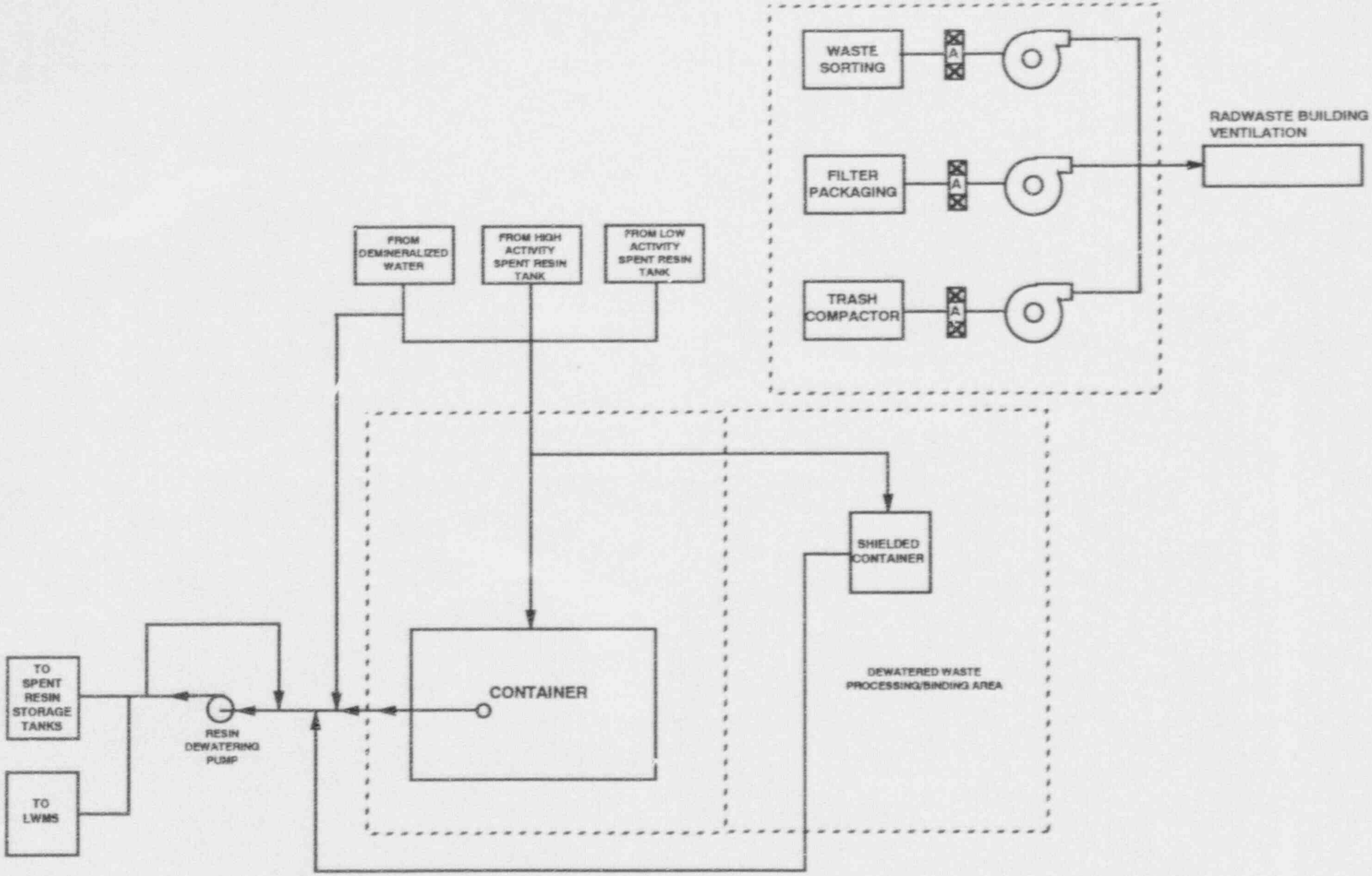


FIGURE 1.11.3-2
DRY STORAGE WASTE SUBSYSTEM

1.11.3 SOLID WASTE MANAGEMENT SYSTEM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

The Solid Waste Management System (SWMS) storage and processing capacity will be evaluated based on as-built plant component characteristics; as well as, operational industry data such as:

a) Frequency that plant ion exchangers are sluiced to the SWMS for processing.

b) Volume of filter and ion exchanger media in plant to be processed in the SWMS prior to disposal.

c) Number of filters in the as-built plant to be processed in the SWMS for disposal.

d) Number of ion exchangers in the as-built plant to be processed in the SWMS for disposal.

e) Plant operating procedures developed by the COL Applicant that may minimize the production of solid waste in the as-built plant.

The WSW subsysten must have sufficient storage and process capacity to process at least two batches in accordance with ANSI/ANS-55.1-1979 recommendations. This ensures that the spent resin tanks are sufficiently sized to permit at least a 30-day decay of short-lived radionuclides prior to processing.

The SWMS is designed to meet the regulatory requirements in accordance with 10CFR 61 for the classification and characterization of solid waste. To achieve this, the COL Applicant will develop boundary conditions for process parameters (such as, settling time, drying time, etc.) to ensure regulatory requirements specified in 10CFR61, such as maximum allowable percent free liquid by volume, are met.

Processed radioactive solid waste will be packaged and shipped to a licensed burial site in accordance with regulatory requirements specified in 10 CFR 71 and by the U.S. Department of Transporation (DOT) 49 CFR 170 through 189. The COL Applicant will develop a program to ensure these requirements are met.

The SWMS is designed to provide for a contr d monitored release to the environment in accordance with 10CFR50, Appen A (General Design Criteria 60 and 64) by the provision system features specified in the SWMS ITAAC documentation.

2. Relationship of Solid Waste Management System ITAAC to the Safety Analysis

   N/A

3. Relationship of Solid Waste Management System ITAAC to PRA

   N/A

4. CESSAR-DC Chapter 14 Tests Applicable to Solid Waste Management System ITAAC

   14.2.12.1.115

1.13 Technical Support Center

Design Description

The Technical Support Center (TSC) is an onsite facility located adjacent to the control room which provides the capability for plant management and technical support to the reactor operating personnel located in the control room during emergency conditions. Plant administration, technical support functions, and contact with offsite activities to assist the control room operators are performed in the TSC throughout the course of an accident. The TSC:

- is located $\leq$ 2 minutes walking time from control room,
- provides an unobstructed view into the control room,
- provides working space of at least 75 square feet per person for a minimum of 25 persons,
- provides storage of and/or access to plant records.

The TSC is monitored for radiation.

The TSC houses communications equipment.

The TSC Technical Data System provides access to plant process instrumentation indications.

Inspections, Tests, Analyses and Acceptance Criteria

Table 1.13-1 specifies the inspections, tests, analysis and associated acceptance criteria for the Technical Support Center.

TABLE 1.13-1

TECHNICAL SUPPORT CENTER
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Technical Support Center:	1. An inspection of the TSC will be performed.	1. The TSC:
a) is located ≤2 minutes walking time from control room,		a) can be reached in ≤ 2 minutes walking time from control room,
b) has an unobstructed view into control room,		b) there are no physical obstructions to viewing the control room,
c) provides working space of at least 75 square feet per person for a minimum of 25 persons,		c) An open space of at least 1875 sq. ft. is provided,
d) provides storage of and/or access to plant records,		d) Plant records and historical data can be accessed.
2. The TSC is monitored for radiation.	2. An inspection of radioactivity monitoring equipment will be performed.	2. Radiation detectors are installed.
3. The TSC houses communications equipment.	3. An inspection of the TSC will be performed.	3. Communications equipment is installed.
4. TSC Technical Data System provides access to plant process instrumentation indications.	4. An inspection of the TSC will be performed.	4. Instrumentation indications exist or can be retrieved in the TSC.

TABLE 1.13-1 (Continued)

TECHNICAL SUPPORT CENTER
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The TSC Technical Data System is independent of control room data processing.	5. Inspections of plant records and tests of TSC Technical Data System will be performed.	5. Plant records along with tests of TSC Technical Data System verify independence of the TSC Technical Data System from control room data processing.

1.13 TECHNICAL SUPPORT CENTER ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   None

2. Relationship of TSC ITAAC to the Safety Analysis

   None

3. Relationship of TSC ITAAC to PRA

   PRA assumes existence of Technical Support Center (TSC), and that TSC can be manned when necessary

4. CESSAR-DC Chapter 14 Tests Applicable to TSC ITAAC

   None

1.18.1 MAIN CONTROL ROOM

Design Description

The Main Control Room (MCR) makes available the annunciators, displays, and controls to 1) operate the plant and 2) maintain plant safety.

The MCR provides workspace and facilities for continuous occupancy and use by a minimum of 2 staff members.

The general configuration of the MCR is shown in Figure 1.18.1-1. The MCR contains the Master Control Console, the Auxiliary Control Console, the Safety Console, the Integrated Process Status Overview, the Control Room Supervisor Console and operations and administration offices.

MCR panels are organized according to the following plant operating functions:

Reactor Coolant System (M1)
Charging & Volume Control System (M2)
Plant Monitoring & Control (M3)
Feedwater & Condensate Systems (M4)
Turbine Control (M5)
Heating, Ventilation, & Air Conditioning (A1)
Cooling Water Systems (A2)
Engineered Safety Features (A3)
Safety Monitoring (A4)
Fire Protection (A5)
Secondary Cycle (A6)
Switchyard (A7)
Electrical Distribution (A8)

The MCR permits execution of tasks to 1) operate the plant and 2) maintain plant safety.

Inspection, Test, Analyses, and Acceptance Criteria

Table 1.18.1-1 specifies the inspections, tests, analyses, and acceptance criteria for the MCR.

TABLE 1.18.1-1

MAIN CONTROL ROOM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The basic configuration for the Main Control Room facility is shown in Figure 1.18.1-1.	1. Inspections of the as-built MCR configuration will be performed.	1. The as-built configuration of the MCR is in accordance with Figure 1.18.1-1 for the components and equipment shown.
2. The MCR makes available annunciators, displays and controls to 1) operate the plant and 2) maintain plant safety.	2. Verification analysis of MCR annunciators, displays and controls, and availability inspection of the as-built MCR will be performed.	2. The results of the availability verification analysis and inspection conform substantially with the availability verification criteria.
3. The MCR provides suitable work space for continuous occupancy and use by a minimum of 2 staff members.	3. Verification analysis of MCR work space suitability, and inspection of the as-built MCR will be performed.	3. The results of the suitability verification analysis and inspection conform substantially with the suitability verification criteria.
4. The MCR permits execution of the MCR tasks to 1) operate the plant and 2) maintain plant safety.	4. Validation tests using a full scale, dynamic simulation (mockup) of the certified MCR will be performed.	4. The results of the validation tests conform substantially to the validation criteria.

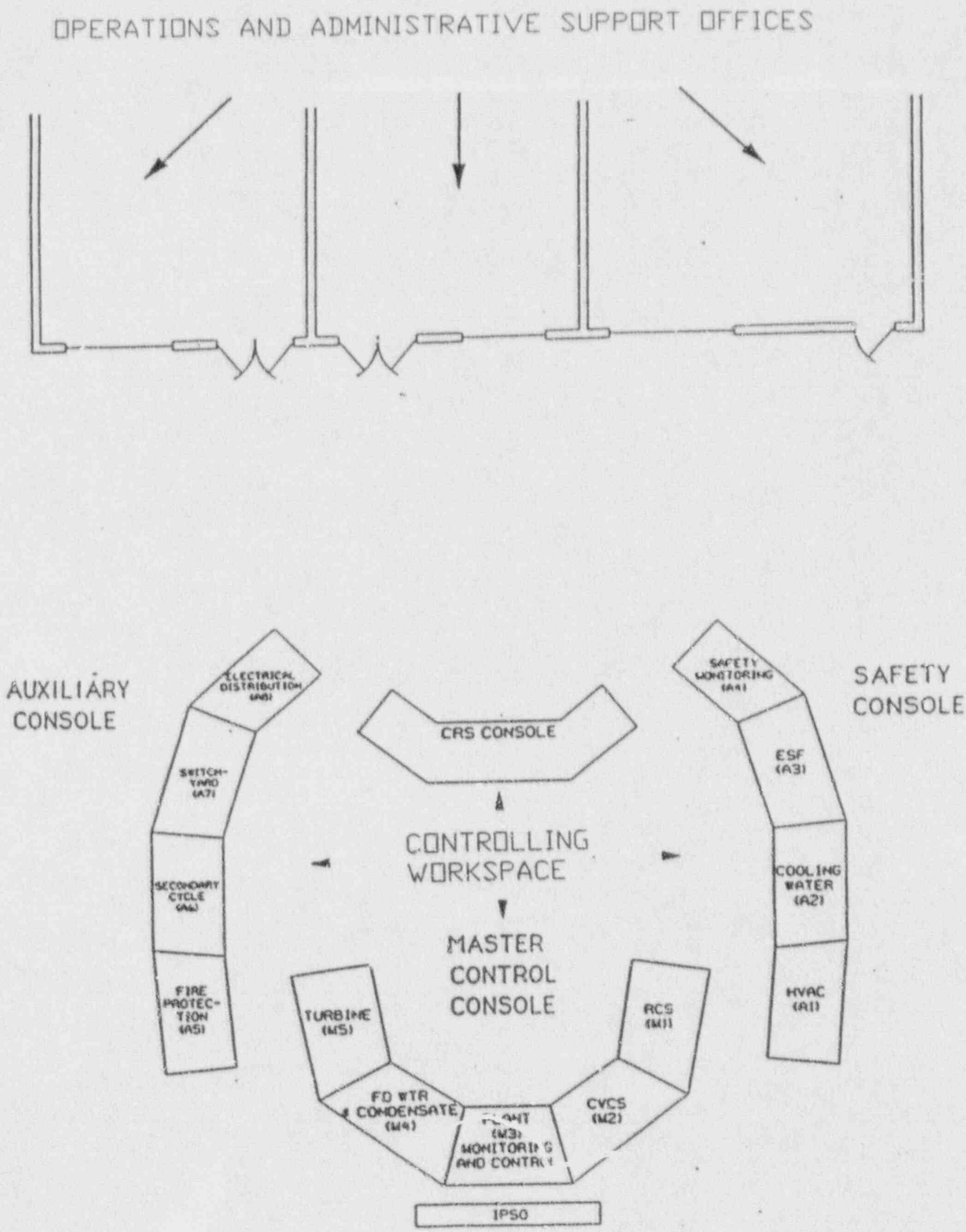


FIGURE 1.18.1-1

1.18.1 MAIN CONTROL ROOM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   1. The following documents are the bases for the MCR design:

      a. HUMAN FACTORS STANDARDS GUIDELINES AND BASES (NPX80-IC-DR791-02) (DRAFT)

      b. NUPLEX 80+ DESIGN BASES (NPX80-IC-DB-790-01)

      c. SYSTEM DESCRIPTION FOR CONTROL COMPLEX INFORMATION SYSTEM (NPX80-IC-SD791-01)

      d. SYSTEM DESCRIPTION FOR CRITICAL FUNCTION AND SUCCESS PATH MONITORING (NPX80-IC-SD790-02)

      e. FUNCTIONAL TASK ANALYSIS METHODOLOGY (CESSAR-DC SECTION 18.5)

      f. OPERATING EXPERIENCE REVIEW FOR SYSTEM 80+ MMI DESIGN (NPX80-IC-RR790-01)

      g. HUMAN FACTORS PROGRAM PLAN FOR THE SYSTEM 80+ STANDARD PLANT DESIGN (NPX80-IC-DP790-01)

      h. HUMAN FACTORS ENGINEERING VERIFICATION AND VALIDATION PLAN FOR NUPLEX 80+ (NPX80-IC-DP790-03)

      i. NUPLEX 80+ VERIFICATION ANALYSIS REPORT (NPX80-TE790-01)

      j. NUPLEX 80+ FUNCTION ANALYSIS AND ALLOCATION REPORT

   2. See CESSAR-DC Section 18.6 for a discussion of the MCR configuration.

2. Relationship of MCR ITAAC to the Safety Analysis

   None

3. Relationship of MCR ITAAC to PRA

None

4. CESSAR-DC Chapter 14 Tests Applicable to MCR ITAAC

None

1.18.2 REMOTE SHUTDOWN ROOM

Design Description

The Remote Shutdown Room (RSR) is located in an area physically separate from the Main Control Room.

The RSR provides work space and facilities for continuous occupancy by at least 3 staff members.

The work space of the RSR contains the Remote Shutdown Panel (RSP). The RSP makes available the annunciators, displays and controls to achieve and maintain hot shutdown of the plant.

The RSP permits execution of tasks to achieve and maintain hot shutdown of the plant.

Inspection, Test. Analyses, and Acceptance Criteria

Table 1.18.2-1 specifies the inspections, tests, analyses and acceptance criteria for the RSR.

TABLE 1.18.2-1
REMOTE SHUTDOWN ROOM
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The RSR is located in an area physically separate from the Main Control Room.	1. Inspection of the location of the as-built RSR will be performed.	1. The certified design commitment is met.
2. The RSR provides work space and facilities for continuous occupancy by at least 3 staff members.	2. Verification analysis of the RSR work space suitability and inspection of the as-built RSR will be performed.	2. The results of the suitability verification analysis and inspection conform substantially with the verification criteria.
3. The RSR makes available the annunciators, displays and controls to achieve and maintain hot shutdown of the plant	3. Verification analysis of the RSR annunciator, display and control availability and availability inspection of the as-built RSR will be performed.	3. The results of the availability verification analysis and inspection conform substantially with the verification criteria.
4. The RSR permits the execution of the RSR tasks to achieve and maintain hot shutdown.	4. Validation tests using full-scale, dynamic simulation (mockup) of the certified RSR will be performed.	4. The results of the validation tests conform substantially with the validation criteria.

1.18.2 REMOTE SHUTDOWN ROOM ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

   See the "Amplifying Information" for ITAAC 1.18.1 for documents which are the bases for the RSR design.

   See CESSAR-DC Section 18.8 for a discussion of the RSR.

2. Relationship of RSR ITAAC to the Safety Analysis

   None

3. Relationship of RSR ITAAC to PRA

   None

4. CESSAR-DC Chapter 14 Tests Applicable to RSR ITAAC

   None

1.18.3 CONTROL PANELS

Design Description

Control Panels provide the annunciators, displays and controls for tasks conducted from the Main Control Room or the Remote Shutdown Room to 1) operate the plant, and/or 2) maintain plant safety.

The Control Panel Human-System Interface (HSI) features use operating conventions that meet human factors design criterria. The followin HSI features are used in the control panel design:

DPS Display Hierarch
DIAS Alarm Tile Displays
DIAS Dedicated Parameter Displays
DIAS Multiple Parameter Displays
CCS Process Controller Displays
CCS Switch Configurations

Local control panels provide annunciators, displays, and controls to support tasks controlled from the Main Control Room or Remote Shutdown Room.

Local control panels HSI meet human factors design criteria.

Inspection, Test, Analyses, and Acceptance Criteria

Table 1.18.3-1 specifies the inspections, tests, analyses, and acceptance criteria that will be applied to each Control Panel.

TABLE 1.18.3-1

CONTROL PANELS
Inspections, Tests, Analyses, and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The Control Panels contain annunciators, displays and controls for tasks conducted from the Main Control Room or Remote Shutdown Room to: 1) operate the plant and/or 2) maintain plant safety.	1. Task analysis of the Control Panel annunciator, display and control inventory will be performed.	1. The results of the task analysis substantially conform with the task analysis criteria.
2. The Control Panel Human System Interface features use operating conventions that meet human factors design criteria. The following HSI are used in the control panel design: DPS Display Hierarchy; DIAS Alarm Tile Displays; DIAS Dedicated Parameter Displays; DIAS Multiple Parameter Displays; CCS Process Controller Displays; and CCS Switch Configurations.	2. Suitability verification inspection of the as-built Control Panels will be performed.	2. The results of the suitability verification inspections conform substantially with the suitability verification inspection criteria.
3. Local control panels contain annunciators, displays, and controls to support tasks controlled from the Main Control Room or Remote Shutdown Room.	3. Task analysis of the local Control Panel annunciator, display and conntrol inventory will be performed.	3. The results of the task analysis conform substantially with the task analysis criteria.
4. Local control panel Human System Interface features meet human factors design criteria.	4. Suitability verification inspection of the as-built local control panels will be performed.	4. The results of the suitability verification inspections conform substantially with the suitability

1.18.3 CONTROL PANELS ITAAC

SUPPORTIVE INFORMATION

1. Amplifying Information

See Section 1.18.1 amplifying information for documents which are the bases for the Control Panel design.

The following applications are standardized Human-System Interface (HSI) features that utilize consistent operating conventions at Nuplex 80+ control panels:

DPS Display Hierarchy
DIAS Alarm Tile Displays
DIAS Dedicated Parameter Displays
DIAS Multiple Parameter Displays
CCS Process Controller Displays
CCS Switch Configurations

STANDARD FEATURE: DPS Display Hierarchy

The DPS Display Hierarchy is a standard Human-System Interface (HSI) feature of the Nuplex 80+ Data Processing System (DPS). The DPS Display Hierarchy submitted for final design approval is described in CESSAR-DC (Chapter 18). The major characteristics of the DPS Display Hierarchy are as follows:

1. The DPS Display Hierarchy is an integrated presentation of Nuplex 80+ process information.

2. The DPS Display Hierarchy provides selectable annunciators and displays of system status and process parameters.

3. Touch-screen VDU devices are utilized.

4. On each display page in the DPS Display Hierarchy, a spatially dedicated message area and main menu are provided.

5. The DPS Display Hierarchy permits selectable access to any of its display pages from any DPS terminal.

6. The DPS Display Hierarchy permits acknowledgment of Nuplex 80+ annunciators.

7. The DPS Display Hierarchy automatically provides specific alarm condition messages at the time of alarm acknowledgment.

8. The DPS Display Hierarchy is configured to conform to the System 80+ Human Factors Standards, Guidelines, & Bases.

9. The DPS Display Hierarchy indications are read at the panel.

10. The DPS VDU devices are located on the vertical panel sections.

11. The DPS Display Hierarchy is diverse and independent of the Discrete Indication and Alarm System (DIAS).

STANDARD FEATURE: DIAS Alarm Tile Display

The DIAS Alarm Tile Display is a standard Human-System Interface (HSI) feature of the Nuplex 80+ Discrete Indication and Alarm System (DIAS). The DIAS Alarm Tile Display submitted for final design approval is described in CESSAR-DC (Chapter 18). The major characteristics of the DIAS Alarm Tile Displays are as follows:

1. Software-generated alarm tiles present groups of functionally-related alarm status messages.

2. Touch-screen VDU devices are utilized.

3. On each DIAS Alarm Tile Display device, the status of alarm tiles is presented on a single alarm tile display page; for each tile, an associated alarm list page is available to present the status of the individual alarm conditions.

4. Unacknowledged alarms on a single tile are acknowledged through the display as a group.

5. Alarm condition messages are automatically provided upon alarm tile acknowledgment.

6. Alarm tiles are assigned to control panels by corresponding plant systems.

7. Alarm tile display devices are located on the vertical panel sections.

8. Alarm tiles on the alarm tile display page are spatially dedicated.

9. DIAS Alarm Tile Displays are configured to conform to the System 80+ Human Factors Standards, Guidelines, & Bases.

10. Tile details are read at its panel; tile status is visible across the controlling work space.

11. Alarm tiles are established for process parameters that provide direct indication of:

    a. Critical Safety Functions
    b. Critical Power Production Functions
    c. Success Path performance
    d. Success Path availability
    e. Damage to major equipment
    f. Personnel hazard

12. Alarms are presented in one of four states: new, existing, cleared, reset.

13. The highest priority of a new or cleared alarm state with the highest priority existing alarm state is provided within a single tile.

14. A tile "stop/resume flash" feature is provided for Priority 2 and 3 alarms.

15. A momentary tone provides an initial audible alert of the transition of one or more alarms to new or cleared states for priority 1 or 2 alarms.

16. A momentary reminder tone provides a recurring audible alert if Priority 1 or 2 alarms remain unacknowledged.

17. Alarm tones emit from the console where the alarming display is located.

STANDARD FEATURE: DIAS Dedicated Parameter Display

The DIAS Dedicated Parameter Display is a standard Human-System Interface (HSI) feature of the Nuplex 80+ Discrete Indication and Alarm System (DIAS). The DIAS Dedicated Parameter Display submitted for final design approval is described in CESSAR-DC (Chapter 18). The major characteristics of the DIAS Dedicated Parameter Displays are as follows:

1. DIAS Dedicated Parameter Displays are software-generated display representations of process parameters. Each dedicated parameter display presents a single value based on redundant sensor data.

2. DIAS Dedicated Parameter Displays present validated information based on redundant sensor data. Validation failures are indicated on the displays.

3. DIAS Dedicated Parameter Displays present spatially dedicated information.

4. A DIAS Dedicated Parameter Display permits continuous display of the individual data points.

5. DIAS Dedicated Parameter Displays incorporate automatic range change features.

6. Touch-screen VDU devices are utilized.

7. DIAS Dedicated Parameter Displays are assigned to control panels by corresponding plant systems.

8. DIAS Dedicated Parameter Display devices are located on the vertical control panel sections.

9. DIAS Dedicated Parameter Displays are configured to conform to the System 80+ Human Factors Standards, Guidelines, & Bases.

10. DIAS Dedicated Parameter Display values are read from across the Main Control Console; the Display details are read at the panel.

11. DIAS Dedicated Parameter Displays are provided for the following:

    a. Critical Safety Functions
    b. Success Path performance
    c. PARI indication
    d. Reg. Guide 1.97

12. DIAS Dedicated Parameter Displays are diverse and independent of the DPS display system.

STANDARD FEATURE: DIAS Multiple Parameter Display

The DIAS Multiple Parameter Display is a standard Human-System Interface (HSI)feature of the Nuplex 80+ Discrete Indication and Alarm System (DIAS). The DIAS Multiple Parameter Display submitted for final design approval is described in CESSAR-DC (Chapter 18). The major characteristics of the DIAS Multiple Parameter Displays are as follows:

1. DIAS Multiple Parameter Displays are software-generated display representations of process parameters.

2. DIAS Multiple Parameter Displays present validated information based on redundant sensor data. Validation failures are indicated on the displays.

3. DIAS Multiple Parameter Displays are digital and analog representations of process parameters.

4. A DIAS Multiple Parameter Display permits continuous display of its individual data points.

5. Touch-screen VDU devices are utilized.

6. Multiple parameters are assigned to control panels and combined into common DIAS Multiple Parameter Display devices based on plant systems relationships.

7. DIAS Multiple Parameter Display devices are located on the vertical control panel sections.

8. DIAS Multiple Parameter Displays are configured to conform to the System 80+ Human Factors Standards, Guidelines, & Bases.

9. DIAS Multiple Parameter Display values are read at the panel.

10. DIAS Multiple Parameter Displays are diverse and independent of the DPS display system.

STANDARD FEATURE: CCS Process Controller Display

The CCS Process Controller Display is a standard Human-System Interface (HSI) feature of the Nuplex 80+ Component Control Systems (CCS). The CCS Process Controller Display submitted for final design approval is described in CESSAR-DC (Chapter 18). The major characteristics of the CCS Process Controller Displays are as follows:

1. CCS Process Controller Displays are software-generated representations of process control devices and their controlled variables.

2. Touch-screen VDU devices are utilized.

3. CCS Process Controller Display devices are located on the control panel bench board sections.

4. CCS Process Controller Displays conform to the System 80+ Human Factors Standards, Guidelines, & Bases.

5. CCS Process Controller Displays are read at the panel.

6. Controls are assigned to control panels based on plant systems, and are combined into Process Controller Display devices based on shared functional relationships.

7. CCS Process Controller Display is divided into static and dynamic sections for master loop and sub loop control and monitoring.

8. CCS Process Controller Displays permits selection of operating modes, loop control signal, and loop setpoints.

9. CCS Process Controller is a man-machine interface device only. All control loop electronics are located outside the main control room.

STANDARD FEATURE: CCS Switch Configuration

The CCS Switch Configurations are a standard Human-System Interface (HSI) feature of the Nuplex 80+ Component Control Systems (CCS). The CCS Switch Configurations submitted for final design approval are described in CESSAR-DC (Chapter 18). The major characteristics of the CCS Switch Configurations are as follows:

1. CCS Switch Configurations utilize physical push buttons with backlit legend status indicators.

2. CCS Switch Configurations permit on-line replacement and bumpless transfer.

3. CCS Switch Configurations are assigned to control panels based on plant systems, and combined into multiple component units based on functional relationships.

4. CCS Switch Configuration devices are located on the control panel bench board sections.

5. CCS Switch Configurations conform to the System 80+ Human Factors Standards, Guidelines, & Bases.

6. CCS Switch Configuration details are read at the panel.

See CESSAR-DC Section 18.7 for discussion of information presentation and panel layout.

2. Relationship of Control Panels ITAAC to the Safety Analysis

None

3. Relationship of Control Panels ITAAC to PRA

None

4. CESSAR-DC Chapter 14 Tests Applicable to Control Panels ITAAC

None