NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

HATCH 1 AND 2

50-321 and 50-366

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NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

HATCH 1 AND 2

50-321 and 50-366

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF FIGURES (continued)

LIST OF TABLES

CAUTION

The information in this report has been developed over an extended period of time based on a site visit, the Final Safety Analysis Report, system and layout drawings, and other published information. To the best of our knowledge, it accurately reflects the plant configuration at the time the information was obtained, however, the information in this document has not been independently verified by the licensee or the NRC.

NOTICE

This sourcebook will be periodically updated with new and/or replacement pages as appropriate to incorporate additional information on this reactor plant. Technical errors in this report should be brought to the attention of the following:

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Correction and other recommended changes should be submitted in the form of marked up copies of the affected text, tables or figures. Supporting documentation should be included if possible.

HATCH 1 AND 2
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	9/89	Original report

HATCH 1 AND 2 SYSTEM SOURCEBOOK

This sourcebook contains summary information on the Hatch 1 and 2 nuclear power plants. Summary data on this plant are presented in Section 1, and similar nuclear power plants are identified in Section 2. Information on selected reactor plant systems is presented in Section 3, and the site and building layout is illustrated in Section 4. A bibliography of reports that describe features of this plant or site is presented in Section 5. Symbols used in the system and layout drawings are defined in Appendix A. Terms used in data tables are defined in Appendix B.

1. SUMMARY DATA ON PLANT

Basic information on the Hatch 1 and 2 nuclear power plant is listed below:

- Docket number	50-321 (Unit 1) and 50-366 (Unit 2)
- Operator	Georgia Power Co.
- Location	Georgia, 11 miles north of Baxley
- Commercial operation date	December 1975 (Unit 1), and September 1979 (Unit 2)
- Reactor type	BWR/4
- NSSS vendor	General Electric
- Power (MWt/MWe)	2436/786 (Unit 1) and, 2436/795 (Unit 2)
- Architect-engineer	Bechtel/Southern Company Services
- Containment type	Steel drywell and wetwell (Mark I)

2. IDENTIFICATION OF SIMILAR NUCLEAR POWER PLANTS

The Hatch nuclear plant has two General Electric BWR/4 nuclear steam supply systems on the site. These are designated Units 1 and 2. Each unit has a Mark I BWR containment incorporating the drywell/pressure suppression concept. Each has a secondary containment structure of reinforced concrete. Other BWR/4 plants in the United States are as follows:

- Browns Ferry Units 1, 2 and 3
- Vermont Yankee
- Peach Bottom Units 2 and 3
- Hatch Units 1 and 2
- Cooper Nuclear Station
- Duane Arnold
- Fitzpatrick
- Brunswick Units 1 and 2
- Fermi Unit 2
- Hope Creek Unit 1
- Limerick Units 1 and 2 (Mark II Containment)
- Shoreham (Mark II Containment)
- Susquehanna Units 1 & 2 (Mark II Containment)

Hatch 1 and 2 uses a high pressure coolant injection system, a single mode reactor core isolation cooling system, a low pressure core spray system and a multi-mode RHR system with no steam condensing capabilities.

3. SYSTEM INFORMATION

This section contains descriptions of selected systems at Hatch 1 and 2 in terms of general function, operation, system success criteria, major components, and support system requirements. A summary of major systems at Hatch 1 and 2 is presented in Table 3-1. In the "Report Section" column of this table, a section reference (i.e. 3.1, 3.2, etc.) is provided for all systems that are described in this report. An entry of "X" in this column means that the system is not described in this report. In the "FSAR Section Reference" column, a cross-reference is provided to the section of the Final Safety Analysis Report where additional information on each system can be found. Other sources of information on this plant are identified in the bibliography in Section 5.

Several cooling water systems are identified in Table 3-1. The functional relationships that exist among cooling water systems required for safe shutdown are shown in Figure 3-1. Details on the individual cooling water systems are provided in the report sections identified in Table 3-1.

Table 3-1. Summary of Hatch 1 and 2 Systems Covered in this Report

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference*
Reactor Heat Removal Systems			
- Reactor Coolant System (RCS)	Same	3.1	4 (5)
- Reactor Core Isolation Cooling (RCIC) Systems	Same	3.2	4.7 (5.5.6)
- Emergency Core Cooling Systems (ECCS)	Core Standby Cooling Systems		
- High-Pressure Injection & Recirculation	High-Pressure Coolant Injection (HPCI) System	3.3	6.4.1 (6.3)
- Low-Pressure Injection & Recirculation	Core Spray (CS) System,	3.3	6.4.3 (6.3)
	Low-Pressure Coolant Injection (LPCI) Mode (an operating mode of the RHR system)	3.3	4.8.6, 6.4.4 (5.5.7.1, 5.5.7.3.5)
- Automatic Depressurization System (ADS)	Same	3.3	6.4.2 (6.3)
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Residual Heat Removal (RHR) System (a multi-mode system)	X	4.8 (5.5.7)
- Main Steam and Power Conversion	Main Steam Supply System,	X	4.5, 4.6, 7.12.1 (10.7)
Systems	Condensate and Feedwater Systems,	X	11.8 (10.4.7)
	Circulating Water System	X	11.6 (10.4.5)
- Other Heat Removal Systems	Steam condensing RHR/RCIC operation (Reactor Isolation Condensing Mode)	X	4.7, 4.8.8 (5.5.6.3, 5.5.7.3.4)

Table 3-1. Summary of Hatch 1 and 2 Systems Covered in this Report (Continued)

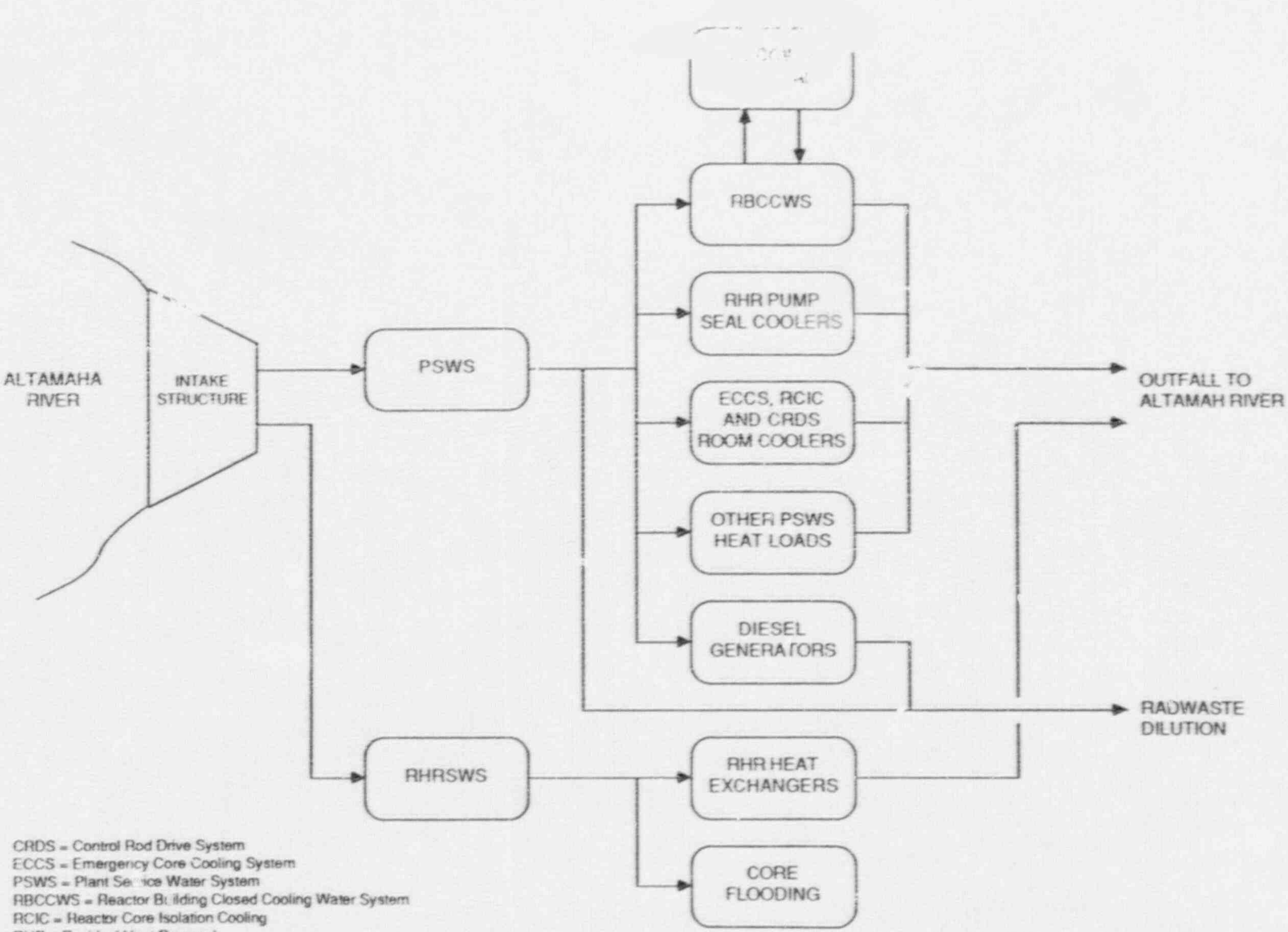
Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Reactor Coolant Inventory Control Systems			
- Reactor Water Cleanup (RWCU) System	Same	X	4.9 (5.5.8)
- ECCS	See above	-	-
- Control Rod Drive Hydraulic System (CRDHS)	Same	3.6	3.4.5.3 (4.2.3.2)
Containment Systems			
- Primary Containment	Same (drywell and pressure suppression chamber)	X	5.1.2, 5.2 (6.2.1.2.1)
- Secondary Containment	Same	X	5.1.3, 5.3 (6.2.1.2.2)
- Standby Gas Treatment System (SGTS)	Same	X	5.3.3.3 (6.2.3)
- Containment Heat Removal Systems			
- Suppression Pool Cooling System	Containment Spray Mode (an operating mode of the RHR system)	3.3	4.8.7 (5.5.7.3.1)
- Containment Spray System	Containment Spray Mode (an operating mode of the RHR system)	3.3	4.8.7 (5.5.7.3.3)
- Containment Fan Cooler System	Primary Containment (Drywell) Cooling System (fan coolers)	X	5.2.3.7 (9.4.6)

Table 3-1. Summary of Hatch 1 and 2 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Containment Systems (continued)			
- Containment Normal Ventilation Systems	Primary Containment (Drywell) Cooling System (fan coolers),	X	5.2.3.7 (9.4.6)
	Reactor Zone Ventilation System	X	10.9.3.2 (9.4.2)
- Combustible Gas Control Systems	Primary Containment Nitrogen Inerting System,	X	5.2.3.9 (6.2.5)
	Primary Containment Purge System (via SGTS)	X	5.2.3.8 (6.2.1.2.1.8)
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	3 (4)
- Control Rod System	Control Rod Drive System	X	3.4 (4.1.3, 4.2.3)
- Chemical Poison System	Standby Liquid Control System (SLCS)	X	3.8 (4.2.3.4)
Instrumentation & Control (I&C) Systems			
- Reactor Protection System (RPS)	Same	3.4	7.2 (7.2)
- Engineered Safety Feature Actuation System (ESFAS)	Primary Containment and Reactor Vessel Isolation Control System,	X	7.3 (7.3)
	Core Standby Cooling System Control and Instrumentation,	3.3	7.4 (7.3)
	Standby Gas Treatment System Actuation	X	5.3.3.3, 7.1.1 (7.3)
- Remote Shutdown System	Reactor Shutdown from outside the main control room	X	None noted for Unit 1 (7.5.2.4)
- Other I&C Systems	Various other systems	X	7.5 to 7.17 (7.4 to 7.7)

Table 3-1. Summary of Hatch 1 and 2 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Support Systems			
- Class 1E Electric Power System	Same	3.5	8 (8.3)
- Non-Class 1E Electric Power System	Same	3.5	8 (8)
- Diesel Generator Auxiliary Systems	Same	3.5	8.4.3 (9.4.5, 9.5.4 to 9.5.7)
- Component Cooling Water (CCW) System	Reactor Building Closed Cooling Water (RBCCW) System	X	10.5 (9.2.2)
- Service Water System (SWS)	Plant Service Water (PSW) System	3.7	10.7 (9.2.1)
- Residual Heat Removal Service Water (RHRSW) System	Same	3.8	10.6 (9.2.7)
- Other Cooling Water Systems	None noted	-	-
- Fire Protection Systems	Same	X	10.8 (9.5.1)
- Room Heating, Ventilating, and Air-Conditioning (HVAC) Systems	Same	X	10.9 (9.4)
- Instrument and Service Air Systems	Compressed Air Systems, Drywell Pneumatic System	X X	10.11 (9.3.1) 10.19 (9.3.6)
- Refueling and Fuel Storage Systems	New and Spent Fuel Storage, Fuel Pool Cooling and Cleanup	X	10.2 to 10.4 (9.1)



CRDS = Control Rod Drive System
ECCS = Emergency Core Cooling System
PSWS = Plant Se ice Water System
RBCCWS = Reactor Bt ilding Closed Cooling Water System
RCIC = Reactor Core Isolation Cooling
PHR = Residual Heat Removal
RHRSWS = Residual Heat Removal Service Water System

Figure 3-1. Cooling Water Systems Functional Diagram for Hatch 1 and 2

3.1 REACTOR COOLANT SYSTEM (RCS)

3.1.1 System Function

The RCS, also called the Nuclear Steam Supply System (NSSS), is responsible for directing the steam produced in the reactor to the turbine where it is used to rotate a generator and produce electricity. The RCS pressure boundary also establishes a boundary against the uncontrolled release of radioactive material from the reactor core and primary coolant.

3.1.2 System Definition

The RCS includes: (a) the reactor vessel, (b) two recirculation loops, (c) recirculation pumps, (d) safety valves, and (e) connected piping out to a suitable isolation valve boundary. A simplified diagram of the Hatch 1 RCS and important system interfaces is shown in Figure 3.1-1 and 3.1-2. A summary of data on selected RCS components is presented in Table 3.1-1. The system for Hatch 2 is similar.

3.1.3 System Operation

During power operation, circulation in the RCS is maintained by one recirculation pump in each of the two recirculation loops and the associated jet pumps internal to the reactor vessel. The steam water mixture flows upward in the core to the steam dryers and separators where the entrained liquid is removed. The steam is piped through the main steam lines to the turbine. The separated liquid returns to the core, mixed with the feedwater and is recycled again.

About 1/3 of the liquid in the downcomer region of the reactor vessel is drawn off by the recirculation pumps. The discharge of these pumps is returned to the inlet nozzles of the jet pumps at high velocity. As the liquid enters the jet pumps the slow moving liquid in the upper region of the downcomer is induced to flow through the jet pumps, producing reactor coolant circulation.

The steam that is produced by the reactor is piped to the turbine via the main steam line. There are two main steam isolation valves (MSIVs) in each main steam line. Condensate from the turbine is returned to the RCS as feedwater.

Following a transient that involves the loss of the main condenser or loss of feedwater, heat from the RCS is dumped to the suppression chamber. A LOCA inside containment or operation of the ADS also dumps heat to the suppression chamber. Makeup to the RCS is provided by the Reactor Core Isolation Cooling (RCIC) system (see Section 3.2) or by the Emergency Core Cooling System (ECCS, see Section 3.3). Heat is transferred from the containment to the ultimate heat sink by the Residual Heat Removal (RHR) system operating in the containment cooling mode. Actuation systems provide for automatic closure of the MSIVs and isolation of other lines connected to the RCS.

3.1.4 System Success Criteria

The RCS success criteria can be described in terms of LOCA and transient mitigation, as follows:

- An unmitigatible LOCA is not initiated.
- If a mitigatible LOCA is initiated, then LOCA mitigating systems are successful.
- If a transient is initiated, then either:
  - RCS integrity is maintained and transient mitigating systems are successful, or
  - RCS integrity is not maintained, leading to a LOCA-like condition (i.e. stuck-open safety or relief valve, reactor coolant pump seal failure), and LOCA mitigating systems are successful.

3.1.5 Component Information

A. RCS
1. Total volume: 16,221 ft^3
2. Water volume: 9,963 ft^3 (including recirculation loops).
3. Steam volume: 6,258 ft^3
4. Steam flow: 10 x 10^6 lb/hr.
5. Normal operating pressure: 1020 psia

B. Safety/Relief Valves (11)
1. Set pressure: 1080 to 1100 psig
2. Relief capacity: 870,000 lb/hr each

C. Recirculation Pumps (2)
1. Rated flow: 45,200 gpm @ 350 ft. head (152 psid)
2. Type: Vertical centrifugal

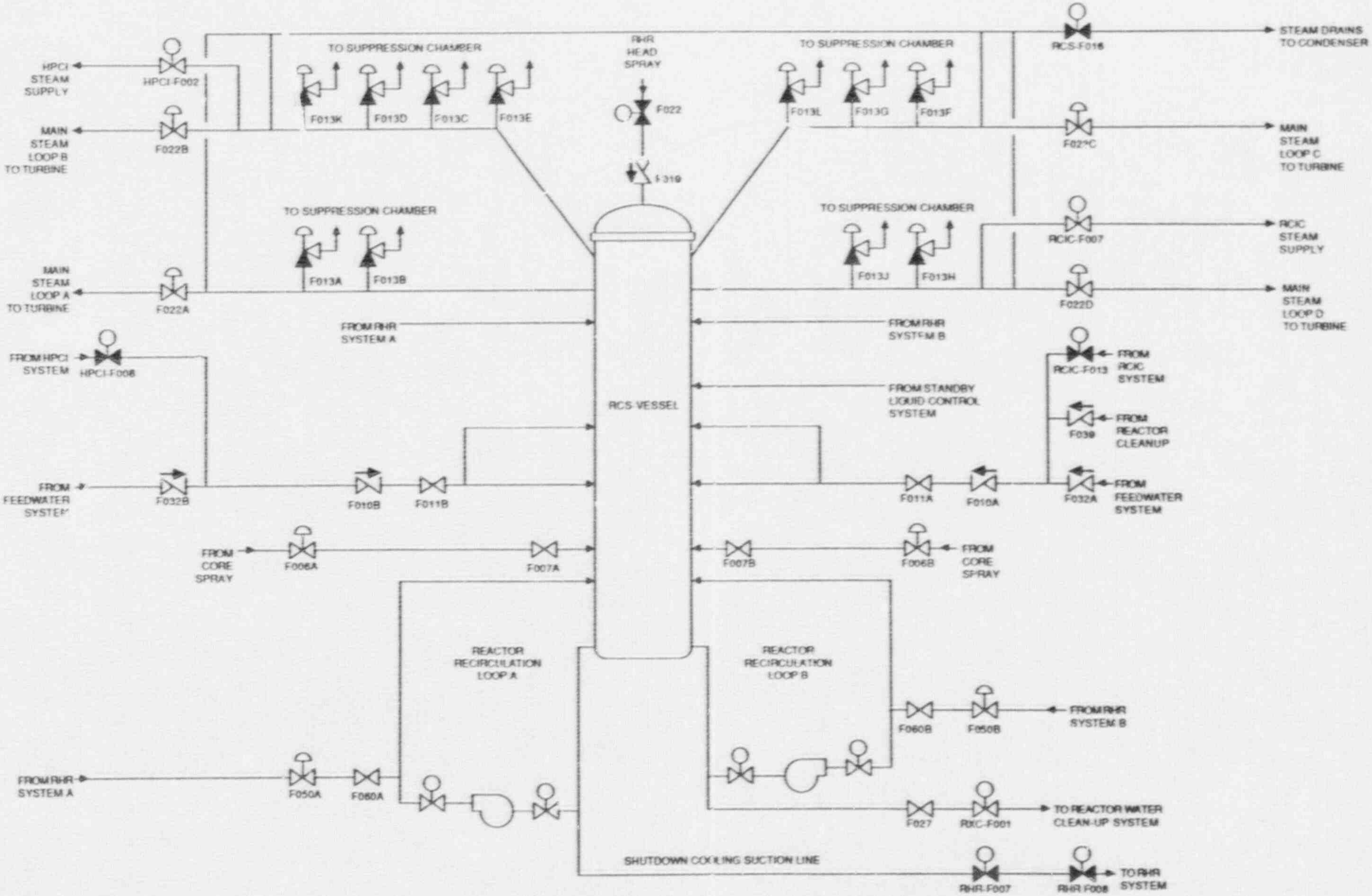
D. Jet Pumps (20)
1. Total flow: 41.72 x 10^6 lb/hr @ 91 ft. head (39 psid)

3.1.6 Support Systems and Interfaces

A. Motive Power
The recirculation pumps are supplied from an AC motor generator set.

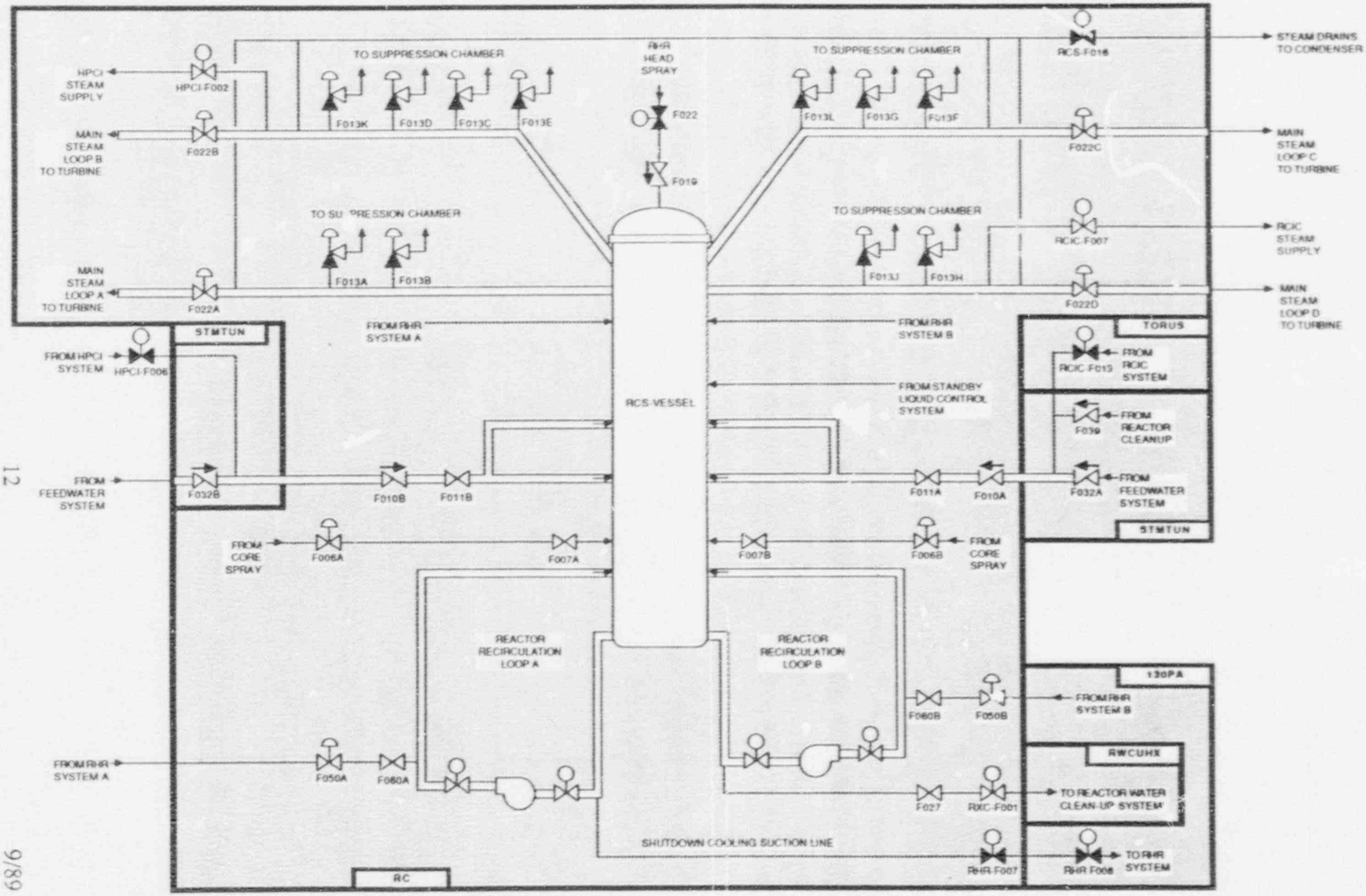
B. MSIV Operating Power
The instrument air system supports normal operation of the MSIVs. Valve operation is controlled by an AC and DC solenoid pilot valve. Both solenoid valves must be deenergized to cause MSIV closure. This design prevents spurious closure of an MSIV if a single solenoid valve should fail. MSIVs are designed to fail closed if instrument air is lost or if both AC and DC control power is lost to the solenoid pilot valves. This is achieved by a local dedicated air accumulator for each MSIV and an independent valve closing spring.

C. Recirculation Pump Cooling
The component cooling water system provides cooling water to the recirculation pump coolers.



NOTE: F013 A,C,E,F,J,K & L are seven remotely operated valves for controlled automatic depressurization (ADS) the other four valves function as safety relief valves, only.

Figure 3.1-1. Hatch Unit 1 - Nuclear Boiler System



NOTE: F013 A,C,E,F,J,K & L are seven remotely operated valves for controlled automatic depressurization (ADS) the other four valves function as safety relief valves, only.

Figure 3.1-2. Hatch Unit 1 - Nuclear Boiler System Showing Component Locations

Table 3.1-1. Hatch 1 Reactor Coolant System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
HPCI-F002	MOV	RC	MCC-S011	600	130RB	AC/1E
HPCI-F003	MOV	130PA	MCC-S022	125/250	130RB	DC/1B
MSD-F016	MOV	RC	MCC-S011	600	130RB	AC/1E
RCIC-F007	MOV	RC	MCC-S012	600	130RB	AC/1G
RCIC-F008	MOV	130PA	MCC-S021	125/250	130RB	DC/1A
RCS-VESSEL	RV	RC				
RHR-F008	MOV	TORUS	MCC-S022	125/250	130RB	DC/1B
RHR-F009	MOV	RC	MCC-S011	600	130RB	AC/1E
RXC-F001	MOV	RC	MCC-S011	600	130RB	AC/1E

3.2 REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.2.1 System Function

The reactor core isolation cooling system provides adequate core cooling in the event that reactor isolation is accompanied by loss of feedwater flow. This system provides makeup at reactor operating pressure and does not require RCS depressurization.

The RCIC system is not considered to be part of the Emergency Core Cooling System (ECCS, see Section 3.3) and does not have a LOCA mitigating function.

3.2.2 System Definition

The reactor core isolation cooling system consists of a steam-driven turbine pump and associated valves and piping for delivering makeup water from the condensate storage tank or the suppression pool to the reactor pressure vessel.

Simplified drawings of the Hatch 1 reactor core isolation cooling system are shown in Figures 3.2-1 and 3.2-2. A summary of data on selected RCIC system components is presented in Table 3.2-1. The system for Hatch 2 is similar.

3.2.3 System Operation

During normal operation the RCIC is in standby with the steam supply valves to the RCIC turbine driven pump closed and the pump suction aligned to the condensate storage tank.

Upon receipt of an RPV low water level signal, the turbine-pump steam supply valves are opened and makeup water is supplied to the RPV. The primary water supply for the RCIC is the condensate storage water tank which contains an 8 hour supply of makeup water. The suppression pool is used as a backup water supply.

3.2.4 System Success Criteria

For the RCIC system to be successful there must be at least one water source and supply path to the turbine-driven pump, an open steam supply path to the turbine, an open discharge path to the RCS, and an open turbine exhaust path to the suppression pool.

3.2.5 Component Information

A. Steam turbine-driven RCIC pump:
   1. Rated Flow: 416 gpm @ 2800 ft. head (1214 psid)
   2. Rated Capacity: 100%
   3. Type: centrifugal

B. Condensate Storage Tank
   1. Capacity: 500,000 gal

3.2.6 Support System and Interfaces

A. Control Signals
   1. The RCIC pump is automatically actuated on a reactor vessel low water level signal
   2. Remote Manual
      The RCIC pump can be actuated by remote manual means from the Main Control Room.

B. Motive Power
   1. The RCIC turbine driven pump is supplied with steam from main steam loop D, upstream of the main steam isolation valves.

2. The steam supply valves to the turbine-pump, RCIC-F045, and the other MOVs required for RCIC operation are Class 1E DC-A loads supplied by station batteries as described in Section 3.5

C. Other
   1. Lubrication and cooling for the RCIC pump is supplied locally.
   2. A room ventilation system cooled by plant service water loop A (see Section 3.7) provides RCIC room cooling.
   3. RCIC pump gland seal leakoff is collected, condensed and returned to the pump switch. A vacuum pump maintains condenser vacuum.

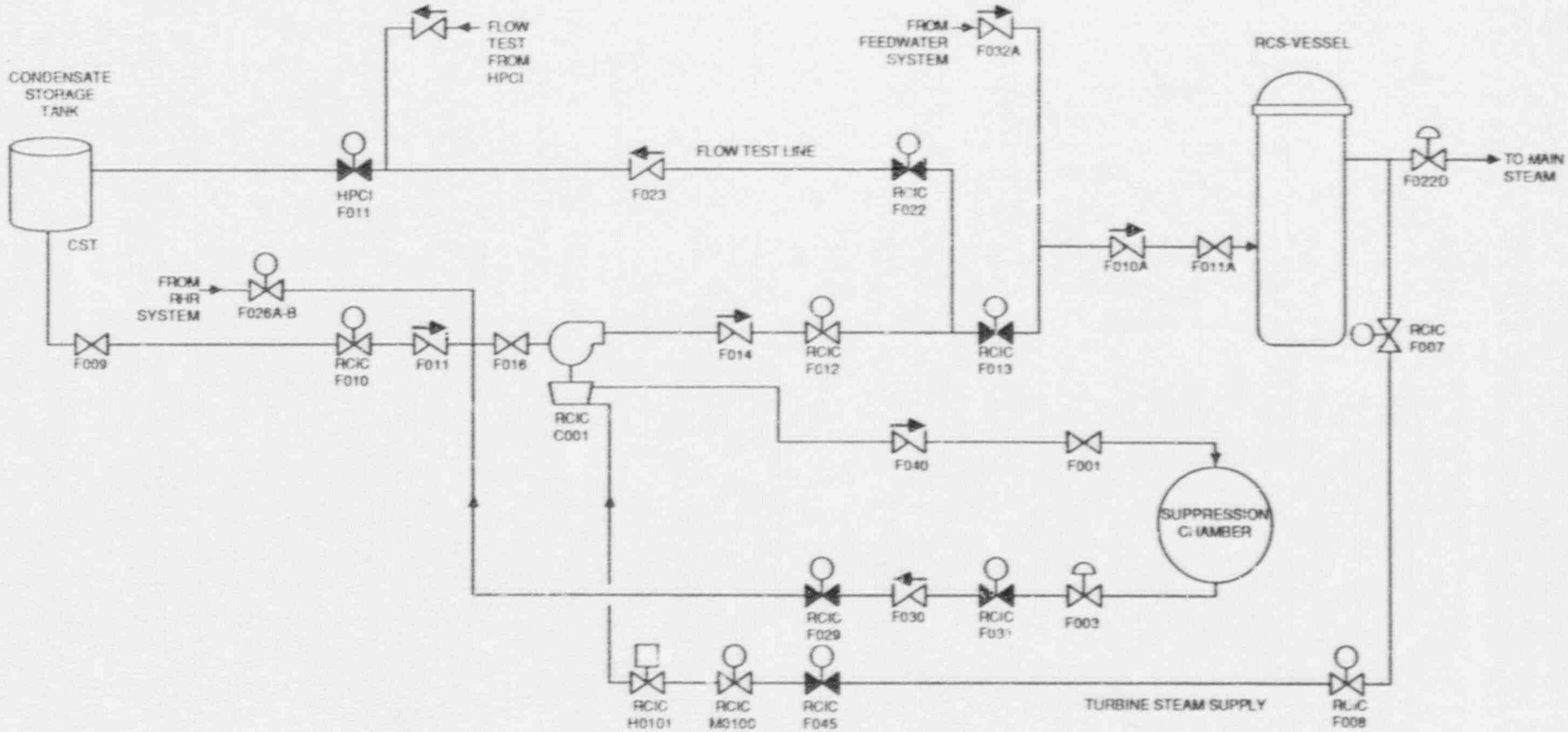


Figure 3.2-1. Hatch Unit 1 Reactor Core Isolation Cooling (RCIC) System

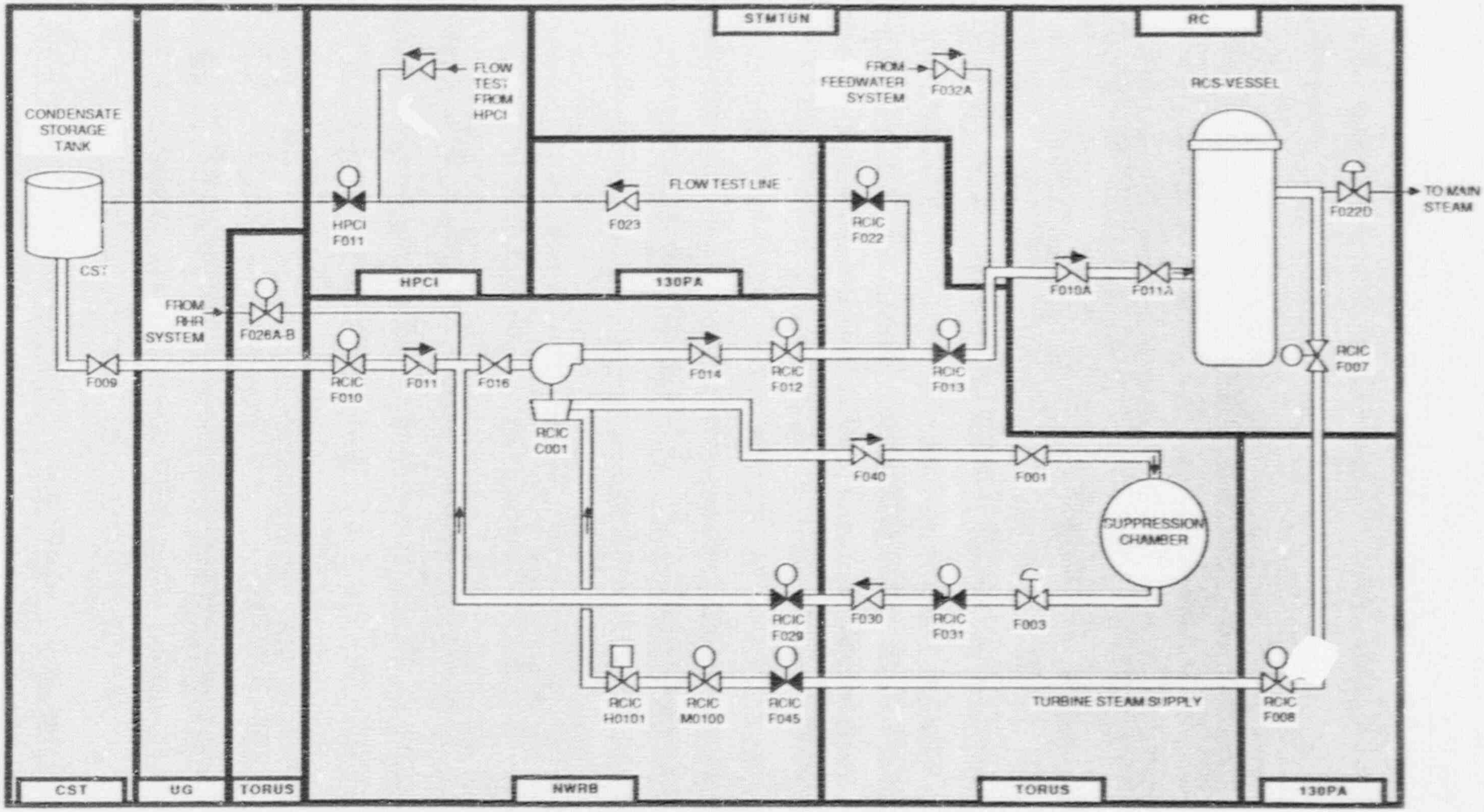


Figure 3.2-2. Hatch Unit 1 Reactor Core Isolation Cooling (RCIC) System Showing Component Locations

Table 3.2-1. Hatch 1 Reactor Core Isolation Cooling System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CST	TK	CST				
RCIC-C001	TDP	NWRB				
RCIC-F007	MOV	RC	MCC-S012	600	130RB	AC/1G
RCIC-F008	MOV	130PA	MCC-S021	125/250	130RB	DC/1A
RCIC-F010	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
RCIC-F012	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
RCIC-F013	MOV	TORUS	MCC-S021	125/250	130RB	DC/1A
RCIC-F022	MOV	TORUS	MCC-S021	125/250	130RB	DC/1A
RCIC-F029	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
RCIC-F031	MOV	TORUS	MCC-S021	125/250	130RB	DC/1A
RCIC-F045	MOV	NERB	MCC-S021	125/250	130RB	DC/1A
RCIC-H0101	HV	NWRB				
RCIC-MO100	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
TORUS	TK	TORUS				

Table 3.2-1. Hatch 1 Reactor Core Isolation Cooling System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CST	TK	CST				
RCIC-C001	TDP	NWRB				
RCIC-F007	MOV	RC	MCC-S012	600	130RB	AC/1G
RCIC-F008	MOV	130PA	MCC-S021	125/250	130RB	DC/1A
RCIC-F010	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
RCIC-F012	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
RCIC-F013	MOV	TORUS	MCC-S021	125/250	130RB	DC/1A
RCIC-F022	MOV	TORUS	MCC-S021	125/250	130RB	DC/1A
RCIC-F029	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
RCIC-F031	MOV	TORUS	MCC-S021	125/250	130RB	DC/1A
RCIC-F045	MOV	NERB	MCC-S021	125/250	130RB	DC/1A
RCIC-H0101	HV	NWRB				
RCIC-MO100	MOV	NWRB	MCC-S021	125/250	130RB	DC/1A
TORUS	TK	TORUS				

3.3 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.3.1 System Function

The ECCS is an integrated set of subsystems that perform emergency coolant injection and recirculation functions to maintain reactor core coolant inventory and adequate decay heat removal following a LOCA. For Unit 1 this system is called the Core Standby Cooling (CSC) system. Unit 2 defines this system as the ECCS system. The ECCS also has a capability for mitigating transients.

3.3.2 System Definition

The emergency coolant injection (ECI) function is performed by the following ECCS subsystems:

- High-pressure Coolant Injection (HPCI) System
- Automatic Depressurization System (ADS)
- Core Spray System (CSS)
- Low-pressure Coolant Injection (LPCI) System

The HPCI system is provided to supply make-up water to the reactor pressure vessel (RPV) in the event of a small break LOCA which does not result in a rapid depressurization of the reactor vessel. The HPCI system consists of a steam-turbine driven pump, system piping, valves and controls.

The automatic depressurization system (ADS) provides automatic RPV depressurization for small breaks so that the low pressure systems (LPCI and CSS) can provide makeup to the RCS. The ADS utilize 7 of the 11 safety/relief valves that discharge the high pressure steam to the suppression pool.

The core spray system supplies make-up water to the reactor vessel at low pressure. The system consists of two independent loops, each of which has an electric driven pump to supply water from the suppression pool to a spray sparger in the reactor vessel above the core.

The low-pressure coolant injection system is an operating mode of the RHR system, and provides make-up water to the reactor vessel at low pressure. The LPCI system consists of four motor driven pumps which supply water for the suppression pool into one of the two recirculation loops.

Simplified drawings of the Hatch 1 ECCS are presented in this section as follows: the HPCI system are shown in Figures 3.3-1 and 3.3-2, the core spray system is shown in Figures 3.3-7 and 3.3-8, LPCI A is shown in Figures 3.3-3 and 3.3-4, and LPCI B is shown in Figures 3.3-5 and 3.3-6. Interfaces between these systems and the RCS are shown in Section 3.1. A summary of data on selected ECCS components is presented in Table 3.3-1. The system for Hatch 2 is similar.

3.3.3 System Operation

All ECCS systems normally are in standby. The manner in which the ECCS operates to protect the reactor core is a function of the rate at which coolant is being lost from the RCS. The HPCI system is normally aligned to take a suction on the Condensate Storage Tank (CST). The HPCI system is automatically started in response to decreasing RPV water level, and will serve as the primary source of makeup if RCS pressure remains high. Operation of the HPCI system is not directly dependent on AC electric power. If the break is of such a size that the coolant loss exceeds the HPCI system capacity or if reactor pressure is too low to operate the steam turbine-driven HPCI pump, then the CSS and LPCI systems can provide higher capacity makeup to the reactor vessel.

Automatic depressurization is provided to automatically reduce RCS pressure if a break has occured and RPV water level is not maintained by the HPCI system. Rapid depressurization permits flow from the CS ; or LPCI systems to enter the vessel. Water can be taken from the suppression pool by each of these system for injection into the core.

3.3.4 System Success Criteria

LOCA mitigation requires that both the emergency coolant injection (ECI) and emergency coolant recirculation (ECR) functions be accomplished. The ECCS success criteria are not clearly defined in the Hatch FSAR but can be inferred from pump capacities that are defined based on certain design basis accidents that are considered in the licensing process based on licensing considerations. The ECI system success criteria for a large LOCA are the following:

- 1 of 2 core spray pumps with a suction on the suppression pool, or
- 1 of the 4 low pressure coolant injection pumps with a suction on the suppression pool.

The ECI system success criteria for a small LOCA are the following:

- The high-pressure coolant injection (HPCI) pump with a suction on the suppression pool or the condensate storage tank, or
- The automatic depressurization system (ADS) and 1 of 4 LPCI pumps with a suction on the suppression pool, or
- The automatic depressurization system and 1 of 2 core spray pumps with a suction on the suppression pool.

The success criterion for the A..S is the use of any 1 of 2 ADS trains. Note that there may be integrated success criteria involving combinations of core spray and LPCI pumps. It is possible that the coolant inventory control function for some small LOCAs can be satisfied by low-capacity high-pressure injection systems such as the control rod drive hydraulic system (see Section 3.6).

The ECR success criteria for LOCAs are related to the ECI success criteria above. All injection systems essentially are operating in a recirculation mode when drawing water from the suppression pool.

For transients, the success criteria for reactor coolant inventory control involve the following:

- Either the reactor core isolation cooling (RCIC) system (not part of the ECCS, see Section 3.2), or
- Small LOCA mitigating systems

For the suppression pool cooling function to be successful, one of two RHR trains must be aligned for containment heat removal and the associated RHR service water train must be operating to complete the heat transfer path from the RHR heat exchangers to the ultimate heat sink. In a given RHR train, one of two RHR pumps must operate.

3.3.5 Component Information

A. Steam turbine-driven HPCI pump (HPCI-C001)
   1. Rated flow: 4250 gpm @ 2580 ft head (1118 psid)
   2. Type: centrifugal

B. Low-pressure Core Injection Pumps (C002 A, B, C, D) (4)
   1. Rated flow: 7700 gpm @ 46 ft. head (20 psid)
   2. Type: centrifugal

C. Core spray pumps C001A and C001B
   1. Rated flow: 4625 gpm @ 260 psid
   2. Type: centrifugal

D. Automatic-depressurization valves (7)
   1. Rated flow: 800,000 lb/hr @ 1125 psig

E. Pressure Suppression Chamber
   1. Design pressure: 56 psig
   2. Design temperature: 340°F
   3. Operating temperature: 95°F
   4. Maximum water volume: 90,550 ft3
   5. Minimum water volume: 87,300 ft3

3.3.6 Support Systems and Interfaces

A. Control signals
   1. Automatic
      a. The HPCI pump, core spray pumps and the LPCI pumps and all their associated valves function upon receipt of low water level in the reactor vessel or high pressure in the drywell.
      b. The ADS system is actuated upon coincident signals of the reactor vessel low water level, drywell high pressure and discharge pressure indication on any LPCI or CS pump but with a 2-min delay.

   2. Remote manual
      ECCS pumps and valves and the ADS can be actuated by remote manual means from the main control room.

B. Motive Power
   1. The ECCS motor-driven pumps and motor-operated valves are Class 1E AC and DC loads that can be supplied from the emergency diesel generator or station battery, as described in Section 3.5.
   2. The steam supply valves to the HPCI turbine are Class 1E DC-B loads.
   3. The HPCI turbine-driven pump is supplied with steam from main steam loop B, upstream of the main steam isolation valves.

C. Other
   1. The HPCI pump has a DC-powered auxiliary lube oil pump that is required for pump startup (ie., to pressurize the oil system for pump thrust bearing lubrication and for operation of the governor system and the hydraulic steam supply valves for the HPCI turbine). Once the HPCI pump is operating, a shaft-driven lube oil pump provides oil pressure, and the DC oil pump is stopped.
   2. HPCI pump gland seal leakoff is collected, condensed, and returned to the pump suction. A vacuum pump maintains condenser vacuum.
   3. Lubrication and cooling for the HPCI pump are supplied locally.
   4. RHR pump cooling is provided by the plant service water system (see Section 3.7).

5. Core spray pump lubrication and cooling is assumed to be provided locally.
6. Room ventilation systems cooled by plant service water (see Section 3.7) are provided as follows:

HPCI pump room	Loop B
RHR (LPCI) pump room	Loop A & B

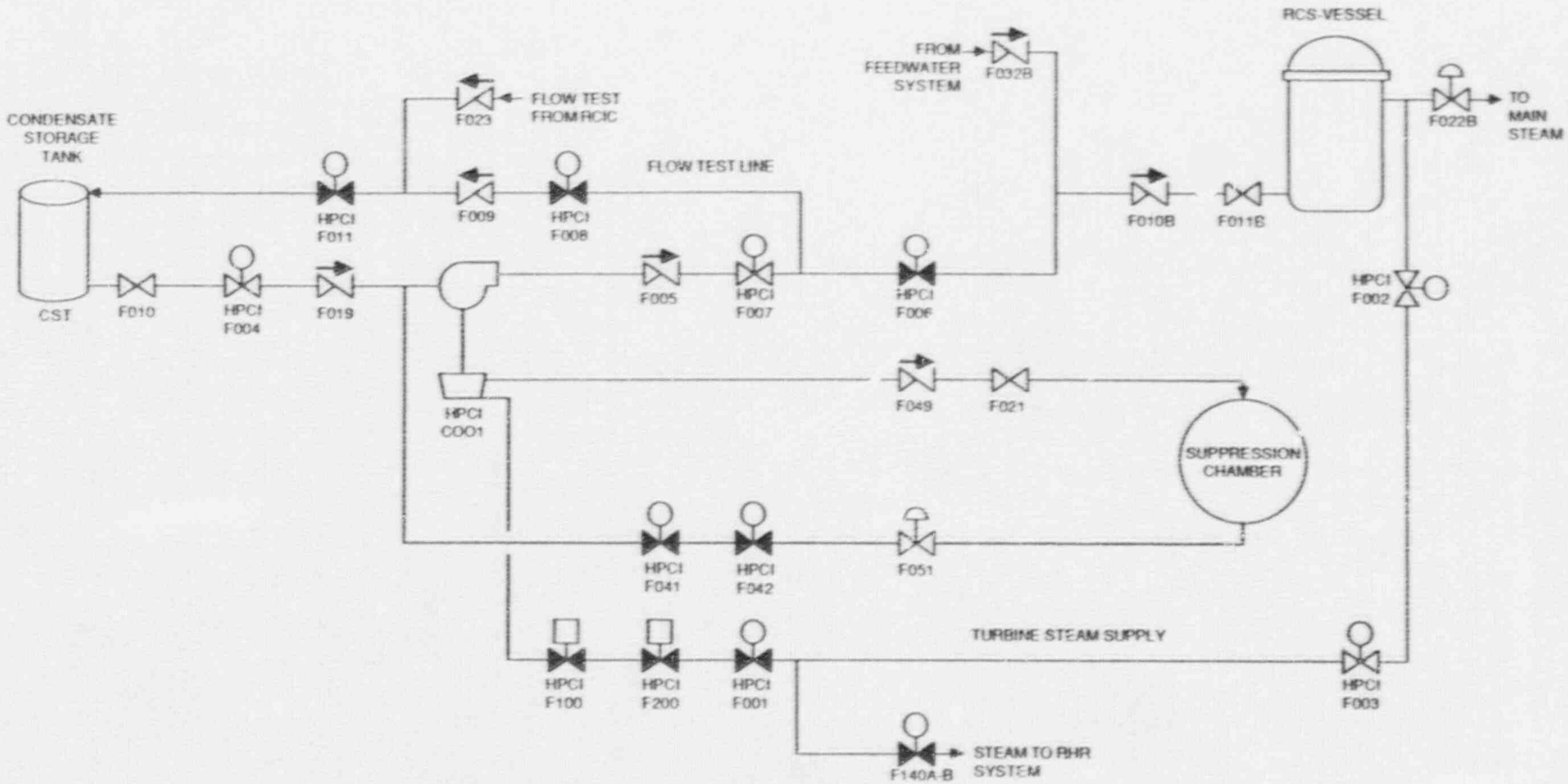


Figure 3.3-1. Hatch Unit 1 High Pressure Coolant Injection (HPCI) System

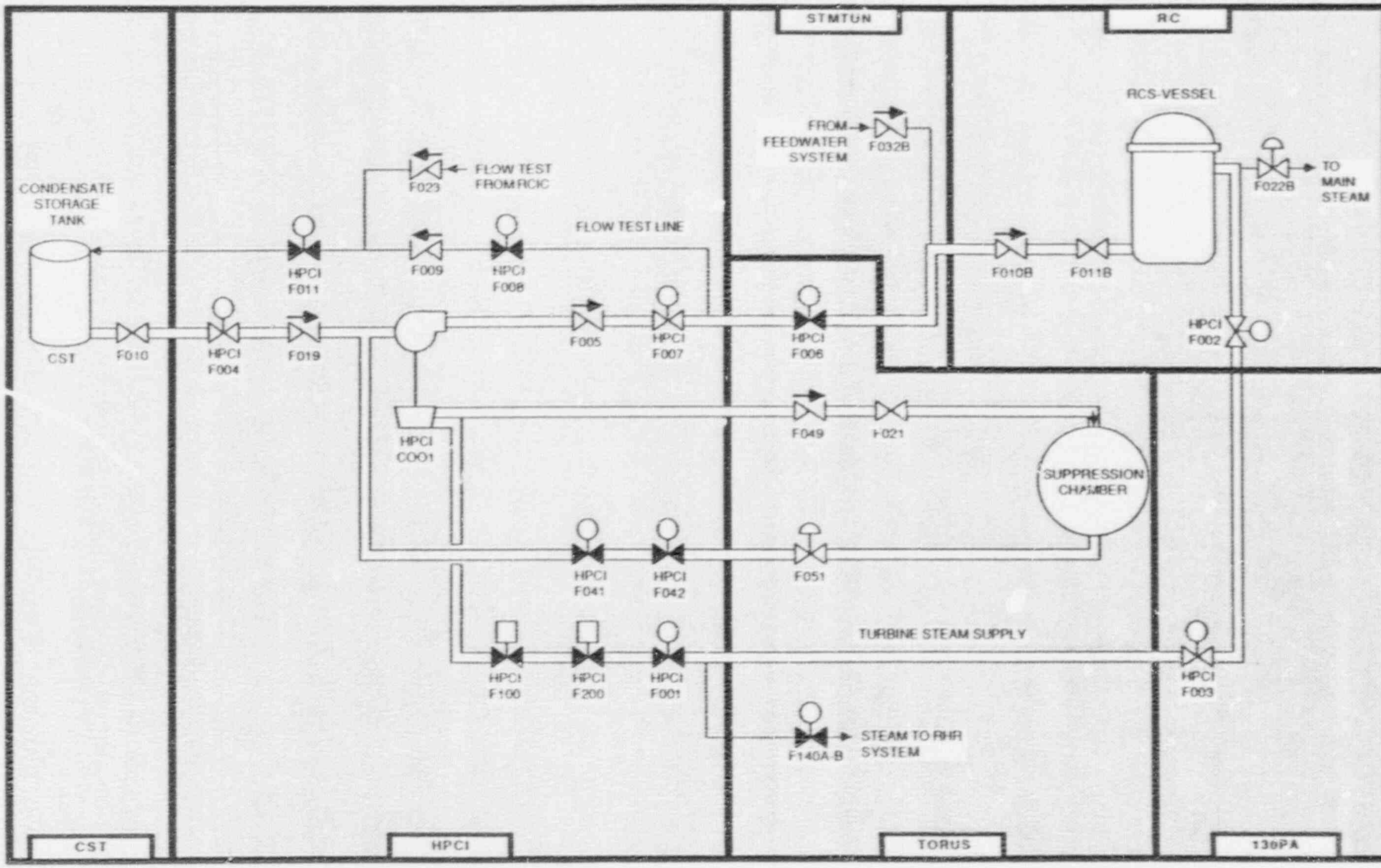


Figure 3.3-2. Hatch Unit 1 High Pressure Coolant Injection (HPCI) System Showing Component Locations

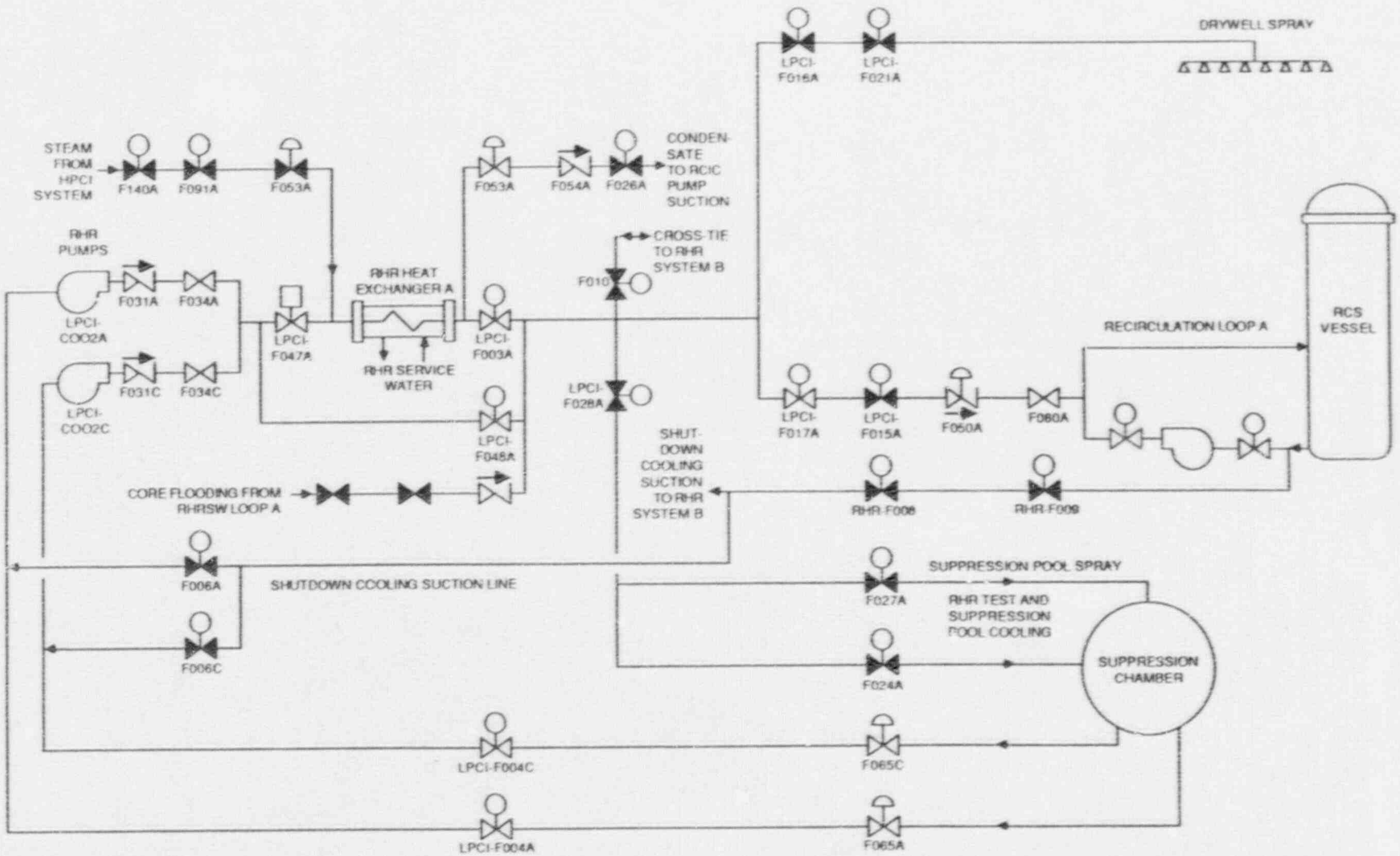


Figure 3.3-3. Hatch Unit 1 Low Pressure Coolant Injection - System A

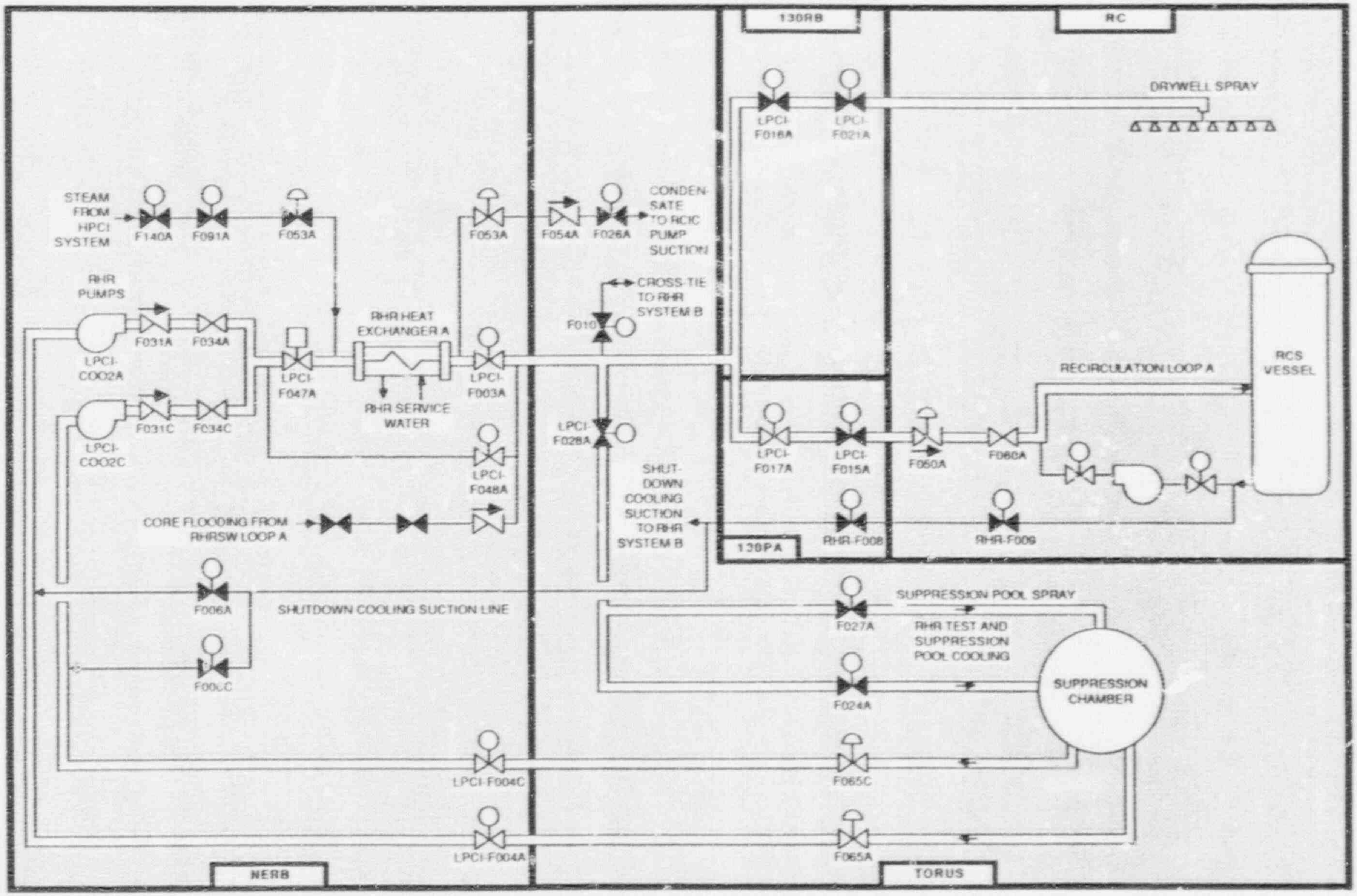


Figure 3.3-4. Hatch Unit 1 Low Pressure Coolant Injection - System A Showing Component Locations

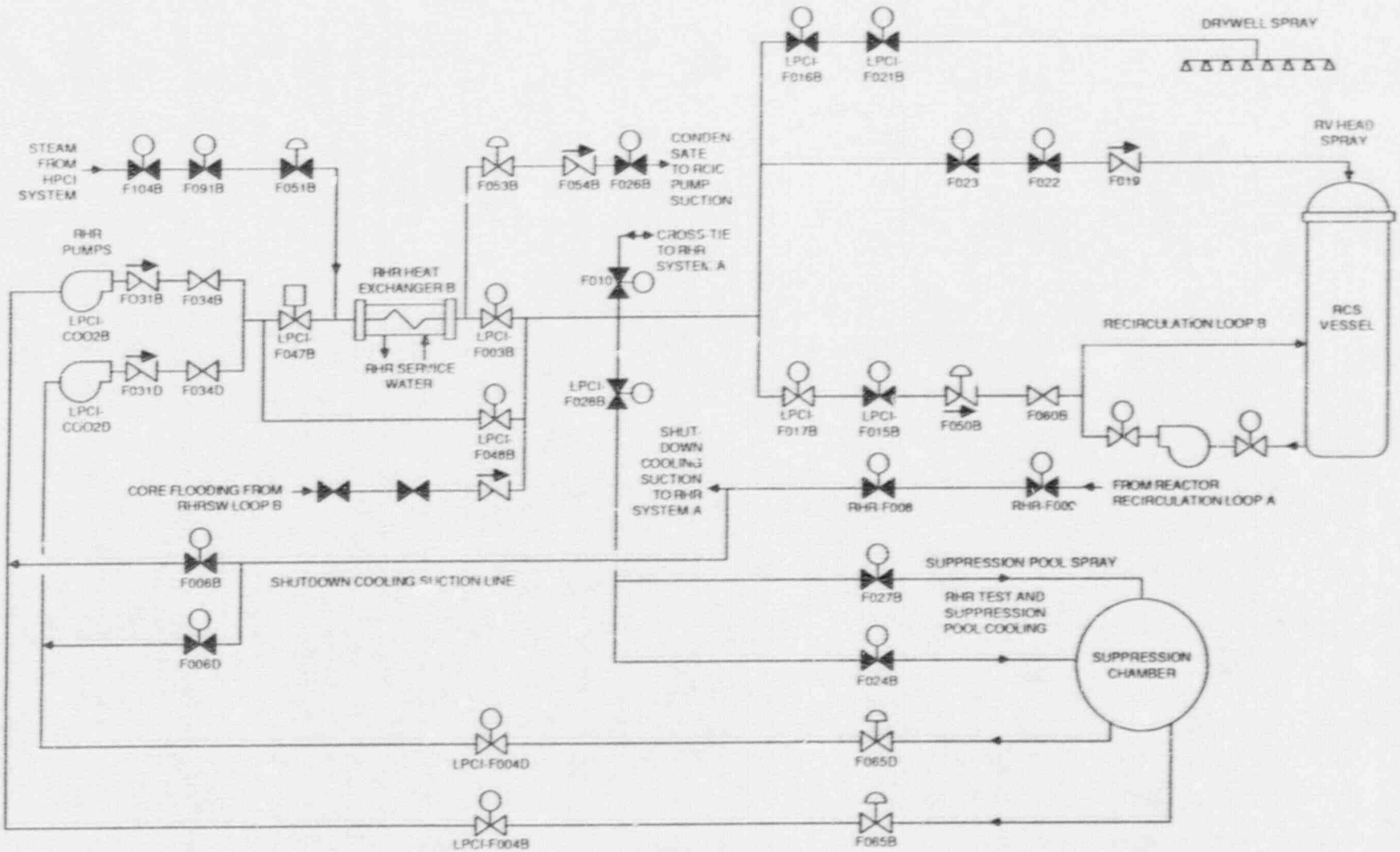


Figure 3.3-5. Hatch Unit 1 Low Pressure Coolant Injection - System B

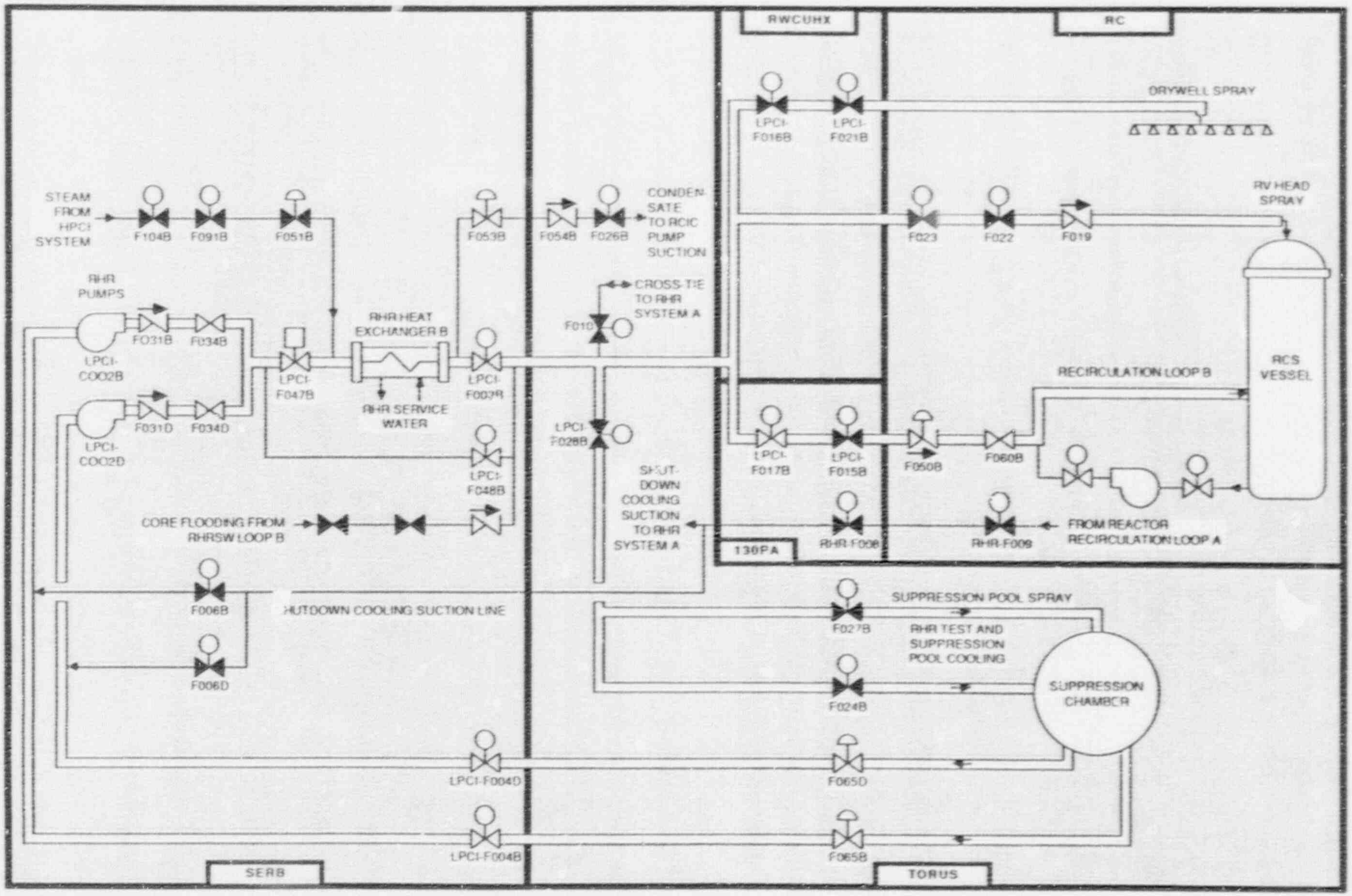


Figure 3.3-6. Hatch Unit 1 Low Pressure Coolant Injection - System B Showing Component Locations

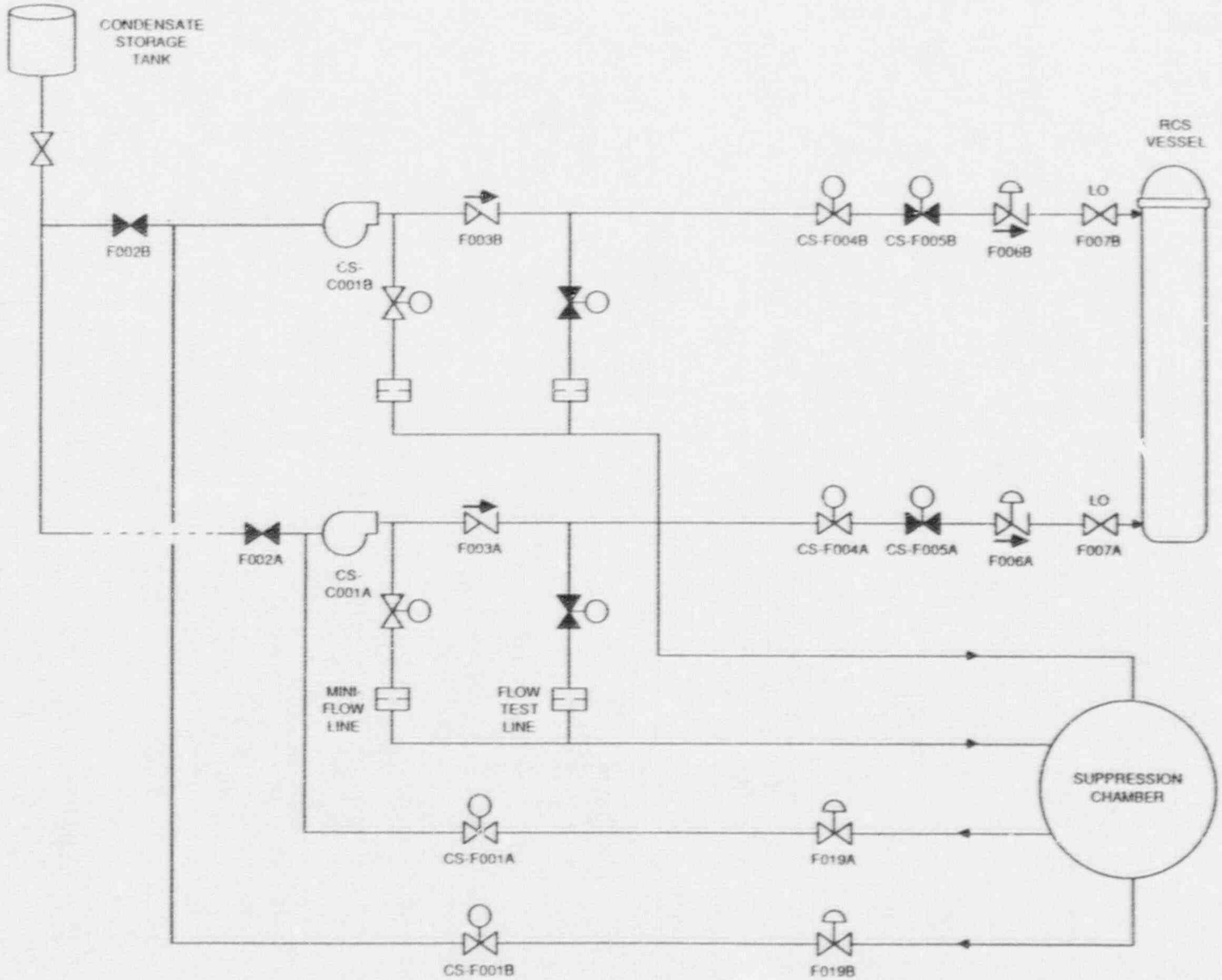


Figure 3.3-7. Hatch Unit 1 Core Spray System (CSS)

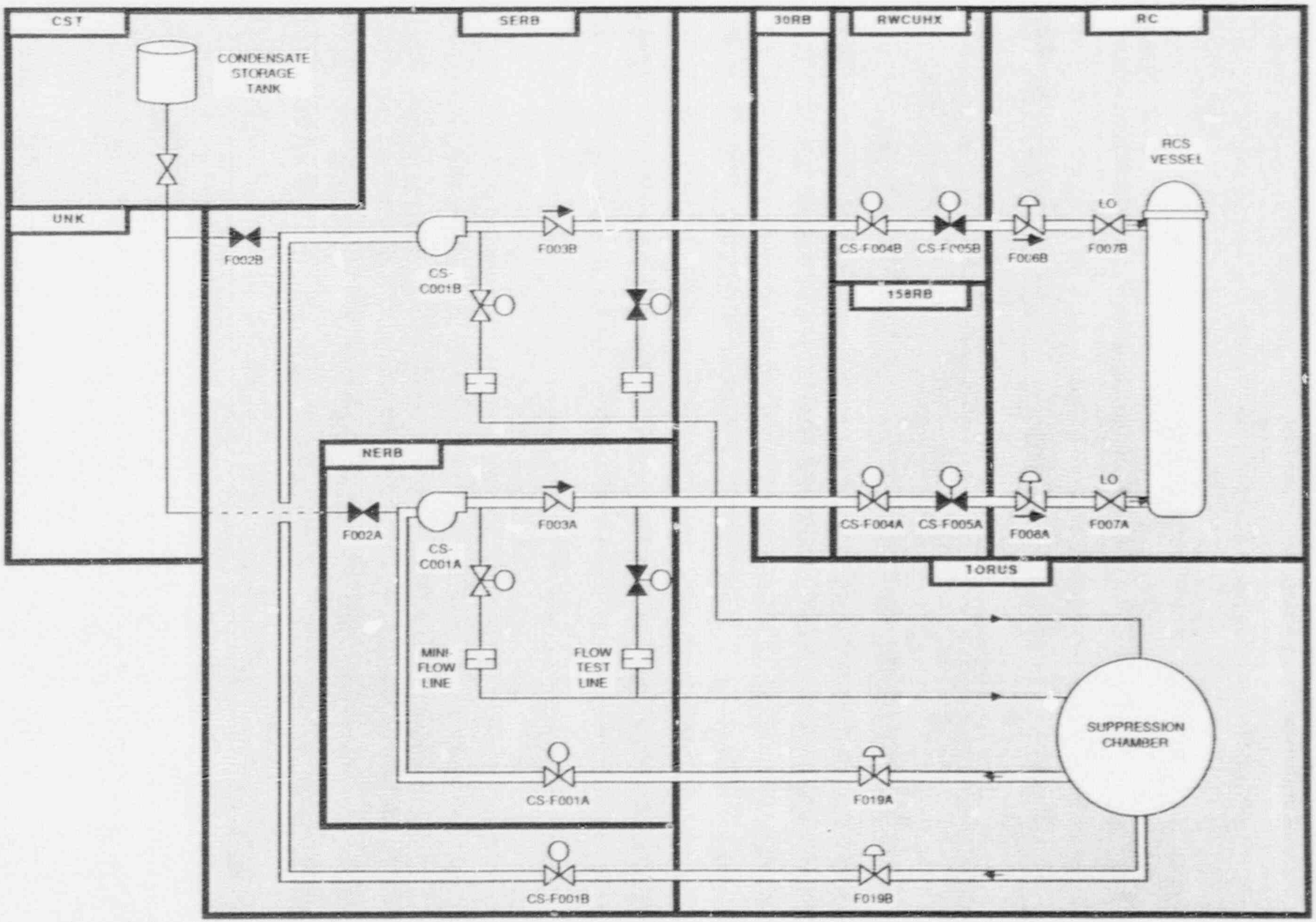


Figure 3.3-8. Hatch Unit 1 Core Spray System (CSS) Showing Component Locations

Table 3.3-1. Hatch 1 Emergency Core Cooling System Data Summary for Selected Components

COMPON[illegible]	[illegible]P.	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CS-C001A	[illegible]	NERB	BUS-1E	4160	DGSW1E	AC/1E
CS-C001B	[illegible]	SERB	BUS-1G	4160	DGSWIG	AC/1G
CS-F001A	MOV	NERB	MCC-S011	600	130RB	AC/1E
CS-F001B	MOV	SERB	MCC-S012	600	130RB	AC/1G
CS-F004A	MOV	158RB	MCC-S011	600	130RB	AC/1E
CS-F004B	MOV	RWCUHX	MCC-S012	600	130RB	AC/1G
CS-F005A	MOV	158RB	MCC-S011	600	130RB	AC/1E
CS-F005B	MOV	RWCUHX	MCC-S012	600	130RB	AC/1G
HPCI-C001	TDP	HPCI				
HPCI-F001	MOV	HPCI	MCC-S022	125/250	130RB	DC/1B
HPCI-F002	MOV	RC	MCC-S011	600	130RB	AC/1E
HPCI-F003	MOV	130PA	MCC-S022	125/250	130RB	DC/1B
HPCI-F004	MOV	HPCI	MCC-S022	125/250	130RB	DC/1B
HPCI-F006	MOV	TORUS	MCC-S022	125/250	130RB	DC/1B
HPCI-F007	MOV	HPCI	MCC-S022	125/250	130RB	AC/1B
HPCI-F008	MOV	HPCI	MCC-S022	125/250	130RB	DC/1B
HPCI-F011	MOV	HPCI	MCC-S022	125/250	130RB	DC/1B
HPCI-F041	MOV	HPCI	MCC-S022	125/250	130RB	DC/1B
HPCI-F042	MOV	HPCI	MCC-S022	125/250	130RB	DC/1B
HPCI-F100	HV	HPCI				
HPCI-F200	HV	HPCI				
LPCI-C002A	MDP	NERB	BUS-1E	4160	DGSW1E	AC/1E
LPCI-C002B	MDP	SERB	BUS-1G	4160	DGSWIG	AC/1G
LPCI-C002C	MDP	NERB	BUS-1F	4160	DGSW1F	AC/1F
LPCI-C002D	MDP	SERB	BUS-1F	4160	DGSW1F	AC/1F
LPCI-F003A	MOV	NERB	MCC-S011	600	130RB	AC/1E
LPCI-F003B	MOV	SERB	MCC-S012	600	130RB	AC/1G
LPCI-F004A	MOV	NERB	MCC-S011	600	130RB	AC/1E

Table 3.3-1. Hatch 1 Emergency Core Cooling System Data Summary for Selected Components (continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
LPCI-F004C	MOV	NERB	MCC-S011	600	130RB	AC/1E
LPCI-F004D	MOV	SERB	MCC-S012	600	130RB	AC/1G
LPCI-F004D	MOV	SERB	MCC-S012	600	130RB	AC/1G
LPCI-F015A	MOV	130PA	MCC-S018A	600	130RB	AC/1E
LPCI-F015B	MOV	130PA	MCC-S018B	600	130RB	AC/1G
LPCI-F016A	MOV	130RB	MCC-S011	600	130RB	AC/1E
LPCI-F016B	MOV	RWCUHX	MCC-S012	600	130RB	AC/1G
LPCI-F017A	MOV	130PA	MCC-S011	600	130RB	AC/1E
LPCI-F017B	MOV	130PA	MCC-S018B	600	130RB	AC/1G
LPCI-F021A	MOV	130RB	MCC-S012	600	130RB	AC/1G
LPCI-F021B	MOV	RWCUHX	MCC-S012	600	130RB	AC/1G
LPCI-F027A	MOV	TORUS	MCC-S011	600	130RB	AC/1E
LPCI-F027B	MOV	TORUS	MCC-S011	600	130RB	AC/1E
LPCI-F028A	MOV	TORUS	MCC-S011	600	130RB	AC/1E
LPCI-F028B	MOV	TORUS	MCC-S012	600	130RB	AC/1G
LPCI-F047A	MOV	NERB	MCC-S011	600	130RB	AC/1E
LPCI-F047B	MOV	SERB	MCC-S012	600	130RB	AC/1G
LPCI-F048A	MOV	NERB	MCC-S011	600	130RB	AC/1E
LPCI-F048B	MOV	SERB	MCC-S012	600	130RB	AC/1G

3.4 INSTRUMENTATION AND CONTROL (I&C) SYSTEMS

3.4.1 System Function

The instrumentation and control systems consist of the Reactor Protection System (RPS), other actuation and control systems, and systems for the display of plant information to the operators. The RPS monitors the reactor plant, and alerts the operator to take corrective action before specified limits are exceeded. The RPS will initiate an automatic reactor trip (scram) to rapidly shutdown the reactor when plant conditions exceed one or more specified limits. The other actuation systems will automatically actuate selected safety systems based on the specific limits or combinations of limits that are exceeded. A remote shutdown capability is provided to ensure that the reactor can be placed in a safe condition in the event that the main control room must be evacuated.

3.4.2 System Definition

The RPS includes sensor and transmitter units, logic units, and output trip relays that interface with the control circuits for components in the Control Rod Drive Hydraulic System (see Section 3.6) Other actuation and control systems include independent sensor and transmitter units and relay units that interface with the control circuits of many different components in safety systems. Operator instrumentation display systems consist of display panels that are powered by 120 VAC power (see Section 3.5). The remote shutdown capability is provided by the Remote Shutdown Panel (RSP).

3.4.3 System Operation

A. RPS

The RPS has four input instrument channels and two output actuation trains. RPS inputs are listed below:

- Neutron monitoring system
- Reactor pressure
- Low water level in reactor vessel
- Turbine stop valve closure
- Turbine control valve fast closure
- Main steam line isolation signal
- Scram discharge header high water level
- Drywell high pressure
- Main steam line radiation
- Manual

Both output channels must be de-energized to initiate a scram. The failure of a single component or power supply does not prevent a desired scram or cause an unwanted scram.

In addition to the scram function, RPS instrumentation is used to actuate other safety systems.

B. Other Actuation and Control Systems

Actuation and control systems cause the various safety systems to be started, stopped, or realigned as needed to respond to abnormal plant conditions. Details regarding actuation logic are included in the system description of the actuated system.

C. Remote Shutdown
The remote shutdown system provides remote control for reactor systems needed to carry out the shutdown function from outside the MCR and to bring the reactor to cold condition in an orderly fashion. This system also provides a variation to the normal system used in the MCR, thus permitting the shutdown of the reactor when feedwater is unavailable and the normal heat sinks (turbine and condenser) are lost (Ref. 1)

The remote shutdown panel is located in the northwest corner switchgear room at el. 130 ft. of the reactor building.

The remote shutdown system panel is designed to comply with the requirements of Safety Class 3, Seismic Category I, and Quality Group C. The following systems have instrumentation and controls on the remote panel:

- Reactor core isolation cooling (RCIC) system
- Residual heat removal (RHR) system
- Recirculation flow control system
- Nuclear boiler system
- Control rod drive system
- RHR service water system
- Plant service water
- Torus level and temperature

The remote shutdown panel is powered from an essential bus so that standby AC power is automatically supplied by the diesel generator in the event of loss-of-offsite power. Manual controls of the diesel Generator are also available in the diesel generator building.

3.4.4 System Success Criteria

A. RPS
The RPS uses hindrance logic (normal = 1, trip = 0) in both the input and output logic. Therefore, a channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). A reactor scram will occur upon loss of control power to the RPS. A reactor scram is implemented by the scram pilot valves in the control rod drive hydraulic system (see Section 3.6). Details of the RPS for Hatch 1 and 2 have not been determined.

B. Other Actuation Systems
A single component usually receives a signal from only one actuation system output train. Trains A and B must be available in order to automatically actuate their respective components. Actuation systems other than the RPS typically use hindrance input logic (normal = 1, trip = 0) and transmission output logic (normal = 0, trip = 1). In this case, an input channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). Control power is needed for the actuation system output channels to send an actuation signal. Note that there may be some actuation subsystems that utilize hindrance output logic. For these subsystems, loss of control power will cause system or component actuation, as is the case

with the RPS. Details of the other actuation systems for Hatch 1 and 2 have not been determined.

C. Manually-Initiated Protective Actions
When reasonable time is available, certain protective actions may be performed manually by plant personnel. The control room operators are capable of operating individual components using normal control circuitry, or operating groups of components by manually tripping the RPS or other actuation subsystem. The control room operators also may send qualified persons into the plant to operate components locally or from some other remote control location (i.e., the remote shutdown panel or a motor control center). To make these judgments, data on key plant parameters must be available to the operators.

3.4.5 Support Systems and Interfaces

A. Control Power
1. RPS
The RPS is powered from two 120 VAC buses (see Section 3.5).
2. Operator Instrumentation
Operator instrumentation displays are powered from instrumentation power sources as described in Section 3.5.

3.4.6 Section 3.4 References

1. Hatch 2 Updated Final Safety Ana.ysis Report, Section 7.5.1.4.2

3.5 ELECTRIC POWER SYSTEM

3.5.1 System Function

The electric power system supplies power to various equipment and systems needed for normal operation and/or response to accidents. The onsite Class 1E electric power system supports the operation of safety class systems and instrumentation needed to establish and maintain a safe shutdown plant condition following an accident, when the normal electric power sources are not available.

3.5.2 System Definition

The onsite Class 1E electric power system consists of five diesel generators and 4160 VAC buses to support both Hatch 1 and 2. Two diesels and 4160 VAC buses are dedicated to each unit. The remaining diesel can be aligned to either unit on a first come first-served basis. The Class 1E electric power system at each Hatch unit consists of two 4160 VAC trains, two 600 VAC trains, a 125/250 VDC subsystem, and a 120 VAC subsystem. Two station batteries supply power to the 125/250 VDC system for normal switchgear control, turbine control, annunciators, and various emergency functions. The 120 VAC system supplies power to the reactor instrumentation and protection circuits.

The 4160 and 480 VAC Class 1E electric power distribution system for Hatch 1 and 2 is shown in Figure 3.5-1. The 125/250 VDC system for Hatch 1 is shown in Figures 3.5-2 and 3.5-3. Similar figures for Hatch 2 are shown in Figures 3.5-4 and 3.5-5. That 125 VDC diesel auxiliary power system for Hatch 1 and 2 is shown in Figure 3.5-6, and the 120/208 VAC instrument power system for both units is shown in Figures 3.5-7 and 3.5-8. A summary of data on selected electric power system components is presented in Table 3.5-1. A partial listing of electrical sources and loads is presented in Table 3.5-2.

3.5.3 System Operation

The auxiliary power system is the normal source of station service power under both normal operating and shutdown conditions. Auxiliary power is obtained from the main generator, through the unit auxiliary transformer connected to the 4160 volt switchgear bus. Each of the two 600 VAC trains receive power from a separate transformer connected to the 4160 volt buses.

Upon loss of auxiliary power, each emergency diesel generator is automatically started and is aligned to supply power to each of three essential 4160 VAC buses. Two of these buses (1E and 1G) in turn supply power to the 600 VAC motor control center buses 1C and 1D. These buses constitute the two separate 600 VAC trains distributing power to the rest of the Class 1E electrical system. The third 4160 VAC bus (1F) is a "swing" bus that can supply power to either of the 600V buses as required.

The normal source of power for the 125/250 VDC system are the battery chargers. Bus 1A is supplied by battery charges A and B, with C as standby. Bus 1B is supplied by battery chargers D and E, with F as a standby. The station batteries 1A and 1B float on their respective buses. These DC buses supply 125/250 VDC to the essential cabinets 1A and 1B which supply Division I ESS and Division II ESS loads.

120/208 VAC instrument power is supplied from the 600V buses (1A and 1B) as are the RPS MG-sets (see Figure 3.5-2).

Redundant safeguards equipment such as motor driven pumps and motor operated valves are supplied by different 4160 VAC buses. For the purpose of discussion, this equipment has been grouped into "load groups". Load group 1E contains components receiving electric power from Bus 1E. Load group 1G contains components powered by bus 1G. Load group 1F contains components powered by Bus 1F. Load group DCA and DCB contains components receiving DC power from DC bus 1A and 1B respectively.

3.5.4 System Success Criteria

Basic system success criteria for mitigating transients and loss of-coolant accidents are defined by front-line systems, which then create demands on support systems. Electric power system success criteria are defined as follows, without taking credit for cross-ties that may exist between independent load groups:

- Each Class 1E DC load group is supplied initially from its respective station battery
- Each Class 1E AC load group is isolated from the non-Class 1E system and is supplied from its respective emergency power source (i.e. diesel generator)
- Power distribution paths to essential loads are intact
- Power to the battery chargers is restored before the batteries are exhausted

A minimum of 2 of 5 diesel generators are needed to achieve safe shutdown at both units following loss of normal power (Ref. 1, Table 9.2.9).

3.5.5 Component Information

A. Standby diesel generators (1A, 1B, 1C)
  1. Power rating: 2850 kW continuous
  2. Rated voltage: 4160 VAC
  3. Manufacturer: Fairbanks Morse

B. Station batteries
  1. Type: Lead-antimony
  2. Cells: 60

3.5.6 Support Systems and Interfaces

A. Control Signals
  1. Automatic
     The standby diesel generator is automatically started based on loss of auxiliary power.
  2. Remote manual
     The diesel generators can be started, and many distribution circuit breakers can be operated from the main control room.

B. Diesel Generator Auxiliary Systems
The following auxiliaries are provided for the emergency diesel generator:
  - Cooling
    Diesel cooling water is provided by the plant service water system (see Section 3.7).
  - Fueling
    Each diesel generator has an independent 1000 gallon "day tank" that is housed in a separate room adjacent to the respective diesel room. A day tank can support four hours of diesel operation. The long-term fuel supply for the diesels consists of five underground 40,000 gallon tanks. The storage tanks can supply any diesel generator and have sufficient capacity to operate four diesel generators at rated capacity for seven days.
  - Lubrication
    Each diesel is provided with an independent lubricating oil system.

- Starting
  Each diesel is provided with an independent air starting system. The diesel control system is supplied from the 125 VDC diesel auxiliary power system (see Figure 3.5-6). The diesel generators are not dependent on the station batteries for power.
- Ventilation
  Diesel room ventilation consists of powered roof ventilators and motor-operated louvers with fire dampers in the diesel building air intake..

C. Switchgear and Battery Room Ventilation Systems
Details on the switchgear and battery room ventilation systems have not been determined.

3.5.7 Section 3.5 References

1. NURGE/CR-2989, "Reliability of Emergency AC Power Systems at Nuclear Power Plants," Oak Ridge National Laboratory, July 1983.

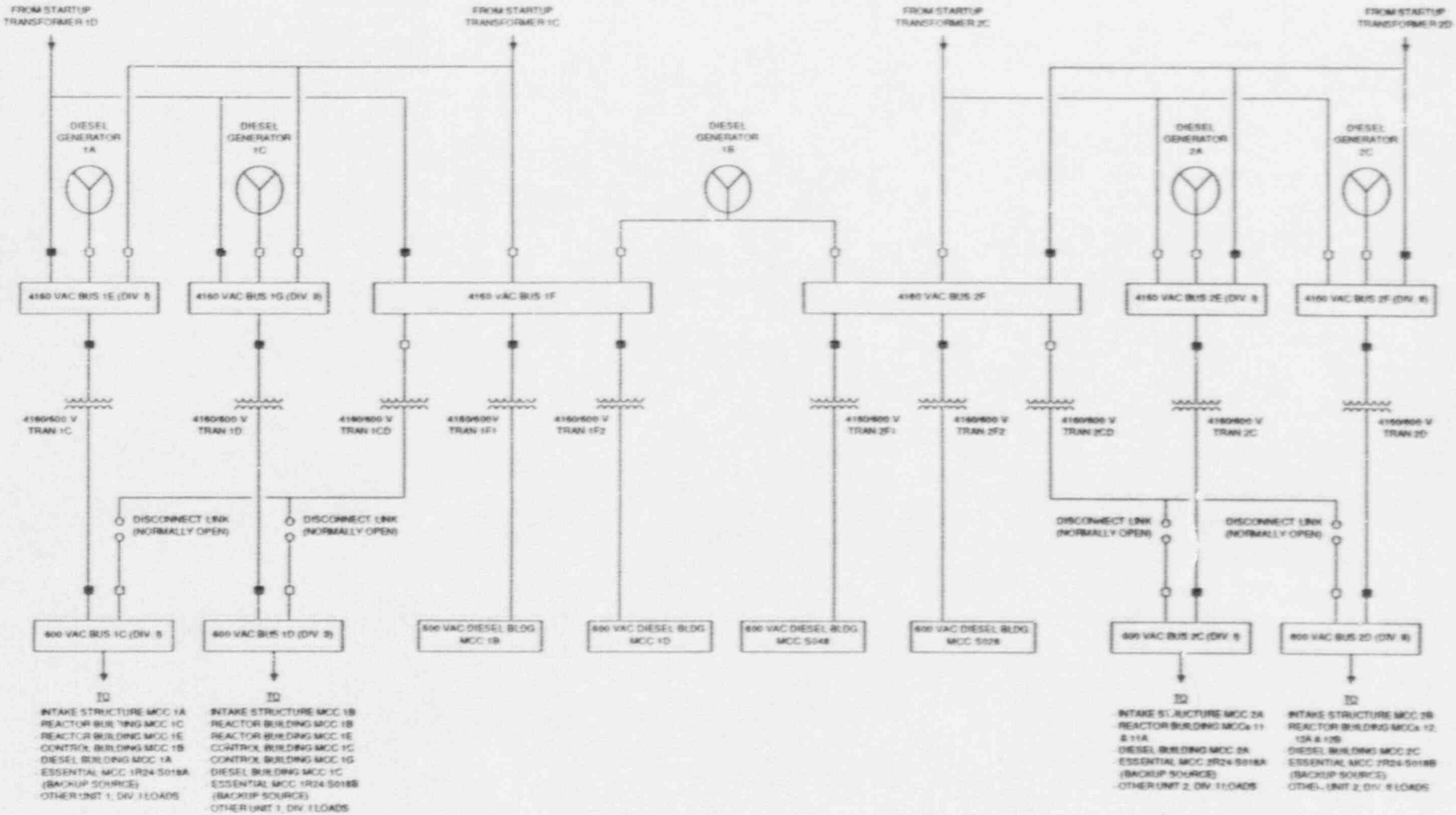


Figure 3.5-1. Hatch Unit 1 and 2 4160 and 600 VAC Electric Power Distribution System

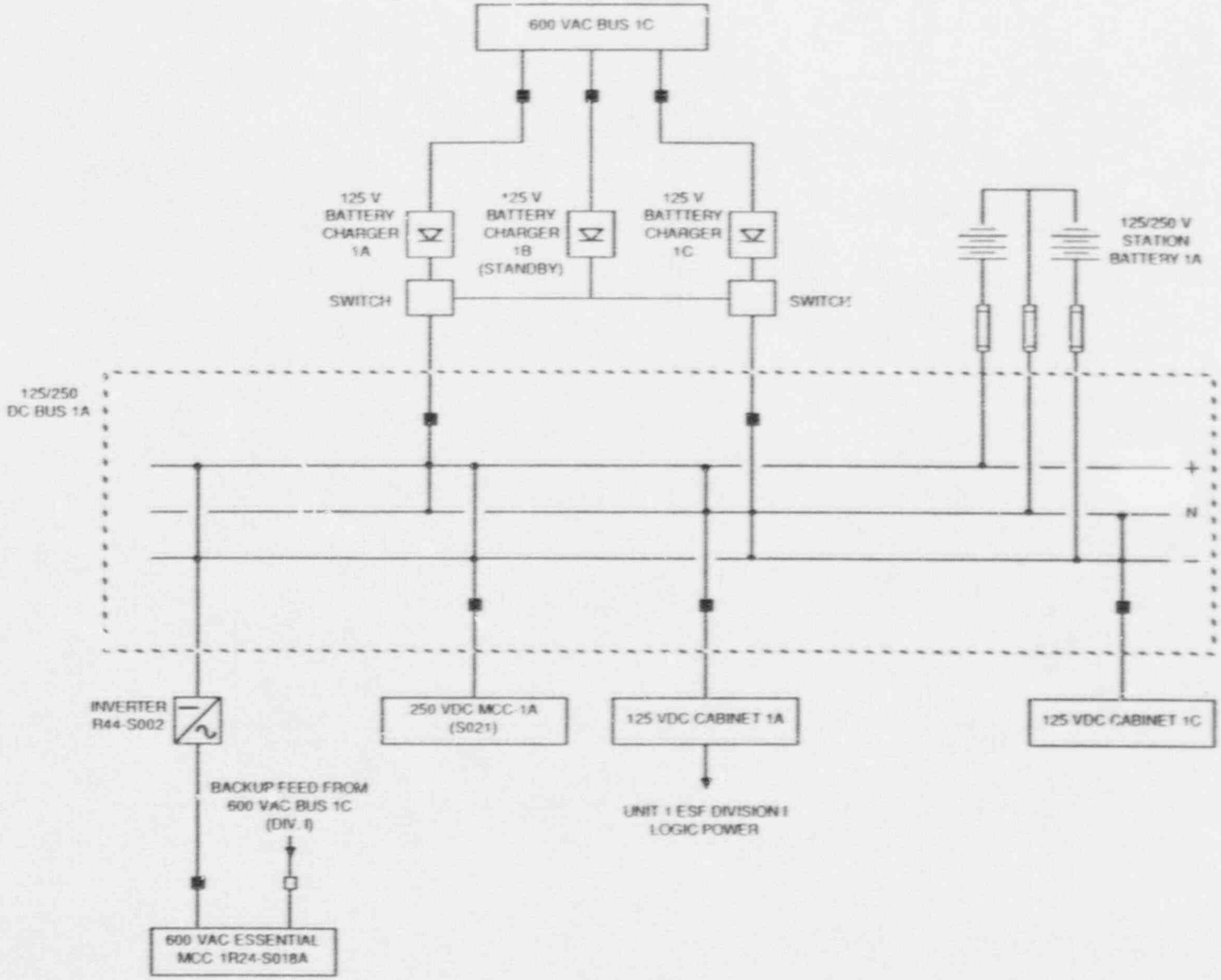


Figure 3.5-2. Hatch Unit 1 125/250 VDC Electric Power Distribution System - Division I

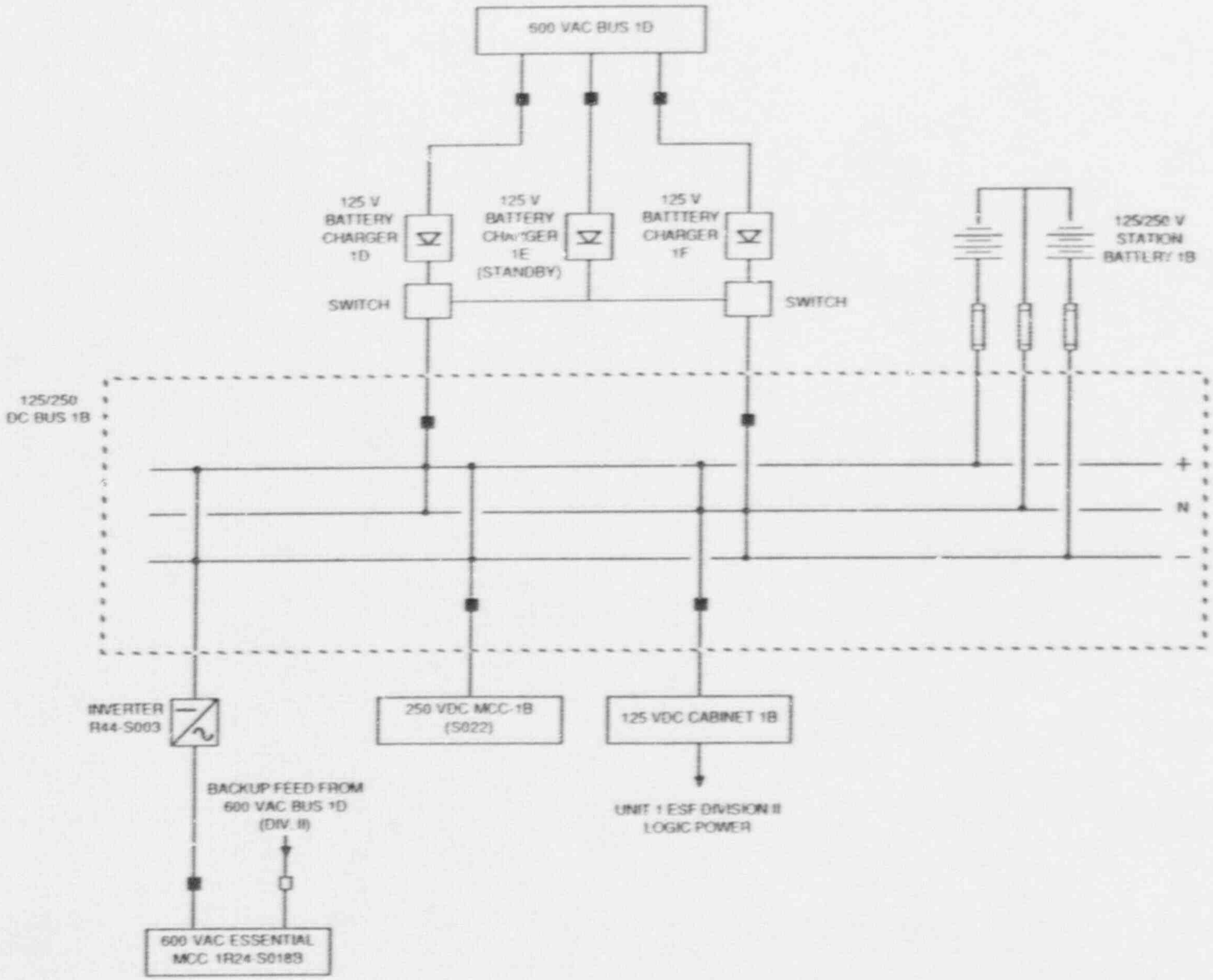


Figure 3.5-3. Hatch Unit 1 125/250 VDC Electric Power Distribution System - Division II

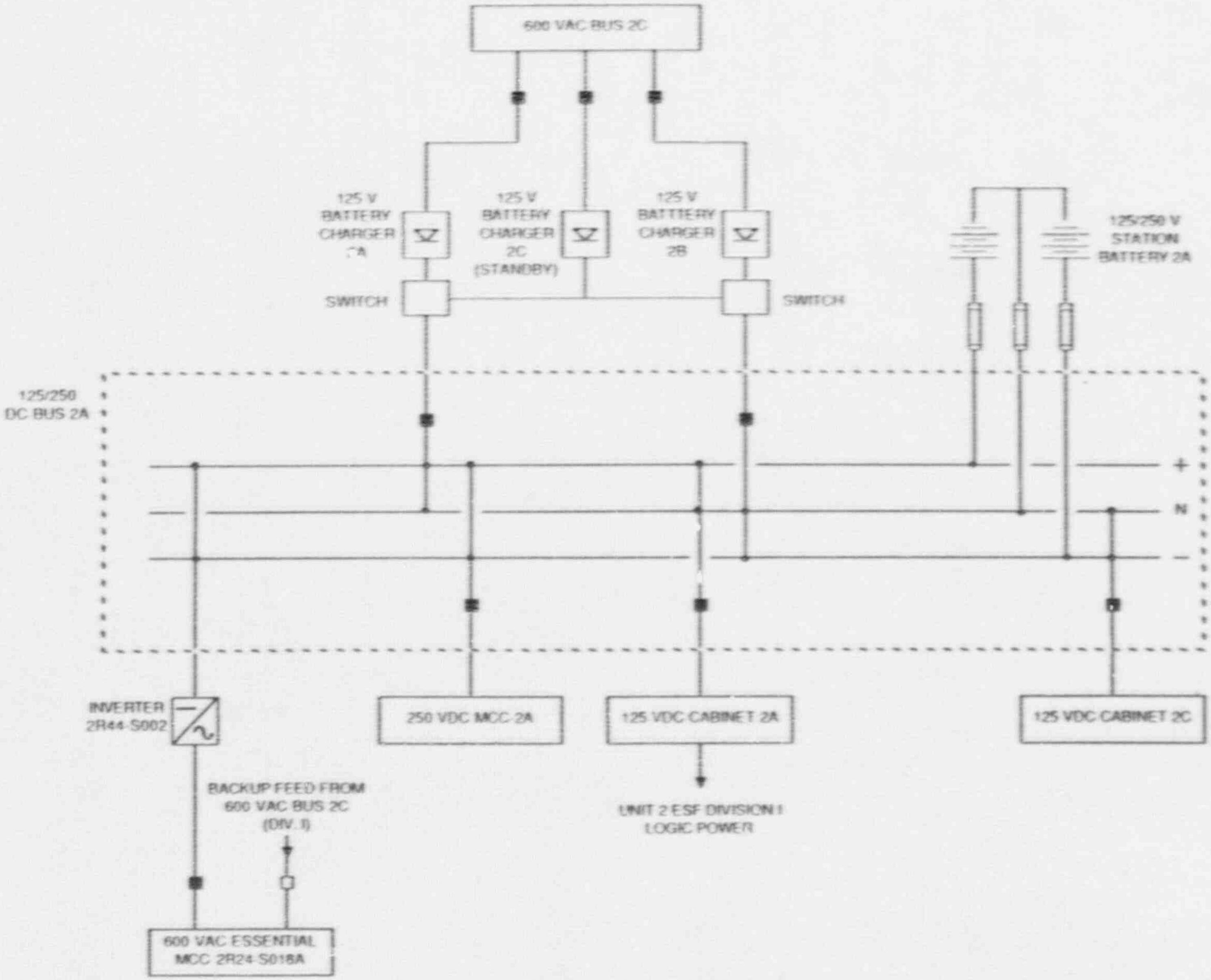


Figure 3.5-4. Hatch Unit 2 125/250 VDC Electric Power Distribution System - Division I

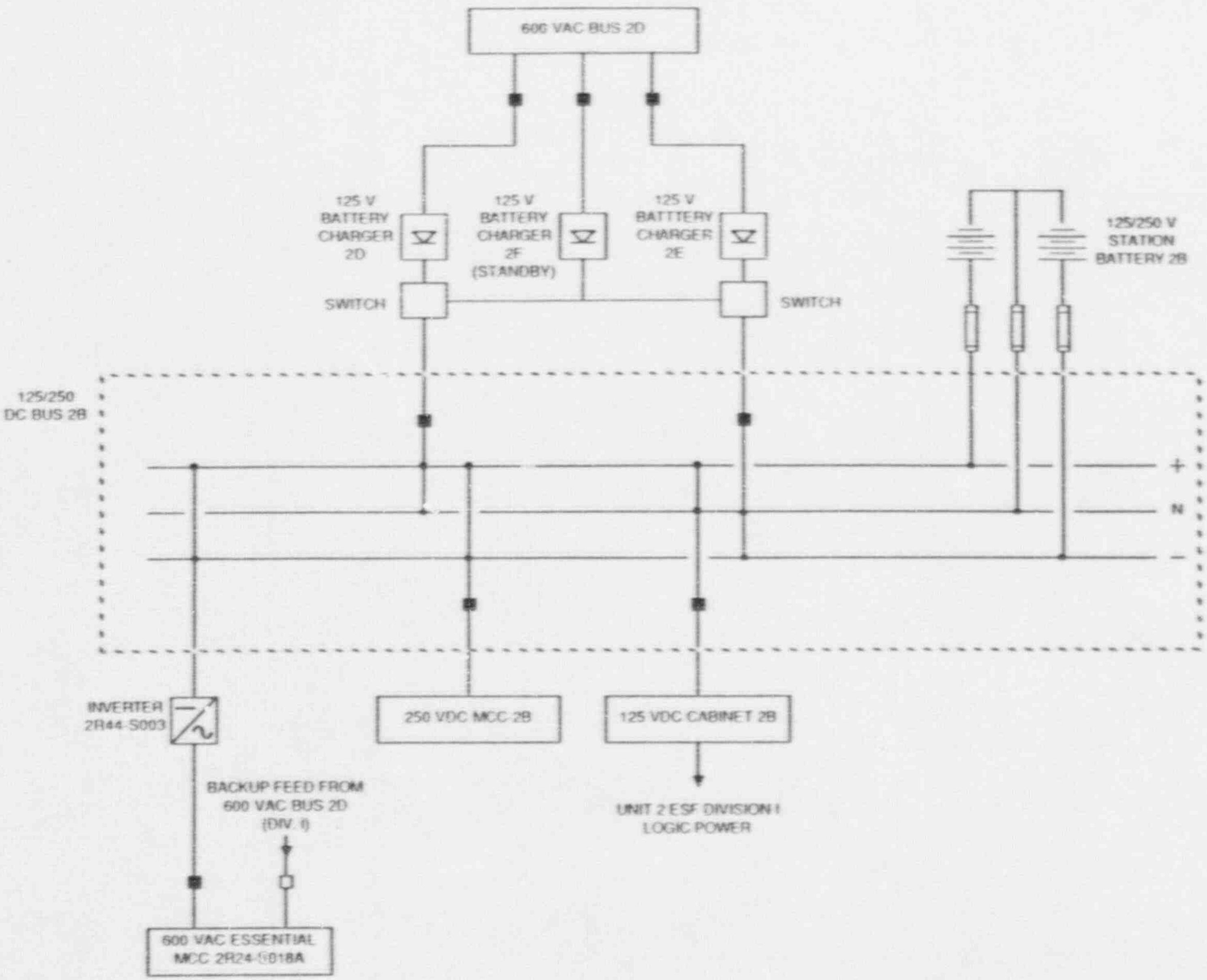


Figure 3.5-5. Hatch Unit 2 125/250 VDC Electric Power Distribution System - Division II

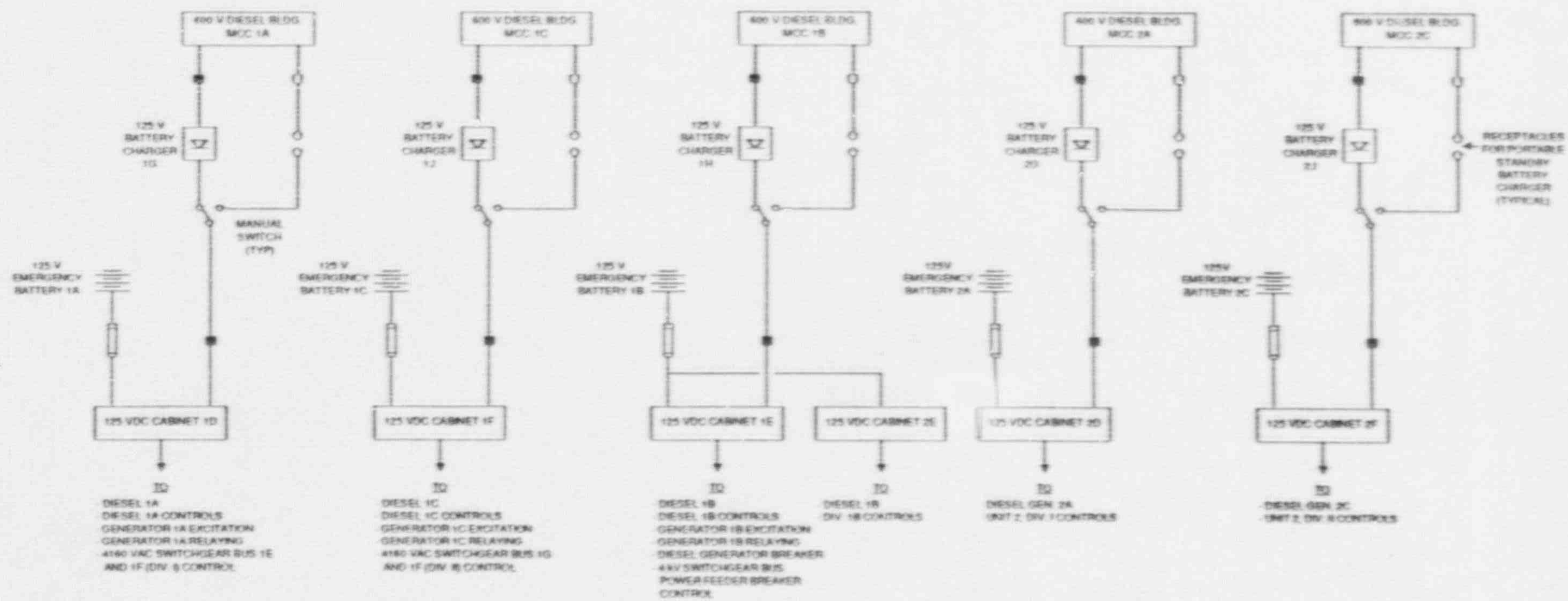


Figure 3.5-6. Hatch Unit 1 and 2 125 VDC Diesel Auxiliary Power System

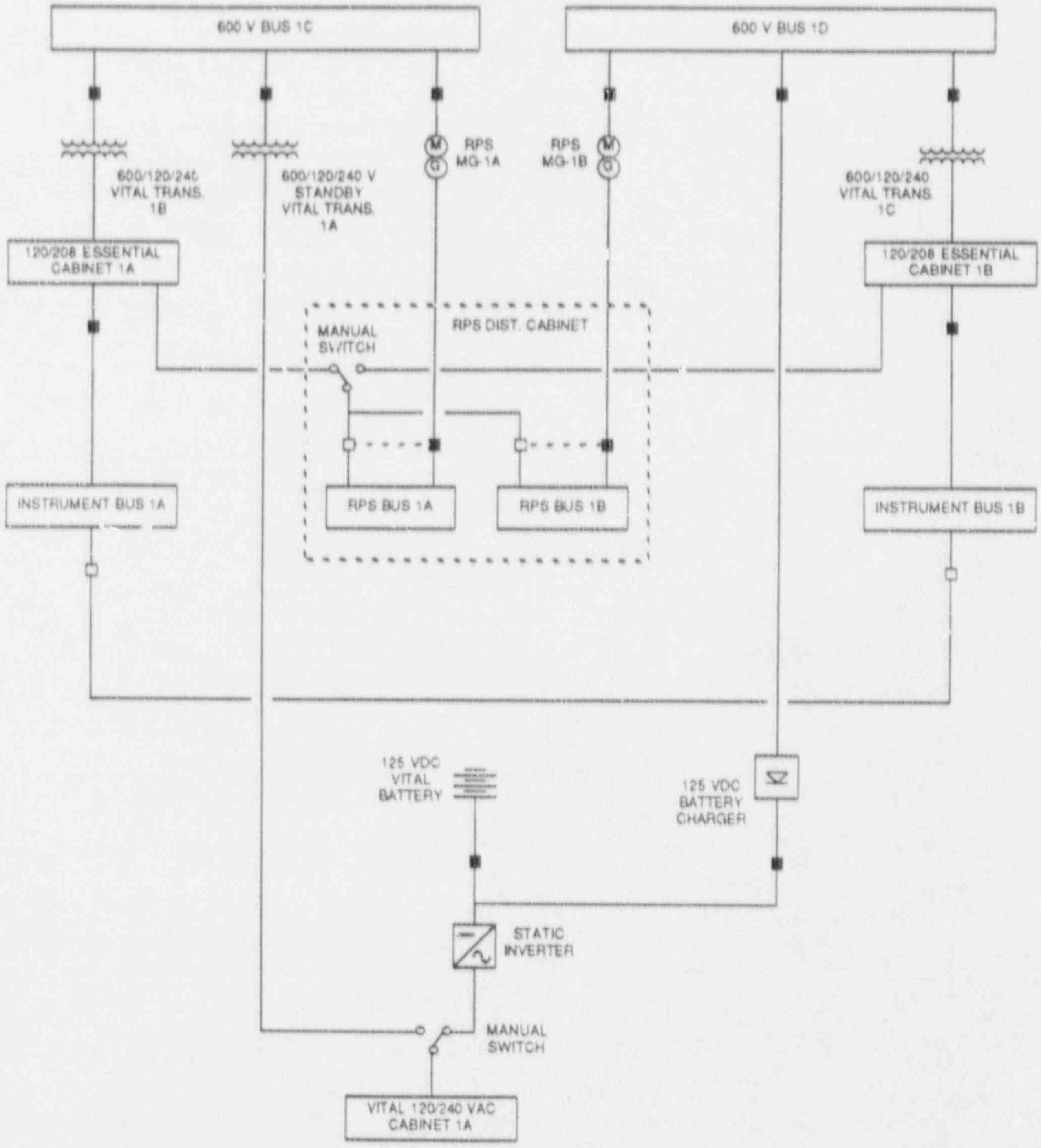


Figure 3.5-7. Hatch Unit 1 120/208 VAC Electric Power Distribution System

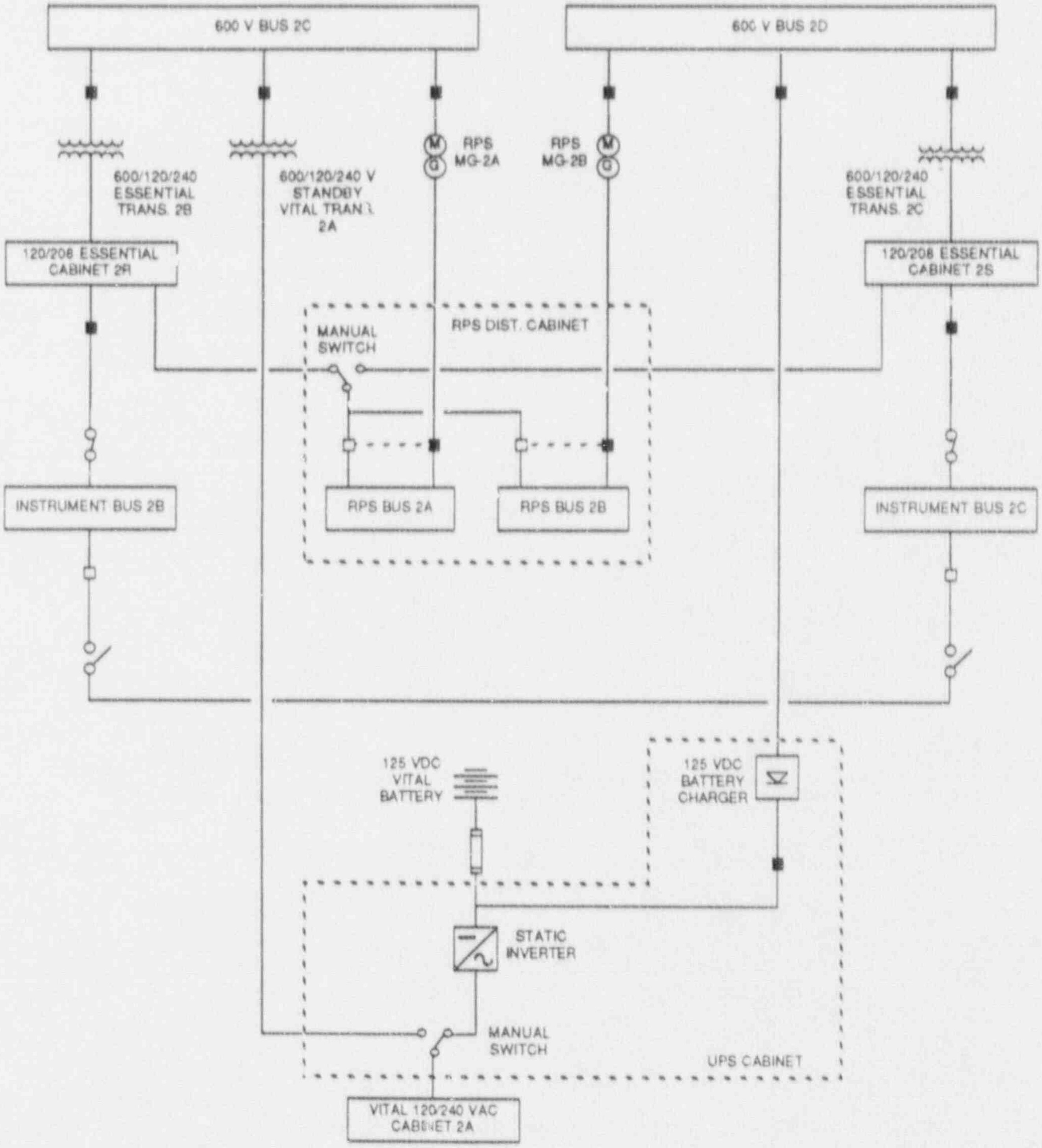


Figure 3.5-8. Hatch Unit 2 120/208 VAC Electric Power Distribution System

Table 3.5-1. Hatch 1 Electric Power System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
125V-BATT	BATT	112CB				
BATT-1E	BATT	DGSW1E				
BATT-1F	BATT	DGSW1F				
BATT-1G	BATT	DGSW1G				
BATT-A	BATT	125-250-1A				
BATT-BTB	BATT	125-250-1B				
BATT-CHG	BC	112CB	BUS-1D	600	6001D	AC/1G
BC-ABC	BC	250-1A	BUS-1C	600	600-1C	AC/1E
BC-DFE	BC	250-1B	BUS-1D	600	600-1D	AC/1G
BUS-1A	BUS	250-1A	BATT-A	125/250	125-250-1A	DC/1A
BUS-1A	BUS	250-1A	BC-ABC	125	250-1A	AC/1E
BUS-1B	BUS	250-1B	BATT-BTB	125/250	125-250-1B	DC/1B
BUS-1B	BUS	250-1B	BC-DFE	125	250-1B	AC/1G
BUS-1C	BUS	6001C	XFMR-TIC	4160	600-1C	AC/1E
BUS-1E	BUS	DGSW1E	DG-1A	4160	DG1A	AC/1E
BUS-1F	BUS	DGSW1F	DG-1B	4160	DG1B	AC/1F
BUS-1G	BUS	DGSW1G	DG-1C	4160	DG1C	AC/1F
BUS-DC1E	BUS	DG1A	BATT-1E	125	DGSW1E	
BUS-DC1F	BUS	DG1B	BATT-1F	125	DGSW1F	
BUS-DCIG	BUS	DG1C	BATT-1G	125	DGSW1G	
BUS-ID	BUS	6001D	XFMR-TID	4160	600-1D	AC/1G
CB-1E	CB	DGSW1E				
CB-1F	CB	DGSW1F				
CB-1G	CB	DGSW1G				
DG-1A	DG	DG1A				AC/1E
DG-1B	DG	DG1B				AC/1F
DG-1C	DG	DG1C				AC/1G
E-CAB-1A	CAB	UNK	E-XFMR-1B	120/208	UNK	AC/1E

Table 3.5-1. Hatch 1 Electric Power System Data Summary for Selected Components (continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
E-CAB-1B	CAB	UNK	E-TRANS-1C	120	UNK	AC/1G
E-XFMR-1C	TRANS	UNK	BUS-1D	600	6001D	AC/1G
E-XMFR-1B	TRANS	UNK	BUS1C	600	600IC	AC/1E
I-BUS-1A	BUS	UNK	E-CAB-1A	120	UNK	AC/1E
I-BUS-1B	BUS	UNK	E-CAB-1B	120	UNK	AC/1G
INV	INV	112CB	125-BATT	125	112CB	
INV	INV	112CB	BC	125	112CB	AC/1G
MCC-S009	MCC	PUMPHS	BUS-1C	600	600-1C	AC/1E
MCC-S010	MCC	PUMPHS	BUS-1D	600	600-1D	AC/1G
MCC-S011	MCC	130RB	BUS-1C	600	600-1C	AC/1E
MCC-S011A	MCC	130RB	BUS-1C	600	600-1C	AC/1E
MCC-S012	MCC	130RB	BUS-1D	600	600-1D	AC/1E
MCC-S012A	MCC	130RB	BUS-1D	600	600-1D	AC/1G
MCC-S012B	MCC	130RB	BUS-1D	600	600-1D	AC/1G
MCC-S018A	MCC	130RB	BUS-1C	600	600-1C	AC/1E
MCC-S018A	MCC	130RB	BUS-1C	600	600-1C	AC/1E
MCC-S018B	MCC	130RB	BUS-1D	600	600-1D	AC/1E
MCC-S021	MCC	130RB	BUS-1A	125/250	250-1A	DC/1A
MCC-S022	MCC	130RB	BUS-1B	125/250	250-1B	DC/1B
MCC-S025	MCC	DGSWIE	BUS-1C	600	600-1C	AC/1E
MCC-S027	MCC	DGSWIG	BUS-1D	600	600-1D	AC/1E
RPS-BUS-1B	BUS	UNK	X-FERSW	120	UNK	AC/1G
RPS-BUS-1B	BUS	UNK	RPS-MG-1D	120	130CB	AC/1G
RPS-BUS1A	BUS	UNK	X-FER-SW	120	UNK	AC/1E
RPS-BUS1A	BUS	UNK	MG-1C	600	6001C	AC/1E
RPS-MG-1C	MG	130CB	BUS-1C	600	6001C	AC/1E
RPS-MG-1D	MG	130CB	BUS-1D	600	6001D	AC/1G
V-CAB-1A	CAB	UNK	V-XFMFR-1A	120	UNK	AC/1E

Table 3.5-1. Hatch 1 Electric Power System Data Summary for Selected Components (continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
V-CAB-1A	CAB	UNK	INV	120	UNK	AC/1G
V-XMFR-1A	TRANS	UNK	BUS-1C	600	6001C	AC/1E
X-FER-SW	SW	UNK	ECAB-1A	120	UNK	AC/1E
X-FER-SW	SW	UNK	E-CAB-1B	120	UNK	AC/1G
XFMR-TCD	TRANS	600-1CDTFR	BUS-1F	4160	DGSW1F	AC/1F
XFMR-TIC	TRANS	6001C	BUS-1E	4160	DESW1E	AC/1E
XFMR-TID	TRANS	6001D	BUS-1G	4160	DGSW1G	AC/1G

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Hatch 1

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
125-BATT	125		112CB	EP	INV	INV	112CB
BATT-1E	125		DGSW1E	EP	BUS-DC1E	BUS	DG1A
BATT-1F	125		DGSW1F	EP	BUS-DC1F	BUS	DG1B
BATT-1G	125		DGSW1G	EP	BUS-DCIG	BUS	DG1C
BATT-A	125/250	DC/1A	125-250-1A	EP	BUS-1A	BUS	250-1A
BATT-BTB	125/250	DC/1B	125-250-1B	EP	BUS-1B	BUS	250-1B
BC	125	AC/1G	112CB	EP	INV	INV	112CB
BC-ABC	125	AC/1E	250-1A	EP	BUS-1A	BUS	250-1A
BC-DFE	125	AC/1G	250-1B	EP	BUS-1B	BUS	250-1B
BUS-1A	125/250	DC/1A	250-1A	EP	MCC-S021	MCC	130RB
BUS-1B	125/250	DC/1B	250-1B	EP	MCC-S022	MCC	130RB
BUS-1C	600	AC/1E	600-1C	EP	BC-ABC	BC	250-1A
BUS-1C	600	AC/1E	600-1C	EP	MCC-S009	MCC	PUMPHS
BUS-1C	600	AC/1E	600-1C	EP	MCC-S011	MCC	130RB
BUS-1C	600	AC/1E	600-1C	EP	MCC-S011A	MCC	130RB
BUS-1C	600	AC/1E	600-1C	EP	MCC-S018A	MCC	130RB
BUS-1C	600	AC/1E	600-1C	EP	MCC-S018A	MCC	130RB
BUS-1C	600	AC/1E	600-1C	EP	MCC-S025	MCC	DGSWIE
BUS-1C	600	AC/1E	6001C	EP	RPS-MG-1C	MG	130CB
BUS-1C	600	AC/1E	6001C	EP	V-XMFR-1A	TRANS	UNK
BUS-1D	600	AC/1G	6001D	EP	BATT-CHG	BC	112CB
BUS-1D	600	AC/1G	600-1D	EP	BC-D[illegible]E	BC	250-1B
BUS-1D	600	AC/1G	6001D	EP	E-XFMR-1C	TRANS	UNK
BUS-1D	600	AC/1G	600-1D	EP	MCC-S010	MCC	PUMPHS
BUS-1D	600	AC/1E	600-1D	EP	MCC-S012	MCC	130RB
BUS-1D	600	AC/1G	600-1D	EP	MCC-S012A	MCC	130RB
BUS-1D	600	AC/1G	600-1D	EP	MCC-S012B	MCC	130RB
BUS-1D	600	AC/1E	600-1D	EP	MCC-S018B	MCC	130RB
BUS-1D	600	AC/1E	600-1D	EP	MCC-S027	MCC	DGSWIG
BUS-1D	600	AC/1G	6001D	EP	RPS-MG-1[illegible]	MG	130CB

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Hatch 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BUS-1E	4160	AC/1E	DGSW1E	ECCS	CS-C001A	MDP	NERB
BUS-1E	4160	AC/1E	DGSW1E	ECCS	LPCI-C002A	MDP	NERB
BUS-1E	4160	AC/1E	DESW1E	EP	XFMR-TIC	TRANS	6001C
BUS-1E	4160	AC/1E	DGSW1E	ESW	ESW-1A	MDP	PUMPHS
BUS-1E	4160	AC/1E	DGSW1E	ESW	ESW-1A	MDP	PUMPHS
BUS-1F	4160	AC/1F	DGSW1F	ECCS	LPCI-C002C	MDP	NERB
BUS-1F	4160	AC/1F	DGSW1F	ECCS	LPCI-C002D	MDP	SERB
BUS-1F	4160	AC/1F	DGSW1F	EP	XFMR-TCD	TRANS	600-1CDTFR
BUS-1F	4160	AC/1F	DGSW1F	ESW	ESW-1C	MDP	PUMPHS
BUS-1F	4160	AC/1F	DESW1F	ESW	ESW-1C	MDP	PUMPHS
BUS-1F	4160	AC/1F	DGSW1F	ESW	ESW-1D	MDP	PUMPHS
BUS-1F	4160	AC/1F	DESW1F	ESW	ESW-1D	MDP	PUMPHS
BUS-1G	4160	AC/1G	DGSWIG	ECCS	CS-C001B	MDP	SERB
BUS-1G	4160	AC/1G	DGSWIG	ECCS	LPCI-C002B	MDP	SERB
BUS-1G	4160	AC/1G	DGSW1G	EP	XFMR-TID	TRANS	6001D
BUS-1G	4160	AC/1G	DGSW1G	ESW	ESW-1B	MDP	PUMPHS
BUS-1G	4160	AC/1G	DGSW1G	ESW	ESW-1B	MDP	PUMPHS
BUS1C	600	AC/1E	600IC	EP	E-XMFR-1B	TRANS	UNK
DG-1A	4160	AC/1E	DG1A	EP	BUS-1E	BUS	DGSW1E
DG-1B	4160	AC/1F	DG1B	EP	BUS-1F	BUS	DGSW1F
DG-1C	4160	AC/1F	DG1C	EP	BUS-1G	BUS	DGSW1G
E-CAB-1A	120	AC/1E	UNK	EP	I-BUS-1A	BUS	UNK
E-CAB-1B	120	AC/1G	UNK	EP	I-BUS-1B	BUS	UNK
E-CAB-1B	120	AC/1G	UNK	EP	X-FER-SW	SW	UNK
E-TRANS-1C	120	AC/1G	UNK	EP	E-CAB-1B	CAB	UNK
E-XFMR-1B	120/208	AC/1E	UNK	EP	E-CAB-1A	CAB	UNK
ECAB-1A	120	AC/1E	UNK	EP	X-FER-SW	SW	UNK
INV	120	AC/1G	UNK	EP	V-CAB-1A	CAB	UNK
MCC-S009	600	AC/1E	PUMPHSN	ESW	ESW-F312	MOV	PUMPHSVP
MCC-S011	[illegible]	AC/1E	130RB	ECCS	CS-F001A	MOV	NERB

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Hatch 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-S011	600	AC/1E	130RB	ECCS	CS-F004A	MOV	158RB
MCC-S011	600	AC/1E	130RB	ECCS	CS-F005A	MOV	158RB
MCC-S011	600	AC/1E	130RB	ECCS	HPCI-F002	MOV	RC
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F003A	MOV	NERB
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F004A	MOV	NERB
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F004C	MOV	NERB
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F016A	MOV	130RB
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F017A	MOV	130PA
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F027A	MOV	TORUS
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F027B	MOV	TORUS
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F028A	MOV	TORUS
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F047A	MOV	NERB
MCC-S011	600	AC/1E	130RB	ECCS	LPCI-F048A	MOV	NERB
MCC-S011	600	AC/1E	130RB	RCS	HPC. F002	MOV	RC
MCC-S011	600	AC/1E	130RB	RCS	MSD-F016	MOV	RC
MCC-S011	600	AC/1E	130RB	RCS	RHR-F009	MOV	RC
MCC-S0.1	600	AC/1E	130RB	RCS	RXC-F001	MOV	RC
MCC-S012	600	AC/1G	130RB	ECCS	CS-F001B	MOV	SERB
MCC-S012	600	AC/1G	130RB	ECCS	CS-F004B	MOV	RWCUHX
MCC-S012	600	AC/1G	130RB	ECCS	CS-F005B	MOV	RWCUHX
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F003B	MOV	SERB
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F004D	MOV	SERB
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F004D	MOV	SERB
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F016B	MOV	RWCUHX
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F021A	MOV	130RB
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F021B	MOV	RWCUHX
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F028B	MOV	TORUS
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F047B	MOV	SERB
MCC-S012	600	AC/1G	130RB	ECCS	LPCI-F048B	MOV	SERB
MCC-S012	600	AC/1G	130RB	RCIC	RCIC-F007	MOV	RC

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Hatch 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-S012	600	AC/1G	130RB	RCS	RCIC-F007	MOV	RC
MCC-S018A	600	AC/1E	130RB	ECCS	LPCI-F015A	MOV	130PA
MCC-S018B	600	AC/1G	130RB	ECCS	LPCI-F015B	MOV	130PA
MCC-S018B	600	AC/1G	130RB	ECCS	LPCI-F017B	MOV	130PA
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F008	MOV	130PA
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F010	MOV	NWRB
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F012	MOV	NWRB
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F013	MOV	TORUS
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F022	MOV	TORUS
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F029	MOV	NWRB
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F031	MOV	TORUS
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-F045	MOV	NERB
MCC-S021	125/250	DC/1A	130RB	RCIC	RCIC-MO100	MOV	NWRB
MCC-S021	125/250	DC/1A	130RB	RCS	RCIC-F008	MOV	130PA
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F001	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F003	MOV	130PA
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F004	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F006	MOV	TORUS
MCC-S022	125/250	AC/1B	130RB	ECCS	HPCI-F007	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F008	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F011	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F041	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	ECCS	HPCI-F042	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	RCIC	HPCI-F011	MOV	HPCI
MCC-S022	125/250	DC/1B	130RB	RCS	HPCI-F003	MOV	130PA
MCC-S022	125/250	DC/1B	130RB	RCS	RHR-F008	MOV	TORUS
MCC-S025	600	AC/1E	DGSW1E	ESW	ESW-F310A	MOV	DGSW1E
MCC-S025	600	AC/1E	DESW1E	ESW	ESW-F310B	MOV	PSWVP2
MCC-S025	600	AC/1E	DGSW1E	ESW	ESW-F315A	MOV	PSWVP1
MCC-S025	600	AC/1E	DGSW1E	ESW	ESW-F317A	MOV	PSWVP1

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Hatch 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-S025	600	AC/1E	DGSW1E	ESW	ESW-F401A	MOV	PUMPHS
MCC-S025	600	AC/1E	DGSW1E	ESW	ESW-F402A	MOV	P[illegible]MPHS
MCC-S027	600	AC/1G	DGSW1G	ESW	ESW-403B	MOV	PUMPHSVP
MCC-S027	600	AC/1G	DGSW1G	ESW	ESW-F310B	MOV	PSWVP2
MCC-S027	600	AC/1G	DGSWIG	ESW	ESW-F310C	MOV	PSWVP1
MCC-S027	600	AC/1G	DGSW1G	ESW	ESW-F315B	MOV	PSWVP2
MCC-S027	600	AC/1G	DGSW1G	ESW	ESW-F317B	MOV	PSWVP2
MCC-S027	600	AC/1G	DGSW1G	ESW	ESW-F402B	MOV	PUMPHSVP
MG-1C	600	AC/1E	6001C	EP	RPS-BUS1A	BUS	UNK
RPS-MG-1D	120	AC/1G	130CB	EP	RPS-BUS-1B	BUS	UNK
V-XFMFR-1A	120	AC/1E	UNK	EP	V-[illegible]AB-1A	[illegible]AB	UNK
X-FER-SW	120	AC/1E	UNK	EP	RPS-BUS1A	BUS	UNK
X-FERSW	120	AC/1G	UNK	EP	RPS-BUS-1B	BUS	UNK
XFMR-TIC	4160	AC/1E	600-1C	EP	BUS-1C	BUS	6001C
XFMR-TID	4160	AC/1G	600-1D	EP	BUS-ID	BUS	6001D

3.6 CONTROL ROD DRIVE HYDRAULIC SYSTEM (CRDHS)

3.6.1 System Function

The CRDHS supplies pressurized water to operate and cc.. the control rod drive mechanisms during normal operation. This system implements a scram command from the reactor protection system (RPS) and drives control rods rapidly into the reactor. The CRDHS also can provide makeup water to the RCS.

3.6.2 System Definition

The CRDHS consists of two high-head, low-flow, pumps, piping, filters, control valves, one hydraulic control unit for each control rod drive mechanism, and instrumentation. Water is supplied from condensate and from the condensate storage tank. The CRDHS also includes scram valves, scram accumulators, and a scram discharge volume (dump tank).

Details of the scram portion of typical BWR CRDHS is shown in Figure 3.6-1 (adapted from Ref 1).

3.6.3 System Operation

During normal operation the CRDHS pumps provide a constant flow for drive mechanism cooling and system pressure stabilization. Excess water not used for cooling is discharged to the RCS. Control rods are driven in or out by the coordinated operation of the direction control valves. Insertion speed is controlled by flow through the insert speed control valve. Rod motion may be either stepped or continuous.

A reactor scram is implemented by pneumatic scram valves in the CRDHS. An inlet scram valve opens to align the insert side of each control rod drive mechanism (CRDM) to the scram accumulator. An outlet scram valve opens to vent the opposite side of each CRDM to the dump tank. This coordinated action results in rapid insertion of control rods into the reactor.

Although not intended as a makeup system, the CRDHS can provide a source of cooling water to the RCS during vessel isolation. It is noted in NUREG-0626 (Ref 2), that this function is particularly important for some BWR/1 and BWR/2 plants for which the CRDHS is the primary source of makeup on vessel isolation. In later model BWR plants, RCS makeup at high pressure is performed by the RCIC (see Section 3.2) and HPCI (see Section 3.3) systems. The maximum RCS makeup rate of the CRDHS is about 200 gpm with both pumps operating (Ref. 3).

3.6.4 System Success Criteria

For the scram function to be accomplished, the following actions must occur in the CRDHS:

- A scram signal must be transmitted by the RPS to the actuated devices (i.e., pilot valves) in the CRDHS.
- The pneumatic inlet scram valve and outlet scram valve must open in the hydraulic control units (HCUs) for the individual control rod drives. This is accomplished by venting the instrument air supply to each valve as follows:
  - Both scram pilot valves in each HCU must be deenergized, or
  - Either backup scram pilot valve must be energized.
- A high-pressure water source must be available from the scram accumulator in each HCU.
- A hydraulic vent path to the scram discharge volume must be available and sufficient collection volume must exist in the scram discharge volume.
- A specified number of control rods must responds and insert into the reactor core (specific number needed is not known).

3.6.5 Component Information

A. Control rod drive pumps (2)
   1. Rated capacity: 100% (for control rod drive function)
   2. Flow rate: about 120 gpm @ 1500 psid head
   3. Type: centrifugal

B. Condensate Storage Tank
   1. Capacity: 500,000 gal

3.6.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The RPS transmits scram commands to solenoid pilot valves which control the pneumatic scram valves

   2. Remote Manual
      a. A reactor scram can be initiated manually from the control room
      b. The CRDHS can be operated manually from the control room to insert and withdraw rods, or to inject water into the RCS

B. Motive Power
   1. The control rod drive pumps are Class 1E AC loads that can be supplied from the emergency diesel generator as described in Section 3.5.

3.6.7 Section 3.6 References

1. NEDO-24708A, "Additional Information Required for NRC Staff Generic Report on Boiling Water Reactors," General Electric Company, December 1980.

2. NUREG-0626, "Generic Evaluation of Feedwater Transients and Small Break Loss-of-Coolant-Accidents in GE-designed Operating Plants and Near-term Operating License Applications," USNRC, January 1980.

3. Harrington, R.M., and Ott, L.J., "The Effect of Small-Capacity, High-Pressure Injection Systems on TQUV Sequences at Browns Ferry Unit One," NUREG/CR-3179, Oak Ridge National Laboratory, September 1983.

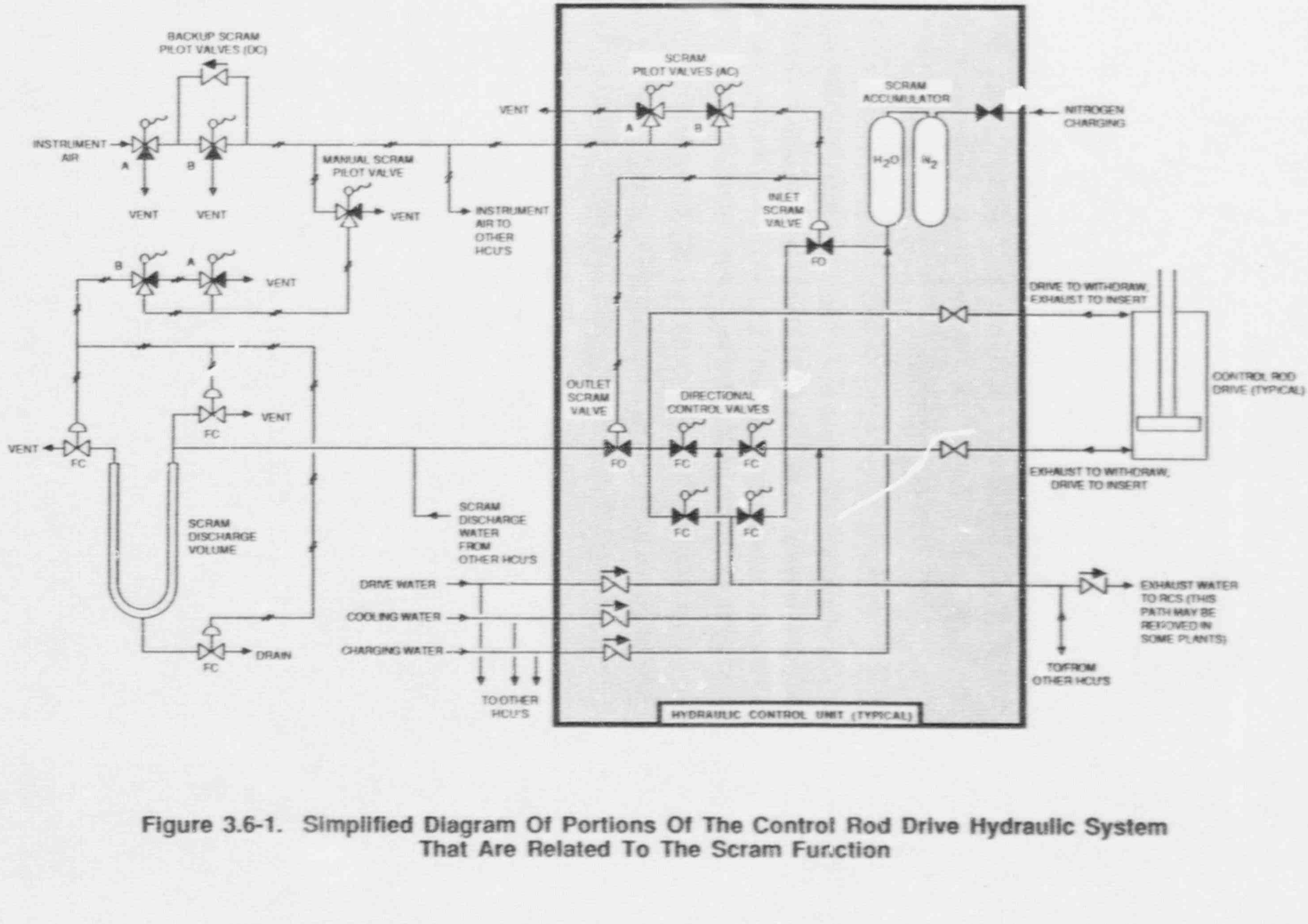


Figure 3.6-1. Simplified Diagram Of Portions Of The Control Rod Drive Hydraulic System That Are Related To The Scram Function

3.7 PLANT SERVICE WATER (PSW) SYSTEM

3.7.1 System Function

The Plant Service Water System provides cooling water from the ultimate heat sink, the Altamaha river, to various heat loads in the plant, including the diesel generator heat exchangers, RHR pump room area coolers, HPCI pump room area coolers, and the control room air conditioners.

3.7.2 System Definition

The PSW system contains four motor driven pumps which take suction through strainers at the intake structure. The pumps supply two headers from which the heat loads are supplied. Upon a loss of offsite power (LOSP) or a LOCA signal, the system is divided into two independent PSW loops. Simplified drawings of the Hatch 1 Plant Service Water System are shown in Figures 3.7-1 and 3.7-2. A summary of data on selected PSW system components is presented in Table 3.7-1. The system for Hatch 2 is similar.

3.7.3 System Operation

During normal operation three service water pumps are required to cool the operating heat loads. The PSW system serves the following heat loads:

- Diesel generators
- Reactor Building Closed Cooling Water (RBCCW) System
- RHR pump seals
- Drywell coolers
- Pump room coolers (RHR, CS, HPCI, RCIC, and CRD room coolers)
- Various air-condition units, including Hatch 1 control room A/C units
- Turbine building chilled water units
- Recirculation M-G set coolers
- Reactor feedwater pump turbine oil coolers
- Various main turbine heat loads
- Other heat loads

3.7.4 System Success Criteria

One pump per PSW train is sufficient for the emergency loads as follows:

	PSW Loop A	PSW Loop B
- Diesel generator	X	X
- Residual heat removal pump seals	X	X
- RHR (LPCI) pump room area coolers	X	X
- HPCI pump room area coolers		X
- Control room air conditioning units	X	X
- RCIC pump room area coolers	X	

3.7.5 Component Information

A. Service Water Pumps (C001 A, B, C, D)
   1. Rated flow: 8500 gpm @ 150 ft. head (65 psid)
   2. Rated capacity: 33 1/3%
   3. Type: vertical turbine

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      Upon receipt of a LOCA or LOSP signal, one pump in each division is started.
   2. Remote manual
      The PWS pumps can be actuated by remote manual means from the control room.

B. Motive Power
   The PWS pumps are Class 1E AC loads that can be supplied from the emergency diesel generator as described in Section 3.5.

C. Other
   The sanitary water system provides PSW pump seal lubrication.

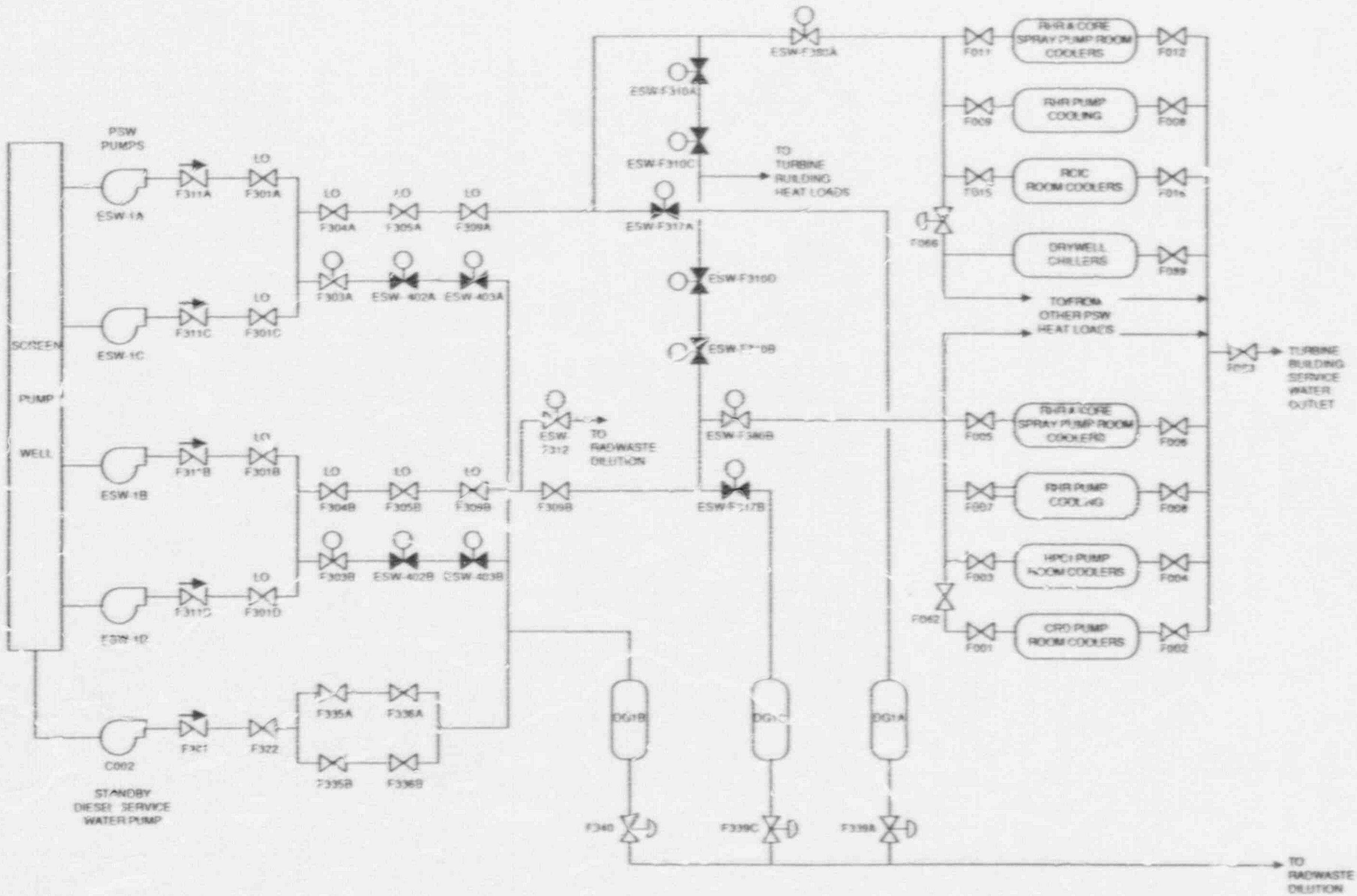


Figure 3.7-1. Hatch Unit 1 Plant Service Water (PSW) System

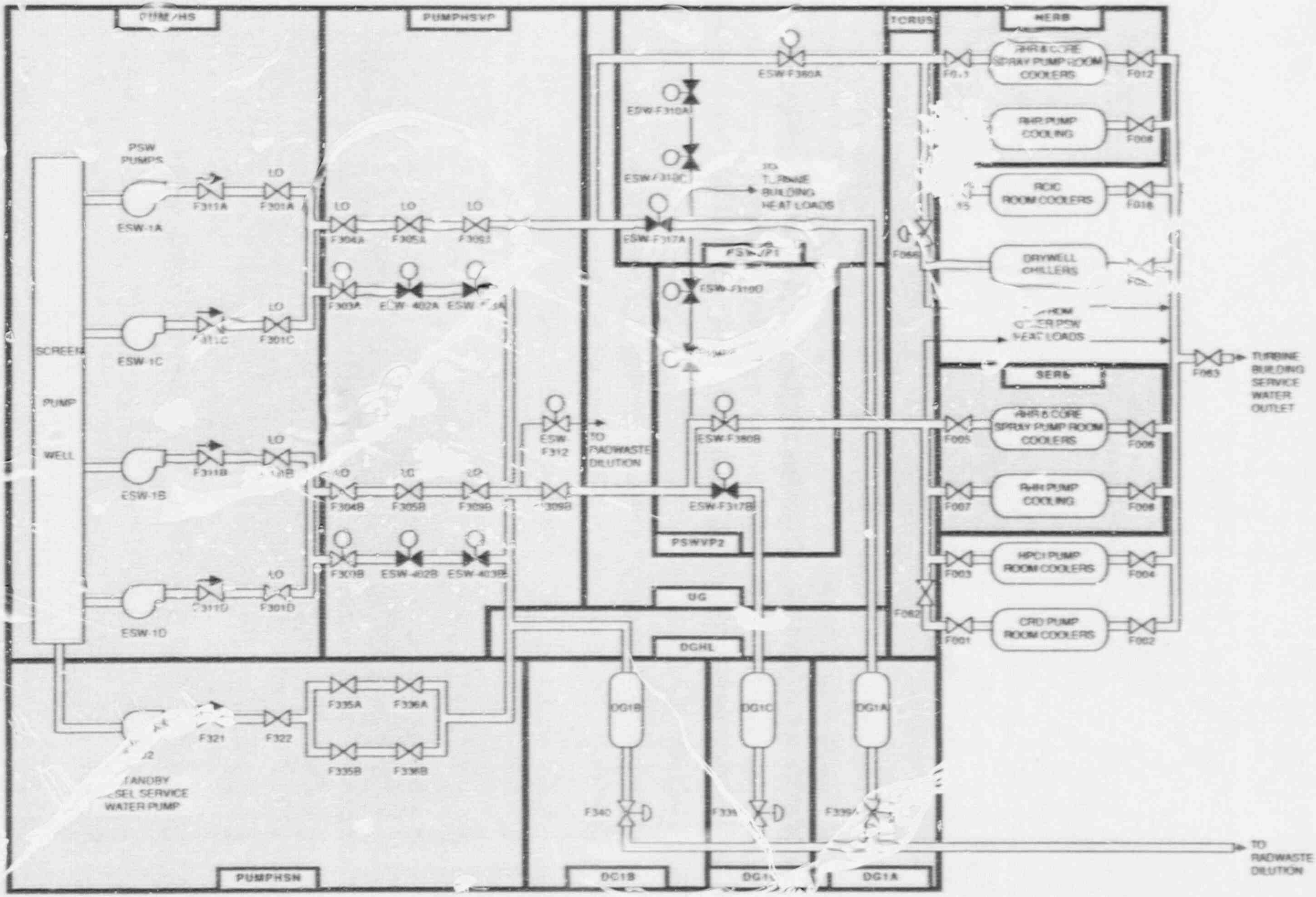


Figure 3.7-2. Hatch Unit 1 Plant Service Water (PSW) System Showing Component Locations

Table 3.7-1. Hatch 1 Plant Service Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
ESW-1A	MDP	PUMPHS	BUS-1E	4160	DGSW1E	AC/1E
ESW-1B	MDP	PUMPHS	BUS-1G	4160	DGSW1G	AC/1G
ESW-1C	MDP	PUMPHS	BUS-1F	4160	DESW1F	AC/1F
ESW-1D	MDP	PUMPHS	BUS-1F	4160	DESW1F	AC/1F
ESW-403B	MOV	PUMPHSVP	MCC S027	600	DGSW1G	AC/1G
ESW-F310A	MOV	DGSW1E	MCC-S025	600	DGSW1E	AC/1E
ESW-F310B	MOV	PSWVP2	MCC-S027	600	DGSW1G	AC/1G
ESW-F310B	MOV	PSWVP2	MCC-S025	600	DESW1E	AC/1E
ESW-F310C	MOV	PSWVP1	MCC-S027	600	DGSW1G	AC/1G
ESW-F312	MOV	PUMPHSVP	MCC-S009	600	PUMPHSN	AC/1E
ESW-F315A	MOV	PSWVP1	MCC-S025	600	DGSW1E	AC/1E
ESW-F315B	MOV	PSWVP2	MCC-S027	600	DGSW1G	AC/1G
ESW-F317A	MOV	PSWVP1	MCC-S025	600	DGSW1E	AC/1E
ESW-F317B	MOV	PSWVP2	MCC-S027	600	DGSW1G	AC/1G
ESW-F401A	MOV	PUMPHS	MCC-S025	600	DGSW1E	AC/1E
ESW-F402A	MOV	PUMPHS	MCC-S025	600	DGSW1E	AC/1E
ESW-F402B	MOV	PUMPHSVP	MCC-S027	600	DGSW1G	AC/1G
INTAKE	TK	PUMPHS				

3.8 RESIDUAL HEAT REMOVAL SERVICE WATER (RHRSW) SYSTEM

3.8.1 System Function

The RHRSW system provides cooling water from the ultimate heat sink (the Altamaha River) to remove decay heat via the RHR heat exchangers. By means of a cross-tie with the RHR system, the RHRSW system also can supply makeup to the RCS when all emergency core cooling systems have failed (Ref. 1).

3.8.2 System Definition

The RHRSW system consists of two independent trains consisting of two pumps each. Each train supplies cooling water from the intake structure to one RHR heat exchanger. Simplified diagrams of the Hatch 1 RHRSW system are shown in Figures 3.8-1 and 3.8-2. The system for Hatch 2 is similar.

3.8.3 System Operation

During power operation, the RHRSW system is not operating. When required, the system is placed in operating by remote manual means. The discharge pressure of the RHRSW pumps is higher than RHR system pressure, therefore, any leakage in an RHR heat exchanger will result in service water leakage into the RHR system. Pressure control is achieved by a flow control valve on the RHR heat exchanger outlet.

3.8.4 System Success Criteria

Each RHRSW train has a rated decay heat removal capacity of 100% (Ref. 2). This implies that two RHRSW pumps supplying a single RHR heat exchanger can provide adequate decay heat removal capacity.

3.8.5 Component Information

A. RHRSW pumps (4)
   1. Type: vertical turbine
   2. Capacity: 4000 gpm @ 897 ft. head (389 psid)

3.8.6 Support Systems and Interfaces

A. Control Signals
   1. Remote manual
      The RHRSW system is actuated by remote manual means.
   2. Automatic
      The RHRSW system is stopped automatically if a low pressure coolant injection actuation signal is present.

B. Motive Power
   The RHRSW pumps are Class 1E AC loads that can be powered from the diesel generators.

C. Other
   1. The sanitary water system provides 3 to 5 gpm for RHRSW pump seal lubrication. Normally pre-lubrication is performed before pump startup. The RHRSW pumps can be started without seal pre-lubrication.
   2. The RHRSW pump motors are believed to be cooled by the plant service water system (Ref. 2), however, this interface could not be located on PSW system drawings.

3.8.7 Section 3.8 References

1. Hatch 1 FSAR, Section 4.8.6.1.

2. Hatch 1 FSAR, Section 10.6.

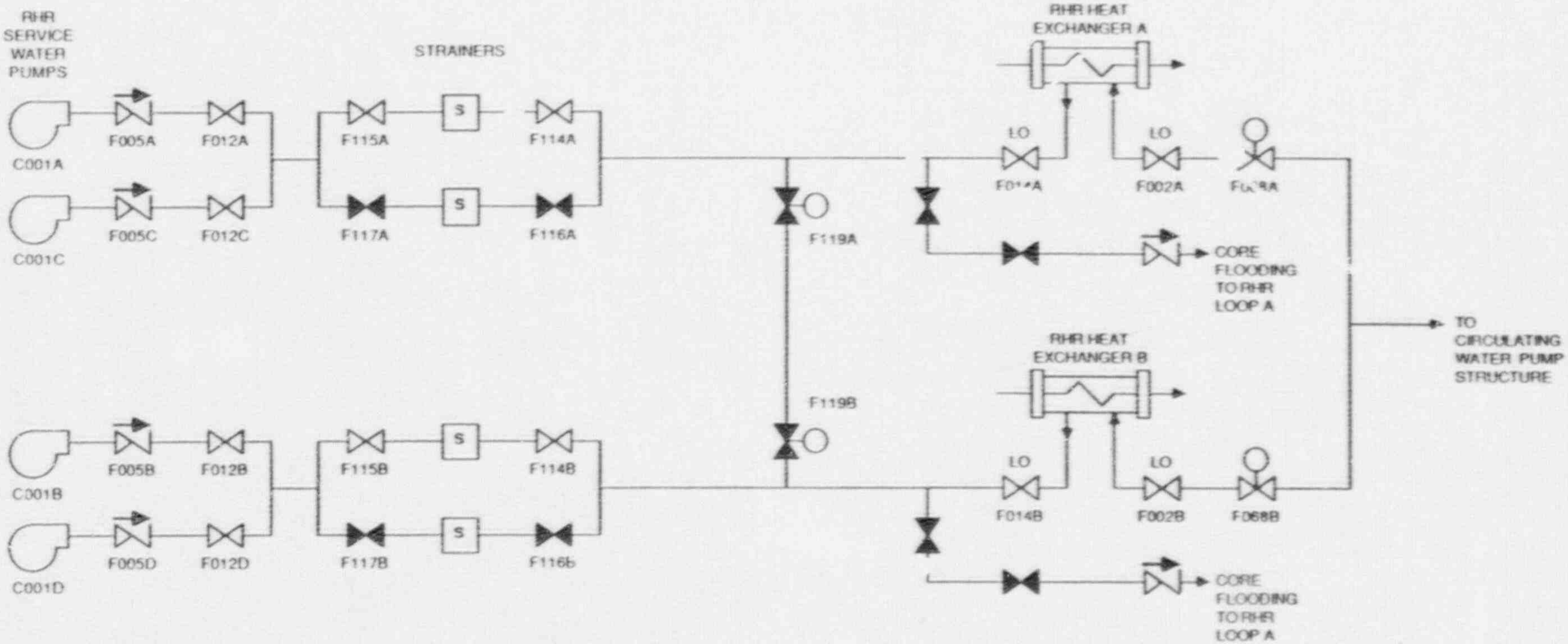


Figure 3.8-1. Hatch Unit 1 Residual Heat Removal Service Water (RHRSW) System

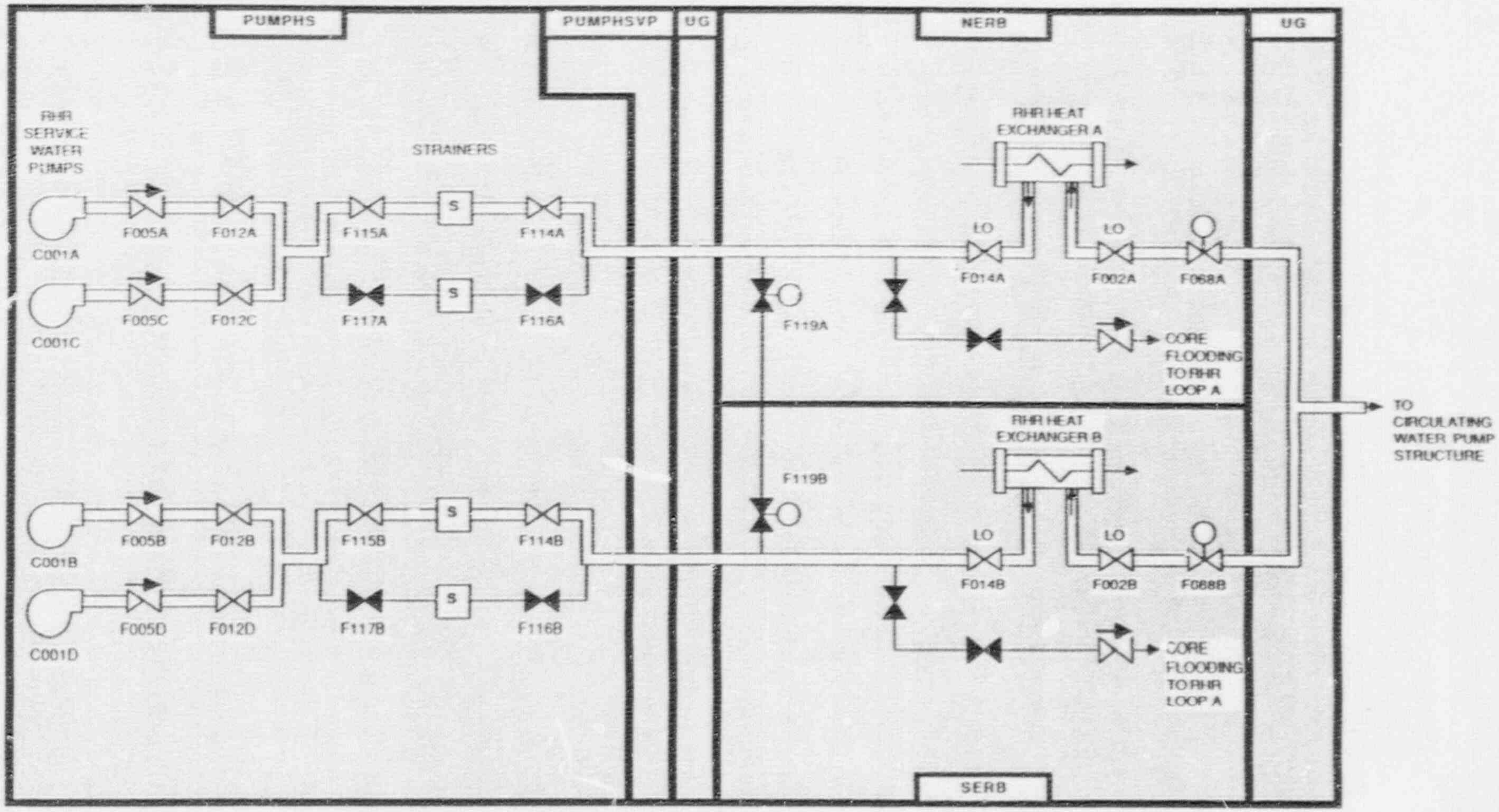


Figure 3.8-2. Hatch Unit 1 Residual Heat Removal Service Water (RHRSW) System Showing Component Locations

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The Edwin I. Hatch nuclear plant is located in Appling County near Baxley Georgia on a 2100 acre site. The site is located 67 miles from the city of Savannah, Georgia and is located on Atamaha River. Figure 4-1 shows a general view of the site and the surrounding area (from Ref. 1).

The major structures at this facility include two reactor buildings, two turbine buildings, a service building, a diesel generator building and the intake structure. The site general arrangement is shown in Figure 4-2.

The site consists of two units arranged so that the axis of each turbine-generator is oriented on a North-South azimuth approximately perpendicular to the Altamaha River.

The reactor buildings are located on the east side of the turbine building. The reactor buildings are mirror images. This building contains the primary containment (drywell and torus) housing the reactor vessel and recirculation piping, the fuel pool, and the emergency core cooling systems. An elevation drawing of the Hatch reactor building is shown in Figure 4-3 (typical for Units 1 and 2).

The main control room is shared by both units and is physically located in the Control Building which is between the Unit 1 and Unit 2 turbine buildings. Below the control room are the cable spreading rooms and switchgear room.

The radwaste equipment for each unit is housed in separate buildings adjacent to both the turbine and reactor buildings. The service building is located to the west of the turbine building and houses the administrative offices and the machine shop facilities.

The diesel generator building is located on the north side of the Unit 2 turbine building and houses the emergency diesel generators and associated switchgear for both units.

The cooling towers are located to the east of the plant and the intake structure for both units is located on the north end of the site.

4.2 FACILITY LAYOUT DRAWINGS

Figures 4-4 thru 4-10 are simplified building layout drawings for the Hatch 1 reactor building. Similar drawings for Hatch 2 are shown in Figures 4-11 to 4-17. The control building is shown in Figures 4-18 to 4-21. The diesel building and the intake structure are shown respectively in Figures 4-22 and 4-23. Some outlying buildings are not shown on these drawings. Major rooms, stairways, elevators, and doorways are shown in the simplified layout drawings, however, many interior walls have been omitted for clarity. Labels printed in uppercase correspond to the location codes listed in Table 4-1 and used in the component data listings and system drawings in Section 3. Some additional labels are included for information and are printed in lowercase type.

A listing of components by location is presented in Table 4-2. Components included in Table 4-2 are those found in the system data tables in Section 3, therefore this table is only a partial listing of the components and equipment that are located in a particular room or area of the plant.

4.3 SECTION 4 REFERENCES

1. Heddleson, F.A., "Design Data and Safety Features of Commercial Nuclear Power Plants.", ORNL-NSIC-55, Volume 2, Oak Ridge National Laboratory, Nuclear Safety Information Center, January 1972.

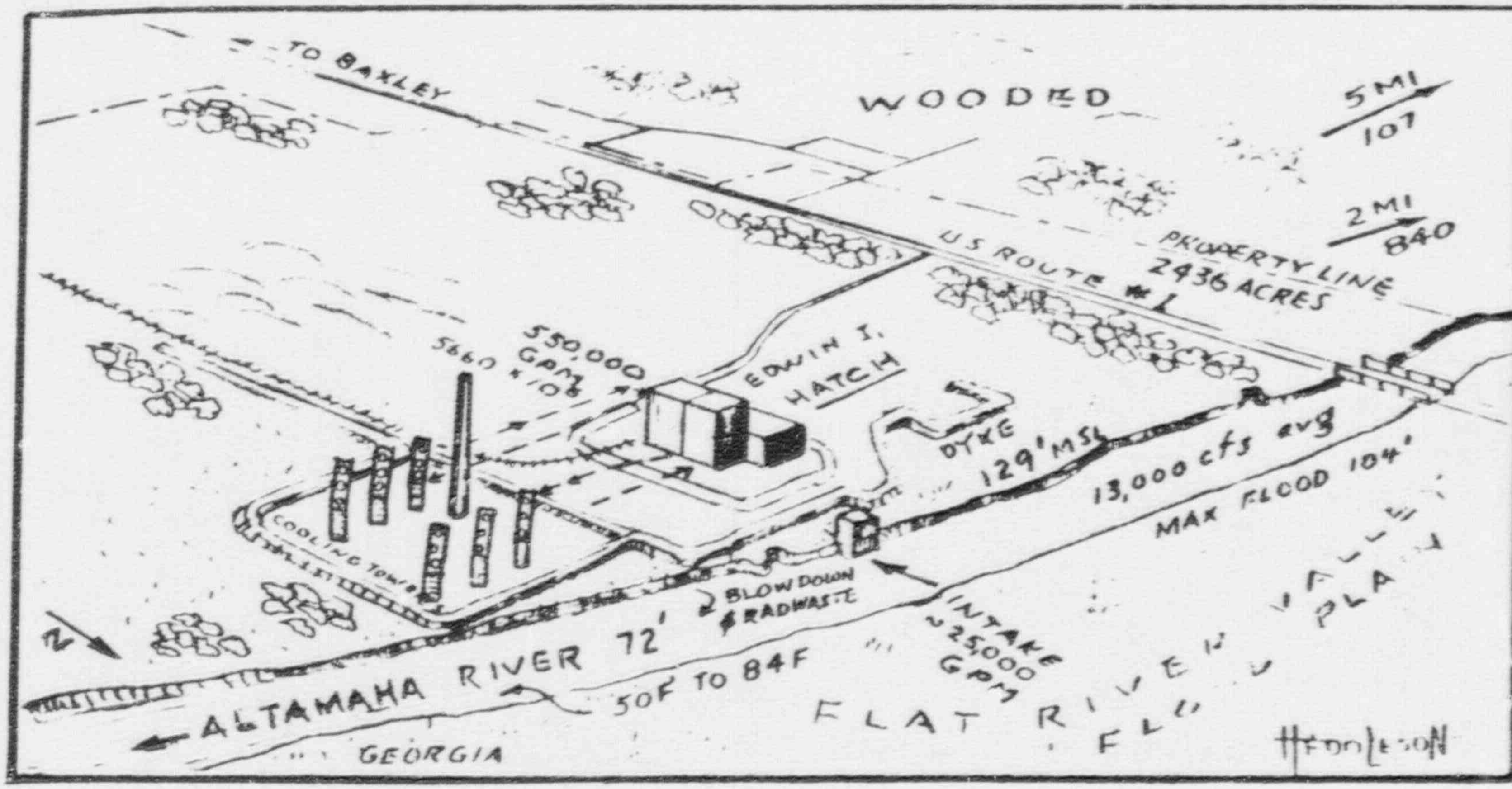


Figure 4-1. General View of Hatch Nuclear Power Plant Site and Vicinity

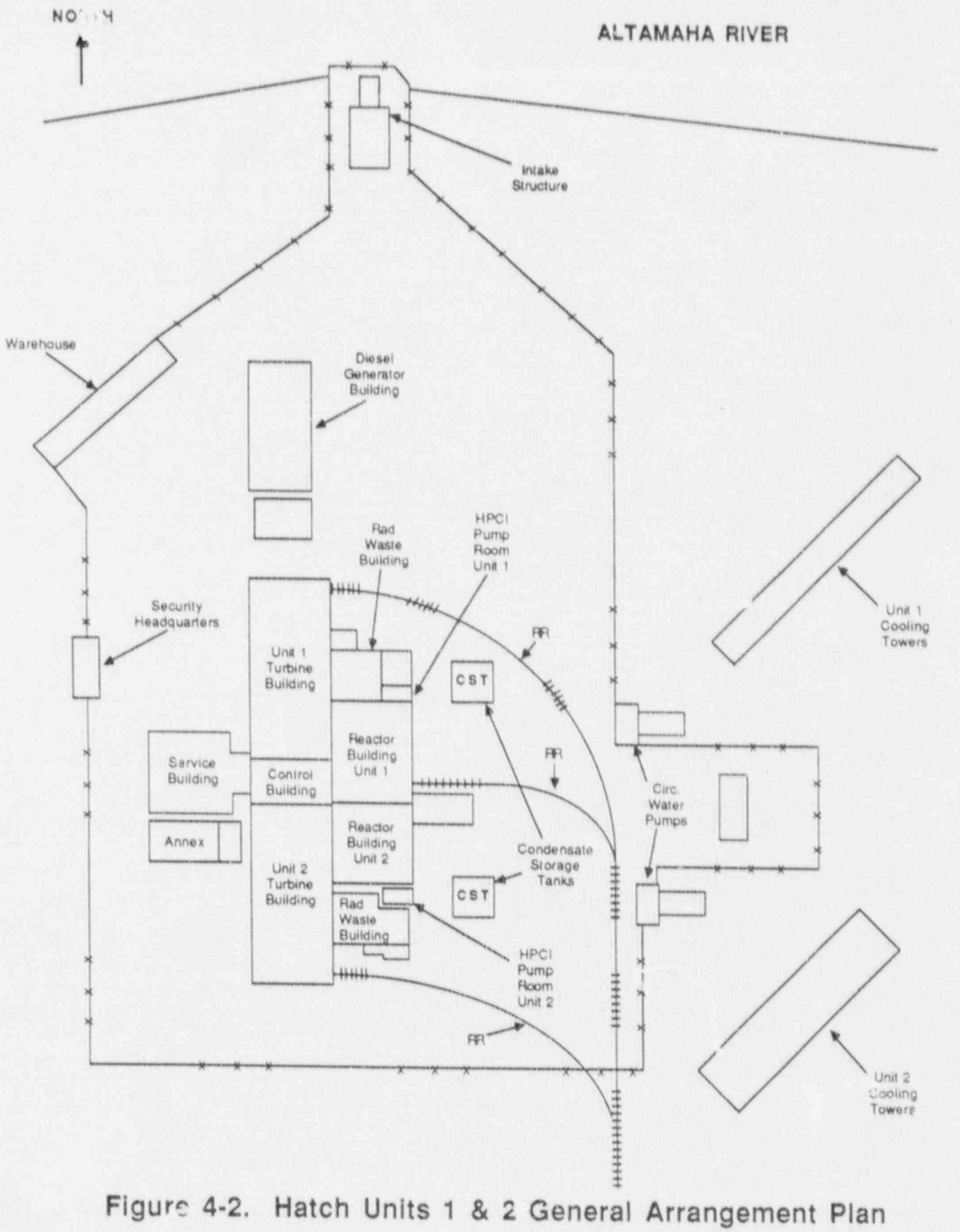


Figure 4-2. Hatch Units 1 & 2 General Arrangement Plan

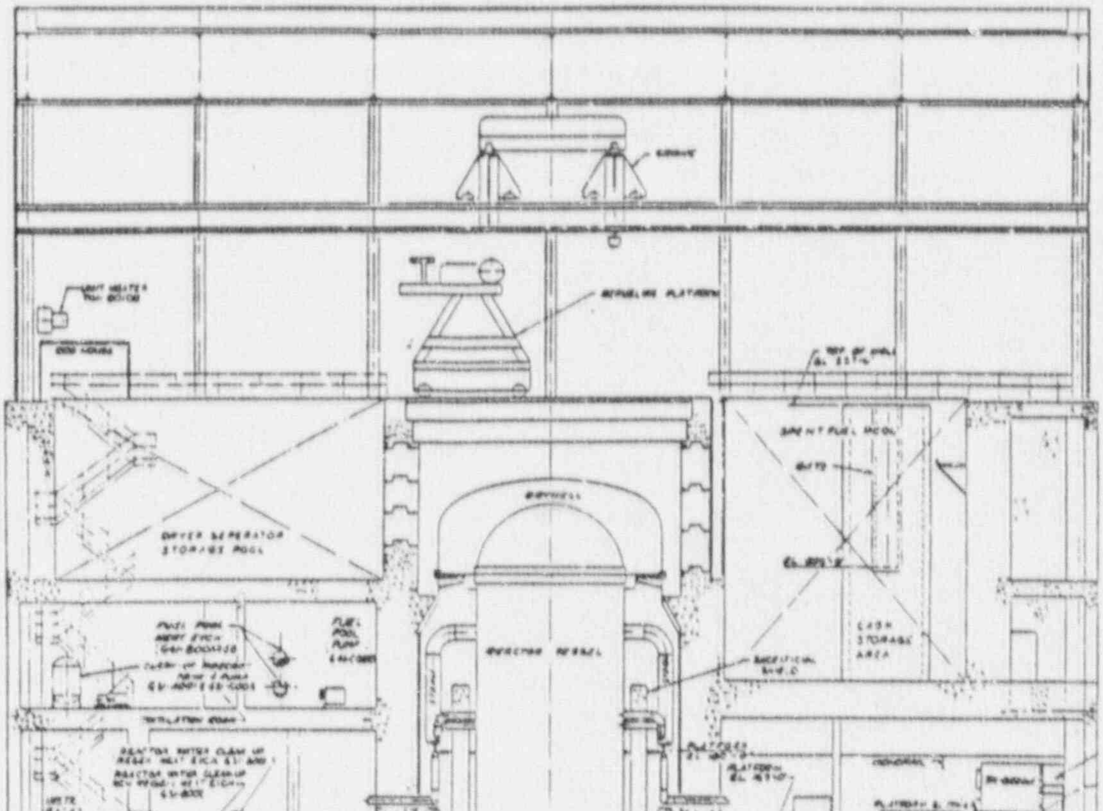


Figure 4-3. Hatch Unit 1 Reactor Building Section View (Sheet 1 of 2)

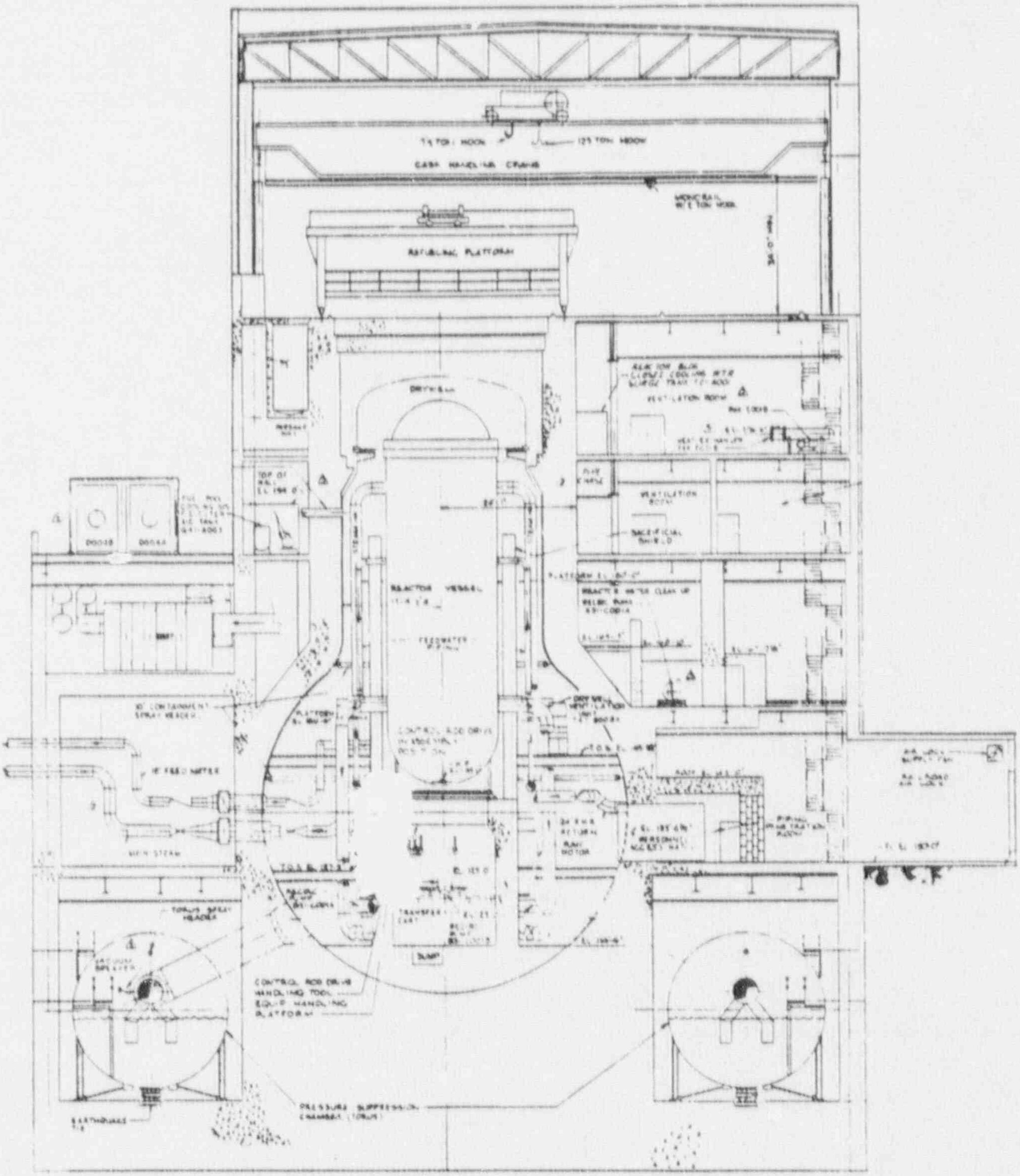
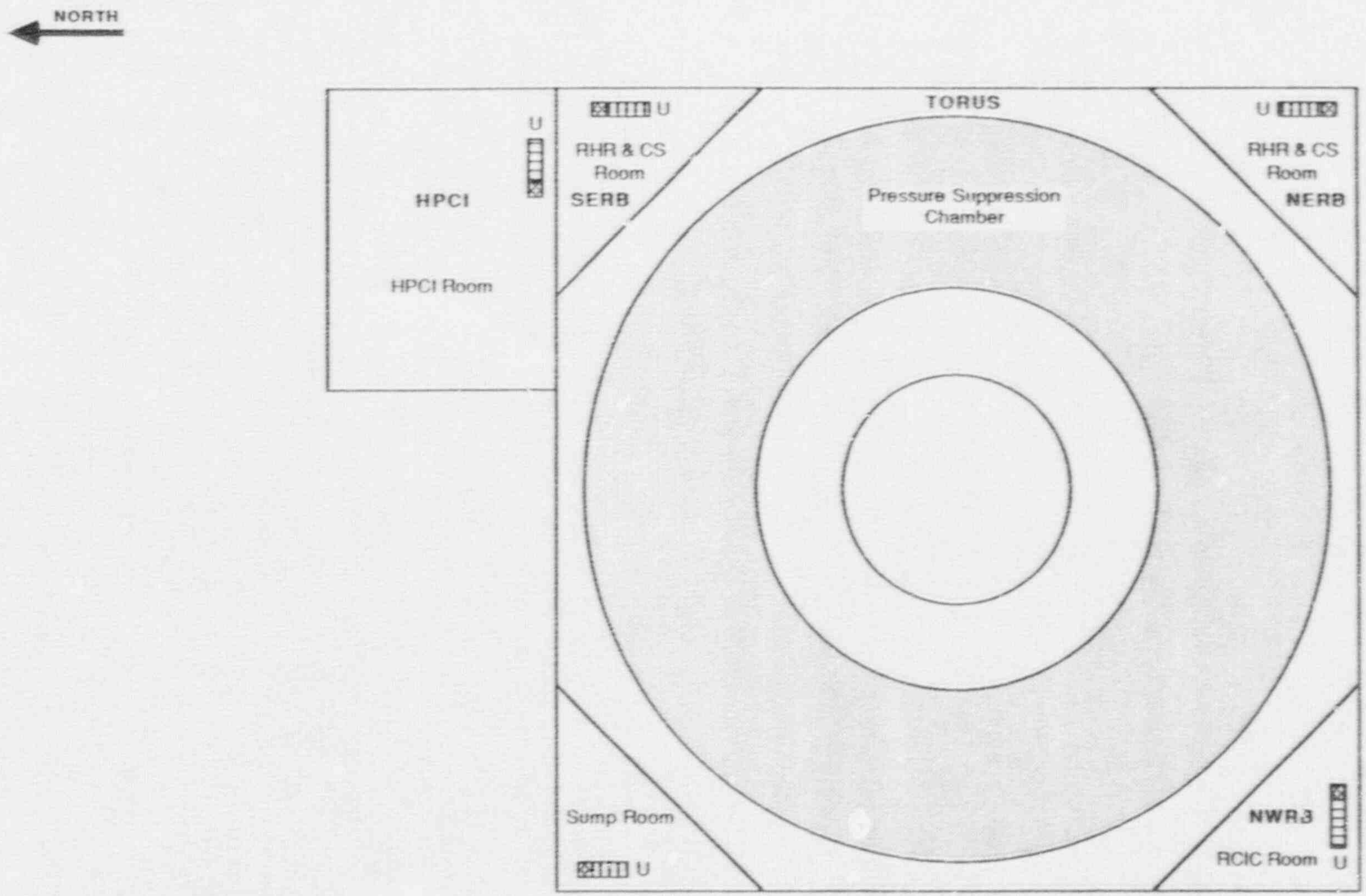
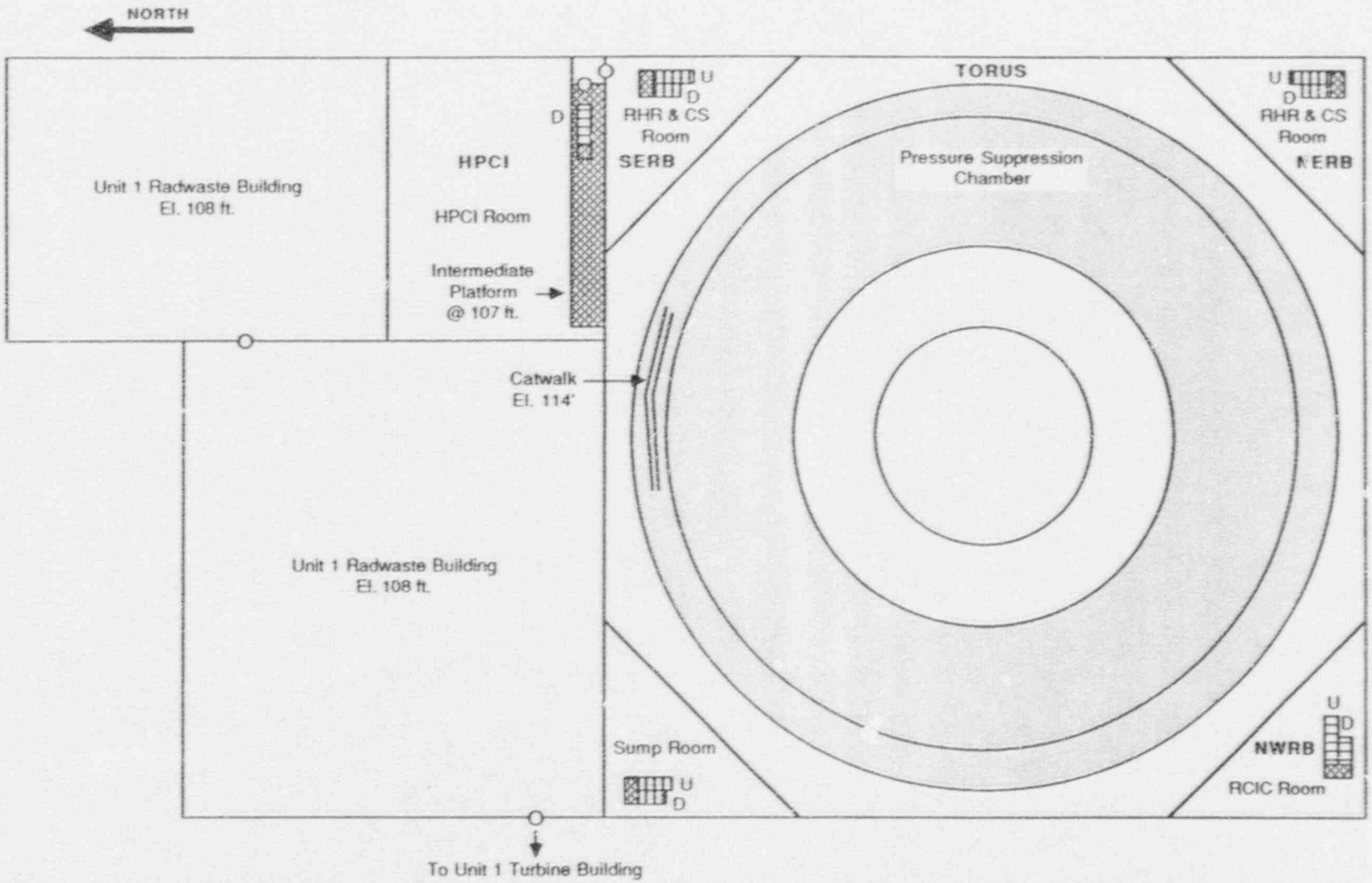


Figure 4-3. Hatch Unit 1 Reactor Building Section View (Sheet 2 of 2)



NOTE: Hatch 1 and 2 are mirror image plants. Areas SERB, NERB, and NWRB were originally assigned to Hatch 2 layouts based on compass position of the rooms (i.e. northeast reactor building, southeast and northwest). For this Hatch 1 layout, the area codes are assigned to the rooms having similar equipment to the Hatch 2 rooms with the same location code.

Figure 4-4. Hatch Unit 1 Reactor Building - Elevation 87 ft.



NOTE: Hatch 1 and 2 are mirror image plants. Areas SERB, NERB and NWRB were originally assigned to Hatch 2 layouts based on compass position of the rooms (i.e. northeast reactor building, southeast and northwest). For this Hatch 1 layout, the area codes are assigned to the rooms having similar equipment to the Hatch 2 rooms with the same location code.

Figure 4-5. Hatch Unit 1 Reactor and Radwaste Buildings - Elevations 107 to 113 ft.

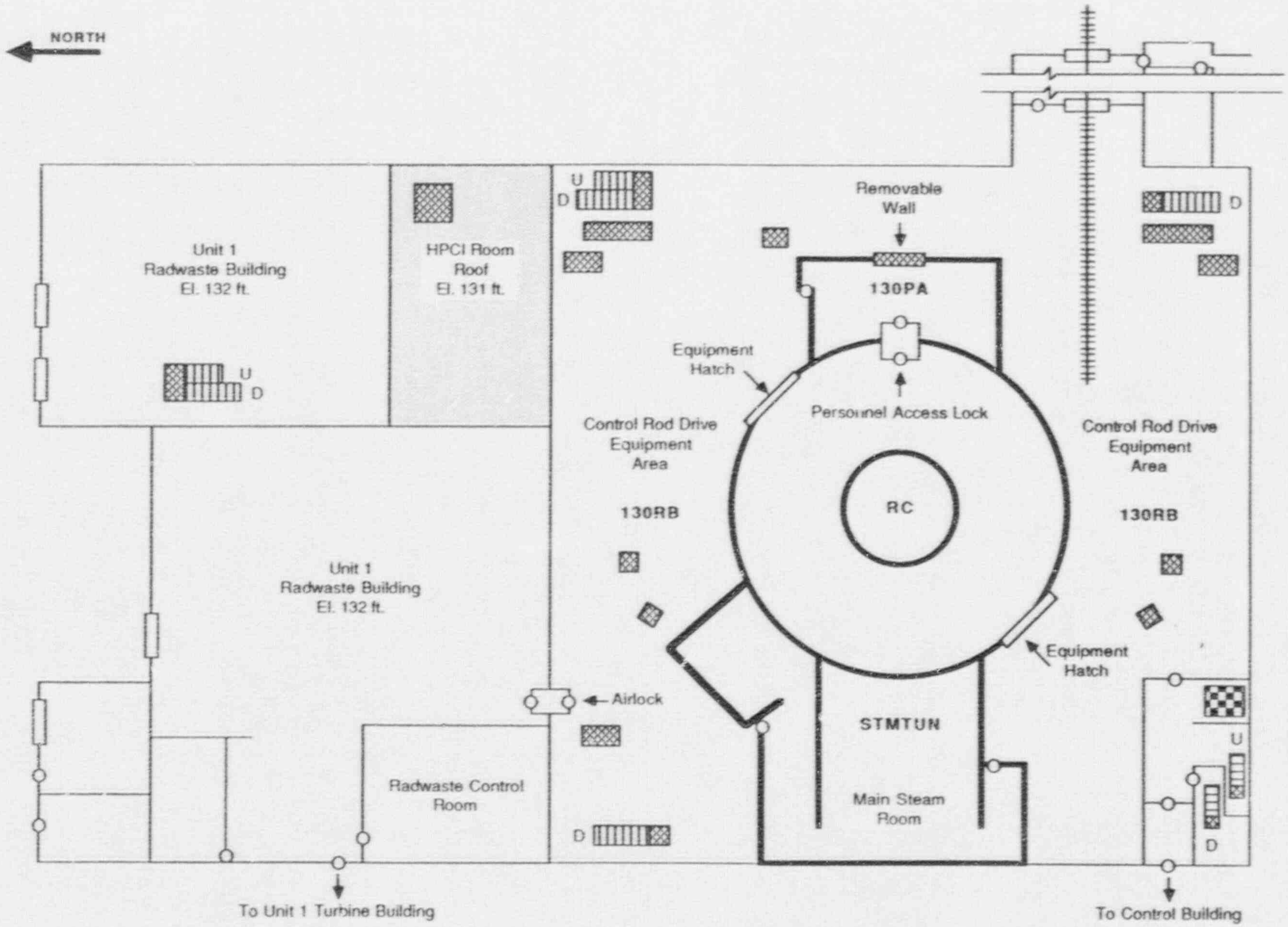


Figure 4-6. Hatch Unit 1 Reactor Building Arrangement - Elevation 130 ft.

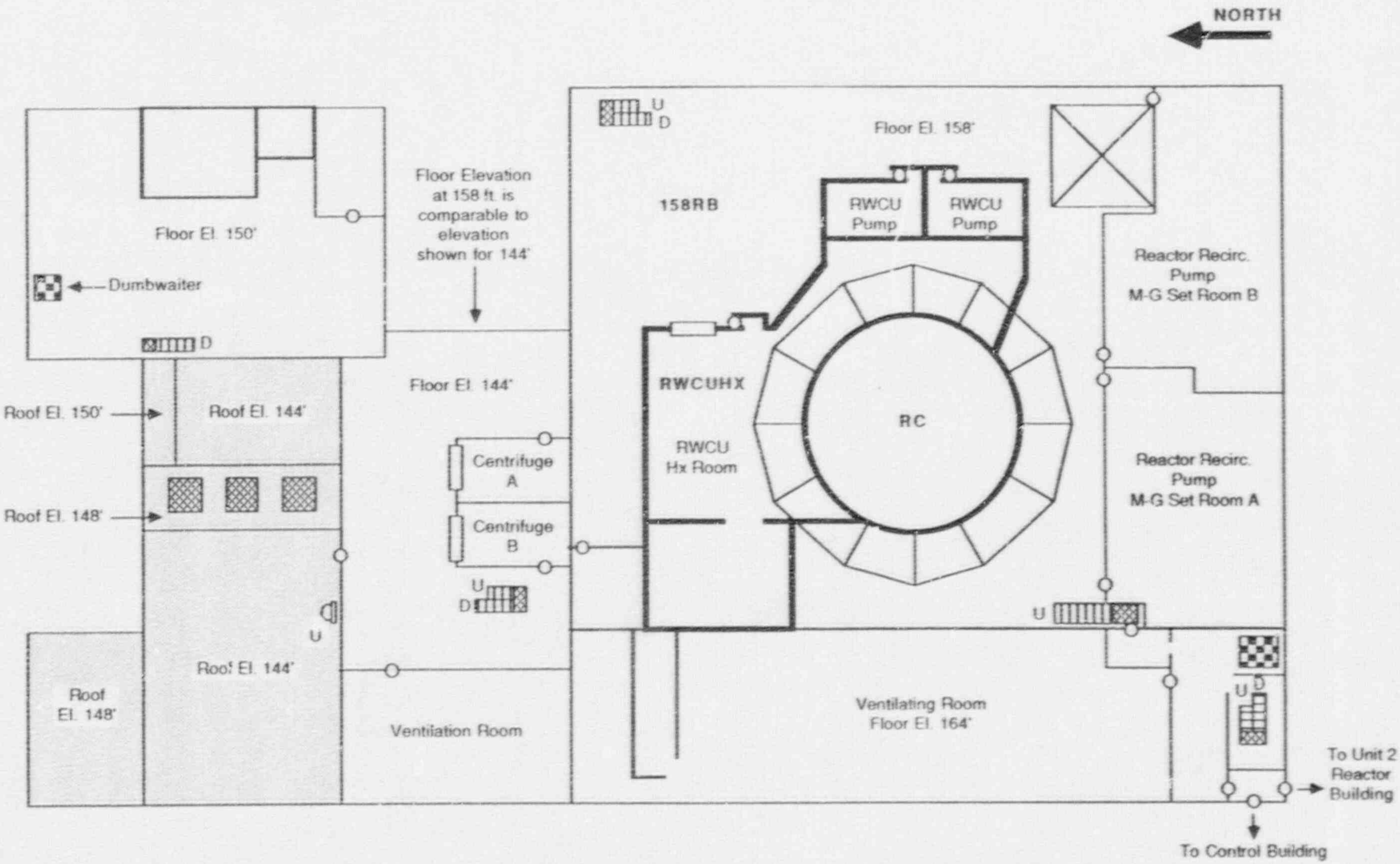


Figure 4-7. Hatch Unit 1 Reactor Building Arrangement - Elevations 144 to 164 ft.

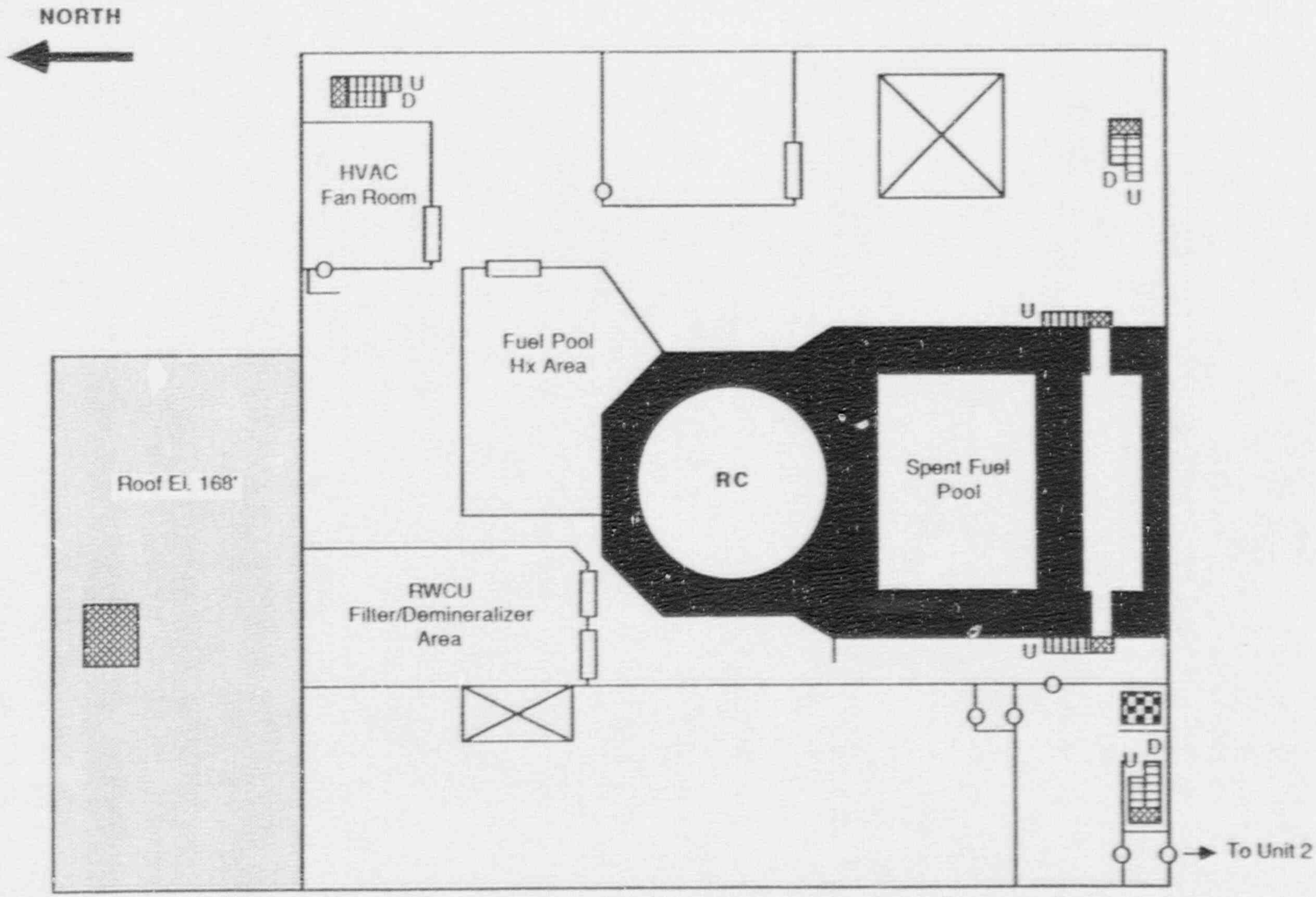


Figure 4-8. Hatch Unit 1 Reactor Building Arrangement - Elevation 185 ft.

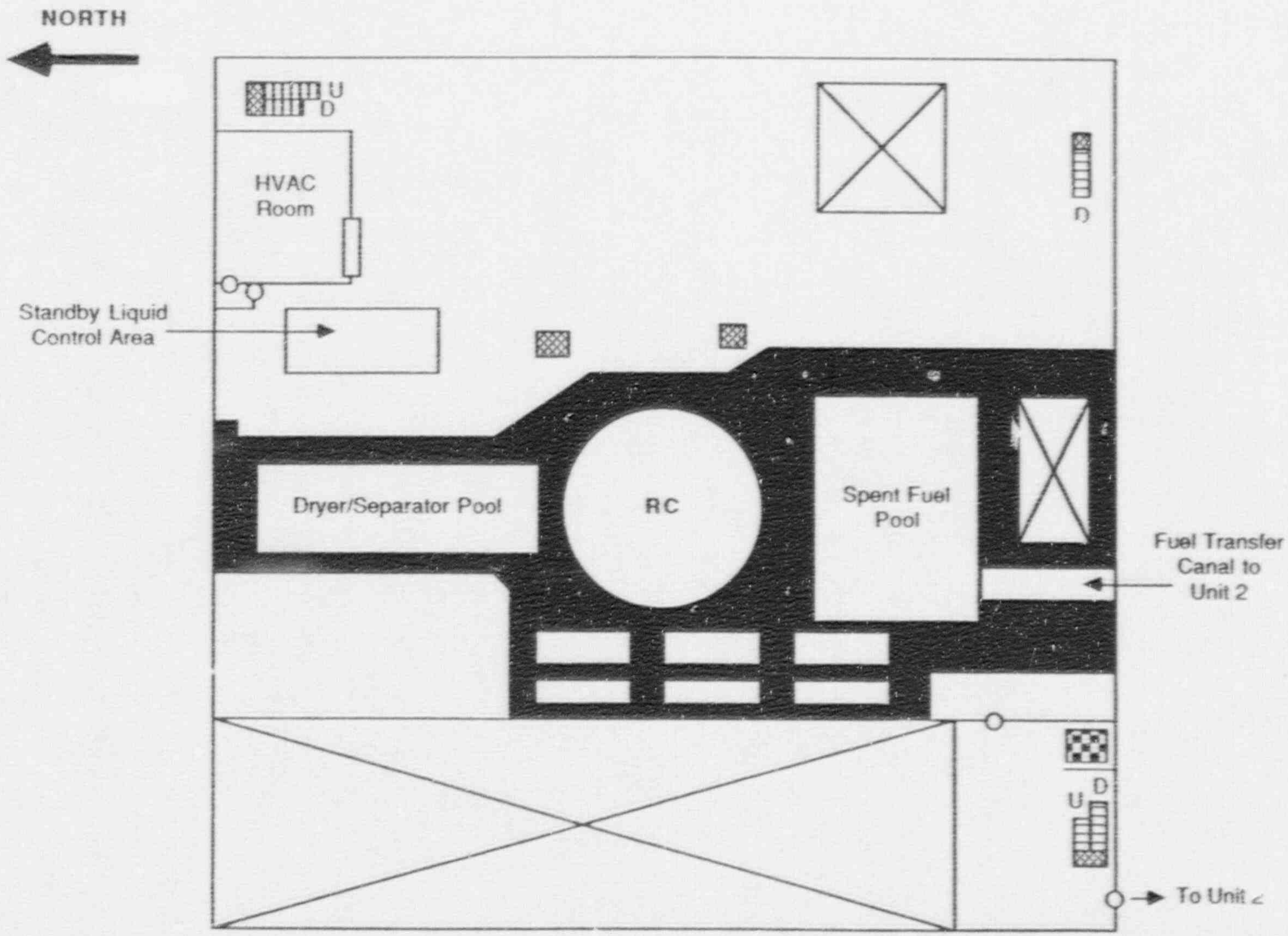


Figure 4-9. Hatch Unit 1 Reactor Building Arrangement - Elevation 203 ft.

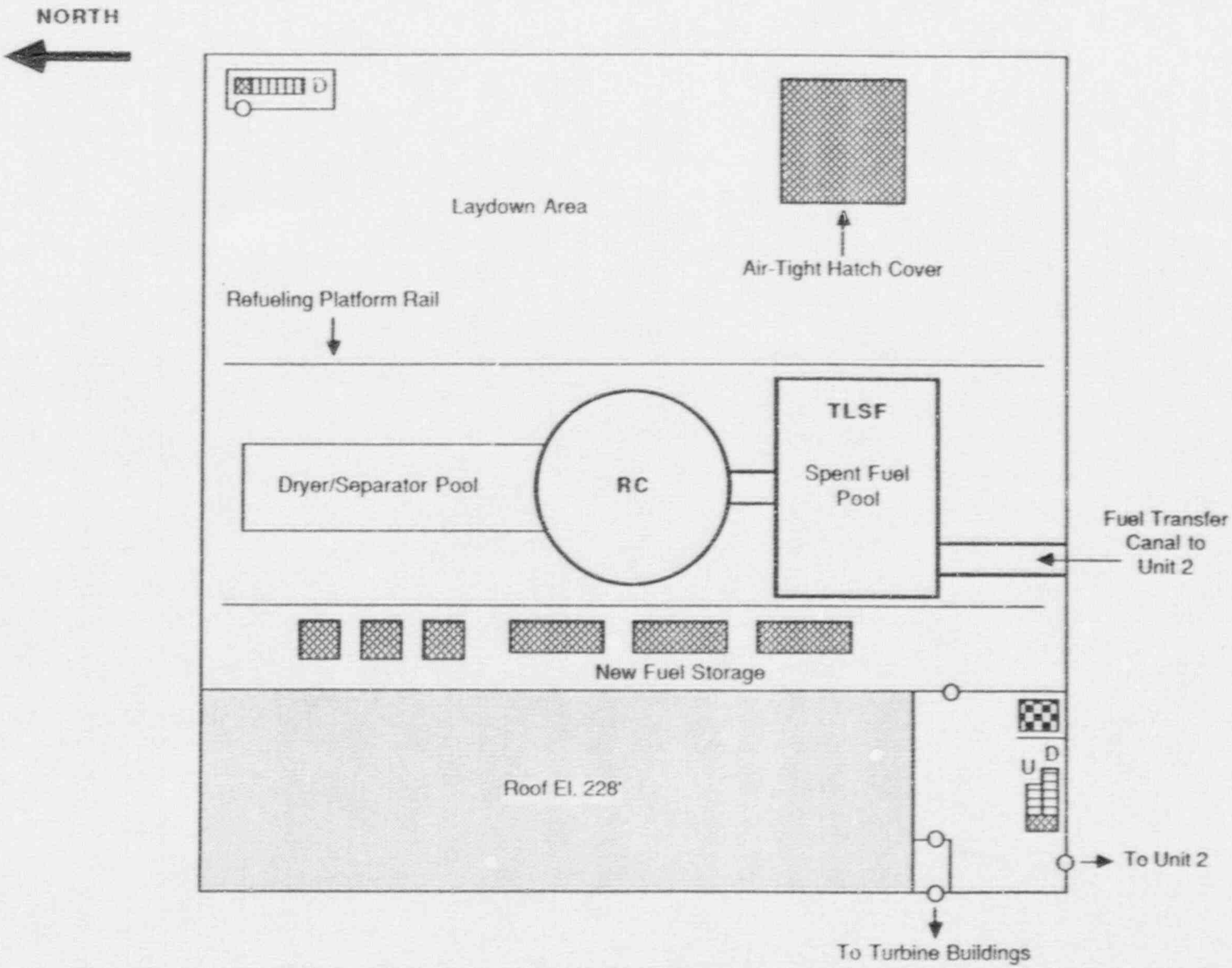


Figure 4-10. Hatch Unit 1 Reactor Building Arrangement - Elevation 228 ft.

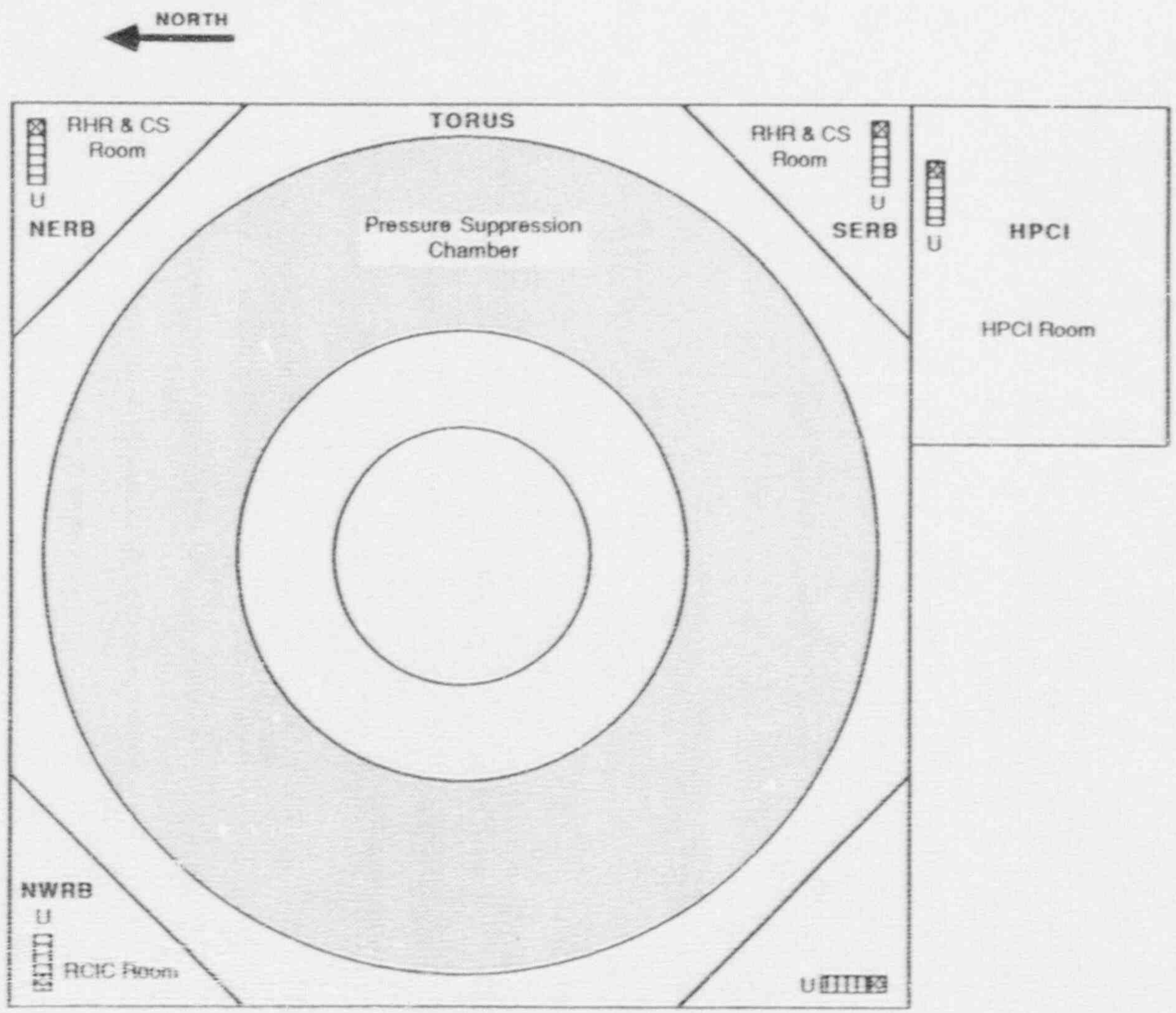


Figure 4-11. Hatch Unit 2 Reactor Building Arrangement - Elevation 87 ft.

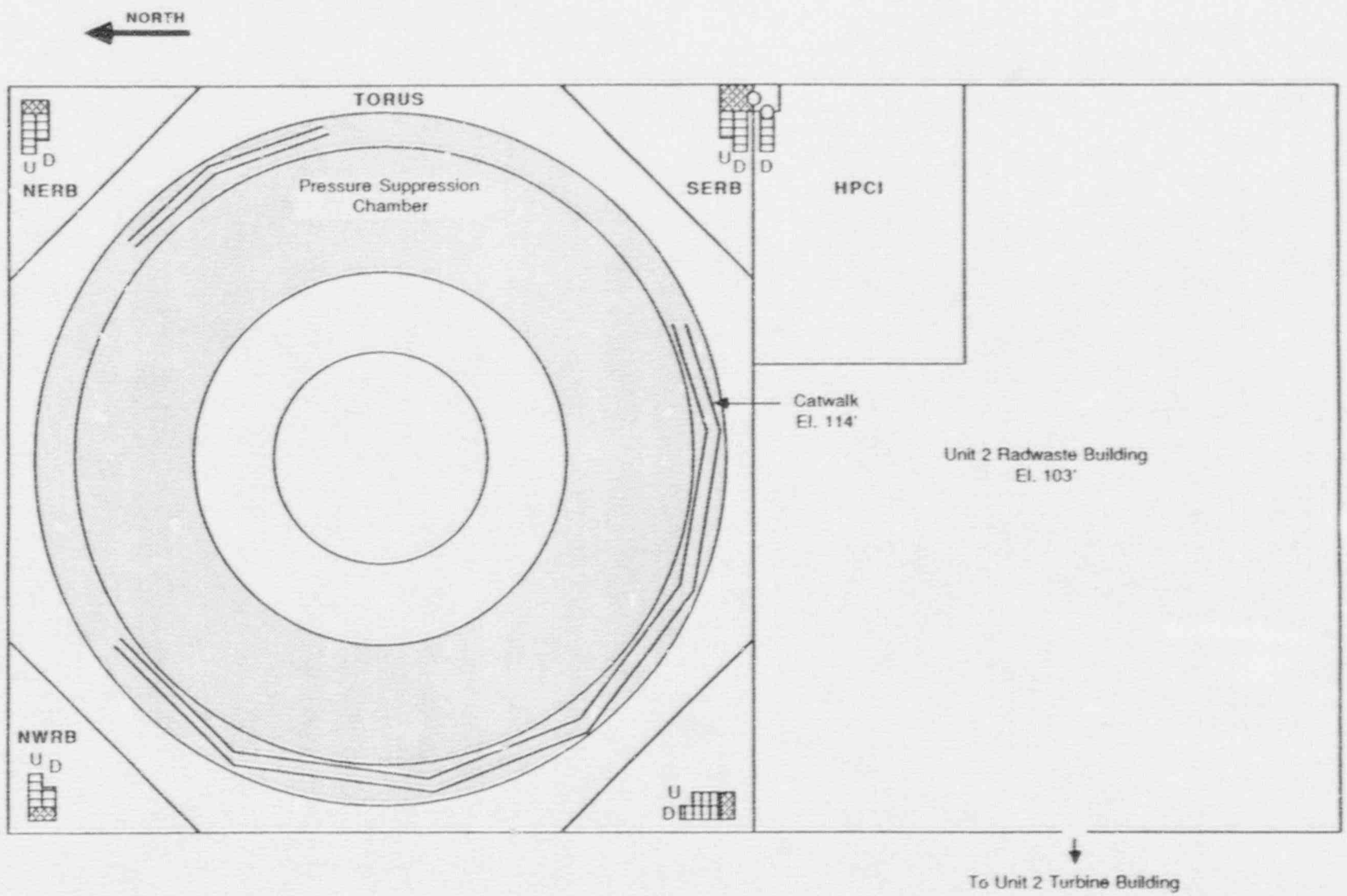


Figure 4-12. Hatch Unit 2 Reactor Building - Elevations 107 to 111 ft.

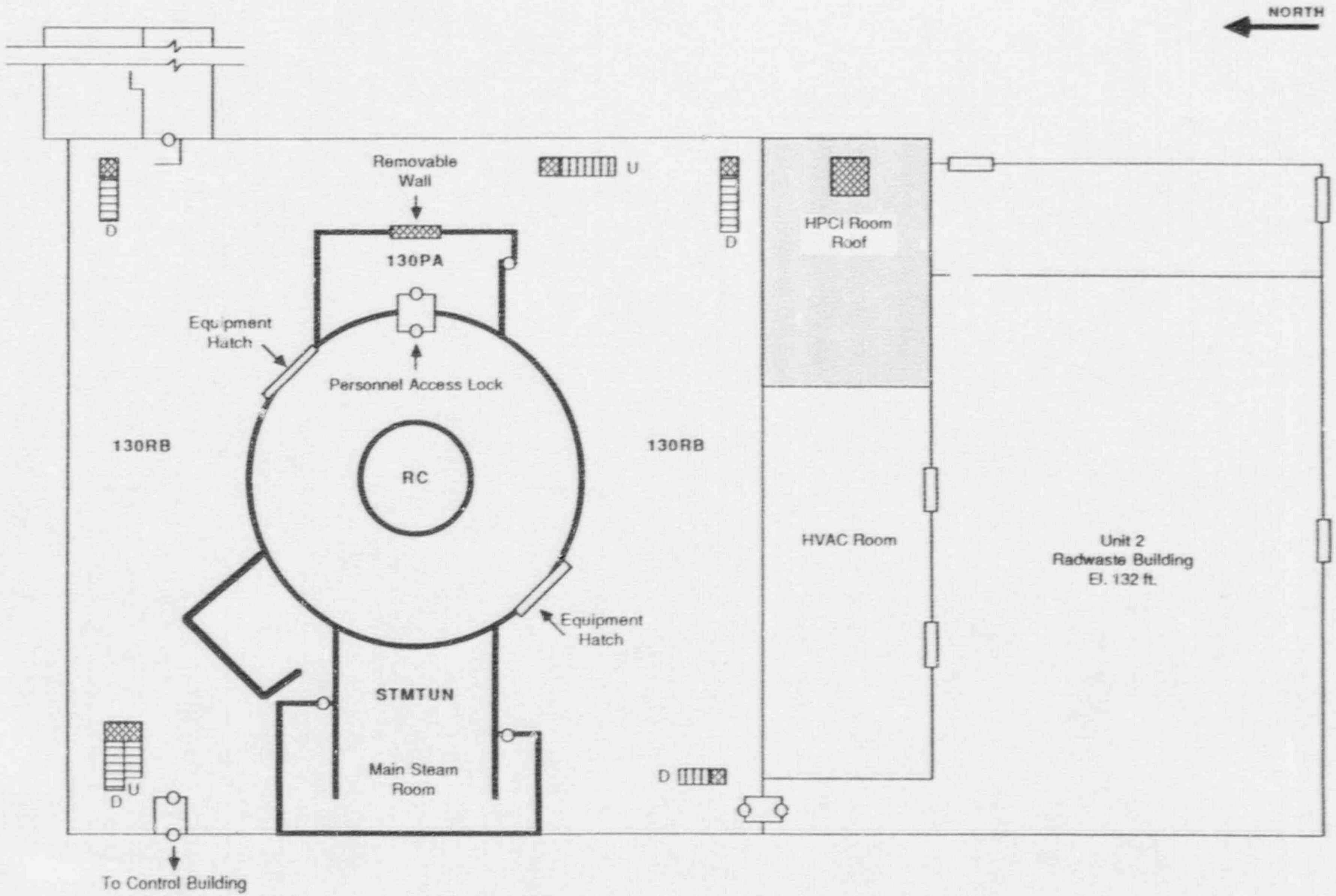


Figure 4-13. Hatch Unit 2 Reactor Building Arrangement - Elevation 130 ft.

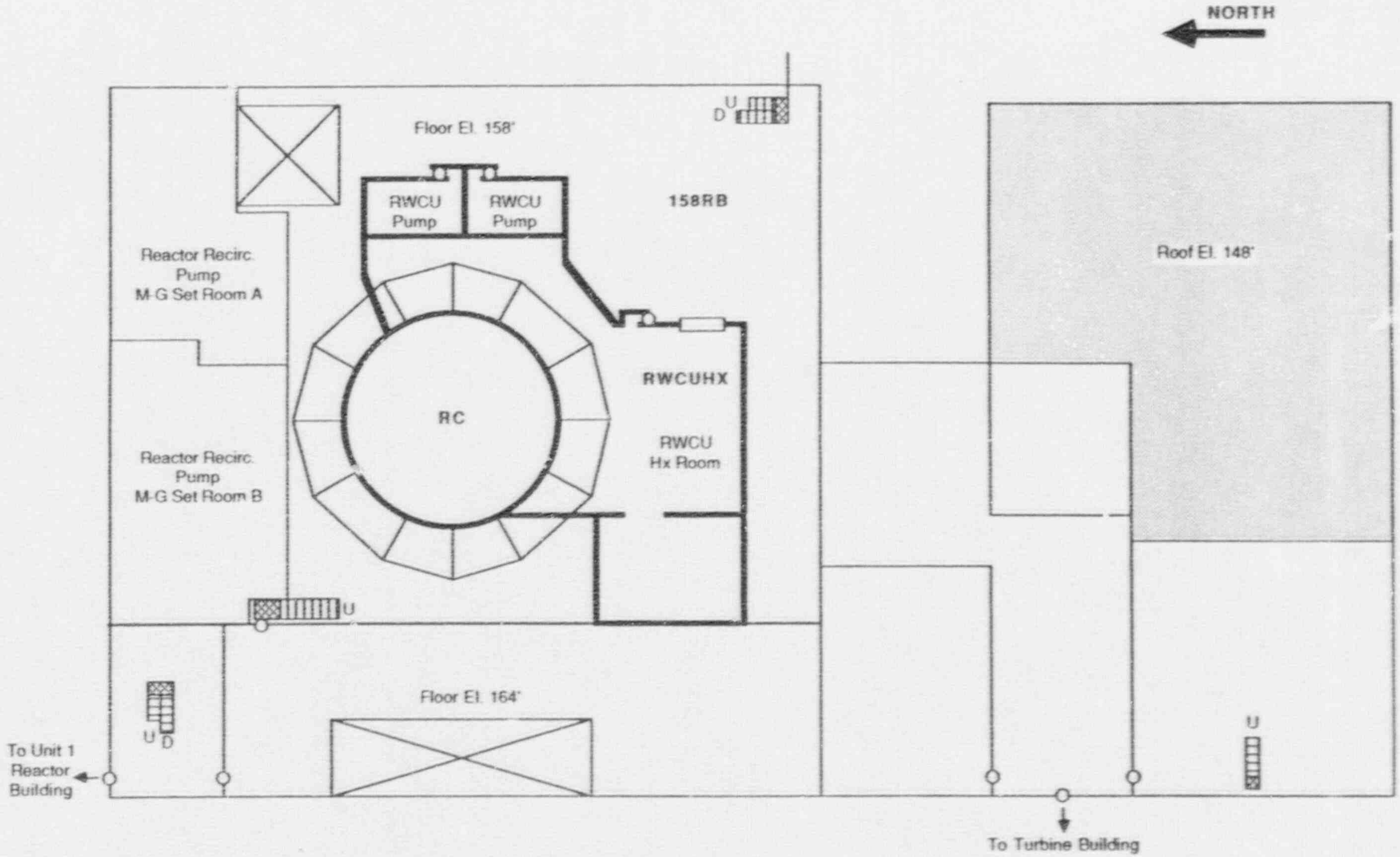


Figure 4-14. Hatch Unit 2 Reactor Building Arrangement - Elevations 158 to 164 ft.

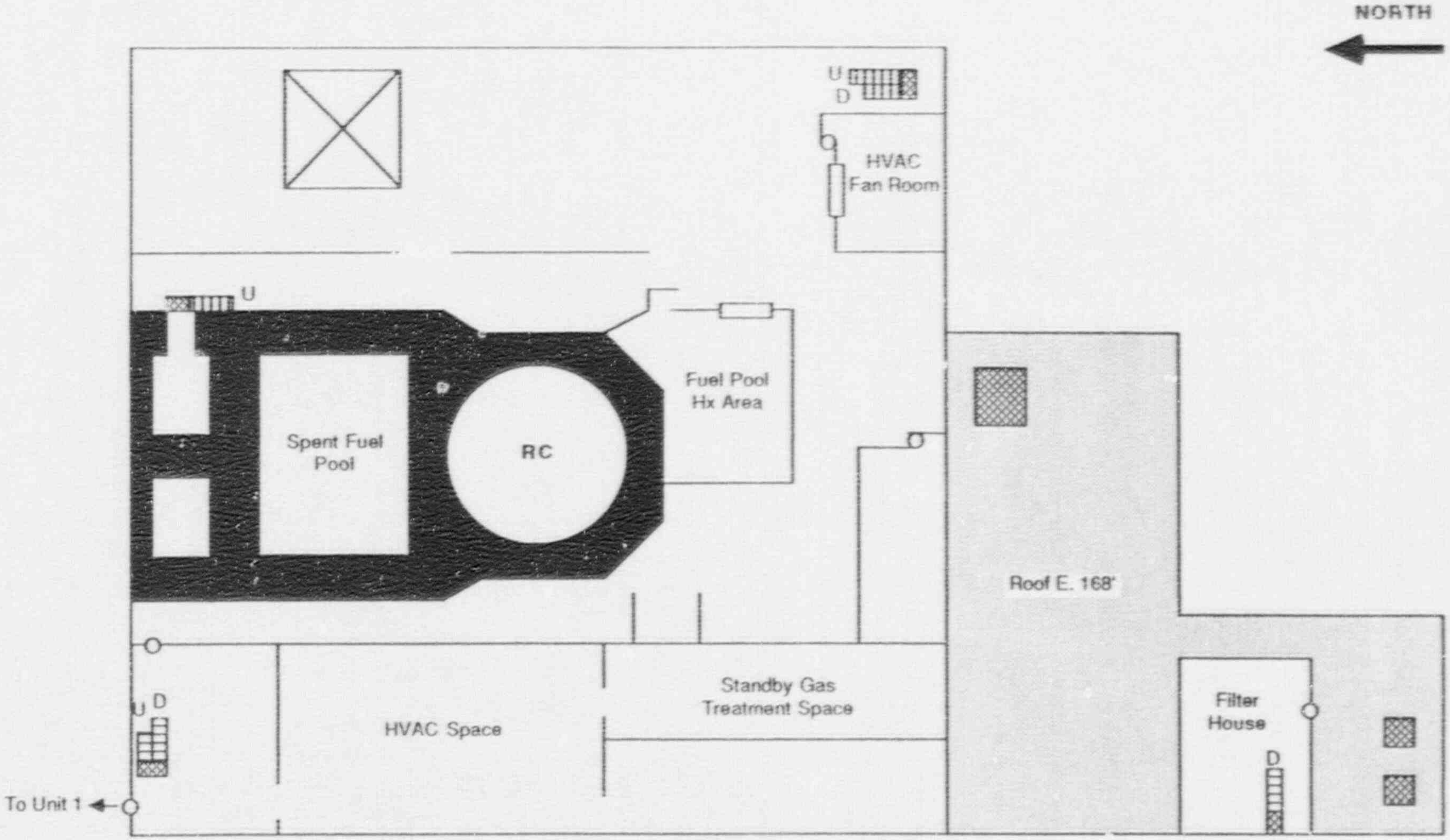


Figure 4-15. Hatch Unit 2 Reactor Building Arrangement - Elevation 185 ft.

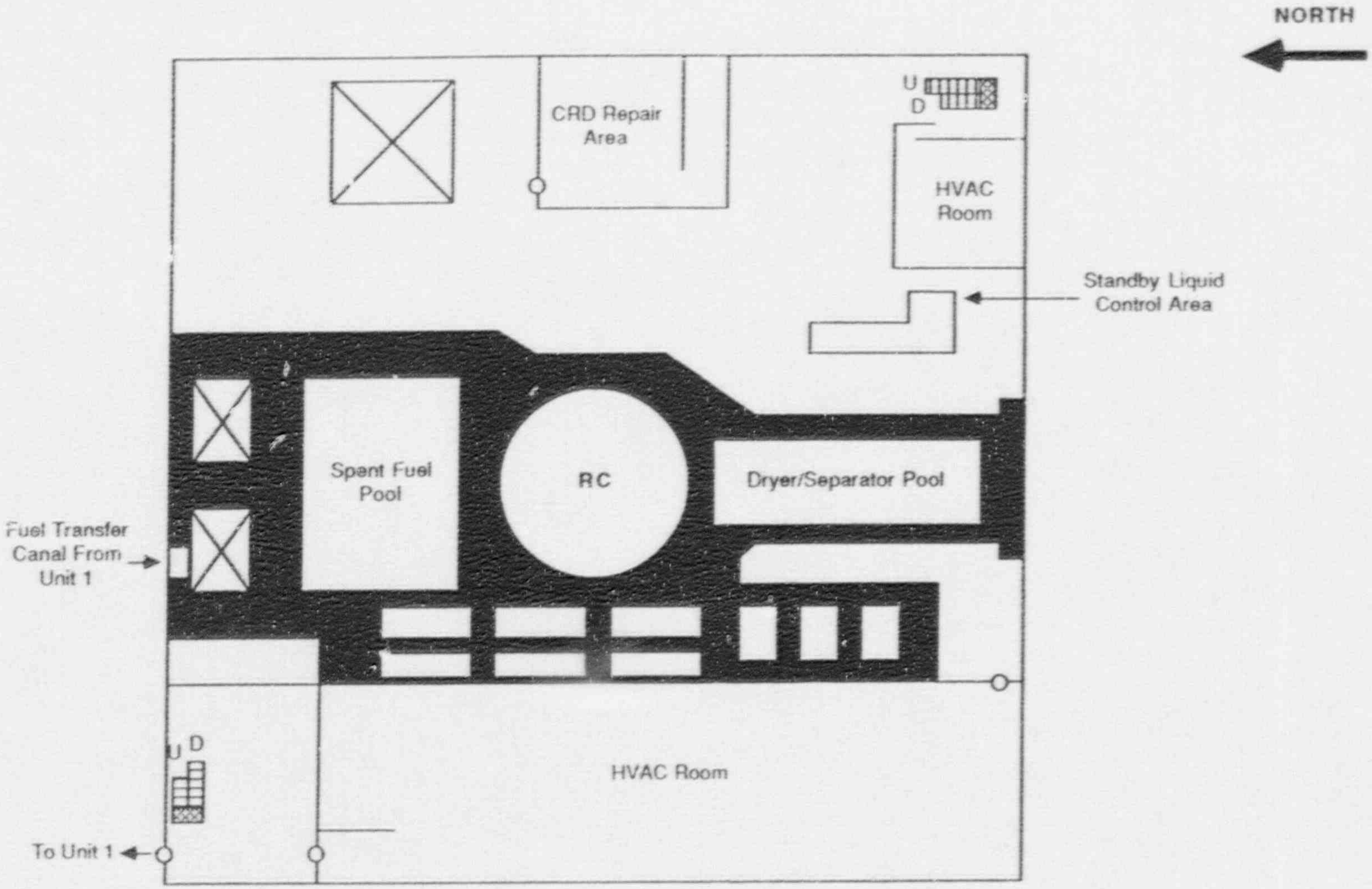


Figure 4-16. Hatch Unit 2 Reactor Building Arrangement - Elevation 203 ft.

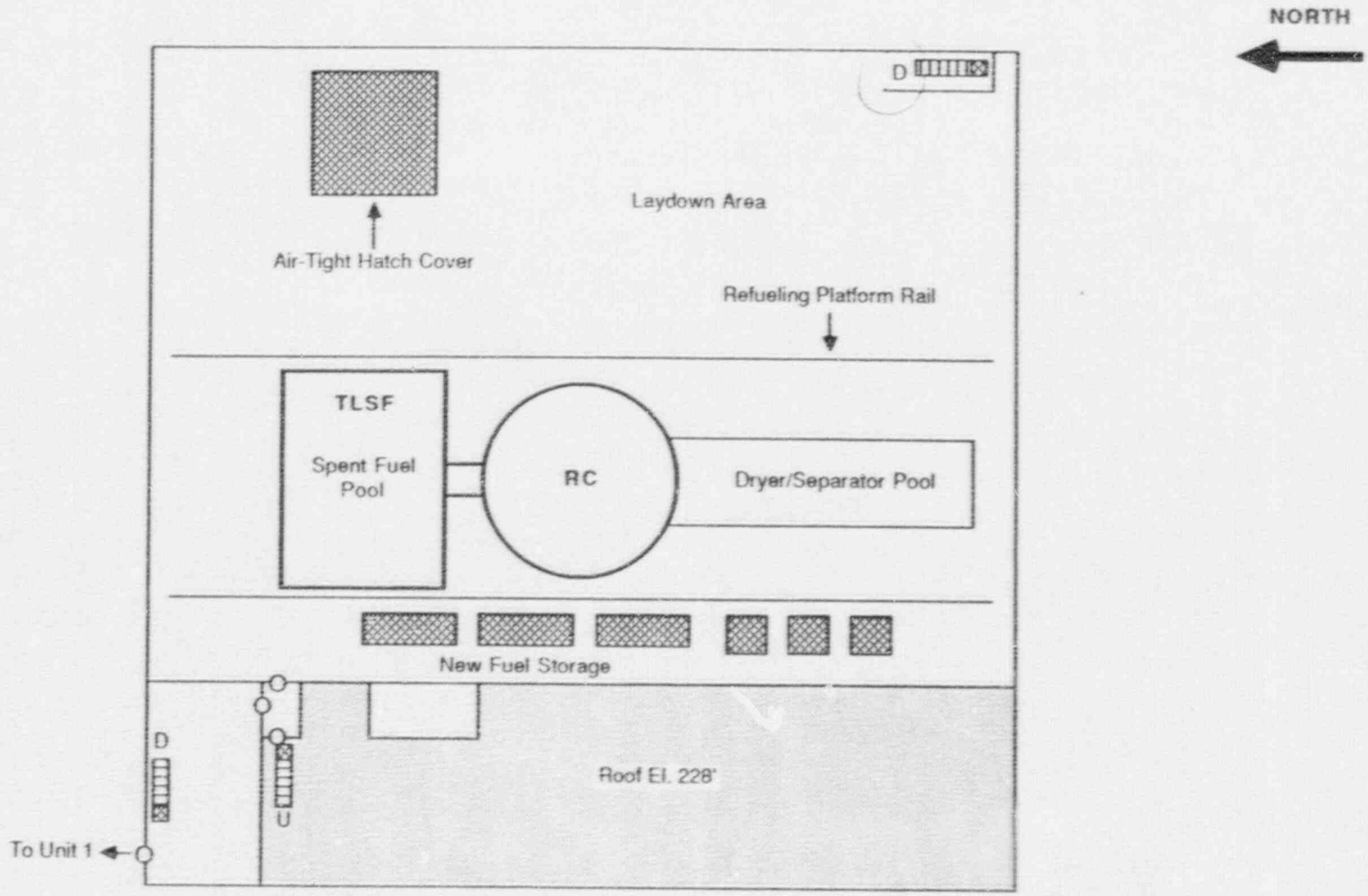


Figure 4-17. Hatch Unit 2 Reactor Building Arrangement - Elevation 228 ft.

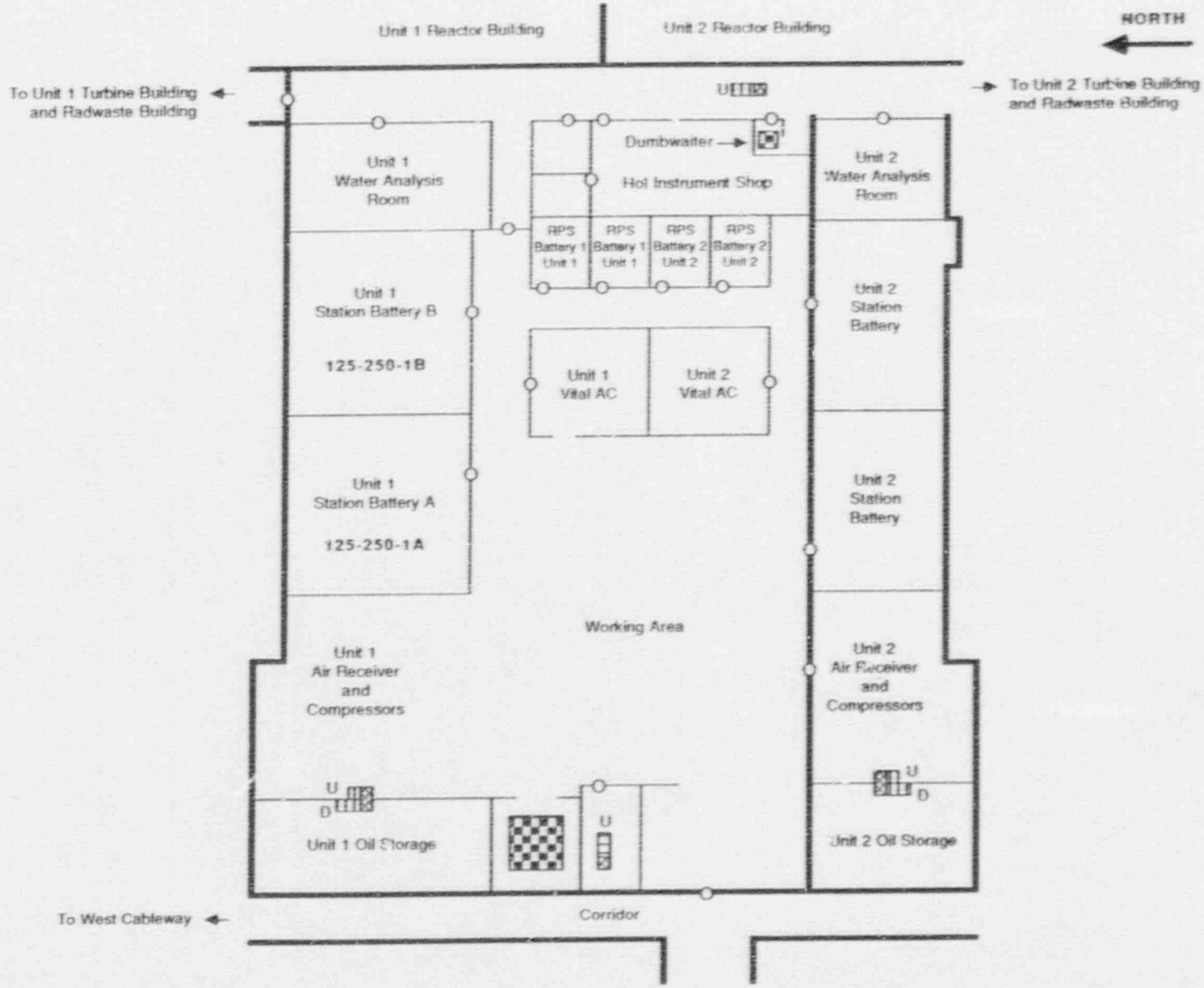


Figure 4-18. Hatch Units 1 & 2 Control Building Arrangement - Elevation 112 ft.

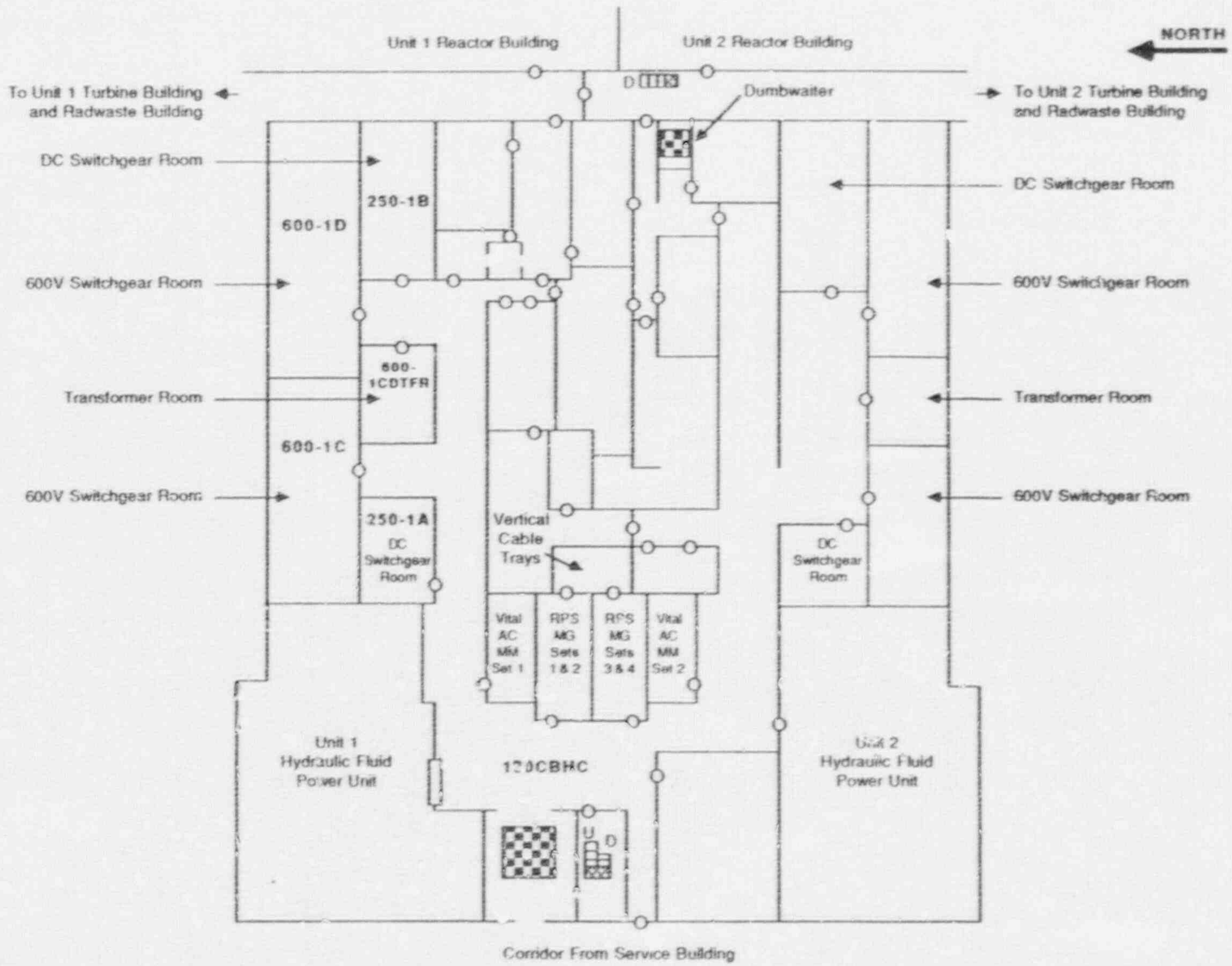


Figure 4-19. Hatch Units 1 & 2 Control Building Arrangement - Elevation 130 ft.

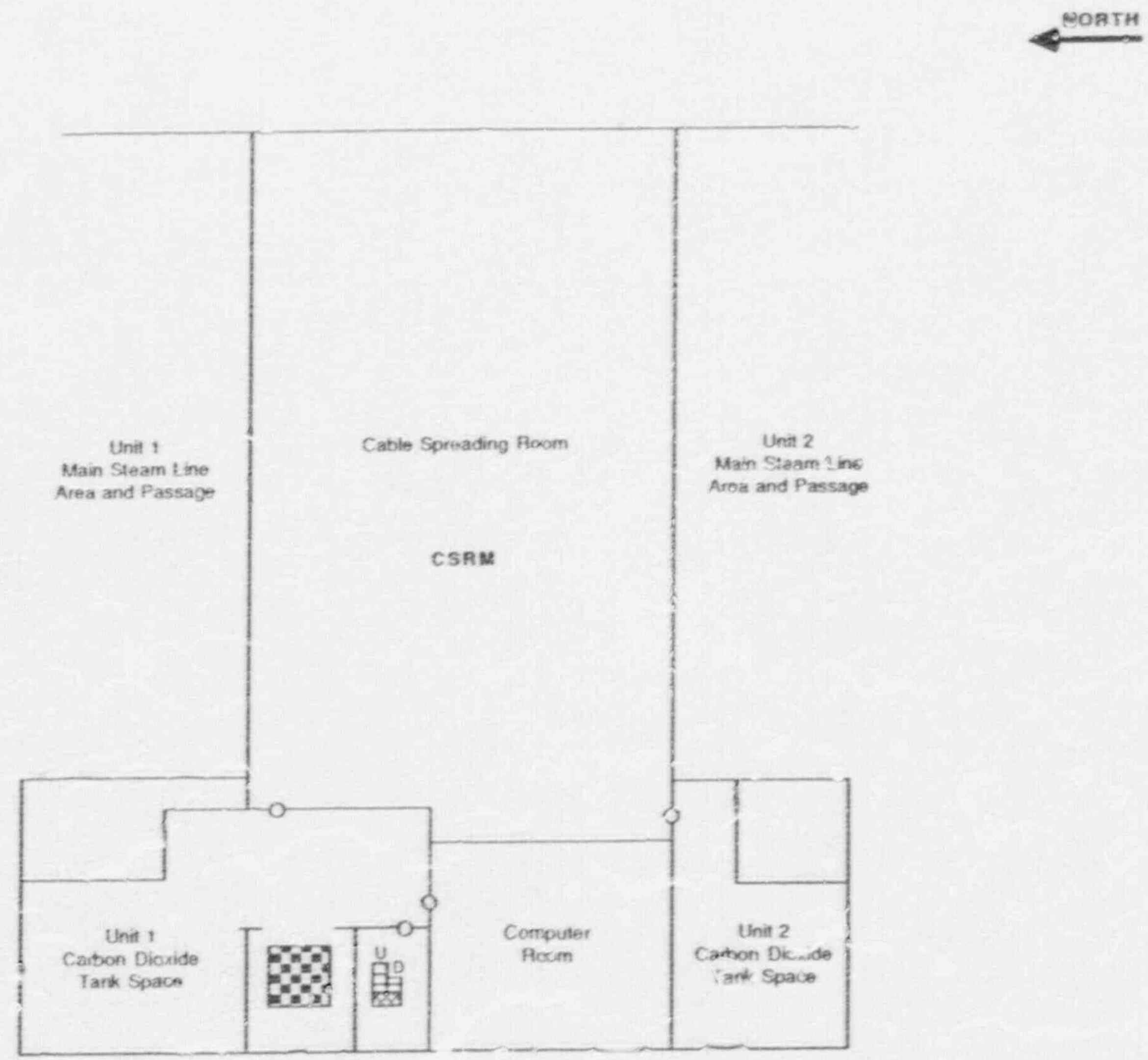


Figure 4-20. Hatch Units 1 & 2 Control Building Arrangement - Elevation 147 ft.

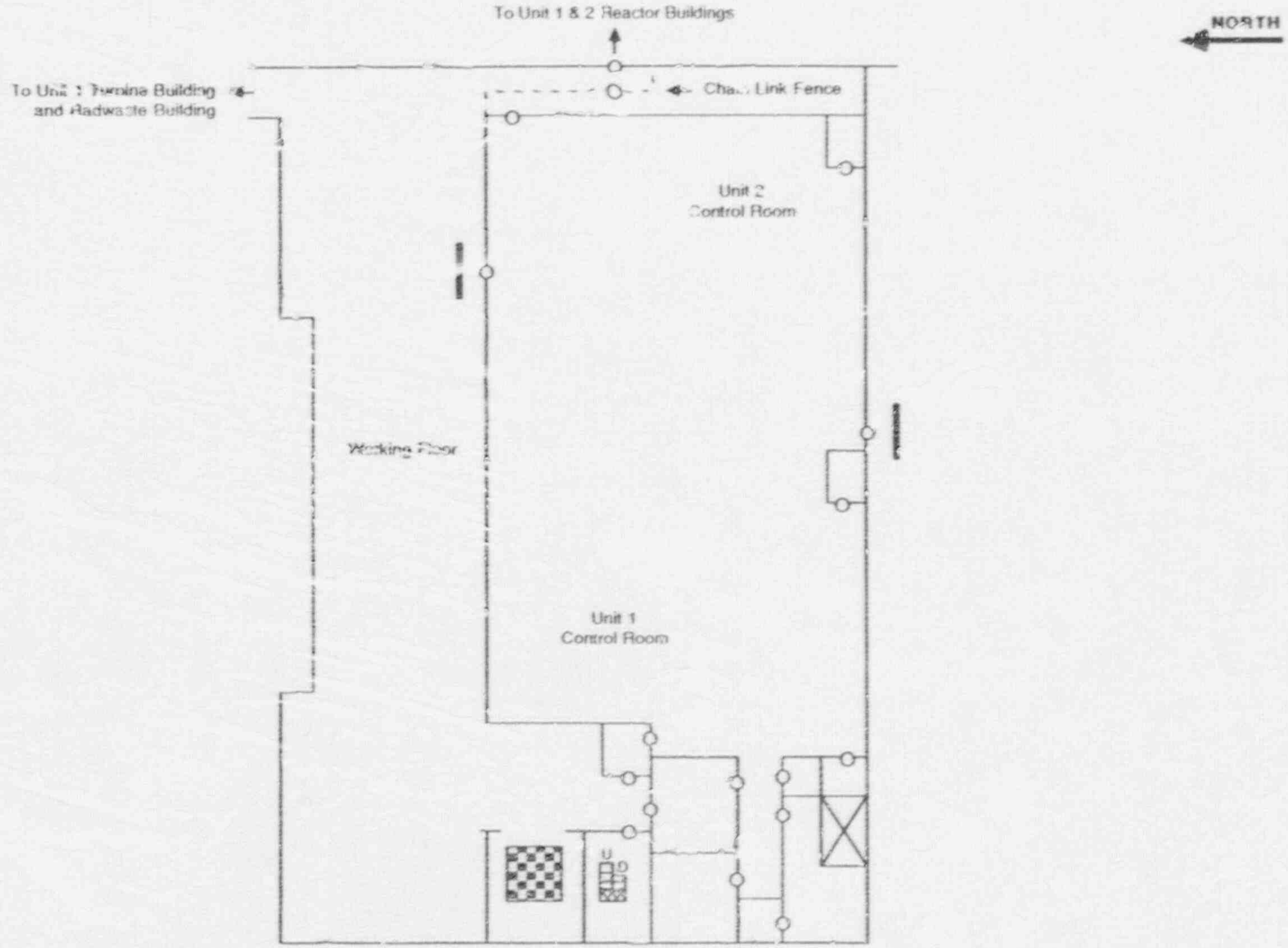


Figure 4-21. Hatch Units 1 & 2 Control Building Arrangement - Elevation 164 ft.

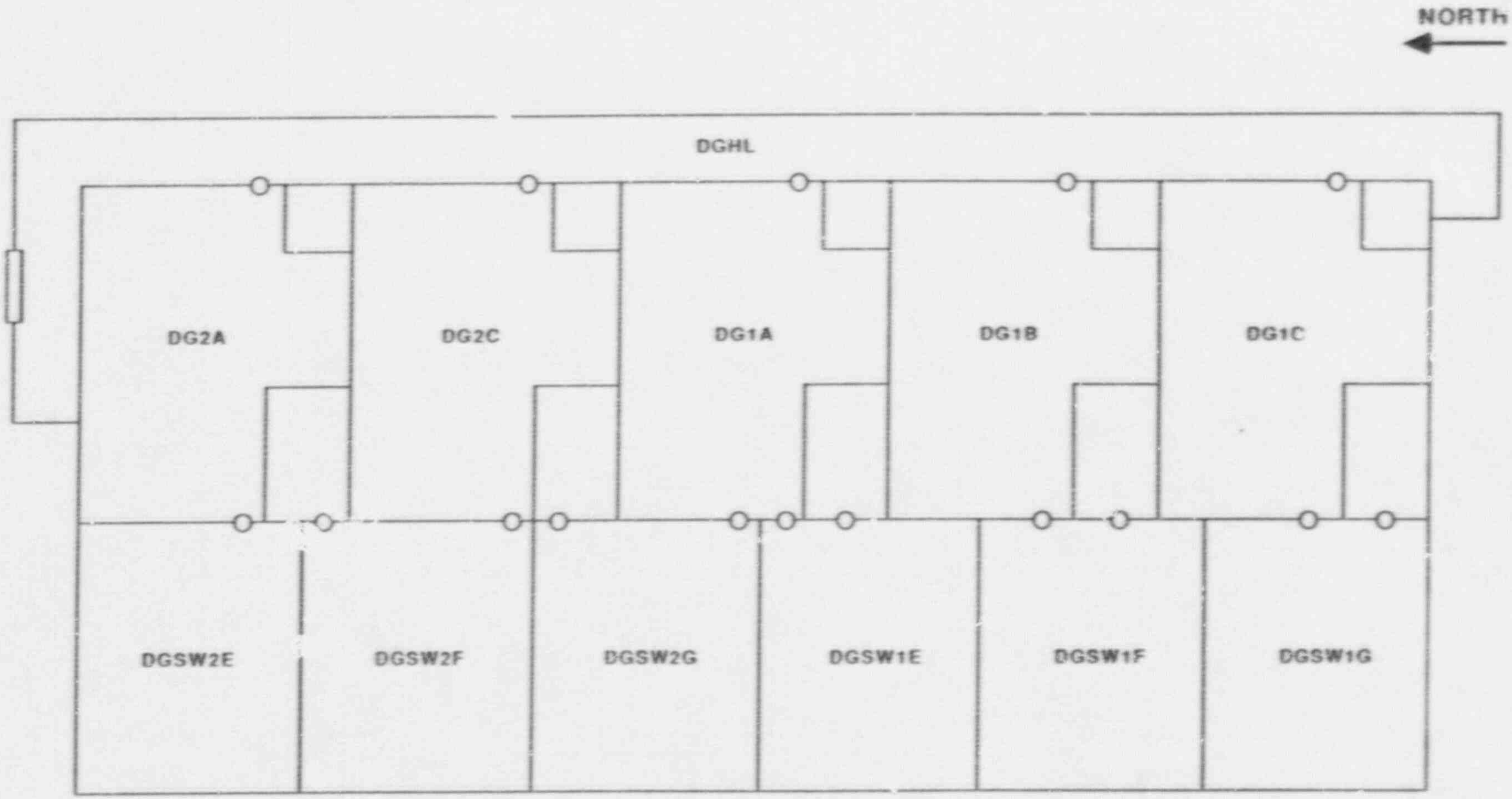


Figure 4-22. Hatch Units 1 & 2 Diesel Generator Building Arrangement

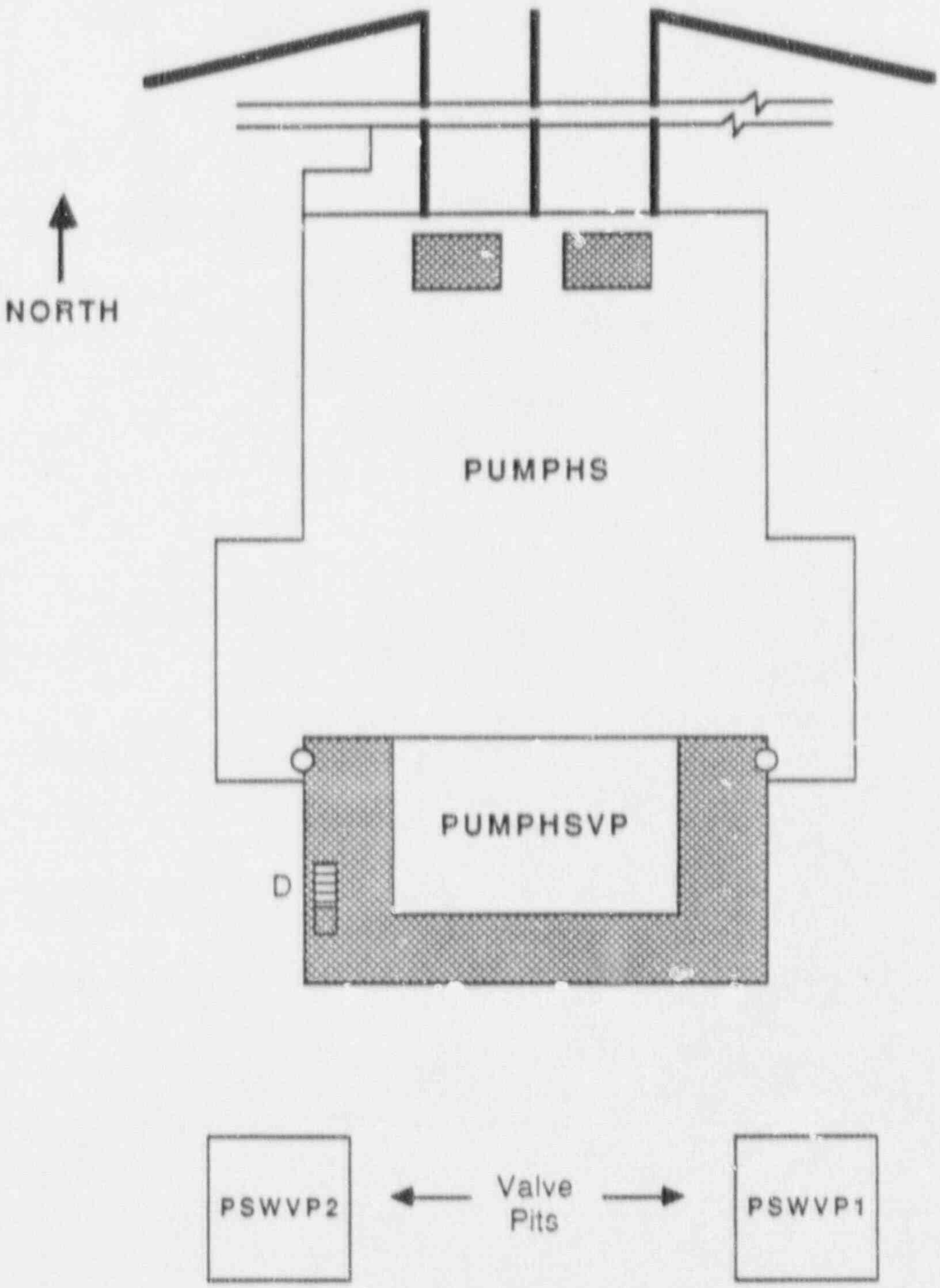


Figure 4-23. Hatch Units 1 & 2 Intake Structure Building Arrangement

Table 4-1. Definition of Hatch 1 Building and Location Codes

Codes	Descriptions
1. 125-250-1A	125/250 VDC Battery Room A, located on the 112' elevation of the Control Building
2. 125-250-1B	125/250 VDC Battery Room B, located on the 112' elevation of the Control Building
3. 130CBHL	Cable Hall Area, located on the 130' elevation of the Control Building
4. 130PA	Personnel Access Area, located on the 130' elevation of the Reactor Building - east side
5. 130RB	130' elevation of the Reactor Building
6. 158RB	158' elevation of the Reactor Building
7. 250-1A	Room 1A, 250 VDC Bus, located on the 130' elevation of the Control Building
8. 250-1B	Room 1B, 250 VDC Bus, located on the 130' elevation of the Control Building
9. 600-1CDTFR	Room 1C/D. 4160/600 VAC transformer room, located on the 130' elevation of Control Building
10. 6001C	600 VAC Bus 1C, located in the Control Building
11. 6001D	600 VAC Bus 1D, located in the Control Building
12. CR	Control Room
13. CSRM	Cable Spreading Room, located on the 147' elevation of the Control Building
14. CST	Condensate Storage Tank, located outside Reactor Building
15. DG1A	Diesel Generator Room 1A, located in Diesel Generator Building
16. DG1B	Diesel Generator Room 1B, located in Diesel Generator Building
17. DG1C	Diesel Generator Room 1C, located in Diesel Generator Building
18. DGHL	Hall Area, located in Diesel Generator Building

Table 4-1. Definition of Hatch 1 Building and Location Codes (Continued)

Codes	Descriptions
19. DGSW1E	4160 VAC Emergency Switchgear 1E, located in the Diesel Generator Building
20. DGSW1F	4160 VAC Emergency Switchgear 1F, located in the Diesel Generator Building
21. DGSW1G	4160 VAC Emergency Switchgear 1G, located in the Diesel Generator Building
22. HPCI	High Pressure Coolant Injection Pump Room, located on the 87' elevation
23. NERB	Corner room on lower elevation of Reactor Building containing Core Spray Pump "A" and RHR Pumps "A" and "C". Located in southeast corner of Unit 1, and northeast corner of Unit 2
24. NWRB	Corner room on lower elevation of Reactor Building containing RCIC Pump. Located in southwest corner of Unit 1 and northwest corner of Unit 2
25. PSWVP1	Service Water Valve Pit No. 1, located in Yard north of Reactor Building
26. PSWVP2	Service Water Valve Pit No. 2, located in Yard north of Reactor Building
27. PUMPHS	Pump House, located in Intake Structure
28. PUMPHSN	North Pump Room, located in Intake Structure
29. PUMPESVP	Pump House Valve Pit, located in Intake Structure
30. RC	Reactor Containment
31. RWCUHX	Reactor Water Clean-up Heat Exchanger Room, located on the 185' elevation of the Reactor Building
32. SERB	Corner room on lower elevation of the Reactor Building containing Core Spray Pump "B" and RHR Pumps "B" and "D". Located in northeast corner of Unit 1 and southeast corner of Unit 2
33. STMTUN	Steam Tunnel, located on the 130' elevation of the Reactor Building

Table 4-1. Definition of Hatch 1 Building and Location Codes (Continued)

Codes	Descriptions
34. TB	Turbine Building
35. TLSF	Spent fuel operating floor, located at the 228' elevation of the Reactor Building
36. TORUS	Pressure suppression chamber, located below 130' elevation of the Reactor Building

Table 4-2. Partial Listing of Components by Location at Hatch 1

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
112CB	EP	125V-BATT	BATT
112CB	EP	BATT-CHG	BC
112CB	EP	INV	INV
112CB	EP	INV	INV
125-250-1A	EP	BATT-A	BATT
125-250-1B	EP	BATT-BTB	BATT
130CB	EP	RPS-MG-1C	MG
130CB	EP	RPS-MG-1D	MG
130PA	ECCS	HPCI-F003	MOV
130PA	ECCS	LPCI-F015A	MOV
130PA	ECCS	LPCI-F015B	MOV
130PA	ECCS	LPCI-F017A	MOV
130PA	ECCS	LPCI-F017B	MOV
130PA	RCIC	RCIC-F008	MOV
130PA	RCS	HPCI-F003	MOV
130PA	RCS	RCIC-F008	MOV
130RB	ECCS	LPCI-F016A	MOV
130RB	ECCS	LPCI-F021A	MOV
130RB	EP	MCC-S011	MCC
130RB	EP	MCC-S011A	MCC
130RB	EP	MCC-S012A	MCC
130RB	EP	MCC-S012	MCC
130RB	EP	MCC-S012B	MCC
130RB	EP	MCC-S018A	MCC
130RB	EP	MCC-S018A	MCC
130RB	EP	MCC-S018B	MCC
130RB	EP	MCC-S021	MCC
130RB	EP	MCC-S022	MCC
158RB	ECCS	CS-F004A	MOV
158RB	ECCS	CS-F005A	MOV

Table 4-2. Partial Listing of Components by Location at Hatch 1 (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
250-1A	EP	BC-ABC	BC
250-1A	EP	BUS-1A	BUS
250-1A	EP	BUS-1A	BUS
250-1B	EP	BC-DFE	BC
250-1B	EP	BUS-1B	BUS
250-1B	EP	BUS-1B	BUS
600-1CDTFR	EP	XFMR-TCD	TRANS
6001C	EP	BUS-1C	BUS
6001C	EP	XFMR-TIC	TRANS
6001D	EP	BUS-ID	BUS
6001D	EP	XFMR-TID	TRANS
CST	ECCS	CST	TK
CST	RCIC	CST	TK
DG1A	EP	DG-1A	DG
DG1A	EP	BUS-DC1E	BUS
DG1A	ESW	DG-1A	DG
DG1B	EP	DG-1B	DG
DG1B	EP	BUS-DC1F	BUS
DG1B	ESW	DG-1B	DG
DG1C	EP	DG-1C	DG
DG1C	EP	BUS-DCIG	BUS
DG1C	ESW	DG-1C	DG
DGSW1E	EP	CB-1E	CB
DGSW1E	EP	BUS-1E	BUS
DGSW1E	EP	BATT-1E	BATT
DGSW1E	ESW	ESW-F310A	MOV
DGSW1F	EP	CB-1F	CB
DGSW1F	EP	BUS-1F	BUS
DGSW1F	EP	BATT-1F	BATT
DGSW1G	EP	CB-1G	CB

Table 4-2. Partial Listing of Components by Location at Hatch 1 (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
DGSW1G	EP	BUS-1G	BUS
DGSW1G	EP	BATT-1G	BATT
DGSWIE	EP	MCC-S025	MCC
DGSWIG	EP	MCC-S027	MCC
HPCI	ECCS	HPCI-F001	MOV
HPCI	ECCS	HPCI-F004	MOV
HPCI	ECCS	HPCI-F007	MOV
HPCI	ECCS	HPCI-F041	MOV
HPCI	ECCS	HPCI-F042	MOV
HPCI	ECCS	HPCI-F100	HV
HPCI	ECCS	HPCI-F200	HV
HPCI	ECCS	HPCI-F008	MOV
HPCI	ECCS	HPCI-C001	TDP
HPCI	ECCS	HPCI-F011	MOV
HPCI	RCIC	HPCI-F011	MOV
NERB	ECCS	CS-C001A	MDP
NERB	ECCS	CS-F001A	MOV
NERB	ECCS	LPCI-F003A	MOV
NERB	ECCS	LPCI-F004A	MOV
NERB	ECCS	LPCI-F004C	MOV
NERB	ECCS	LPCI-F047A	MOV
NERB	ECCS	LPCI-F048A	MOV
NERB	ECCS	LPCI-C002A	MDP
NERB	ECCS	LPCI-C002C	MDP
NERB	RCIC	RCIC-F045	MOV
NWRB	RCIC	RCIC-C001	TDP
NWRB	RCIC	RCIC-F010	MOV
NWRB	RCIC	RCIC-F012	MOV
NWRB	RCIC	RCIC-F029	MOV
NWRB	RCIC	RCIC-H0101	HV

Table 4-2. Partial Listing of Components by Location at Hatch 1 (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
NWRB	RCIC	RCIC-MO100	MOV
PSWVP1	ESW	ESW-F310C	MOV
PSWVP1	ESW	ESW-F317A	MOV
PSWVP1	ESW	ESW-F315A	MOV
PSWVP2	ESW	ESW-F317B	MOV
PSWVP2	ESW	ESW-F315B	MOV
PSWVP2	ESW	ESW-F310B	MOV
PSWVP2	ESW	ESW-F310B	MOV
PUMPHS	EP	MCC-S009	MCC
PUMPHS	EP	MCC-S010	MCC
PUMPHS	ESW	ESW-1A	MDP
PUMPHS	ESW	ESW-1C	MDP
PUMPHS	ESW	ESW-1B	MDP
PUMPHS	ESW	ESW-1D	MDP
PUMPHS	ESW	ESW-F401A	MOV
PUMPHS	ESW	ESW-F402A	MOV
PUMPHS	ESW	INTAKE	TK
PUMPHS	ESW	ESW-1A	MDP
PUMPHS	ESW	ESW-1C	MDP
PUMPHS	ESW	ESW-1B	MDP
PUMPHS	ESW	ESW-1D	MDP
PUMPHSVP	ESW	ESW-F312	MOV
PUMPHSVP	ESW	ESW-F402B	MOV
PUMPHSVP	ESW	ESW-403B	MOV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	HPCI-F002	MOV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV

Table 4-2. Partial Listing of Components by Location at Hatch 1 (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RC	RCIC	RCIC-F007	MOV
RC	RCIC	RCS-VESSEL	RV
RC	RCS	MSD-F016	MOV
RC	RCS	HPCI-F002	MOV
RC	RCS	RCIC-F007	MOV
RC	RCS	RCS-VESSEL	RV
RC	RCS	RHR-F009	MOV
RC	RCS	RXC-F001	MOV
RWCUHX	ECCS	CS-F004B	MOV
RWCUHX	ECCS	CS-F005B	MOV
RWCUHX	ECCS	LPCI-F016B	MOV
RWCUHX	ECCS	LPCI-F021B	MOV
SERB	ECCS	CS-C001B	MDP
SERB	ECCS	CS-F001B	MOV
SERB	ECCS	LPCI-F003B	MOV
SERB	ECCS	LPCI-F047B	MOV
SERB	ECCS	LPCI-F004D	MOV
SERB	ECCS	LPCI-F004D	MOV
SERB	ECCS	LPCI-F048B	MOV
SERB	ECCS	LPC- C002B	MDP
SERB	ECCS	LPCI-C002D	MDP
TORUS	ECCS	TORUS	TK
TORUS	ECCS	HPCI-F006	MOV
TORUS	ECCS	TORUS	TK
TORUS	ECCS	LPCI-F027B	MOV
TORUS	ECCS	LPCI-F028A	MOV
TORUS	ECCS	LPCI-F028B	MOV
TORUS	RCIC	RCIC-F013	MOV
TORUS	RCIC	RCIC-F022	MOV
TORUS	RCIC	RCIC-F031	MOV

Table 4-2. Partial Listing of Components by Location at Hatch 1 (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
TORUS	RCIC	TORUS	TK
TORUS	RCS	RHR-F008	MOV
TORUS	ECCS	LPCI-F027A	MOV
UNK	EP	E-XMFR-1B	TRANS
UNK	EP	E-CAB-1A	CAB
UNK	EP	I-BUS-1A	BUS
UNK	EP	X-FER-SW	SW
UNK	EP	RPS-BUS1A	BUS
UNK	EP	X-FER-SW	SW
UNK	EP	RPS-BUS1A	BUS
UNK	EP	V-XMFR-1A	TRANS
UNK	EP	V-CAB-1A	CAB
UNK	EP	V-CAB-1A	CAB
UNK	EP	RPS-BUS-1B	BUS
UNK	EP	RPS-BUS-1B	BUS
UNK	EP	I-BUS-1B	BUS
UNK	EP	E-CAB-1B	CAB
UNK	EP	E-XFMR-1C	TRANS

5. BIBLIOGRAPHY FOR HATCH 1 AND 2

1. NUREG-0395, "Technical Specifications for Edwin I. Hatch Nuclear Plant, Unit 2," USNRC.

2. NUREG-0411, "Safety Evaluation Report Related to the Operation of the Edwin I. Hatch Nuclear Plant, Unit No. 2," USNRC.

3. NUREG-0417, "Final Environmental Statement for Edwin I. Hatch, Unit 2," USNRC.

APPENDIX A
DEFINITION OF SYMBOLS USED IN THE SYSTEM AND LAYOUT DRAWINGS

A1. SYSTEM DRAWINGS

A1.1 Fluid System Drawings

The simplified system drawings are accurate representations of the major flow paths in a system and the important interfaces with other fluid systems. As a general rule, small fluid lines that are not essential to the basic operation of the system are not shown in these drawings. Lines of this type include instrumentation lines, vent lines, drain lines, and other lines that are less than 1/3 the diameter of the connecting major flow path. There usually are two versions of each fluid system drawing; a simplified system drawing, and a comparable drawing showing component locations. The drawing conventions used in the fluid system drawings are the following:

- Flow generally is left to right.
  - Water sources are located on the left and water "users" (i.e., heat loads) or discharge paths are located on the right.
  - One exception is the return flow path in closed loop systems which is right to left.
  - Another exception is the Reactor Coolant System (RCS) drawing which is "vessel-centered", with the primary loops on both sides of the vessel.
  - Horizontal lines always dominate and break vertical lines.

- Component symbols used in the fluid system drawings are defined in Figure A-1.
  - Most valve and pump symbols are designed to allow the reader to distinguish among similar components based on their support system requirements (i.e., electric power for a motor or solenoid, steam to drive a turbine, pneumatic or hydraulic source for valve operation, etc.)
  - Valve symbols allow the reader to distinguish among valves that allow flow in either direction, check (non-return) valves, and valves that perform an overpressure protection function. No attempt has been made to define the specific type of valve (i.e., as a globe, gate, butterfly, or other specific type of valve).
  - Pump symbols distinguish between centrifugal and positive displacement pumps and between types of pump drives (i.e., motor, turbine, or engine).

- Locations are identified in terms of plant location codes defined in Section 4 of this Sourcebook.
  - Location is indicated by shaded "zones" that are not intended to represent the actual room geometry.
  - Locations of discrete components represent the actual physical location of the component.
  - Piping locations between discrete components represent the plant areas through which the piping passes (i.e. including pipe tunnels and underground pipe runs).
  - Component locations that are not known are indicated by placing the components in an unshaded (white) zone.
  - The primary flow path in the system is highlighted (i.e., bold white line) in the location version of the fluid system drawings.

A1.2 Electrical System Drawings

The electric power system drawings focus on the Class 1E portions of the plant's electric power system. Separate drawings are provided for the AC and DC portions of the Class 1E system. There often are two versions of each electrical system drawing; a simplified system drawing, and a comparable drawing showing component locations. The drawing conventions used in the electrical system drawings are the following:

- Flow generally is top to bottom
  - In the AC power drawings, the interface with the switchyard and/or offsite grid is shown at the top of the drawing.
  - In the DC power drawings, the batteries and the interface with the AC power system are shown at the top of the drawing.
  - Vertical lines dominate and break horizontal lines.

- Component symbols used in the electrical system drawings are defined in Figure A-2.

- Locations are identified in terms of plant location codes defined in Section 4 of this Sourcebook.
  - Locations are indicated by shaded "zones" that are not intended to represent the actual room geometry.
  - Locations of discrete components represent the actual physical location of the component.
  - The electrical connections (i.e., cable runs) between discrete components, as shown on the electrical system drawings, DO NOT represent the actual cable routing in the plant.
  - Component locations that are not known are indicated by placing the discrete components in an unshaded (white) zone.

A2. SITE AND LAYOUT DRAWINGS

A2.1 Site Drawings

A general view of each reactor site and vicinity is presented along with a simplified site plan showing the arrangement of the major buildings, tanks, and other features of the site. The general view of the reactor site is obtained from ORNL-NSIC-55 (Ref. 1). The site drawings are approximately to scale, but should not be used to estimate distances on the site. As-built scale drawings should be consulted for this purpose.

Labels printed in bold uppercase correspond to the location codes defined in Section 4 and used in the component data listings and system drawings in Section 3. Some additional labels are included for information and are printed in lowercase type.

A2.2 Layout Drawings

Simplified building layout drawings are developed for the portions of the plant that contain components and systems that are described in Section 3 of this Sourcebook. Generally, the following buildings are included: reactor building, auxiliary building, fuel building, diesel building, and the intake structure or pumphouse. Layout drawings generally are not developed for other buildings.

Symbols used in the simplified layout drawings are defined in Figure A-3. Major rooms, stairways, elevators, and doorways are shown in the simplified layout drawings however, many interior walls have been omitted for clarity. The building layout drawings, are approximately to scale, should not be used to estimate room size or distances. As-built scale drawings for should be consulted his purpose.

Labels printed in uppercase bolded also correspond to the location codes defined in Section 4 and used in the component data listings and system drawings in Section 3. Some additional labels are included for information and are printed in lowercase type.

A3. APPENDIX A REFERENCES

1. Heddleson, F.A., "Design Data and Safety Features of Commercial Nuclear Power Plants.", ORNL-NSIC-55, Volumes 1 to 4, Oak Ridge National Laboratory, Nuclear Safety Information Center, December 1973 (Vol.1), January 1972 (Vol. 2), April 1974 (Vol. 3), and March 1975 (Vol. 4)

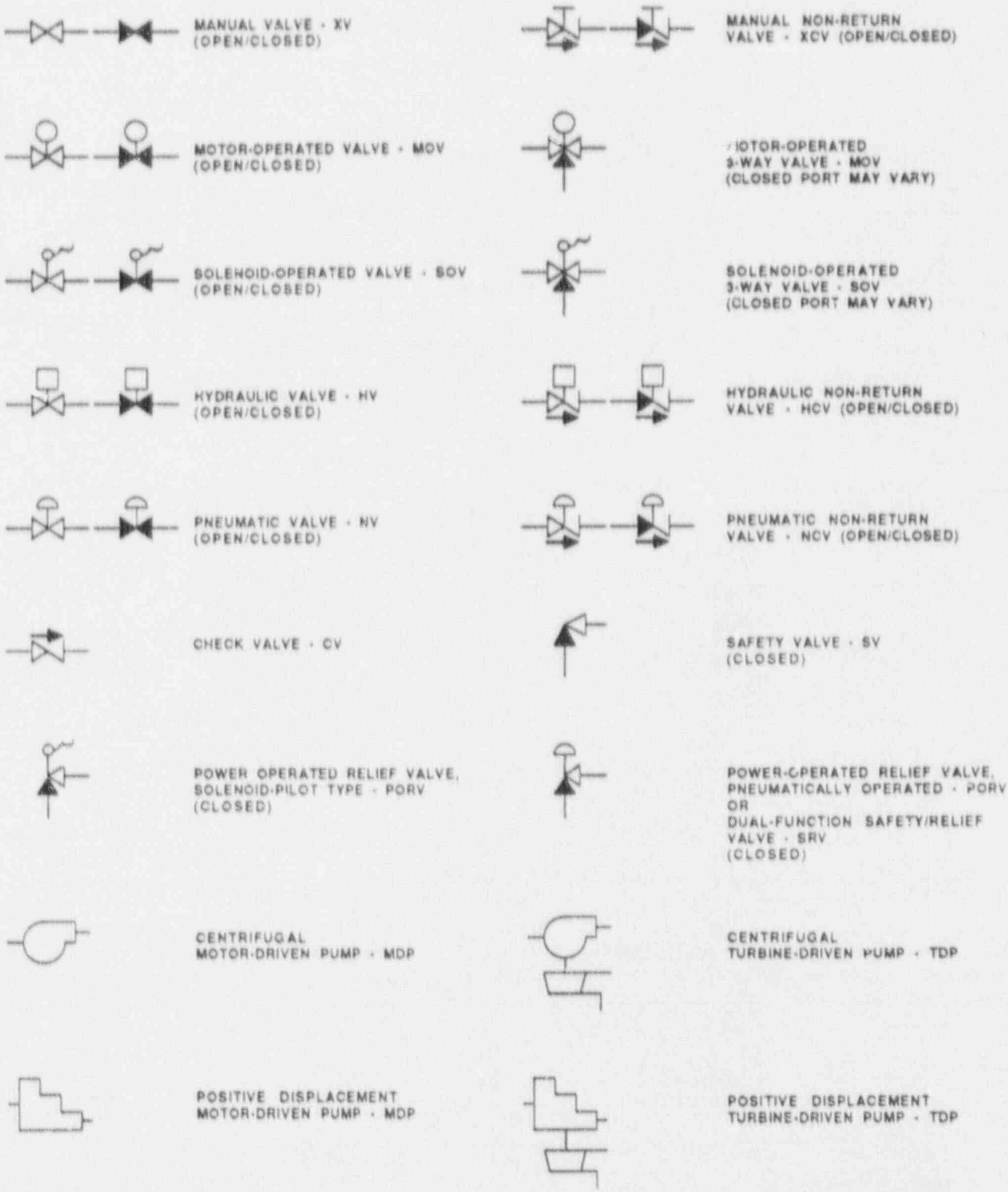


Figure A-1. Key To Symbols In Fluid System Drawings

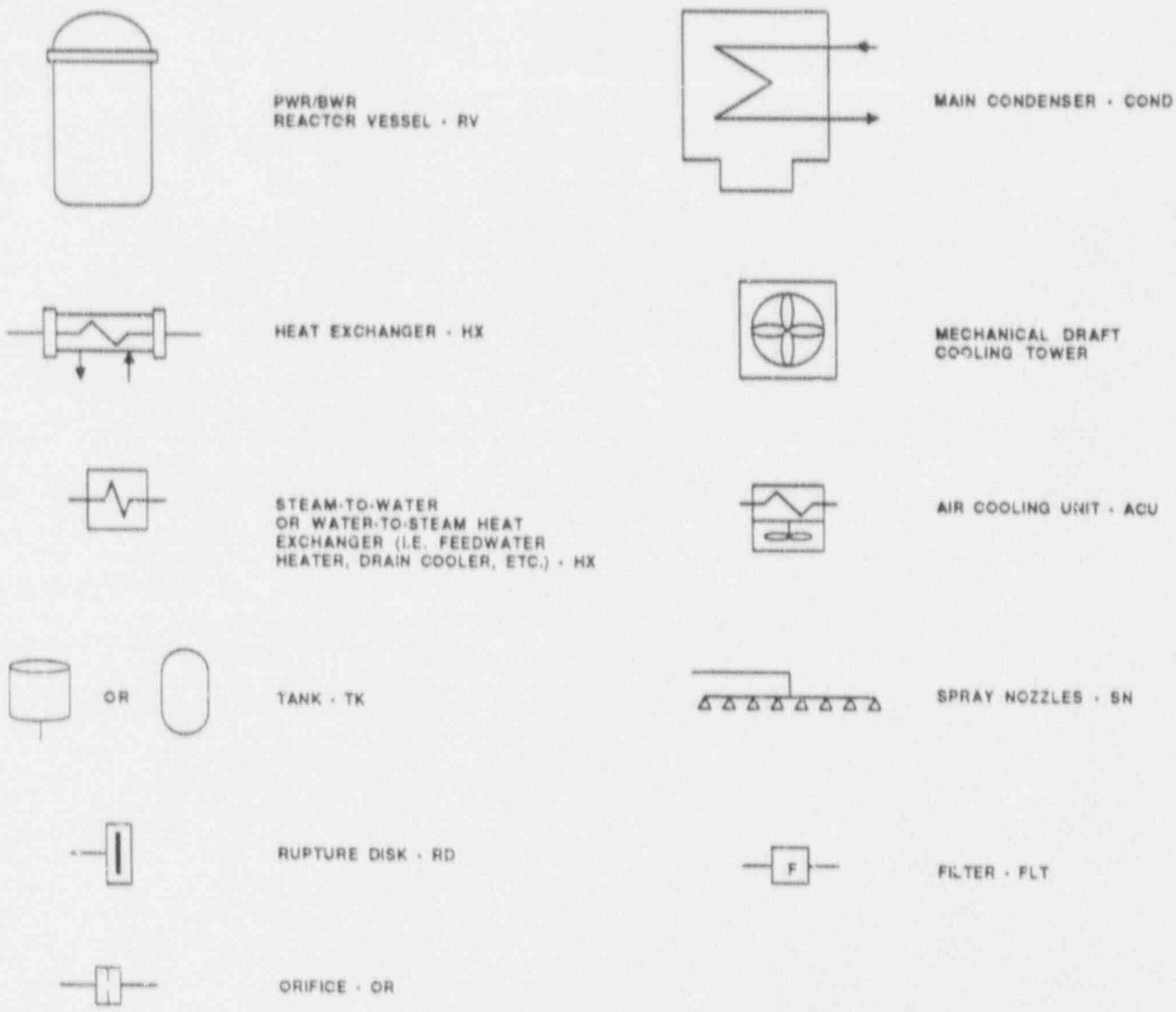


Figure A-1. Key To Symbols In Fluid System Drawings (Continued)

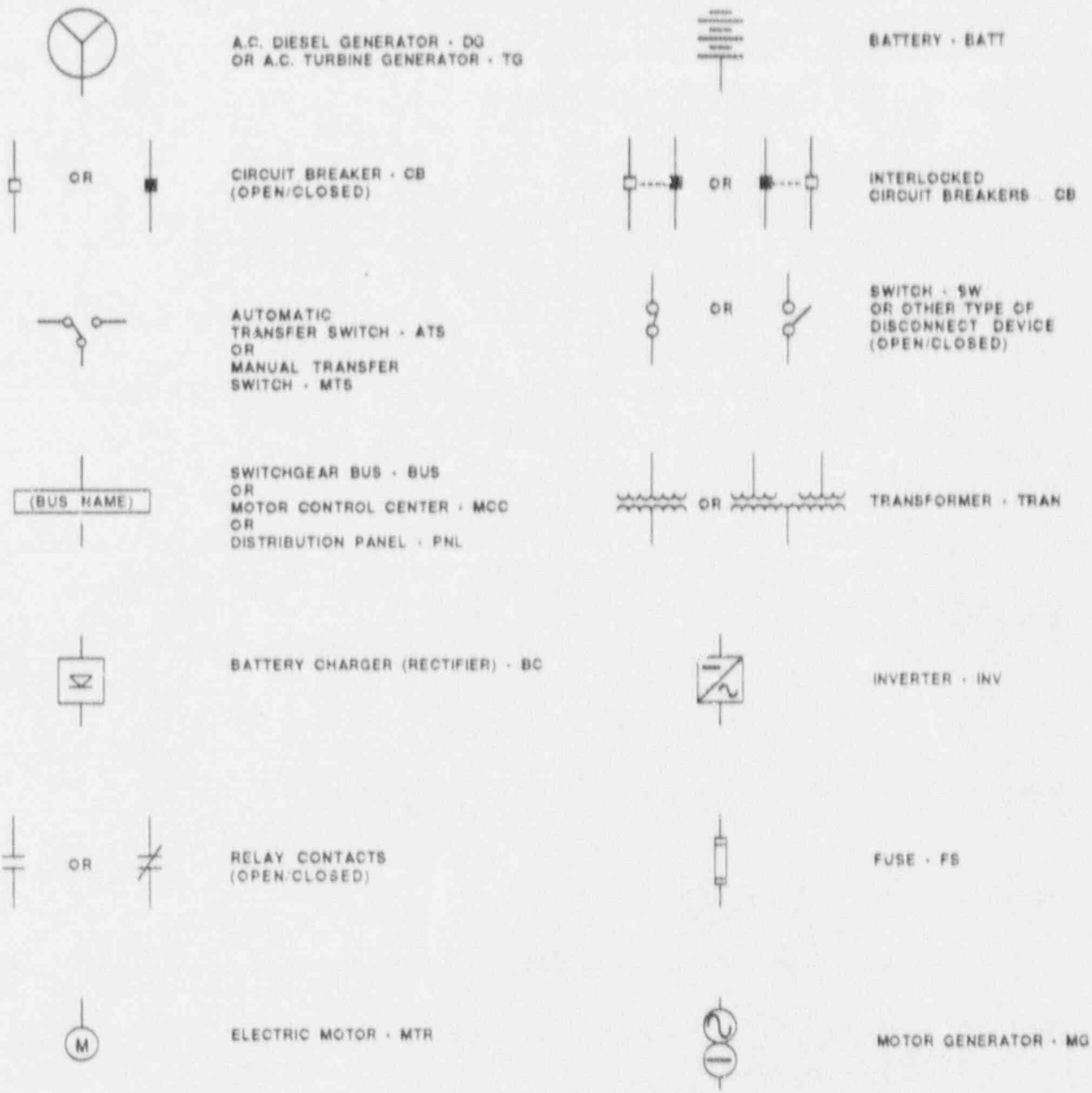


Figure A-2. Key To Symbols In Electrical System Drawings

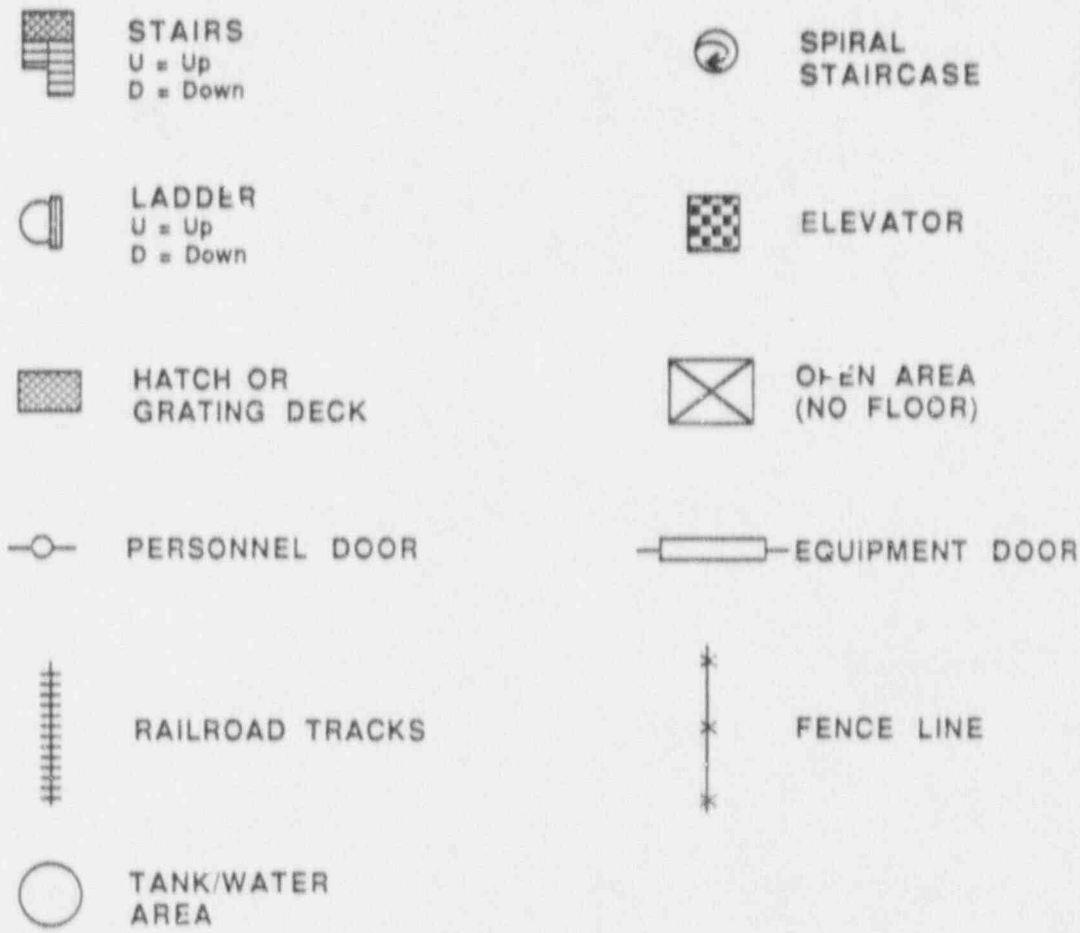


Figure A-3. Key To Symbols In Facility Layout Drawings

APPENDIX B
DEFINITION OF TERMS USED IN THE DATA TABLES

Terms appearing in the data tables in Sections 3 and 4 of this Sourcebook are defined as follows:

SYSTEM (also LOAD SYSTEM) - All components associated with a particular system description in the Sourcebook have the same system code in the data base. System codes used in this Sourcebook are the following:

Code	Definition
RCS	Reactor Coolant System
RCIC	Reactor Core Isolation Cooling System
ECCS	Emergency Core Cooling Systems (including HPCI, LPCI, LPCS and ADS)
EP	Electric Power System
CCW	Component Cooling Water System
PSW	Plant Service Water System

COMPONENT ID (also LOAD COMPONENT ID) - The component identification (ID) code in a data table matches the component ID that appears in the corresponding system drawing. The component ID generally begins with a system preface followed by a component number. The system preface is not necessarily the same as the system code described above. For component IDs, the system preface corresponds to what the plant calls the component (e.g. HPI, RHR). An example is HPI-730, denoting valve number 730 in the high pressure injection system, which is part of the ECCS. The component number is a contraction of the component number appearing in the plant piping and instrumentation drawings (P&IDs) and electrical one-line system drawings.

LOCATION (also COMPONENT LOCATION and POWER SOURCE LOCATION) - Refer to the location codes defined in Section 4.

COMPONENT TYPE (COMP TYPE) - Refer to Table B-1 for a list of component type codes.

POWER SOURCE - The component ID of the power source is listed in this field (see COMPONENT ID, above). In this data base, a "power source" for a particular component (i.e. a load or a distribution component) is the next higher electrical distribution or generating component in a distribution system. A single component may have more than one power source (i.e. a DC bus powered from a battery and a battery charger).

POWER SOURCE VOLTAGE (also VOLTAGE) - The voltage "seen" by a load of a power source is entered in this field. The downstream (output) voltage of a transformer, inverter, or battery charger is used.

EMERGENCY LOAD GROUP (EMERG LOAD GROUP) - AC and DC load groups (or electrical divisions) are defined as appropriate to the plant. Generally, AC load groups are identified as AC/A, AC/B, etc. The emergency load group for a third-of-a-kind load (i.e. a "swing" load) that can be powered from either of two AC load groups would be identified as AC/AB. DC load group follows similar naming conventions.

TABLE B-1. COMPONENT TYPE CODES

COMPONENT	COMP TYPE
VALVES:	
Motor-operated valve	MOV
Pneumatic (air-operated) valve	NV or AOV
Hydraulic valve	HV
Solenoid-operated valve	SOV
Manual valve	XV
Check valve	CV
Pneumatic non-return valve	NCV
Hydraulic non-return valve	HCV
Safety valve	SV
Dual function safety/relief valve	SRV
Power-operated relief valve (pneumatic or solenoid-operated)	PORV
PUMPS:	
Motor-driven pump (centrifugal or PD)	MDP
Turbine-driven pump (centrifugal of PD)	TDP
Diesel-driven pump (centrifugal of PD)	DDP
OTHER FLUID SYSTEM COMPONENTS:	
Reactor vessel	RV
Steam generator (U-tube or once-through)	SG
Heat exchanger (water-to-water HX, or water-to-air HX)	HX
Cooling tower	CT
Tank	TANK or TK
Sump	SUMP
Rupture disk	RD
Orifice	ORIF
Filter or strainer	FLT
Spray nozzle	SN
Heaters (i.e. pressurizer heaters)	HTR
VENTILATION SYSTEM COMPONENTS:	
Fan (motor-driven, any type)	FAN
Air cooling unit (air-to-water HX, usually including a fan)	ACU or FCU
Condensing (air-conditioning) unit	COND
EMERGENCY POWER SOURCES:	
Diesel generator	DG
Gas turbine generator	GT
Battery	BATT

TABLE B-1. COMPONENT TYPE CODES (Continued)

COMPONENT	COMP TYPE
ELECTRIC POWER DISTRIBUTION EQUIPMENT:	
Bus or switchgear	BUS
Motor control center	MCC
Distribution panel or cabinet	PNL or CAB
Transformer	TRAN or XFMR
Battery charger (rectifier)	BC or RECT
Inverter	INV
Uninterruptible power supply (a unit that may include battery, battery charger, and inverter)	U[illegible]
Motor generator	MG
Circuit breaker	CB
Switch	SW
Automatic transfer switch	ATS
Manual transfer switch	MTS