NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

RANCHO SECO

50-312

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50-312

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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.

RANCHO SECO
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	2/89	Original report

RANCHO SECO SYSTEM SOURCEBOOK

This sourcebook contains summary information on the Rancho Seco nuclear power plant. 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 Rancho Seco nuclear power plant is listed below:

- Docket number	50-312
- Operator	Sacramento Municipal Utility District
- Location	Sacramento County, California
- Commercial operation date	4/75
- Reactor type	PWR
- NSSS vendor	Babcock & Wilcox
- Number of loops	2
- Power (MWt/MWe)	2772/916
- Architect-engineer	Bechtel
- Containment type	Freestanding cylindrical steel containment vessel enclosed by a separate reinforced concrete shield building

2. IDENTIFICATION OF SIMILAR NUCLEAR POWER PLANTS

The Rancho Seco plant has a Babcock & Wilcox PWR two-loop nuclear steam supply system (NSSS) and a dry containment. Other Babcock & Wilcox plants in the United States include:

- Oconee 1, 2 & 3
- ANO-1
- TMI-1
- Crystal River
- Davis Besse
- Bellefonte 1 & 2

The following major point of comparison can be identified:

- Rancho Seco has a "lowered loop" RCS similar to Oconee, ANO-1, TMI-1, and Crystal River.

- One of two AFW pumps at Rancho Seco has a tandem steam turbine/electric motor drive.

3. SYSTEM INFORMATION

This section contains descriptions of selected systems at Rancho Seco in terms of general function, operation, system success criteria, major components, and support system requirements. A summary of major systems at Rancho Seco 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 Rancho Seco 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
- Auxiliary Feedwater (AFW) and Secondary Steam Relief (SSR) Systems	Same	3.2	10.2.2.2
- Emergency Core Cooling Systems (ECCS)	Same		
- High-Pressure Injection & Recirculation	High Pressure Injection System	3.3	6.2
- Low-Pressure Injection & Recirculation	Low Pressure Injection System, Core Flooding System	3.3 3.3	6.2 6.2
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Decay Heat Removal (DHR) System	3.3	9.5
- Main Steam and Power Conversion Systems	Main Steam Supply System, Condensate and Feedwater System, Condenser Circulating Water System	X X X	10.3 10.4 9.4.4
- Other Heat Removal Systems	None identified	X	-
Reactor Coolant Inventory Control Systems			
- Chemical and Volume Control System (CVCS) (Charging System)	Make-up and Purification System	3.4	9.2
- ECCS	See ECCS, above	-	-

Table 3-1. Summary of Rancho Seco Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Containment Systems			
- Containment	Same	X	5.2
- Containment Heat Removal Systems			
- Containment Spray System	Reactor Building Spray System	3.9	6.3
- Containment Fan Cooler System	Reactor Building Emergency Cooling System	3.9	6.4
- Containment Normal Ventilation Systems	Reactor Building Normal Ventilation System	X	9.7.1.1, 9.7.2.1
- Combustible Gas Control Systems	Hydrogen Recombiner and Monitoring Systems, Reactor Building Purge System	X	9.7.1.1, 9.7.2.1
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	3
- Control Rod System	Rod Drive System	X	3, 7.2.2
- Boration Systems	See makeup and purification system, above	-	-
Instrumentation & Control (I&C) Systems			
- Reactor Protection System (RPS)	Same	3.5	[illegible].1.2
- Engineered Safety Feature Actuation System (ESFAS)	Safety Features Actuation System	3.5	7.1.3
- Remote Shutdown System	Various local panels	3.5	7.4.8.3
- Other I&C Systems	Various systems	X	7.1.4, 7.2, 7.3

Table 3-1. Summary of Rancho Seco 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	3.6	8.2
- Non-Class 1E Electric Power System	Same	3.6	8.2
- Diesel Generator Auxiliary Systems	Same	3.6	8.2.3.1.2, 9.7.3.3
- Component Cooling Water (CCW) System	Nuclear Service Cooling Water System,	3.7	9.4.3
	Component Cooling Water System	X	9.4.3
- Service Water System (SWS)	Nuclear Service Raw Water System	3.8	9.4.2
- Other Cooling Water Systems	Plant Cooling Water System,	X	9.4.5
	Component and Turbine Plant Cooling Water System	X	9.4.6
- Fire Protection Systems	Same	X	[illegible]
- Room Heating, Ventilating, and Air-Conditioning (HVAC) Systems	Station Ventilation Systems	X	9.7
- Instrument and Service Air Systems	Plant Compressed Air System	X	9.10
- Refueling and Spent Fuel Systems	Spent Fuel Cooling System, Fuel Handling System	X	9.6, 9.8
- Radioactive Waste Systems	Same	X	11.1
- Radiation Protection Systems	Radiation Shielding, Radiation Monitoring System	X	11.2, 11.3

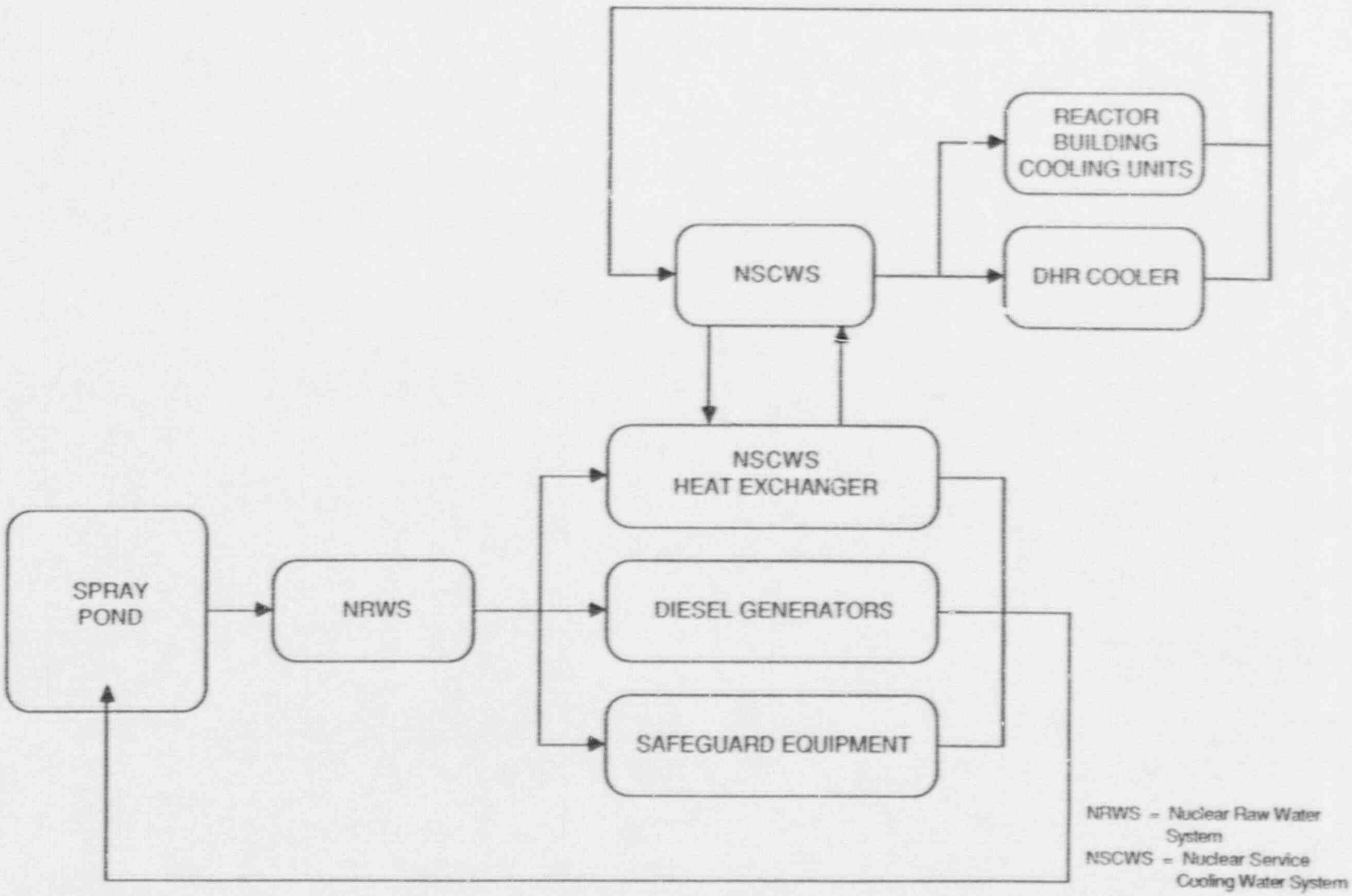

Figure 3-1. Cooling Water Systems Functional Diagram for Rancho Seco

3.1 REACTOR COOLANT SYSTEM (RCS)

3.1.1 System Function

The RCS transfers heat from the reactor core to the secondary coolant system via the steam generators. 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) main coolant loops, (c) main coolant pumps, (d) the primary side of the steam generators, (e) pressurizer, and (f) connected piping out to a suitable isolation valve boundary. An elevation drawing of a B&W RCS similar to Rancho Seco (i.e. a "lowered loop" RCS) is shown in Figure 3.1-1. Simplified diagrams of the RCS and important system interfaces are shown in Figures 3.1-2 and 3.1-3. A summary of data on selected RCS components is presented in Table 3.1-1.

3.1.3 System Operation

During power operation, circulation in the RCS is maintained by two main coolant pumps in each of the two main coolant loops. RCS pressure is maintained within a prescribed band by the combined action of pressurizer heaters and pressurizer spray. RCS coolant inventory is measured by pressurizer water level which is maintained within a prescribed band by the chemical and volume control system (makeup and purification system).

At power, core heat is transferred to secondary coolant (feedwater) in the steam generators. The heat transfer path to the ultimate heat sink is completed by the main steam and power conversion system and the circulating water system.

Following a transient or small LOCA (if RCS inventory is maintained), reactor core heat is still transferred to secondary coolant in the steam generators. Flow in the RCS is maintained by the main coolant pumps or by natural circulation. The heat transfer path to the ultimate heat sink can be established by using the secondary steam relief system (see Section 3.2) to vent main steam to atmosphere when the power conversion and circulating water systems are not available. If reactor core heat removal by this alternate path is not adequate, the RCS pressure will increase and a heat balance will be established in the RCS by venting steam or reactor coolant to the containment through the pressurizer relief valves. There is one power-operated relief valve (PORV) and two safety valves on the pressurizer. A continued inability to establish adequate heat transfer to the steam generators will result in a LOCA-like condition (i.e., continuing loss of reactor coolant through the pressurizer relief valves). Repeated cycling of these relief valves has resulted in valve failure (i.e., relief valve stuck open).

Following a large LOCA, reactor core heat is dumped to the containment as reactor coolant and ECCS makeup water spills from the break. For a short-term period, the containment can act as a heat sink; however, the containment cooling systems must operate in order to complete a heat transfer path to the ultimate heat sink.

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. Volume: 11,800 ft^3, including pressurizer
   2. Normal operating pressure: 2185 psig

B. Pressurizer
   1. Normal water volume: Unknown ft^3
   2. Normal steam volume: Unknown ft^3

C. Safety Valves (2)
   1. Set pressure: 2500 psig
   2. Relief capacity: 345,000 lb/hr each

D. Power-Operated Relief Valve
   1. Set pressure: 2450 psig
   2. Relief capacity: 112,000 lb/hr
   3. Type: Electromatic (solenoid-controlled, pilot-operated)

E. Steam Generators (2)
   1. Type: Once-through
   2. Primary-side volume: Unknown ft^3

F. Pressurizer Heaters
   1. Capacity: 126 kW supplied from Class 1E AC power

3.1.6 Support Systems and Interfaces

A. Motive Power
   1. Some pressurizer heaters are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.
   2. The main coolant pumps are supplied from Non-Class 1E switchgear.

B. Main Coolant Pump Seal Injection Water System
   The makeup system supplies seal water to cool the main coolant pump shaft seals and to maintain a controlled inleakage of seal water into the RCS. Loss of seal water flow may result in RCS leakage through the pump shaft seals which will resemble a small LOCA.

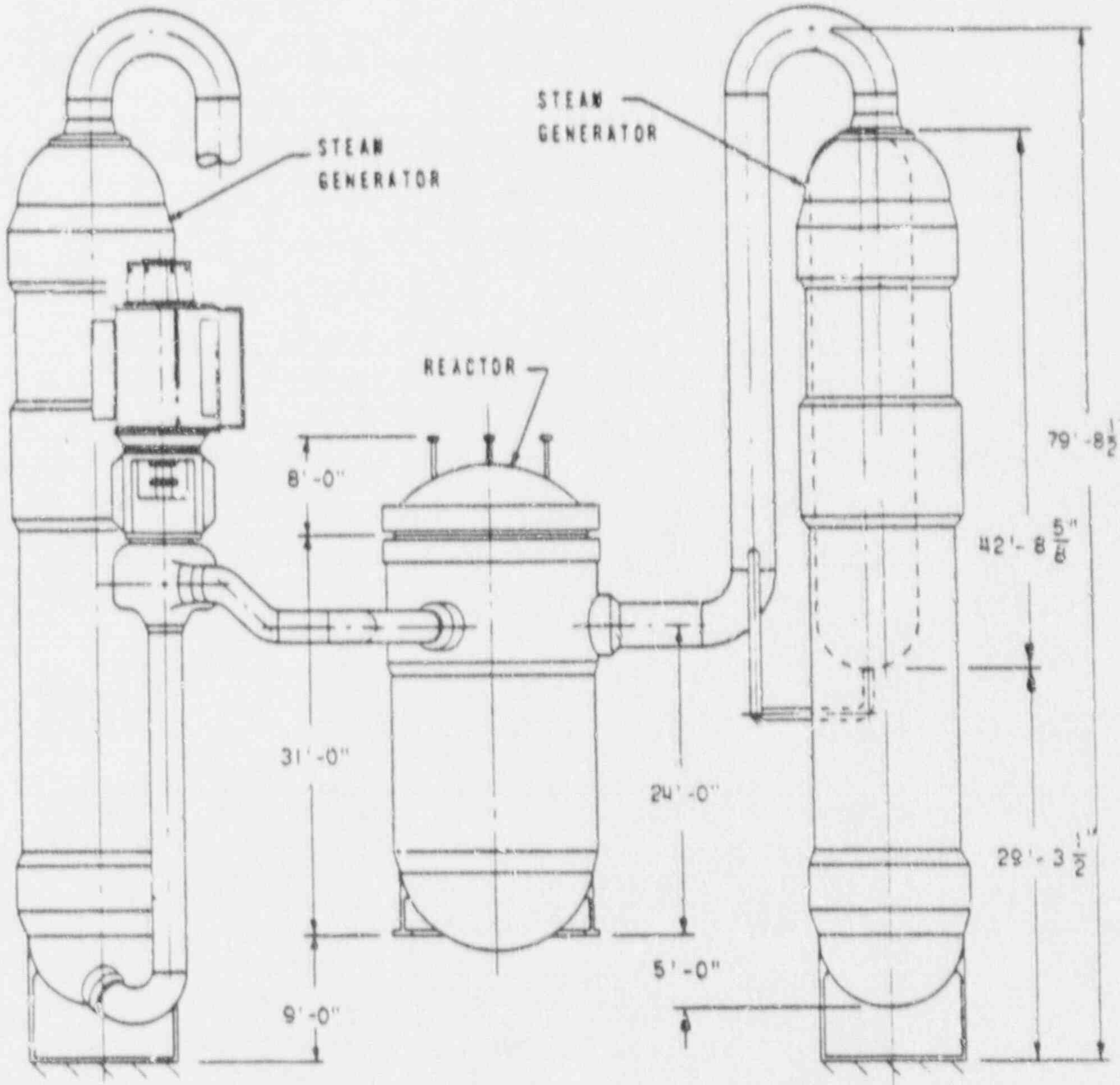

Figure 3.1-1. Elevation View of a Lowered-Loop Babcock & Wilcox RCS

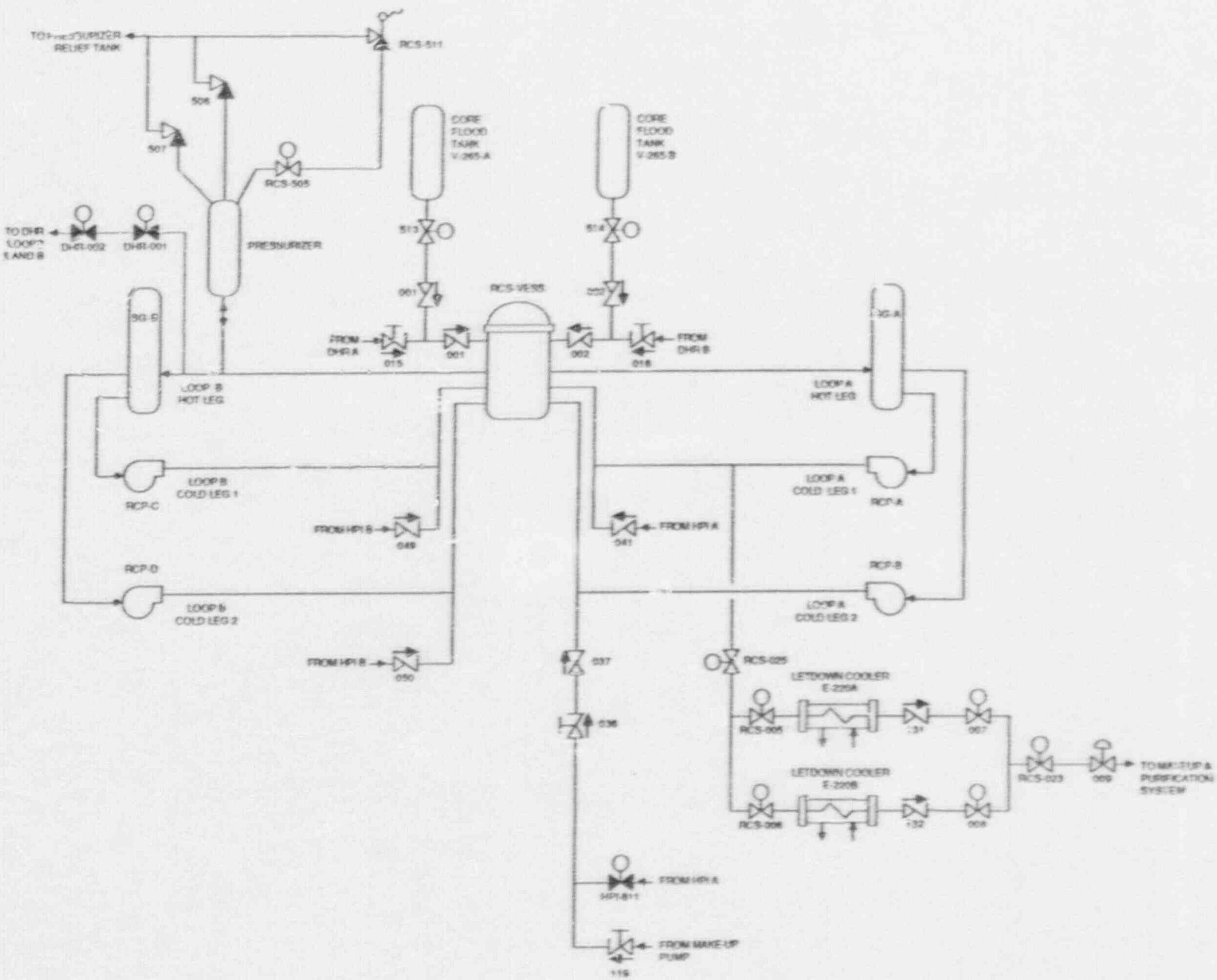

Figure 3.1-2. Rancho Seco Reactor Coolant System

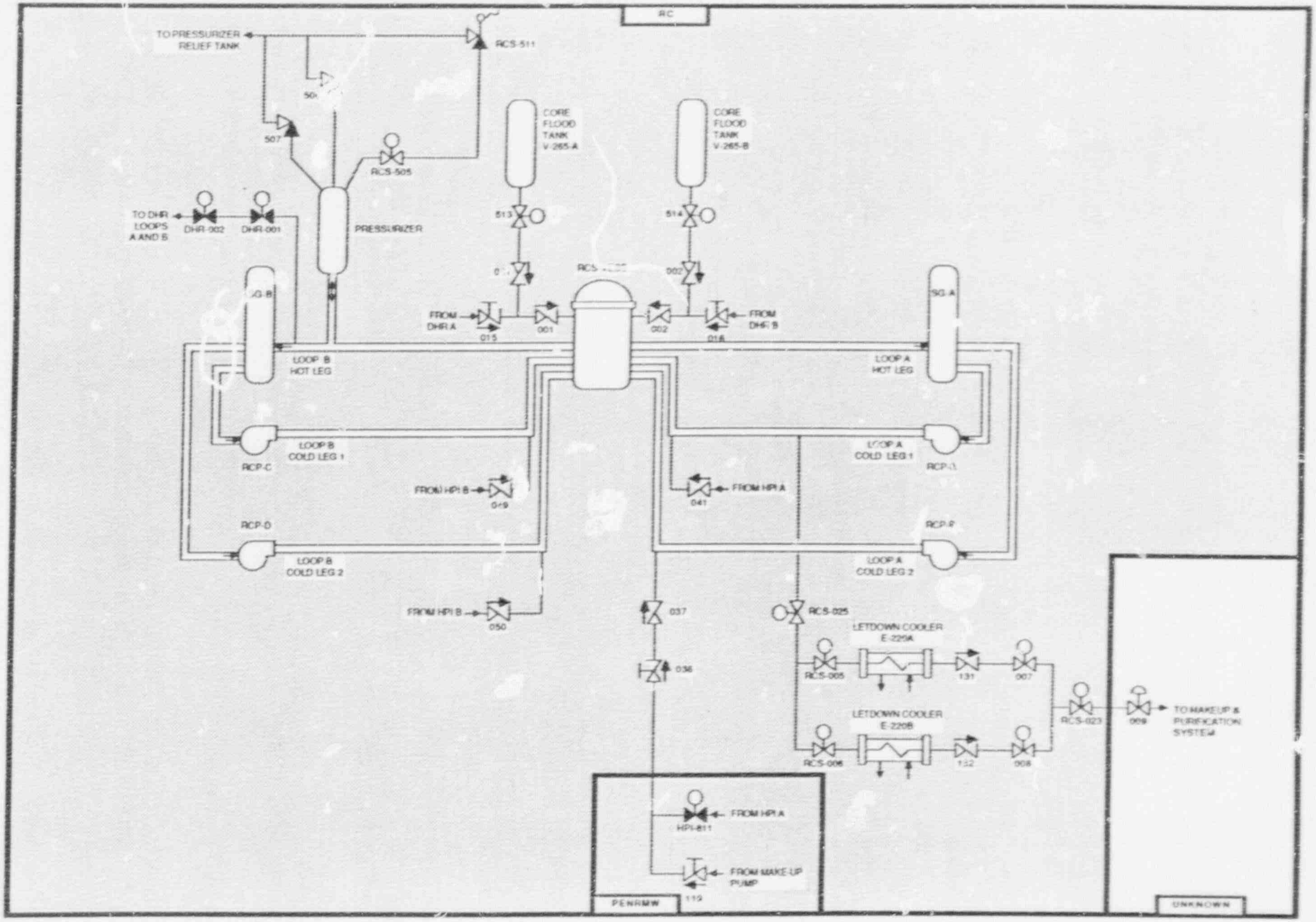

Figure 3.1-3. Rancho Seco Reactor Coolant System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
DHR-001	MOV	RC	MCCS2A1	480	480VRMW	A
DHR-002	MOV	RC	MCCS2B1	480	480VRME	B
RCS-23	MOV	RC	MCC S2A1	480	480VRMW	A
RCS-2S	MOV	RC	MCCS2B1	480	480VRME	B
RCS-5	MOV	RC	MCC S2A1	480	480VRMW	A
RCS-505	SRV	RC	MCCS2B1	480	480VRME	B
RCS-511	PORV	RC				
RCS-6	MOV	RC	MCC S2A1	480	480VRMW	A
RCS-VESS	RV	RC				

3.2 AUXILIARY FEEDWATER (AFW) SYSTEM AND SECONDARY STEAM RELIEF (SSR) SYSTEM

3.2.1 System Function

The AFW system provides a source of feedwater to the steam generators to remove heat from the reactor coolant system (RCS) when: (a) the main feedwater system is not available, and (b) RCS pressure is too high to permit heat removal by the residual heat removal (RHR) system. The SSR system provides a steam vent path from the steam generators to the atmosphere, thereby completing the heat transfer path to an ultimate heat sink when the main steam and power conversion systems are not available. Together, the AFW and SSR systems constitute an open-loop fluid system that provides for heat transfer from the RCS following transients and small-break LOCAs.

3.2.2 System Definition

The AFW system contains one motor driven pump (P-319) and one pump capable of being driven by a motor or steam turbine (P-318). The normal water source for the pumps is the condensate storage tank. Alternate sources of water are the Folsom South Canal or the plant reservoir. Each AFW pump is normally aligned to supply both of two steam generators, but can be aligned to supply either steam generator through a crosstie. The turbine-driven AFW pump P-318 receives its steam supply from one or both steam generators and exhausts to the atmosphere.

The SSR system includes nine safety valves, two turbine bypass valves, and three atmospheric dump valves on each of the two main steam lines.

Simplified drawings of the AFW and SSR systems are shown in Figures 3.2-1 and 3.2-2. A summary of data on selected AFW system components is presented in Table 3.2-1.

3.2.3 System Operation

During normal operation the AFW system is in standby, and is automatically actuated when needed to maintain the secondary coolant inventory in the steam generators. The system also can be manually started from the control room, and the turbine driven pump can be started and controlled locally. The AFW system can operate independently of the Integrated Control System (ICS).

The AFW pumps are normally supplied from separate headers from the condensate storage tank. The Folsom South canal is the preferred backup water source for the AFW system.

When the main condenser is not available as a heat sink, reactor core decay heat is rejected to an ultimate heat sink by venting to atmosphere via nine safety valves, or three atmospheric dump valves on each main steam line.

3.2.4 System Success Criteria

For the decay heat removal function to be successful, both the AFW system and the SSR system must operate successfully. The AFW success criteria are the following (Ref. 1):

- Any one AFW pump can provide adequate flow.
- Water must be provided from at least one source to the AFW pump suctions. Alternative water sources include (insert actual sources)
- Makeup of 760 gpm to any one or two steam generator provides adequate decay heat removal from the reactor coolant system.

The SSR system must operate to complete the heat transfer path to the environment. The number of safety valves that must open for the decay heat removal function is not known.

3.2.5 Component Information

A. AFW pumps P-318 and P-319
   1. Rated flow: 840 gpm @ 1162 psi head
   2. Rated capacity: 100%
   3. Type: Centrifugal
   4. Drive: Electric motor: P-319
      Electric motor/steam turbine: P-318

B. Condensate storage tank
   1. Capacity: 450,000 gallons

C. Secondary steam relief valves
   1. Nine safety valves per main steam line
   2. Two turbine bypass valves per main steam line
   3. Three atmospheric dump valves per main steam line

3.2.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. Pump Start
         The AFW pumps are automatically actuated on loss of main feed water, loss of all four reactor coolant pumps, or on a safety feature actuation system (SFAS) signal.
      b. AFW flow control
         Flow in the AFW system is controlled by either the SFAS (valves 577 and 578) or by the ICS (valves 527 and 528).
   2. Remote manual
      a. Plant operators can place the AFW system in operation from the main control room.
      b. AFW pump speed can be controlled from the remote shutdown panel.
   3. Manual
      a. The AFW pumps can be started and controlled locally. Valves can be operated locally.
      b. Alignment to supply the AFW system from Folsom South canal system must be done manually.

B. Motive Power
   1. AFW pumps and motor-operated valves are Class 1E AC and DC loads as described in Section 3.6.

C. Other
   1. Lubrication and cooling are provided locally for pumps and the turbine drive.
   2. Control air requirements to support operation of AFW and atmospheric dump valves have not been determined.

3.2.7 Section 3.2 References

1. Ilberg, D., Youngblood, R., and Papazaglou, I.A., "Review of the Rancho Seco Nuclear Generating Station Unit No. 2 Auxiliary Feedwater System Reliability Analysis," NUREG/CR-3013, Brookhaven National Laboratory, April 1983.

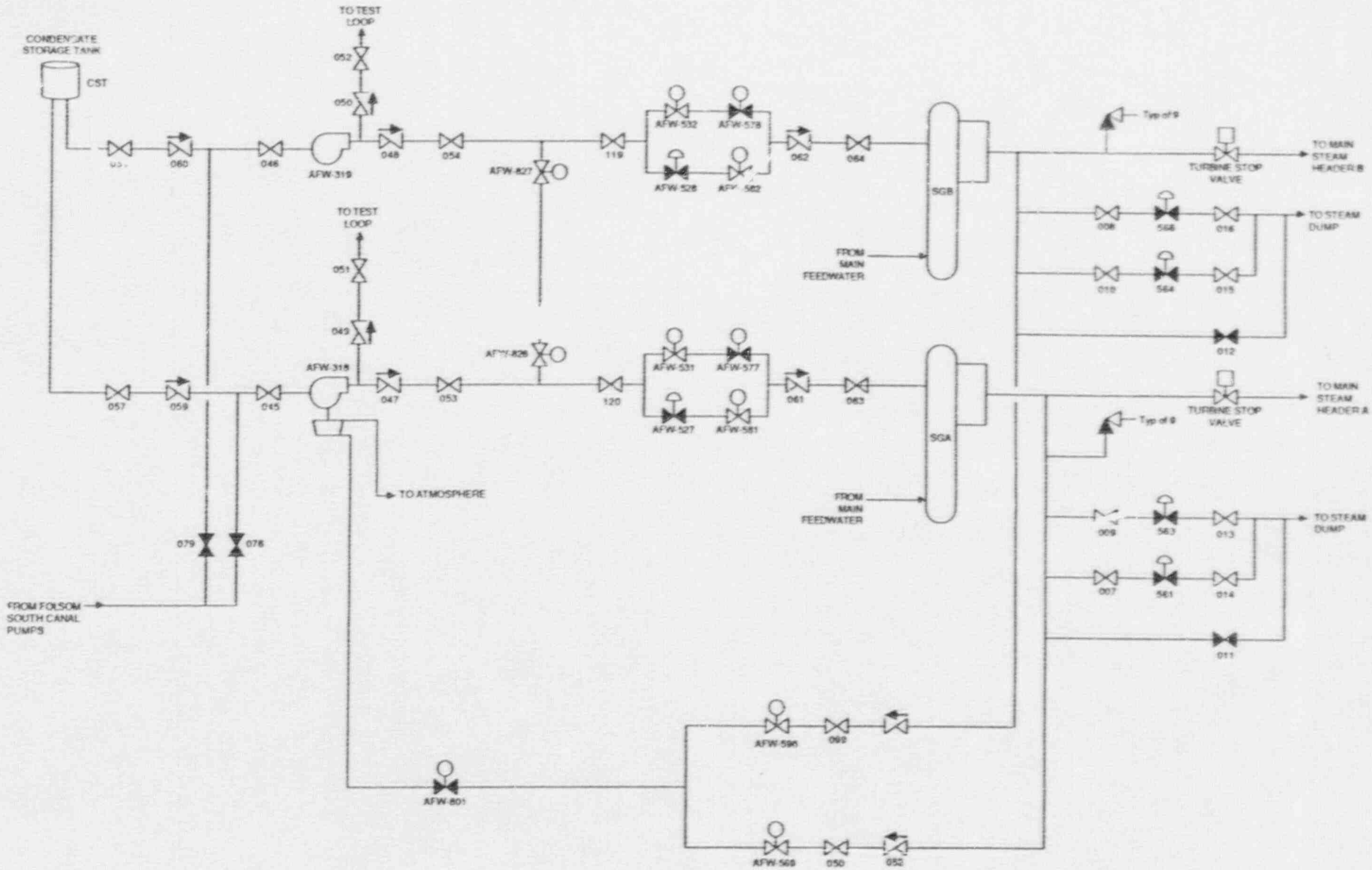

Figure 3.2-1. Rancho Seco Auxiliary Feedwater System

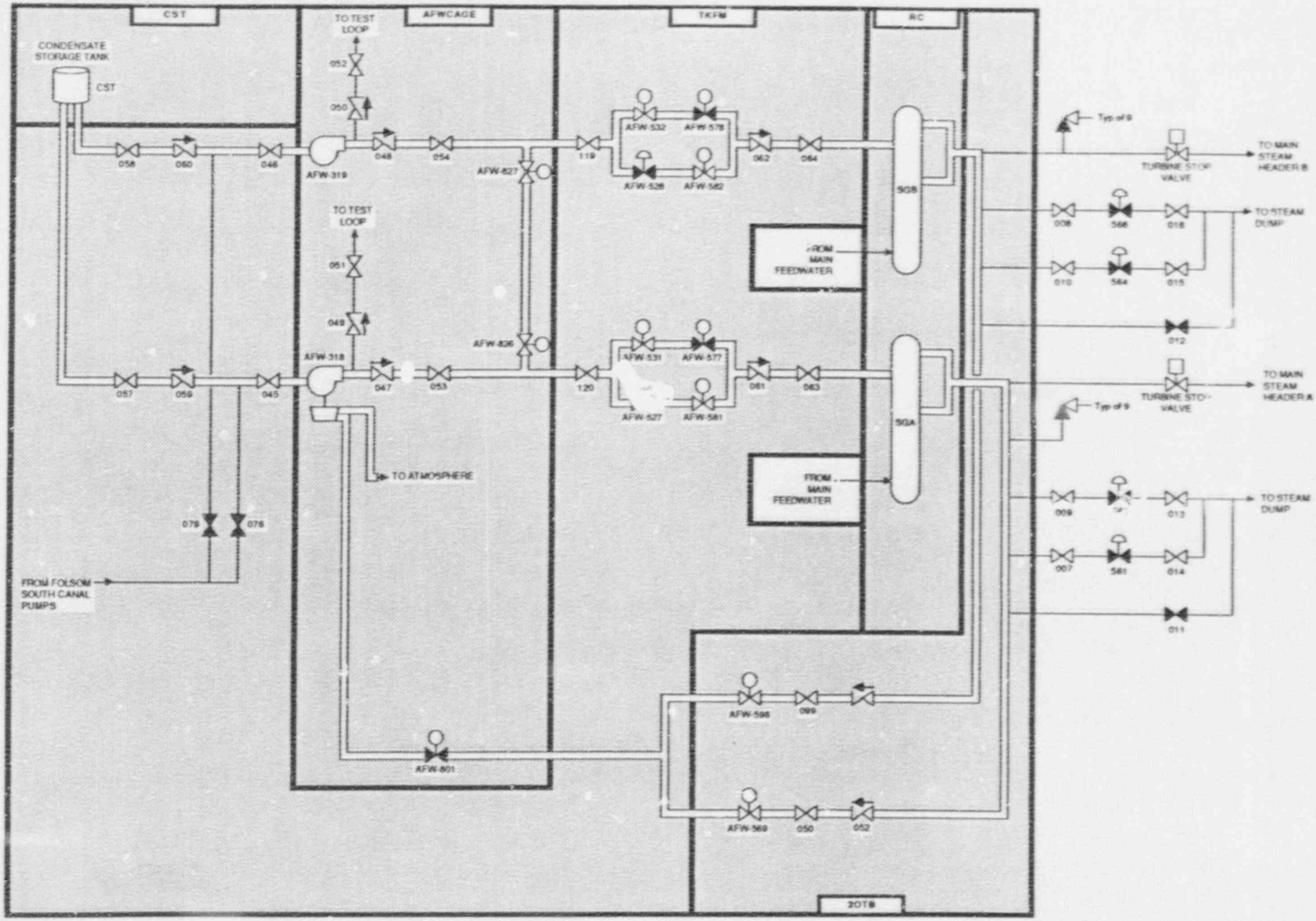

Figure 3.2-2. Rancho Seco Auxiliary Feedwater System Showing Component Locations

Table 3.2-1. Rancho Seco Auxiliary Feedwater System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
AFW-318	MDP	AFWCAGE	BUS 4B2	4160	NSEB	B2
AFW-318	TDP	AFWCAGE				
AFW-319	MDP	AFWCAGE	BUS 4A2	4160	NSEB	A2
AFW-527	AOV	TKFM				
AFW-528	AOV	TKFM				
AFW-531	MOV	TKFM	PANEL SOB2	125	NSEB	B2
AFW-532	MOV	TKFM	PANEL SOB2	125	NSEB	B2
AFW-569	MOV	TKFM	MCC S2A1	480	480VRMW	A
AFW-577	MOV	TKFM	PANEL SOD2	125	NSEB	B2
AFW-578	MOV	TKFM	PANEL SOC2	125	NSEB	A2
AFW-581	MOV	TKFM	PANEL SOC2	125	NSEB	A2
AFW-582	MOV	TKFM	PANEL SOD2	125	NSEB	B2
AFW-596	MOV	TKFM	MCCS2B1	480	480VRME	B
AFW-801	MOV	AFWCAGE	PANEL SOB2	125	NSEB	B2
AFW-826	MOV	AFWCAGE	MCC S2B3	480	NSEB	B2
AFW-827	MOV	AFWCAGE	MCC S2A3	480	NSEB	A2
CST	TK	CST				
SGA	SG	RC				
SGB	SG	RC				

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. The coolant injection function is performed during a relatively short-term period after LOCA initiation, followed by realignment to a recirculation mode of operation to maintain long-term, post-LOCA core cooling. Heat from the reactor core is transferred to the containment. The heat transfer path to the ultimate heat sink is completed by the reactor building spray system and reactor building cooling units.

3.3.2 System Definition

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

- Core Flooding system (passive core flood tanks)
- High pressure injection (HPI) system
- Low pressure injection (LPI) system

The HPI system, consisting of three HPI pumps, provides the high pressure coolant injection capability. One HPI pump also is used as the normal source of RCS makeup (see Section 3.4). The decay heat removal (DHR) pumps perform the low pressure injection function. The Borated Water Storage Tank (BWST) and the makeup tanks are the water sources for ECCS The BWST normally supplies water for LOCA mitigation while the makeup tank is used for normal makeup to the RCS. The HPI system injects coolant into all four RCS cold legs while the LPI system and the core flood tanks inject directly into the reactor vessel.

After the injection phase is completed, recirculation (ECR) is performed by the DHR pumps drawing suction from the containment sump and discharging into the reactor vessel (low pressure recirculation) or to the suction of the HPI pumps (high pressure recirculation). Heat is transferred to the nuclear service cooling water system by the DHR coolers.

Simplified drawings of the high pressure injection system are shown in Figures 3.3-1 and 3.3-2. The decay heat removal system is shown in Figures 3.3-3 and 3.3-4. Interfaces between the core flood tanks, the ECCS injection and recirculation subsystems, and the RCS are shown in Section 3.1. A summary of data on selected ECCS components is presented in Table 3.3-1.

3.3.3 System Operation

During normal operation, the ECCS is in standby. Following a LOCA, the core flood tanks will supply borated water to the RCS as soon as RCS pressure drops below accumulator pressure (about 600 psig). On low reactor coolant system pressure or high reactor building pressure, the two HPI and two DHR pumps are automatically started. Pump suction is aligned to the BWST.

When the BWST water level drops to a prescribed low level setpoint, the low pressure injection pumps are manually realigned to draw a suction from the containment sump and deliver water to the RCS cold legs. If depressurization of the RCS proceeds slowly, high pressure recirculation can be accomplished by aligning the discharge of the LPI pumps to the suction of the HPI pumps.

3.3.4 System Success Criteria

LOCA mitigation requires that both the emergency coolant injection and emergency coolant recirculation functions be accomplished. The ECI success criteria for a large LOCA are the following (Ref. 1 and 2):

- core flood tanks provide makeup as RCS pressure drops below tank pressure, and
- 1 of 2 DHR pumps delivers its rated flow to the RCS

If the ECI success criteria is met, then the following large LOCA ECR success criteria will apply (Ref. 1):

- At least one of two DHR pump and heat exchanger trains is realigned for recirculation and takes a suction on the containment sump and injects into the RCS, and the DHR heat exchanger is adequately cooled.

ECI success criteria for a small LOCA are the following (Ref. 2):

- 1 of 3 HPI pumps takes a suction on the BWST and injects into the RCS cold legs.

- Decay heat removal by the AFW and SSR systems is successful.

If the small LOCA ECI success criteria are not, the following ECR success criteria will apply (Ref. 1):

- 1 of 2 DHR pumps takes suction on the containment sump and discharges to the suction side of the corresponding HPI pump which injects the water into the RCS.

- Cooling is provided by the associated DHR heat exchanger.

3.3.5 Component Information

A. High pressure injection pumps 238A and 238B
   1. Rated flow: 300 gpm @ approximately 6680 ft head (2896 psid)
   2. Rated capacity: 100%
   3. Type: centrifugal

B. High pressure injection pump 236 (makeup pump)
   1. Rated flow: 300 gpm @ 5545 ft. head (2404 psid)
   2. Rated capacity: 100%
   3. Type: centrifugal

C. Low pressure injection (decay heat removal) pumps 261A and 261B
   1. Rated flow: 3000 gpm @ 350 ft. head (152 psid)
   2. Rated capacity: 100%
   3. Shutoff head: 429 ft. head (186 psid)
   4. Type: centrifugal

D. Core flood tanks (2)
   1. Accumulator total volume: 1410 ft^3
   2. Minimum water volume: 1040 ft^3
   3. Normal operating pressure: 600 psig
   4. Nominal boric acid concentration: 1800 ppm

E. Borated water storage tank
   1. Capacity: 450,000 gallons
   2. Design pressure: Atmospheric
   3. Minimum boron concentration: 1800 ppm

F. DHR coolers E-260A and E-260B
   1. Design duty: 33.8 x 10^6 Btu/hr
   2. Type: shell and tube

3.3.6 Support Systems and Interfaces

A. Control signals
   1. Automatic
      The ECCS injection subsystems are automatically actuated by the safety features actuation system (SFAS) as described in Section 3.5.
   2. Remote manual
      a. An SFAS signal can be initiated by remote manual means from the main control room.
      b. The transition from the injection to the recirculation phase of ECCS operation is initiated by remote manual means.

B. Motive Power
   1. The ECCS motor-driven pumps and motor-operated valves are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.

C. Other
   1. Each DHR heat exchanger is cooled by an independent loop of the Nuclear Service Cooling Water System (see Section 3.7).
   2. Each HPI and DHR pump and their respective room coolers are cooled by the Nuclear Service Raw Water System (see Section 3.8).
   3. Pump lubrication is assumed to be provided locally.

3.3.7 Section 3.3 References

1. Rancho Seco Updated Final Safety Analysis Report, Section 6.2.2.4

2. Rancho Seco Updated Final Safety Analysis Report, Section 6.2.3.

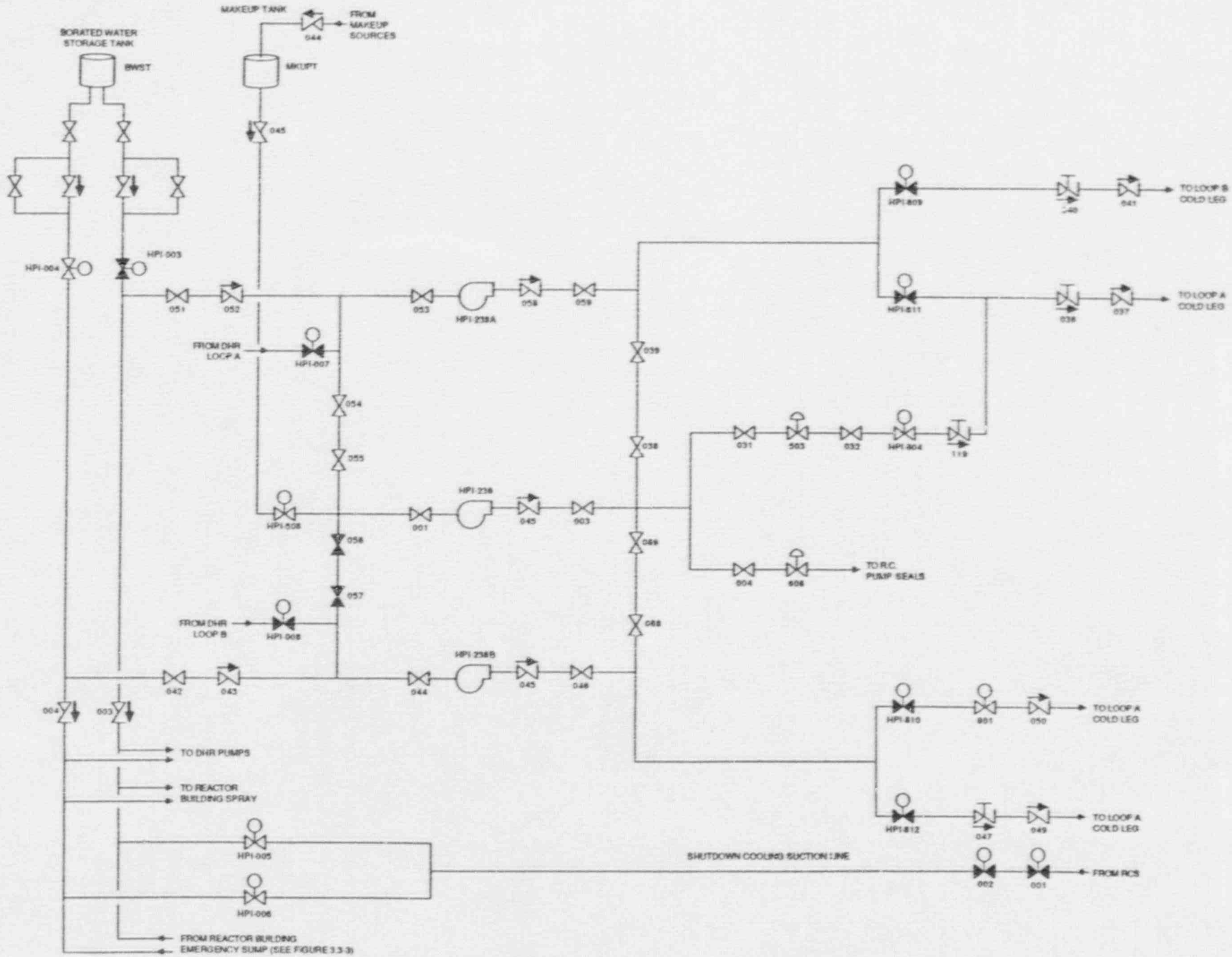

Figure 3.3-1. Rancho Seco High Pressure Injection System

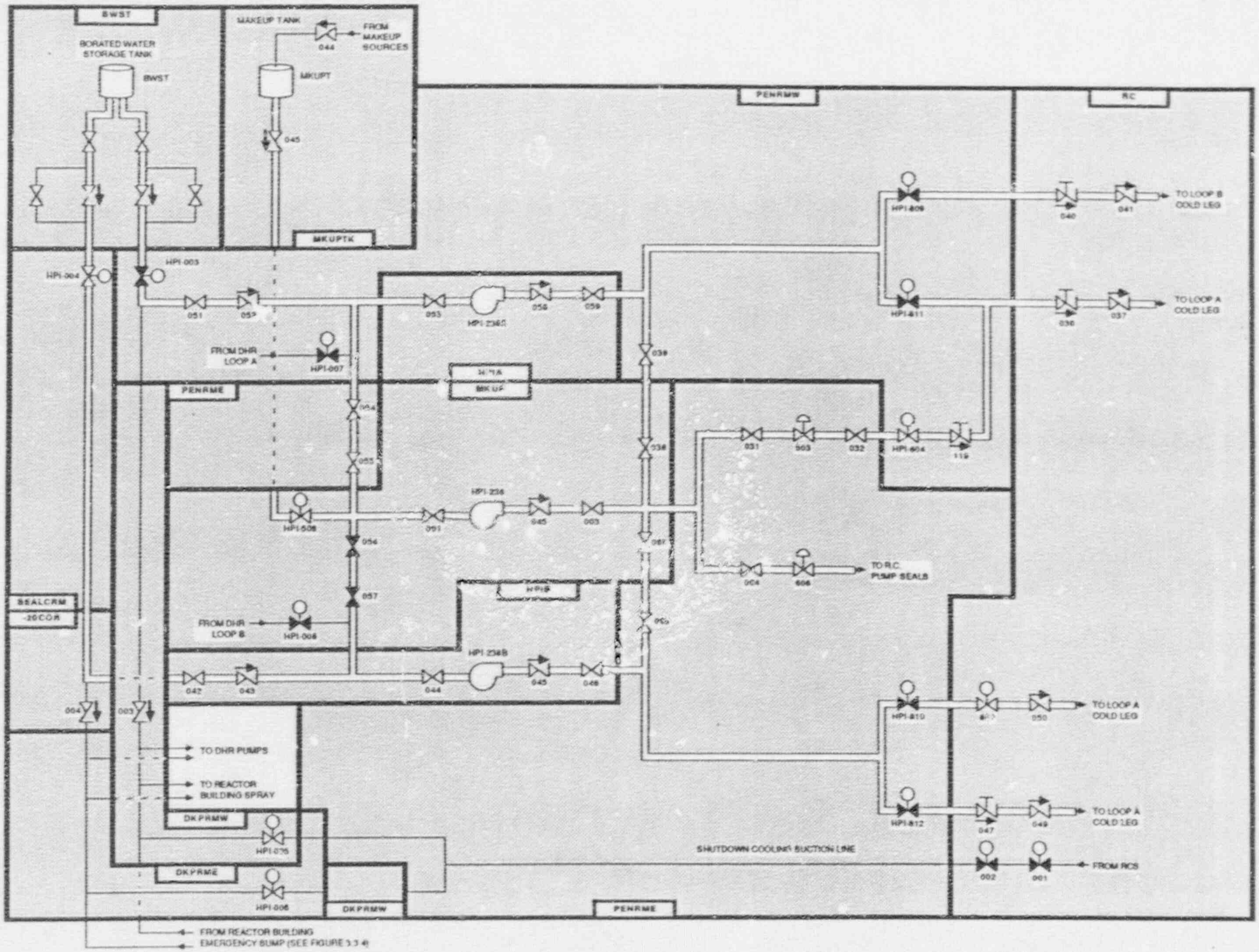

Figure 3.3-2. Rancho Seco High Pressure Injection System Showing Component Locations

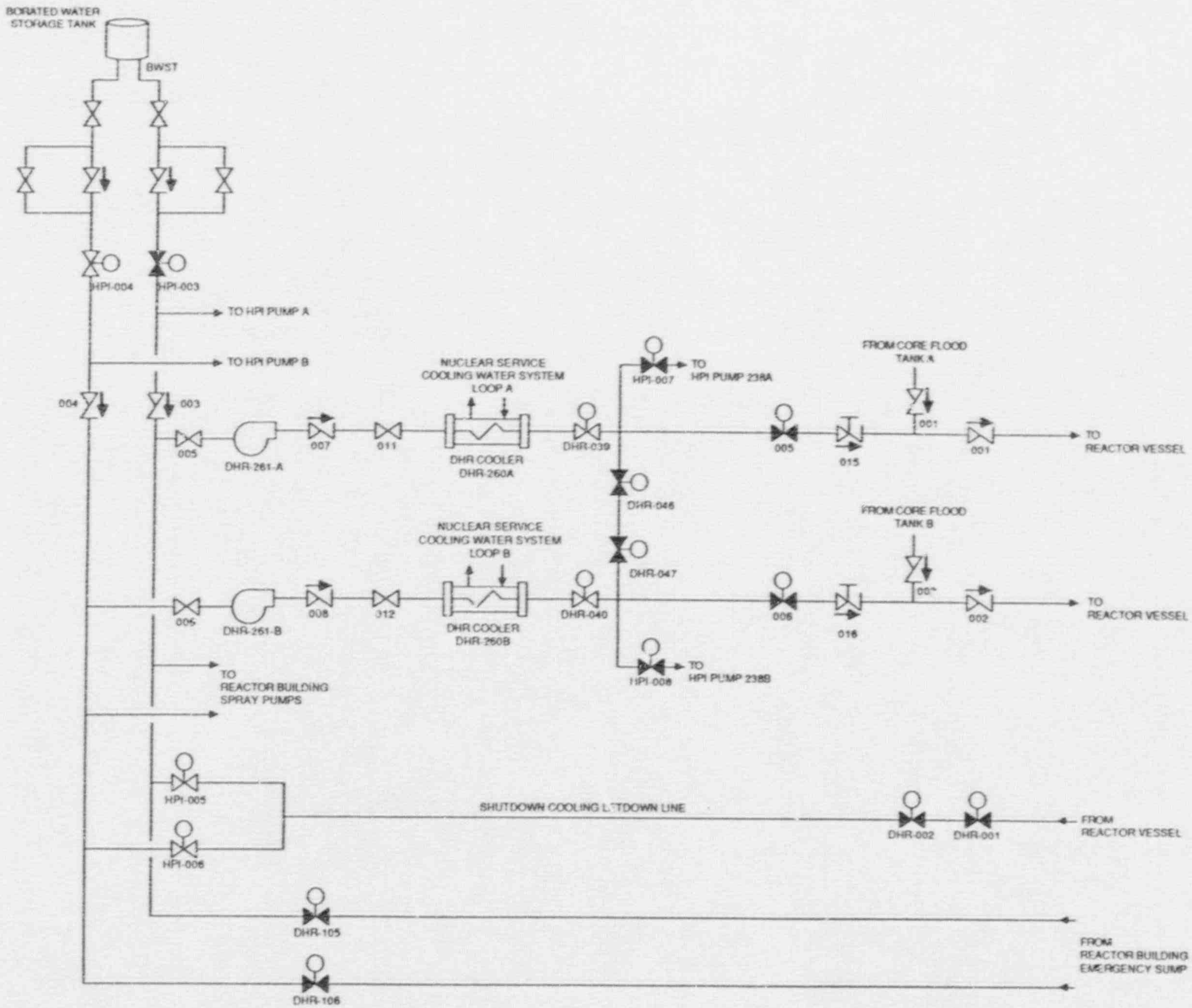

Figure 3.3-3. Rancho Seco Decay Heat Removal System

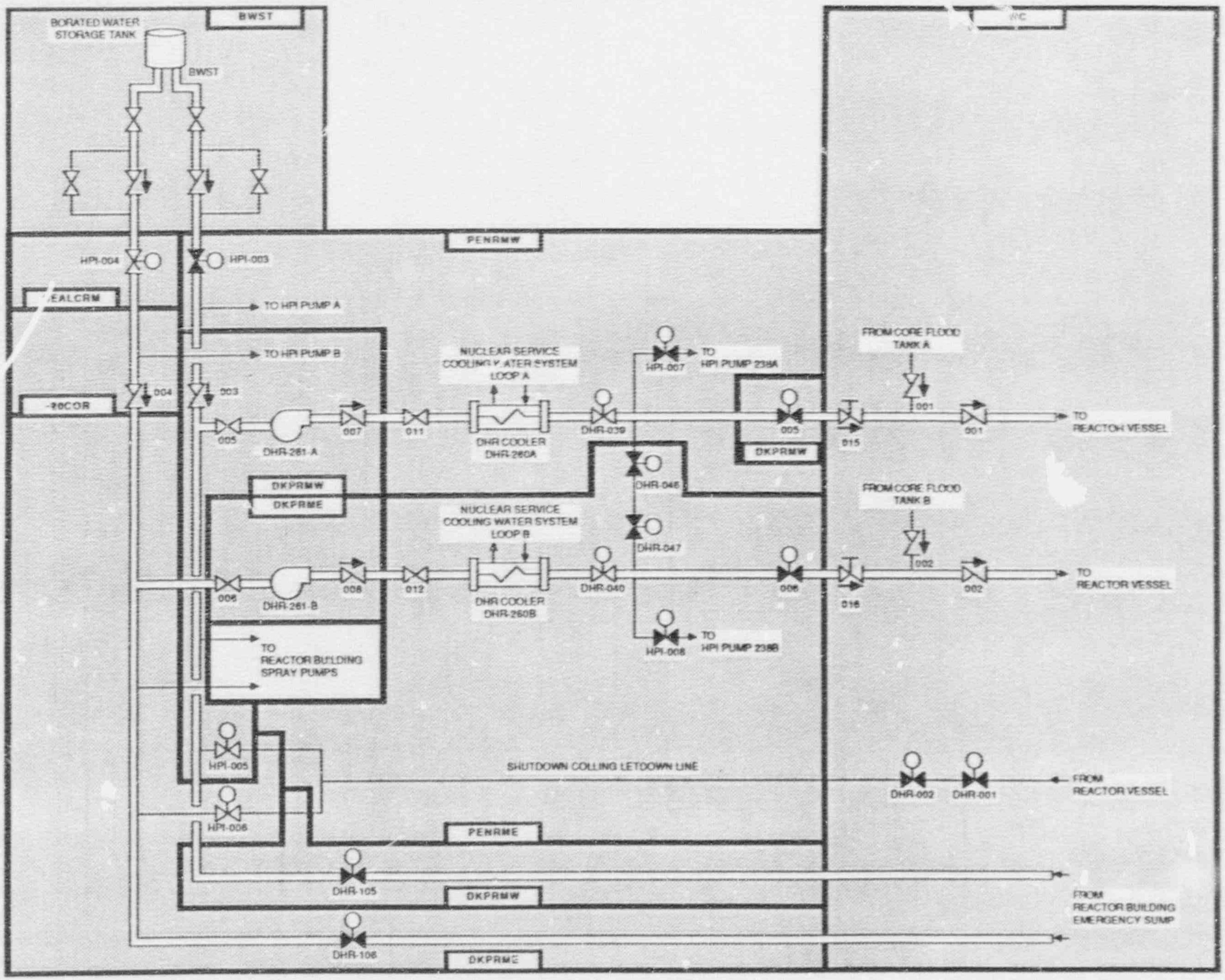

Figure 3.3-4. Rancho Seco Decay Heat Removal System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BWST	TK	BWST				
DHR-039	MOV	PENRMW	MCCS2A1	480	480VRMW	A
DHR-040	MOV	PENRME	MCCS2B1	480	480VRME	B
DHR-046	MOV	PENRME	MCCS2A1	480	480VRMW	A
DHR-047	MOV	PENRME	MCCS2B1	480	480VRME	B
DHR-105	MOV	DKPRMW	MCCS2A1	480	480VRMW	A
DHR-106	MOV	DKPRME	MCCS2B1	480	480VRME	B
DHR-260A	HX	PENRMW				
DHR-260B	HX	PENRME				
DHR-261B	MDP	DKPRMW	BUS 4A	4160	4KVRMW	A
DHR-261B	MDP	DKPRME	BUS 4B	4160	4KVRME	B
HPI-003	MOV	PENRMW	MCCS2A1	480	480VRMW	A
HPI-004	MOV	SEALCRM	MCCS2B1	480	480VRME	B
HPI-005	MOV	DKPRMW	MCCS2A1	480	480VRMW	A
HPI-005	MOV	DKPRMW	MCCS2A1	480	480VRMW	A
HPI-006	MOV	DKPRME	MCCS2B1	480	480VRME	B
HPI-006	MOV	DKPRME	MCCS2B1	480	480VRME	B
HPI-007	MOV	PENRMW	MCCS2A1	480	480VRMW	A
HPI-008	MOV	PENRME	MCCS2B1	480	480VRME	B
HPI-236	MDP	MKUP	BUS 4B	4160	4KVRME	B
HPI-238A	MDP	HPIA	BUS 4A	4160	4KVRMW	A
HPI-238B	MDP	HPIB	BUS 4B	4160	4KVRME	B
HPI-508	MOV	MKUP	MCCS2B1	480	480VRME	B
HPI-508	MOV	MKUP	MCCS2A1	480	480VRMW	A
HPI-508	MOV	MKUP	MCCS2B1	480	480VRME	B
HPI-508	MOV	MKUP	MCC S2A1	480	480VRMW	A
HPI-604	MOV	PENRMW	PANEL C	120	DCPNLW	A
HPI-809	MOV	PENRMW	PANEL C	120	DCPNLW	A

Table 3.3-1. Rancho Seco Emergency Core Cooling System Data Summary for Selected Components (Continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
HPI-810	MOV	PENRME	PANEL D	120	DCPNLE	B
HPI-811	MOV	PENRMW	PANEL C	120	DCPNLW	A
HPI-812	MOV	PENRME	PANEL D	120	DCPNLE	B
SUMP	TK	RC				

3.4 MAKEUP AND PURIFICATION SYSTEM

3.4.1 System Function

The makeup system, in conjunction with the purification system, is responsible for maintaining the proper water inventory in the Reactor Coolant System and maintaining water purity and the proper concentration of neutron absorbing and corrosion inhibiting chemicals in the reactor coolant.

3.4.2 System Definition

The makeup and purification system provides a means for injection of control poison in the form of boric acid solution, chemical additions for corrosion control, and reactor coolant cleanup and degasification. This system also adds makeup water to the RCS, draws off a small side stream of reactor coolant for purification and provides seal water injection to the reactor coolant pump seals.

The RCS water makeup function can be performed by the high pressure injection (HPI) pumps which are part of the ECCS (see Section 3.3). This system, while designed for LOCA mitigation, also is used to inject high pressure makeup water into the RCS during normal operation and for transient mitigation.

The functions of the makeup and purification system are performed by the following components: (a) the high pressure injection pumps, (b) boric acid pumps, (c) primary water and demineralized water transfer pumps, (d) makeup tank, (e) boric acid addition tank, (f) primary water storage tank (PWST), (g) demineralized water storage tank (h) BWST, and (i) various heat exchangers and demineralizers.

The makeup tank and high pressure injection pumps are shown in the simplified drawing of the high pressure injection system (Section 3.3). A drawing of the normal water source to the makeup tank is shown in Figure 3.4-1.

3.4.3 System Operation

During normal plant operation, one high pressure injection pump (usually pump 236) is running with its suction aligned to the makeup tank. The letdown flow from RCS cold leg 1 (loop A) is cooled on the shell side of the regenerative heat exchanger, then directed to the purification system and the makeup tank. The reactor makeup control system maintains the desired inventory in the makeup tank. The bulk of the makeup flow is pumped back to the RCS through cold leg 2 (loop A). A portion of the charging flow is directed to the reactor coolant pumps through a seal water injection filter.

3.4.4 System Success Criteria

For post-transient makeup to the RCS the following makeup system success criteria is assumed:

- One of three HPI pumps is available.
- A makeup path to the RCS is available.
- A long-term water source must be available to the charging pumps. Available water sources include the makeup tank, the BWST, demineralized water system, and the boric acid storage tanks.

3.4.5 Component Information

A. High pressure injection pumps 238A and 238B
   1. Rated flow: 300 gpm @ 6680 ft. head (2896 psid)
   2. Rated capacity: 100% (based on makeup function)
   3. Type: centrifugal

B. High pressure injection pump 236 (makeup pump)
   1. Rated flow: 300 gpm @ 5545 ft. head (2404 psid)
   2. Rated capacity: 100% (based on makeup function)
   3. Type: centrifugal

C. Borated Water Storage Tank (BWST)
   1. Capacity: 450,000 gallons
   2. Minimum water volume: 482,778 gallons
   3. Boron concentration: 1,800 minimum
   4. Operating pressure: atmospheric

D. Makeup Tank
   1. Volume: 600 ft^3
   2. Nominal Water Volume: 400 ft^3 (about 3000 gallons)
   3. Operating pressure: 15 to 35 psig

3.4.6 <u>Support Systems and Interfaces</u>

A. Control Signals
   1. Automatic
      a. During normal operation, the HPI pump aligned for normal makeup is automatically controlled by the pressurizer level control system.
      b. The SFAS automatically isolates the makeup tank from the suction of the HPI pumps.
   2. Remote Manual
      The HPI pumps can be actuated by remote manual means from the control room.

B. Motive Power
   1. The HPI pumps and motor operated valves are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.

C. Other
   1. The HPI pumps and their respective room coolers are cooled by the Nuclear Service Raw Water System (see Section 3.8).
   2. Pump lubrication is assumed to be provided locally.

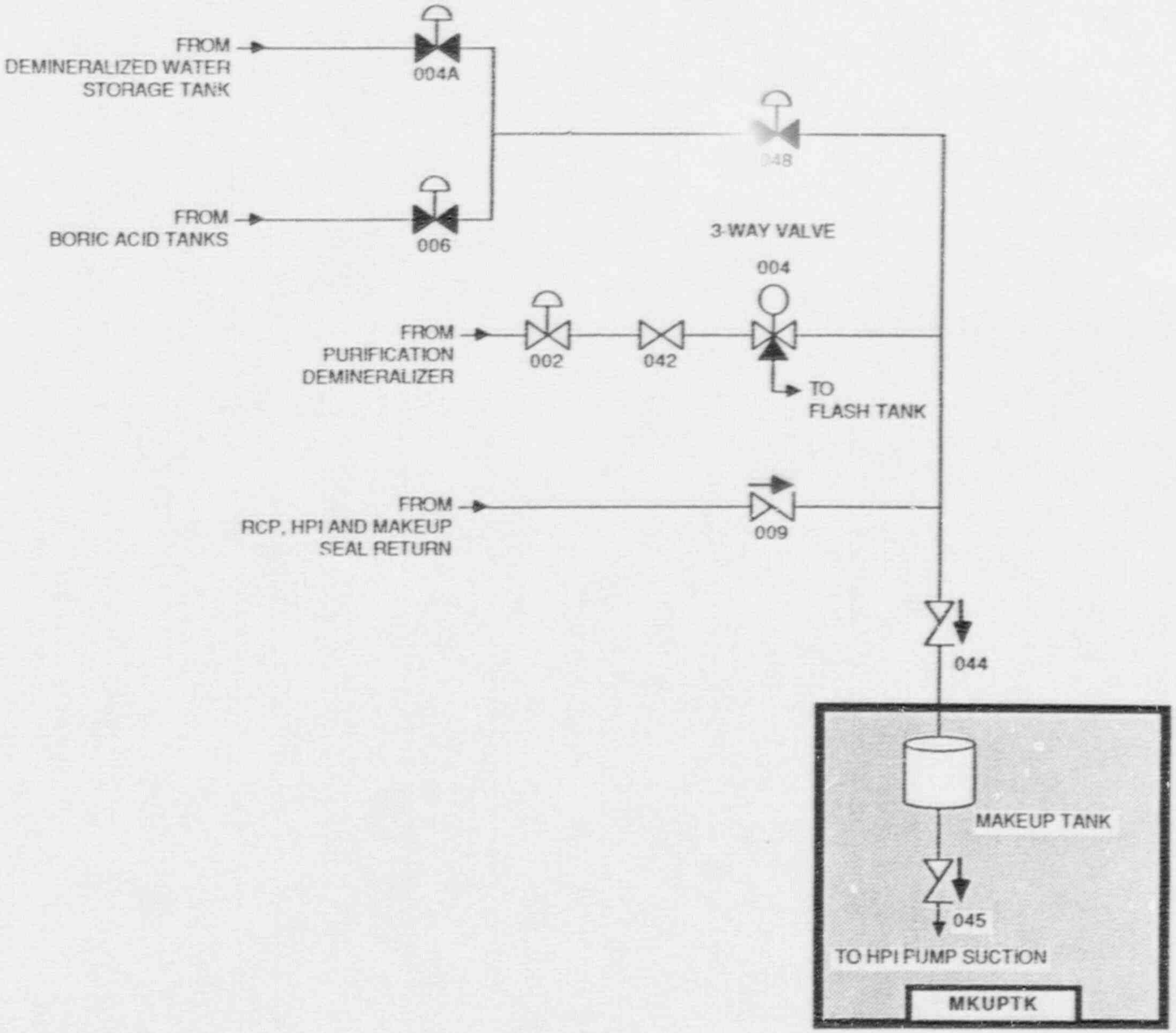

Figure 3.4-1. Rancho Seco Normal Water Sources for Makeup Tank

3.5 INSTRUMENTATION AND CONTROL (I & C) SYSTEMS

3.5.1 System Function

The Instrumentation and Control systems include the reactor protection system (RPS), the safety features actuation system (SFAS), the integrated control system (ICS), the control rod drive system (CRDS), and systems for the display of plant information to the operators. The protection systems, RPS and SFAS, perform important control and safety functions. These systems extend from the sensing instruments to the final actuating devices, such as circuit breakers and pump or valve motor contractors. The control systems, CRDS and ICS, regulate reactor output by the use of moveable control rod assemblies and by coordinating reactor, steam generator, and turbine operation. A remote shutdown capability is provided to ensure that the reactor can be placed in a safe condition in the event that the control room must be evacuated.

3.5.2 System Definition

The RPS includes sensor and transmitter units, logic units, and output trip relays that operate reactor trip circuit breakers to cause a reactor scram. The SFAS and ICS include sensor and transmitter units, logic units and relays that interface with the control circuits for many different sets of components that can be actuated by these systems. The CRDS includes drive controls, power supplies, position indicators, operating panels and indicators, safety devices, and enclosures. Operator instrumentation display systems consist of display panels in the control room and at the Auxiliary Shutdown Panel (ASP) that are powered by the 120 VAC and 125 VDC electric power system (see Section 3.6).

3.5.3 System Operation

A. RPS

The B&W RPS has four input instrument channels (A, B, C, and D), each terminating in a channel trip relay that provides an input to four reactor trip modules. Each reactor trip module is a 2-out-of-4 logic unit that is controlled by the four input instrument channels. A trip of any two of the four input channels should trip all four reactor trip modules. The scram breaker contacts are arranged in what is effectively a 1-out-of-2-taken-twice logic. RPS trips are listed below:

- Overpower
- High neutron flux (flow-based limit)
- High neutron flux for number and combination of coolant pumps in operation
- High reactor outlet temperature
- Low RCS pressure
- High RCS pressure
- High containment pressure
- Anticipatory trip due to loss of main feedwater, main turbine trip, or low steam generator level
- Manual

The manual scram circuit bypasses the RPS logic trains and directly deenergizes the undervoltage coils in the scram breakers, causing these breakers to open.

B. SFAS

The SFAS is a 3 input channel and 2-out-of-3 coincidence logic system. The three input logic channels monitor the following plant parameters:

- Reactor coolant pressure
- Reactor building pressure
- Essential bus voltage
- BWST, core flood tank, and NCW surge tank levels

There are two SFAS output actuation trains, A and B. In general, the SFAS "A" train controls equipment powered from Class 1E AC electrical Division A and the SFAS "B" train controls redundant equipment powered from Division B. An individual component usually receives an actuation signal from only one SFAS train. The SFAS generates the following signals: (1) high pressure injection actuation, (2) low pressure injection actuation, (3) Reactor building spray actuation, (4) containment isolation, (5) reactor building cooling, and (6) actuation of standby redundant diesel generators A and B. The control room operators can manually trip the SFAS logic subsystems.

C. CRDS

The CRDS inserts the control rod assemblies into the core upon receipt of protection system (RPS or SFAS) trip signals. Trip command has priority over all other commands. In addition the rods are inserted to maintain the reactor reactivity within rate limits during startup and operation.

D. ICS

The ICS matches megawatt generation to unit load demand. This function is achieved by coordinating the steam flow to the turbine with the rate of steam generation. Feed-forward control is used to assure the proper relationships between the generated load, turbine valves, feedwater flow, and reactor power.

E. ASP

Plant operators can establish and maintain a safe hot shutdown condition from the ASP when the main control room is not habitable.

3.5.4 System Success Criteria

A. RPS

The four reactor trip modules use hindrance logic (normal = 1, trip = 0) for their input and output logic. Therefore, a channel will be in a tripped state if input signals are lost, power to the channel is lost, or control power is lost. A bypass for the channel may be used for testing or maintenance, leaving the channel in a non-tripped condition. The breakers are arranged in a 1-out-of-2-taken-twice logic. A reactor scram will occur on loss of control power to the RPS. A scram is initiated by scram circuit breakers which must open in response to a scram signal. Each reactor trip module requires a 2-out-of-4 coincidence from the input instrument channels to cause a scram. This coincidence should trip all four reactor trip modules. There are two scram circuit breakers in series in each power path to the control rods. Only one must open to cause the associated rods to scram. Details of the scram system for Rancho Seco have not been determined. (Ref. 2)

B. SFAS

A single component generally receives a signal from only one SFAS output train, either A or B. Therefore, SFAS trains A and B must both be operating to automatically actuate their respective components. Each train uses a 2-out-of-3 input channels logic system. The SFAS uses hindrance input logic (normal =

1, trip = 0) for the analog instruments and bistables, and transmission output logic (normal = 0, trip = 1) for the output logic. Therefore, control power is needed for an SFAS actuation signal. Details of the Rancho Seco SFAS have not been determined. (Ref. 3)

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 an SFAS 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 Auxiliary Shutdown Panels or a motor control center). To make these judgements, data on key plant parameters must be available to the operators.

3.5.5 Support Systems and Interfaces

A. Control Power
1. RPS
The RPS input instrument channels are powered from 120 VAC essential distribution panels A, B, C, and D.
2. SFAS
The SFAS input instrument channels are powered from 120 VAC essential distribution panels A, B, C, and D.
3. CRDS
The CRDS is powered from 120 VAC essential distribution panels A, B, C, and D.
4. ICS
Control power source has not been identified.
5. Auxiliary shutdown panel
Control power source has not been identified.

3.5.6 Section 3.5 References

1. Rancho Seco Updated Final Safety Analysis Report, Section 7.4.8.3.

2. Rancho Seco Updated Final Safety Analysis Report, Section 7.1.2.

3. Rancho Seco Updated Final Safety Analysis Report, Section 7.1.3.1.

3.6 ELECTRIC POWER SYSTEM

3.6.1 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.

3.6.2 System Definition

The onsite Class 1E electric power system consists of four 4160 buses, designated 4A, 4B, 4A2, and 4B2. There are four standby diesel generators connected to the buses designated A, B, A2, and B2. There are also four 480 VAC load center buses, designated 3A, 3B, 3A2, and 3B2. Various motor control centers receive their power from the 480 VAC buses.

Emergency power for vital instruments, control, and emergency lighting is supplied by eight 125 VDC station batteries. The batteries energize eight DC distribution panels, designated A, B, C, D, SOA2, SOB2, SOC2, and SOD2. Four 120 VAC instrument buses are connected to the DC distribution centers through inverters.

A simplified one-line diagram of the 4160 and 480 VAC electric power system is shown in Figure 3.6-1. The 125 VDC and 120 VAC distribution systems are shown in Figure 3.6-2. 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.

3.6.3 System Operation

During normal operation, the Class 1E electric power system is supplied by station service power from the main generator and the 220 kV switching station. The normal source for the 4160 buses is the 220 kV system. The transfer from the preferred power source to the diesel generators is accomplished automatically by opening the normal source circuit breakers and then reenergizing the Class 1E portion of the electric power system from the diesel generators. Following a start command, each diesel generator is designed to reach rated speed and be capable of accepting loads within 10 seconds.

The DC power system normally is supplied through the battery chargers, with the batteries "floating" on the system, maintaining a full charge. Upon loss of AC power, the entire DC load draws from the batteries. The batteries can support the design DC load for about two hours. (Ref. 1)

The 120 VAC vital buses normally receive power from DC distribution centers through an inverter.

Redundant safety equipment such as motor driven pumps and motor operated valves are supplied by different Class 1E buses. For the purpose of discussion, this equipment has been grouped into "load groups". Load group "A" contains components receiving electric power either directly or indirectly from 4160 bus 4A. Load group "B" contains components powered either directly or indirectly from 4160 bus 4B. Load group "A2" is powered directly or indirectly from 4160 bus 4A2. Load group "B2" is powered directly or indirectly from 4160 bus 4B2.

3.6.4 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 battery (also needed for diesel starting)
- 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

3.6.5 Component Information

A. Standby diesel generators A and B
   1. Rating: 2750 kW at 0.8 power factor
   2. Rated voltage: 4160 VAC
   3. Manufacturer: General Motors

B. Standby diesel generators A2 and B2
   1. Rating: 3500 kW
   2. Rated voltage: 4160 VAC
   3. Manufacturer: unknown

C. Batteries (8)
   1. Rated voltage: 125 VDC
   2. Capacity: approximately 2 hours with design loads (Ref. 1)

3.6.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The standby diesel generators are automatically started by the Safety Features Actuation System (SFAS, see Section 3.5)
   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
   1. Diesel Cooling Water System
      Heat for generators A and B is transferred from a jacket water system to the nuclear raw water cooling system (see Section 3.8). Heat for generators A2 and B2 is transferred to radiators adjacent to the diesel generator building.
   2. Diesel Starting System
      The air starting system for each diesel is capable of multiple start attempts without requiring AC power to recharge the starting air accumulators. The station batteries are needed for diesel starting.
   3. Diesel Fuel Oil Transfer and Storage System
      A "day tank" for each diesel generator provides for approximately 2 hours of operation. The day tanks are automatically replenished from separate underground gallon storage tanks during engine operation. Each storage tank is furnished with motor driven fuel oil pumps.
   4. Diesel Lubrication System
      Each diesel generator has its own lubrication system.
   5. Diesel Room Ventilation System
      Supply and exhaust fans, driven by Class 1E power, are local to the generators

C. Switchgear and Battery Room Ventilation System
Details on the ventilation system serving the switchgear and battery rooms have not been determined.

3.6.7 Section 3.6 References

1. Rancho Seco Updated FSAR, Section 8.2.2.6.

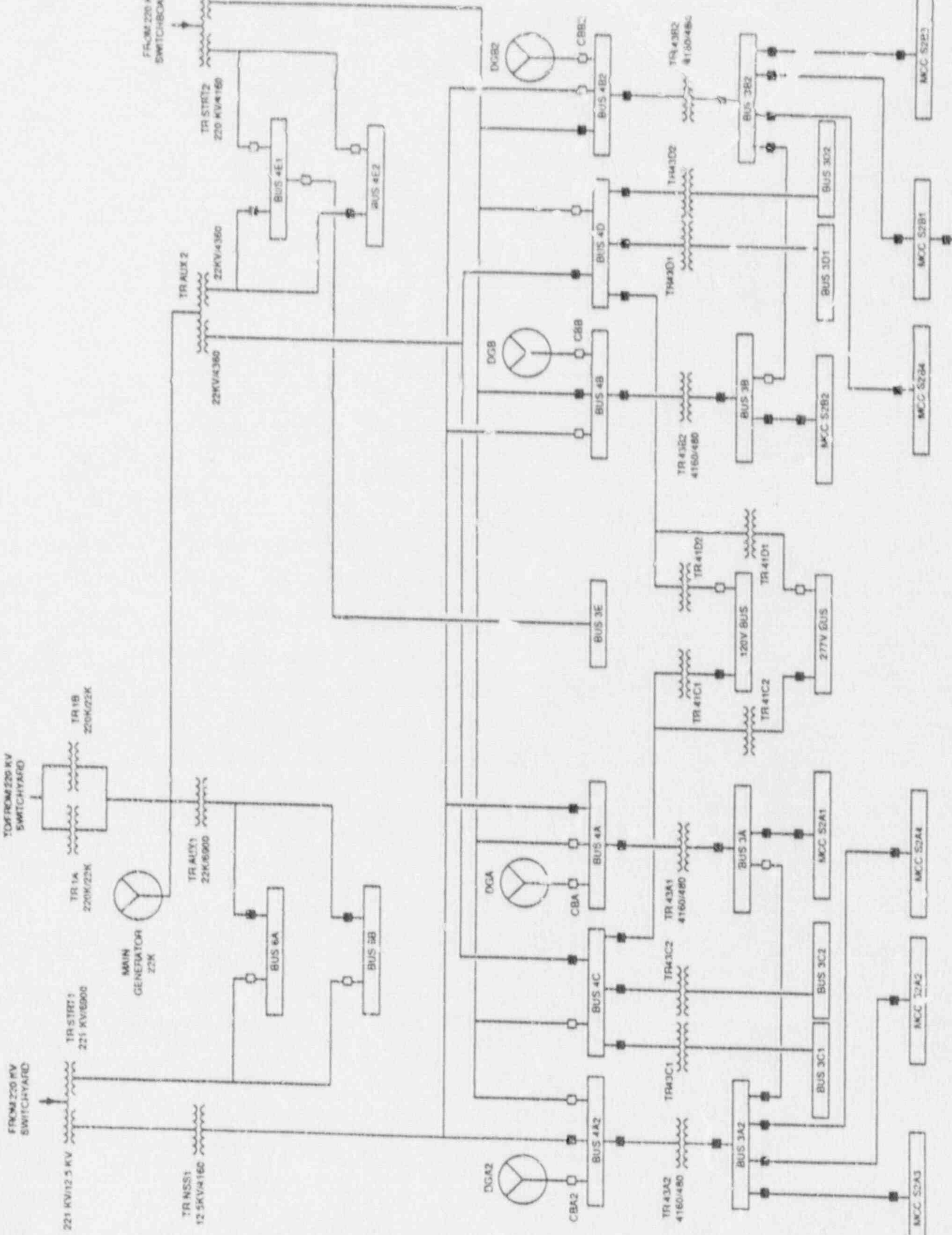

Figure 3.6-1. Rancho Seco AC Power System

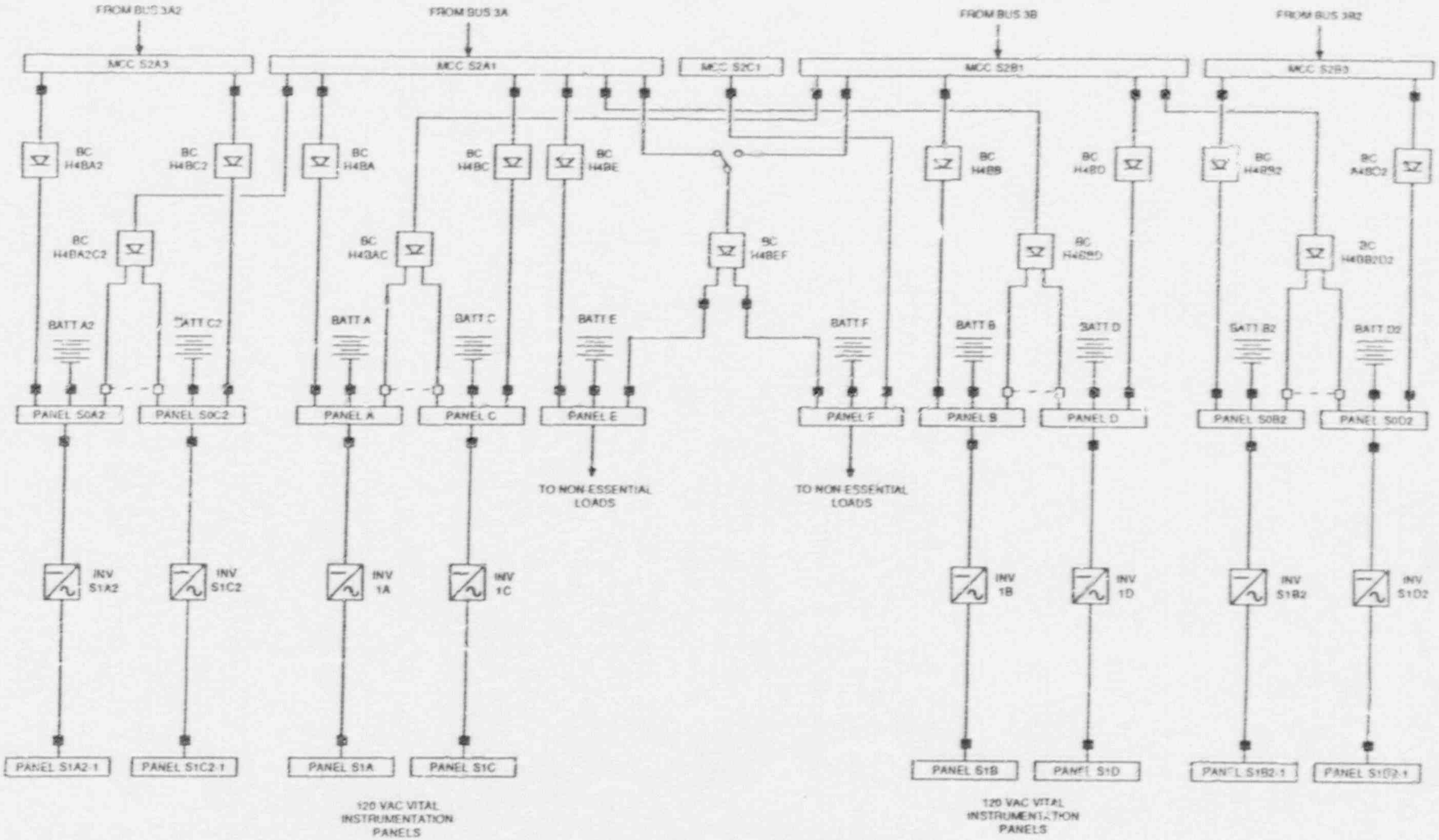

Figure 3.6-2. Rancho Seco 125 VDC/120 VAC Electric Power System

Table 3.6-1. Rancho Seco Electric Power System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BATT A	BATT	BATAC		125		A
BATT B	BATT	BATBD		125		B
BATT C	BATT	BATAC		125		A
BATT D	BATT	BATBD		125		B
BATT SOA2	BATT	NSEB		125		A2
BATT SOB2	BATT	NSEB		125		B2
BATT SOC2	BATT	NSEB		125		A2
BATT SOD2	BATT	NSEB		125		B2
BC-H4BA	BC	DCPNLW	MCCS2A1	480	480VRMW	A
BC-H4BA2	BC	NSEB	MCCS2A3	480	NSEB	A2
BC-H4BA2C2	BC	NSEB	MCCS2A1	480	480VRMW	A
BC-H4BAC	BC	DCPNLW	MCCS2B1	480	480VRME	B
BC-H4BB	BC	DCPNLE	MCCS2B1	480	480VRME	B
BC-H4BB2	BC	NSEB	MCCS2B3	480	NSEB	B2
BC-H4BB2D2	BC	NSEB	MCCS2B1	480	480VRME	B
BC-H4BBD	BC	DCPNLE	MCCS2A1	480	480VRMW	A
BC-H4BC	BC	DCPNLW	MCCS2A1	480	480VRMW	A
BC-H4BC2	BC	NSEB	MCCS2A3	480	NSEB	A2
BC-H4BD	BC	DCPNLE	MCCS2B1	480	480VRME	B
BC-H4BD2	BC	NSEB	MCCS2B3	480	NSEB	B2
BUS 3A	BUS	480VRMW	TR43A1	480	TRR3A	A
BUS 3A	BUS	480VRMW	BUS 3A2	480	NSEB	A2
BUS 3A2	BUS	NSEB	BUS 3A	480	NSEB	A
BUS 3A2	BUS	NSEB	TR 43A2	480	NSEB	A2
BUS 3B	BUS	480VRME	TR43B2	480	4KVRME	B
BUS 3B	BUS	480VRME	BUS 3B2	480	NSEB	B2
BUS 3B2	BUS	NSEB	BUS 3B	480	NSEB	B
BUS 3B2	BUS	NSEB	TR 43B2A	480	NSEB	B2

Table 3.6-1. Rancho Seco Electric Power System Data Summary for Selected Components (Continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BUS 4A2	BUS	NSEB	CB 4A2	4160	NSEB	A2
BUS 4B2	BUS	NSEB	CB 4B2	4160	NSEB	B2
BUS4A	BUS	4KVRMW	CB 4A	4160	4KVRMW	A
BUS4B	BUS	4KVRME	CB 4B	4160	4KVRME	B
CB 4A2	CB	NSEB	DGA2	4160	NEWDGA2	A2
CB 4B2	CB	NSEB	DGB2	4160	NEWDGB2	B2
CB4A	CB	4KVRMW	DGA	4160	DGA	A
CB4B	CB	4KVRME	DGB	4160	DGB	B
DG A2	DG	NEWDGA2		4160		A2
DG B2	DG	NEWDGB2		4160		B2
DGA	DG	DGA		4160		A
DGB	DG	DGB		4160		B
INV 1A	BUS	UNKNOWN	PANEL A	125	DCPNLW	A
INV 1B	BUS	UNKNOWN	PANEL B	125	DCPNLE	B
INV 1C	BUS	UNKNOWN	PANEL C	125	DCPNLW	A
INV 1D	BUS	UNKNOWN	PANEL D	125	DCPNLE	B
MCCS2A1	BUS	480VRMW	BUS 3A	480	480VRMW	A
MCCS2A3	BUS	NSEB	BUS 3A2	480	NSEB	A2
MCCS2B1	BUS	480VRME	BUS 3B	480	480VRME	B
MCCS2B3	BUS	NSEB	BUS 3B2	480	NSEB	B2
PANEL A	BUS	DCPNLW	BC-H4BA	125	DCPNL[illegible]	A
PANEL A	BUS	DCPNLW	BATT A	125	BATAC	A
PANEL A	BUS	DCPNLW	BC-H4BAC	125	DCPNLW	A
PANEL B	BUS	DCPNLE	BC-H4BB	125	DCPNLE	B
PANEL B	BUS	DCPNLE	BC-H4BBD	125	DCPNLE	B
PANEL B	BUS	DCPNLE	BATT B	125	BATBD	B
PANEL C	BUS	DCPNLW	BC-H4BAC	125	DCPNLW	A
PANEL C	BUS	DCPNLW	BATT C	125	BATAC	A

Table 3.6-1. Rancho Seco Electric Power System Data Summary for Selected Components (Continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
PANEL C	BUS	DCPNLW	BC-H4BC	125	DCPNLW	A
PANEL D	BUS	DCPNLE	BC-H4BBD	125	DCPNLE	B
PANEL D	BUS	DCPNLE	BATT D	125	BATBD	B
PANEL D	BUS	DCPNLE	BC-H4BD	125	DCPNLE	B
PANEL S1A	BUS	DCPNLW	INV 1A	120	DCPNLW	A
PANEL S1B	BUS	DCPNLE	INV 1B	120	DCPNLE	B
PANEL S1C	BUS	DCPNLW	INV 1C	120	DCPNLW	A
PANEL S1D	BUS	DCPNLE	INV 1D	120	DCPNLE	B
PANEL SOA2	BUS	NSEB	BATT SOA2	125	NSEB	A2
PANEL SOA2	BUS	NSEB	BC-H4BA2	125	NSEB	A2
PANEL SOA2	BUS	NSEB	BC-H4BA2C2	125	NSEB	A2
PANEL SOB2	BUS	NSEB	BATT SOB2	125	NSEB	B2
PANEL SOB2	BUS	NSEB	BC-H4BB2	125	NSFB	B2
PANEL SOB2	BUS	NSEB	BC-H4BB2D2	125	NSEB	B2
PANEL SOC2	BUS	NSEB	BATT SOC2	125	NSEB	A2
PANEL SOC2	BUS	NSEB	BC-H4BC2	125	NSEB	A2
PANEL SOC2	BUS	NSEB	BC-H4BA2C2	125	NSEB	A2
PANEL SOD2	BUS	NSEB	BATT SOD2	125	NSEB	B2
PANEL SOD2	BUS	NSEB	BC-H4BD2	125	NSEB	B2
PANEL SOD2	BUS	NSEB	BC-H4BB2D2	125	NSEB	B2
TR 43A2	XFMR	NSEB	BUS 4A2	4160	NSEB	A2
TR 43B2A	XFMR	NSEB	BUS 4B2	4160	NSEB	B2
TR43A1	XFMR	TBR3A	BUS 4A	4160	4KVRMW	A
TR43B2	XFMR	4KVRME	BUS 4B	4160	4KVRME	B

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Rancho Seco

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BATT A	125	A	BATAC	EP	PANEL A	BUS	DCPNLW
BATT B	125	B	BATBD	EP	PANEL B	BUS	DCPNLE
BATT C	125	A	BATAC	EP	PANEL C	BUS	DCPNLW
BATT D	125	B	BATBD	EP	PANEL D	BUS	DCPNLE
BATT SOA2	125	A2	NSEB	EP	PANEL SOA2	BUS	NSEB
BATT SOA2	125	A2	NSEB	EP	PANEL SOA2	AUX	NSEB
BATT SOB2	125	B2	NSEB	EP	PANEL SOB2	BUS	NSEB
BATT SOB2	125	B2	NSEB	EP	PANEL SOB2	AUX	NSEB
BATT SOC2	125	A2	NSEB	EP	PANEL SOC2	BUS	NSEB
BATT SOD2	125	B2	NSEB	EP	PANEL SOD2	BUS	NSEB
BC-H4BA	125	A	DCPNLW	EP	PANEL A	BUS	DCPNLW
BC-H4BA2	125	A2	NSEB	EP	PANEL SOA2	BUS	NSEB
BC-H4BA2C2	125	A2	NSEB	EP	PANEL SOA2	BUS	NSEB
BC-H4BA2C2	125	A2	NSEB	EP	PANEL SOC2	BUS	NSEB
BC-H4BAC	125	A	DCPNLW	EP	PANEL A	BUS	DCPNLW
BC-H4BAC	125	A	DCPNLW	EP	PANEL C	BUS	DCPNLW
BC-H4BB	125	B	DCPNLE	EP	PANEL B	BUS	DCPNLE
BC-H4BB2	125	B2	NSEB	EP	PANEL SOB2	BUS	NSEB
BC-H4BB2D2	125	B2	NSEB	EP	PANEL SOB2	BUS	NSEB
BC-H4BB2D2	125	B2	NSEB	EP	PANEL SOD2	BUS	NSEB
BC-H4BBD	125	B	DCPNLE	EP	PANEL B	BUS	DCPNLE
BC-H4BBD	125	B	DCPNLE	EP	PANEL D	BUS	DCPNLE
BC-H4BC	125	A	DCPNLW	EP	PANEL C	BUS	DCPNLW
BC-H4BC2	125	A2	NSEB	EP	PANEL SOC2	BUS	NSEB
BC-H4BD	125	B	DCPNLE	EP	PANEL D	BUS	DCPNLE
BC-H4BD2	125	B2	NSEB	EP	PANEL SOD2	BUS	NSEB
BUS 3A	480	A	480VRMW	CCS	RBCU-500A	ACU	RC
BUS 3A	480	A	480VRMW	CCS	RBCU-500C	ACU	RC
BUS 3A	480	A	480VRMW	CCS	RBS-291A	MDP	DKPRMW
BUS 3A	480	A	NSEB	EP	BUS 3A2	BUS	NSEB
BUS 3A	480	A	480VRMW	EP	MCCS2A1	BUS	480VRMW

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Rancho Seco (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BUS 3A	480	A	480VRMW	NCW	NCW-482A	MDP	TKFM
BUS 3A2	480	A2	NSEB	EP	BUS 3A	BUS	480VRMW
BUS 3A2	480	A2	NSEB	EP	MCCS2A3	BUS	NSEB
BUS 3B	480	B	480VRME	CCS	RBCU-500B	ACU	RC
BUS 3B	480	B	480VRME	CCS	RBCU-500D	ACU	RC
BUS 3B	480	B	480VRME	CCS	RBS-291B	MDP	DKPRME
BUS 3B	480	B	NSEB	EP	BUS 3B2	BUS	NSEB
BUS 3B	480	B	480VRME	EP	MCCS2B1	BUS	480VRME
BUS 3B	480	B	480VRME	NCW	NCW-482B	MDP	TKFM
BUS 3B2	480	B2	NSEB	EP	BUS 3B	BUS	480VRME
BUS 3B2	480	B2	NSEB	EP	MCCS2B3	BUS	NSEB
BUS 4A	4160	A	4KVRMW	ECCS	DHR-261B	MDP	DKPRMW
BUS 4A	4160	A	4KVRMW	ECCS	HPI-238A	MDP	HPIA
BUS 4A	4160	A	4KVRMW	EP	TR43A1	XFMR	TRR3A
BUS 4A	4160	A	4KVRMW	NRW	NRW-472A	MDP	NRWA
BUS 4A2	4160	A2	NSEB	AFW	AFW-319	MDP	AFWCAGE
BUS 4A2	4160	A2	NSEB	EP	TR 43A2	XFMR	NSEB
BUS 4B	4160	B	4KVRME	ECCS	DHR-261B	MDP	DKPRME
BUS 4B	4160	B	4KVRME	ECCS	HPI-236	MDP	MKUP
BUS 4B	4160	B	4KVRME	ECCS	HPI-238B	MDP	HPIB
BUS 4B	4160	B	4KVRME	EP	TR43B2	XFMR	4KVRME
BUS 4B	4160	B	4KVRME	NRW	NRW-472B	MDP	NRWB
BUS 4B2	4160	B2	NSEB	AFW	AFW-318	MDP	AFWCAGE
BUS 4B2	4160	B2	NSEB	EP	TR 43B2A	XFMR	NSEB
CB 4A	4160	[illegible]	4KVRMW	EP	BUS4A	BUS	4KVRMW
CB 4A2	4160	A2	NSEB	EP	BUS 4A2	BUS	NSEB
CB 4B	4160	B	4KVRME	EP	BUS4B	BUS	4KVRME
CB 4B2	4160	B2	NSEB	EP	BUS 4B2	BUS	NSEB
DGA	4160	A	DGA	EP	CB4A	CB	4KVRMW
DGA2	4160	A2	NEWDGA2	EP	CB 4A2	CB	NSEB
DGB	4160	B	DGB	EP	CB4B	CB	4KVRME

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Rancho Seco (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
DGB2	4160	B2	NEWDGB2	EP	CB 4B2	CB	NSEB
INV 1A	120	A	DCPNLW	EP	PANEL S1A	BUS	DCPNLW
INV 1B	120	B	DCPNLE	EP	PANEL S1B	BUS	DCPNLE
INV 1C	120	A	DCPNLW	EP	PANEL S1C	BUS	DCPNLW
INV 1D	120	B	DCPNLE	EP	PANEL S1D	BUS	DCPNLE
MCC S2A1	480	A	480VRMW	AFW	AFW-569	MOV	TKFM
MCC S2A1	480	A	480VRMW	ECCS	HPI-508	MOV	MKUP
MCC S2A1	480	A	480VRMW	RCS	RCS-23	MOV	RC
MCC S2A1	480	A	480VRMW	RCS	RCS-5	MOV	RC
MCC S2A1	480	A	480VRMW	RCS	RCS-6	MOV	RC
MCC S2A3	480	A2	NSEB	AFW	AFW-827	MOV	AFWCAGE
MCC S2B3	480	B2	NSEB	AFW	AFW-826	MOV	AFWCAGE
MCCS2A1	480	A	480VRMW	CCS	RBS-107	MOV	PENRMW
MCCS2A1	480	A	480VRMW	ECCS	DHR-039	MOV	PENRMW
MCCS2A1	480	A	480VRMW	ECCS	DHR-046	MOV	PENRME
MCCS2A1	480	A	480VRMW	ECCS	DHR-105	MOV	DKPRMW
MCCS2A1	480	A	480VRMW	ECCS	HPI-003	MOV	PENRMW
MCCS2A1	480	A	480VRMW	ECCS	HPI-005	MOV	DKPRMW
MCCS2A1	480	A	480VRMW	ECCS	HPI-005	MOV	DKPRMW
MCCS2A1	480	A	480VRMW	ECCS	HPI-007	MOV	PENRMW
MCCS2A1	480	A	480VRMW	ECCS	HPI-508	MOV	MKUP
MCCS2A1	480	A	480VRMW	EP	BC-H4BA	BC	DCPNLW
MCCS2A1	480	A	480VRMW	EP	BC-H4BA2C2	BC	NSEB
MCCS2A1	480	A	480VRMW	EP	BC-H4BBD	BC	DCPNLE
MCCS2A1	480	A	480VRMW	EP	BC-H4BC	BC	DCPNLW
MCCS2A1	480	A	480VRMW	NCW	NCW-005	MOV	PENRMW
MCCS2A1	480	A	480VRMW	NCW	NCW-007	MOV	PENRMW
MCCS2A1	480	A	480VRMW	NCW	NCW-009	MOV	PENRMW
MCCS2A1	480	A	480VRMW	NCW	NCW-011	MOV	PENRMW
MCCS2A1	480	A	480VRMW	NCW	NCW-017	MOV	PENRMW
MCCS2A1	480	A	480VRMW	NCW	NCW-019	MOV	PENRMW

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Rancho Seco (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCCS2A1	480	A	480VRMW	RCS	DHR-001	MOV	RC
MCCS2A3	480	A2	NSEB	EP	BC-H4BA2	BC	NSEB
MCCS2A3	480	A2	NSEB	EP	BC-H4BC2	BC	NSEB
MCCS2B1	480	B	480VRME	AFW	AFW-596	MOV	TKFM
MCCS2B1	480	B	480VRME	CCS	RBS-108	MOV	PENRME
MCCS2B1	480	B	480VRME	ECCS	DHR-040	MOV	PENRME
MCCS2B1	480	B	480VRME	ECCS	DHR-047	MOV	PENRME
MCCS2B1	480	B	480VRME	ECCS	DHR-106	MOV	DKPRME
MCCS2B1	480	B	480VRME	ECCS	HPI-004	MOV	SEALCRM
MCCS2B1	480	B	480VRME	ECCS	HPI-006	MOV	DKPRME
MCCS2B1	480	B	480VRME	ECCS	HPI-006	MOV	DKPRME
MCCS2B1	480	B	480VRME	ECCS	HPI-008	MOV	PENRME
MCCS2B1	480	B	480VRME	ECCS	HPI-508	MOV	MKUP
MCCS2B1	480	B	480VRME	ECCS	HPI-508	MOV	MKUP
MCCS2B1	480	B	480VRME	EP	BC-H4BAC	BC	DCPNLW
MCCS2B1	480	B	480VRME	EP	BC-H4BB	BC	DCPNLE
MCCS2B1	480	B	480VRME	EP	BC-H4BB2D2	BC	NSEB
MCCS2B1	480	B	480VRME	EP	BC-H4BD	BC	DCPNLE
MCCS2B1	480	B	480VRME	NCW	NCW-006	MOV	PENRME
MCCS2B1	480	B	480VRME	NCW	NCW-008	MOV	PENRME
MCCS2B1	480	B	480VRME	NCW	NCW-010	MOV	PENRME
MCCS2B1	480	B	480VRME	NCW	NCW-012	MOV	PENRME
MCCS2B1	480	B	480VRME	NCW	NCW-016	MOV	PENRME
MCCS2B1	480	B	480VRME	NCW	NCW-018	MOV	PENRME
MCCS2B1	480	B	480VRME	RCS	DHR-002	MOV	RC
MCCS2B1	480	B	480VRME	RCS	RCS-2S	MOV	RC
MCCS2B1	480	B	480VRME	RCS	RCS-505	SRV	RC
MCCS2B3	480	B2	NSEB	EP	BC-H4BB2	BC	NSEB
MCCS2B3	480	B2	NSEB	EP	BC-H4BD2	BC	NSEB
PANEL A	125	A	DCPNLW	EP	INV 1A	BUS	UNKNOWN
PANEL B	125	B	DCPNLE	EP	INV 1B	BUS	UNKNOWN

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Rancho Seco (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
PANEL C	120	A	DCPNLW	ECCS	HPI-604	MOV	PENRMW
PANEL C	120	A	DCPNLW	ECCS	HPI-809	MOV	PENRMW
PANEL C	120	A	DCPNLW	ECCS	HPI-811	MOV	PENRMW
PANEL C	125	A	DCPNLW	EP	INV 1C	BUS	UNKNOWN
PANEL D	120	B	DCPNLE	ECCS	HPI-810	MOV	PENRME
PANEL D	120	B	DCPNLE	ECCS	HPI-812	MOV	PENRME
PANEL D	125	B	DCPNLE	EP	INV 1D	BUS	UNKNOWN
PANEL SOB2	125	B2	NSEB	AFW	AFW-531	MOV	TKFM
PANEL SOB2	125	B2	NSEB	AFW	AFW-532	MOV	TKFM
PANEL SOB2	125	B2	NSEB	AFW	AFW-801	MOV	AFWCAGE
PANEL SOC2	125	A2	NSEB	AFW	AFW-578	MOV	TKFM
PANEL SOC2	125	A2	NSEB	AFW	AFW-581	MOV	TKFM
PANEL SOD2	125	B2	NSEB	AFW	AFW-577	MOV	TKFM
PANEL SOD2	125	B2	NSEB	AFW	AFW-582	MOV	TKFM
TR 43A2	480	A2	NSEB	EP	BUS 3A2	BUS	NSEB
TR 43B2A	480	B2	NSEB	EP	BUS 3B2	BUS	NSEB
TR43A1	480	A	TRR3A	EP	BUS 3A	BUS	480VRMW
TR43B2	480	B	4KVRME	EP	BUS 3B	BUS	480VRME

3.7 NUCLEAR SERVICE COOLING WATER (NCW) SYSTEM

3.7.1 System Function

The NCW system is designed to provide cooling for various components and remove residual and sensible heat from the RCS and containment during plant shutdown by cooling the DHR heat exchangers. The NCW system is an intermediate cooling loop between the heat loads and the service water system.

3.7.2 System Definition

The NCW system is a closed loop cooling system consisting of two essential cooling loops. Each essential loop consists of one pump and one NCW heat exchanger. The cooling loads are divided between the two essential loops in such a manner to ensure that each loop serves a redundant set of components needed to establish and maintain a safe shutdown condition following a design basis accident. The NCW heat exchangers transfer heat to the Nuclear Raw Service Water System. A surge tank accommodates expansion, contraction, and inleakage of water.

Simplified drawings of the essential loops of the NCW system are shown in Figures 3.7-1 and 3.7-2. A summary of data on selected NCW system components is presented in Table 3.7-1.

3.7.3 System Operation

The NCW system is required for plant cooldown and shutdown operation, but not for normal operation. During an emergency, the NCW system is automatically started by an SFAS signal. Each loop of the NCW system supports two reactor building cooling units and one DHR cooler.

3.7.4 System Success Criteria

In general, the components cooled by the NCW are served by only one loop and its associated pump and heat exchanger. Therefore, the cooled components can be assumed to fail their function if their associated NCW loop is unavailable.

3.7.5 Component Information

A. Nuclear Service Cooling Water Pumps 482A and 482B
   1. Rated flow: 6500 gpm @ 120 ft head (52 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

B. Nuclear Service Cooling Heat Exchangers 480A and 480B
   1. Design duty: 165 x 10^6 Btu/hr
   2. Type: shell and tube

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      An SFAS signal (see Section 3.5) will start the NCW pumps.
   2. Remote Manual
      The NCW pumps can be actuated by remote manual means from the control room.

B. Motive Power

1. The NCW motor-driven pumps and motor operated valves are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.

C. Other

1. The NCW heat exchangers are cooled by the Nuclear Raw Water System (see Section 3.8).
2. Lubrication and cooling are provided locally for the NCW pumps.

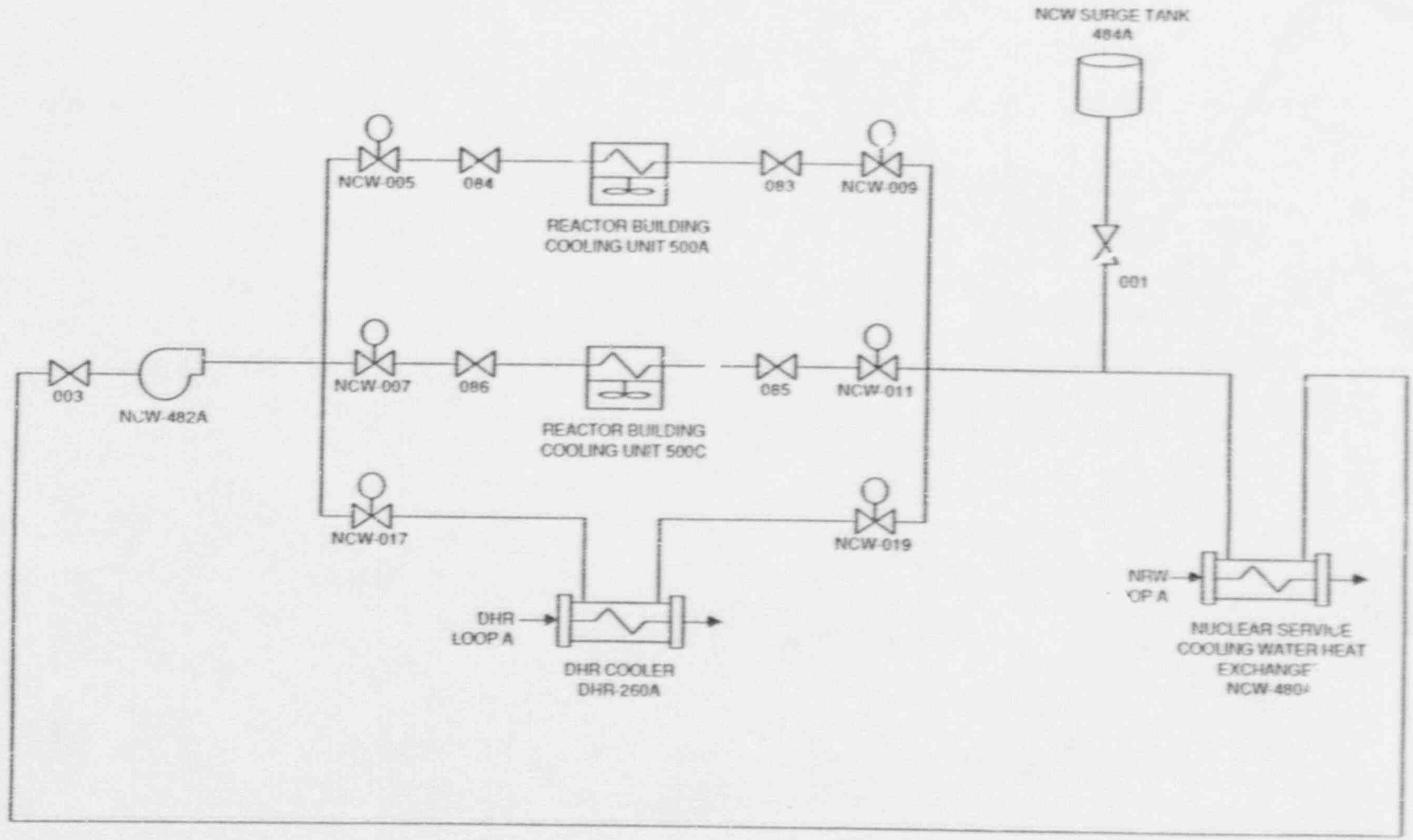

Figure 3.7-1. Rancho Seco Nuclear Service Cooling Water System
(Page 1 of 2)

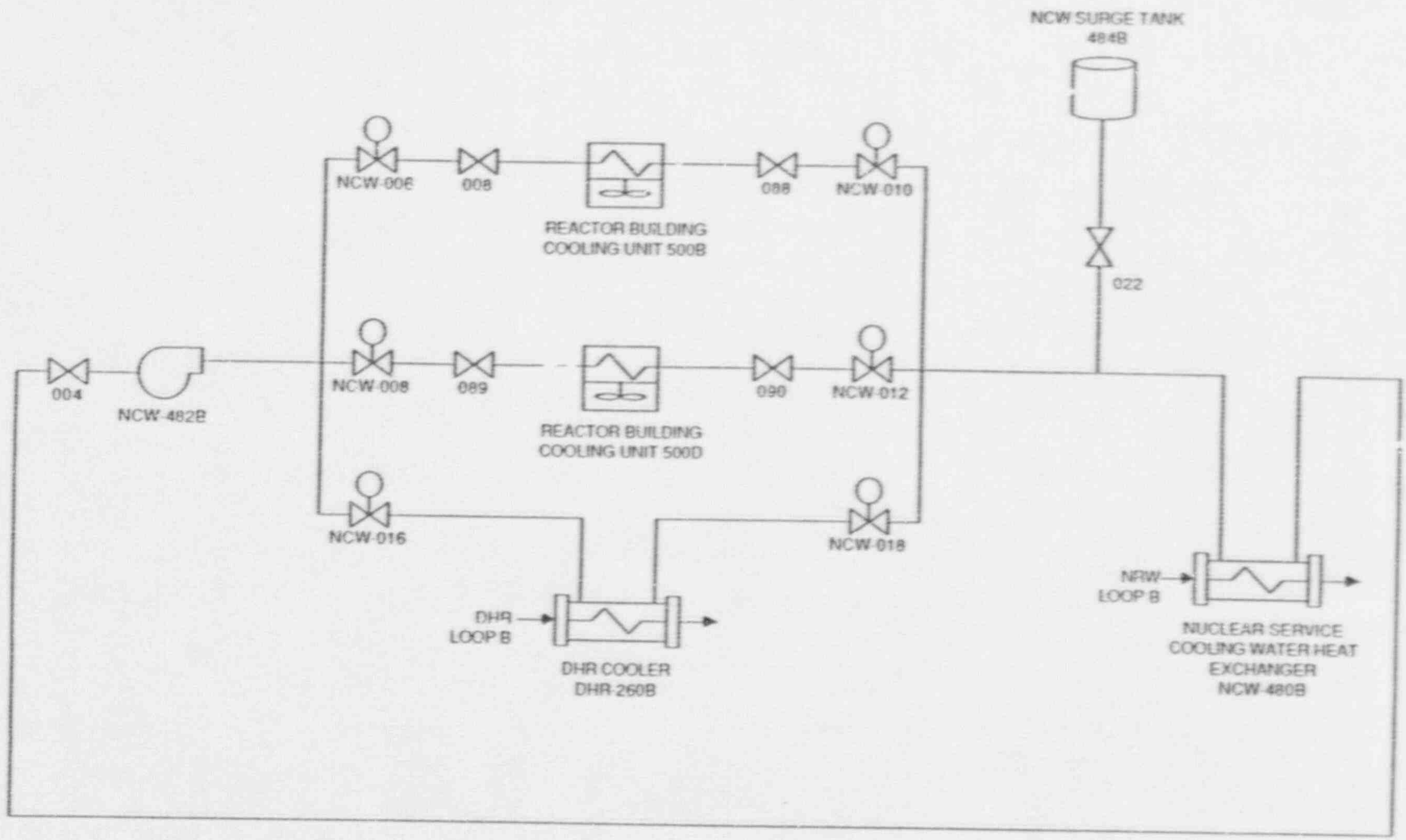

Figure 3.7-1. Rancho Seco Nuclear Service Cooling Water System (Page 2 of 2)

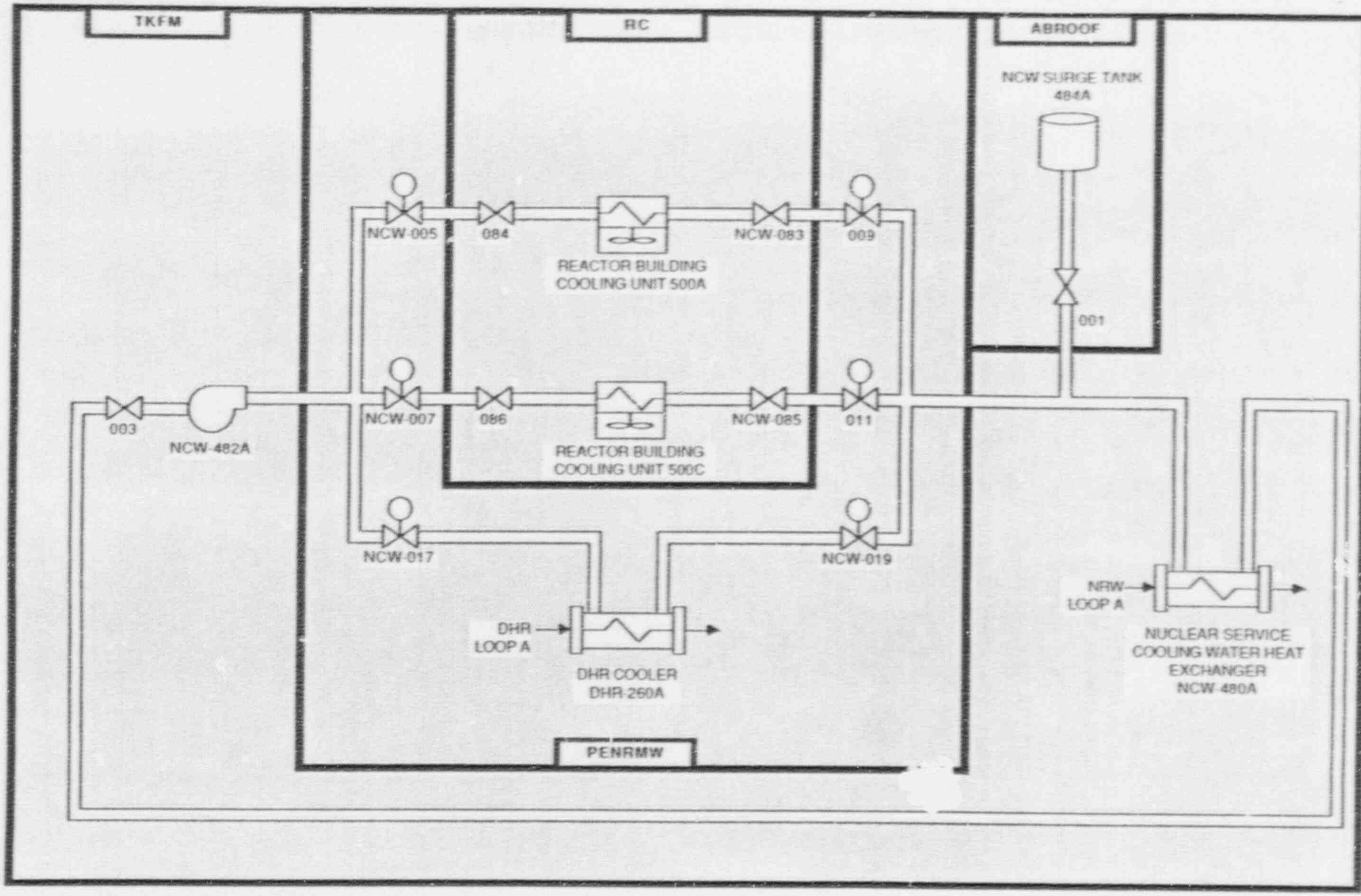

Figure 3.7-2. Rancho Seco Nuclear Service Cooling Water System Showing Component Locations (Page 1 of 2)

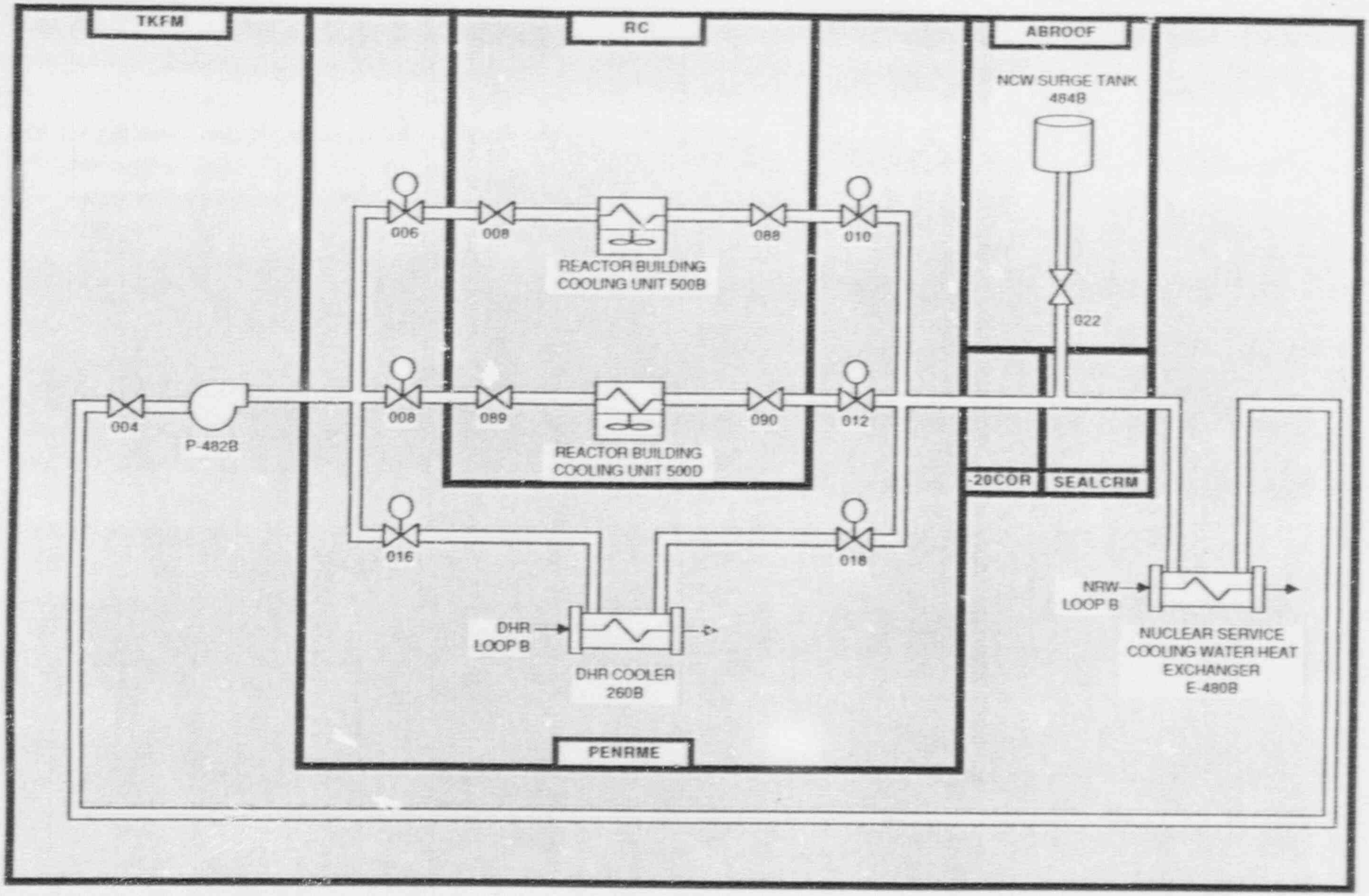

Figure 3.7-2. Rancho Seco Nuclear Service Cooling Water System Showing Component Locations (Page 2 of 2)

Table 3.7-1. Rancho Seco Nuclear Service Cooling Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
NCW-005	MOV	PENRMW	MCCS2A1	480	480VRMW	A
NCW-006	MOV	PENRME	MCCS2B1	480	480VRME	B
NCW-007	MOV	PENRMW	MCCS2A1	480	480VRMW	A
NCW-008	MOV	PENRME	MCCS2B1	480	480VRME	B
NCW-009	MOV	PENRMW	MCCS2A1	480	480VRMW	A
NCW-010	MOV	PENRME	MCCS2B1	480	480VRME	B
NCW-011	MOV	PENRMW	MCCS2A1	480	480VRMW	A
NCW-012	MOV	PENRME	MCCS2B1	480	480VRME	B
NCW-016	MOV	PENRME	MCCS2B1	480	480VRME	B
NCW-017	MOV	PENRMW	MCCS2A1	480	480VRMW	A
NCW-018	MOV	PENRME	MCCS2B1	480	480VRME	B
NCW-019	MOV	PENRMW	MCCS2A1	480	480VRMW	A
NCW-480A	HX	TKFM				
NCW-480B	HX	TKFM				
NCW-482A	MDP	TKFM	BUS 3A	480	480VRMW	A
NCW-482B	MDP	TKFM	BUS 3B	480	480VRME	B

3.8 NUCLEAR SERVICE RAW WATER (NRW) SYSTEM

3.8.1 System Function

The NRW System supplies cooling water from the ultimate heat sink, the spray ponds, to various heat loads in the plant. The system is designed to provide a continuous flow of cooling water to those systems and components necessary for plant safety either during normal operation or under abnormal and accident conditions.

3.8.2 System Definition

The NRW System contains two independent headers, each supplied by a single motor-driven pump. Simplified drawings of the NRW system are shown in Figure 3.8-1 and 3.8-2. A summary of data on selected NRW system components is presented in Table 3.8-1.

3.8.3 System Operation

During normal operation the NRW system is in standby. The normal sources of water for the NRW system are the spray ponds. Makeup water for the spray ponds is normally supplied by the service water system from the Folsom South Canal. The NRW pumps take suction from the spray ponds and circulate it through the heat exchangers. The warm water is returned to the spray ponds through a system of spray nozzles.

3.8.4 System Success Criteria

Following a LOCA, either of the two independent NRW trains is capable of handling all heat loads for 13.8 days without make-up (Ref. 1). Components are cooled by only one NRW train, however. The NRW trains can be manually cross-connected.

3.8.5 Component Information

A. NRW pumps 472A and 472B
   1. Rated flow: 16,000 gpm @ 80 ft. head (35 psid)
   2. Rated Capacity: 100%
   3. Type: Vertical, wet pit

B. Ultimate Heat Sink
   1. Spray ponds (East and West)

3.8.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      An SFAS Signal (see Section 3.5) causes the actuation of the NRW pumps 472A and 472B.
   2. Remote Manual
      The NRW pumps can be actuated by remote manual means from the control room.

B. Motive Power
   The NRW motor driven pumps and motor operated valves are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.

C. Other
   1. Lubrication and cooling are provided locally for the NRW pumps.
   2. The method of NRW pump room ventilation has not been determined.

3.8.7 Section 3.8 References

1. Rancho Seco Updated Final Safety Analysis Report, Section 9.4.2.3.

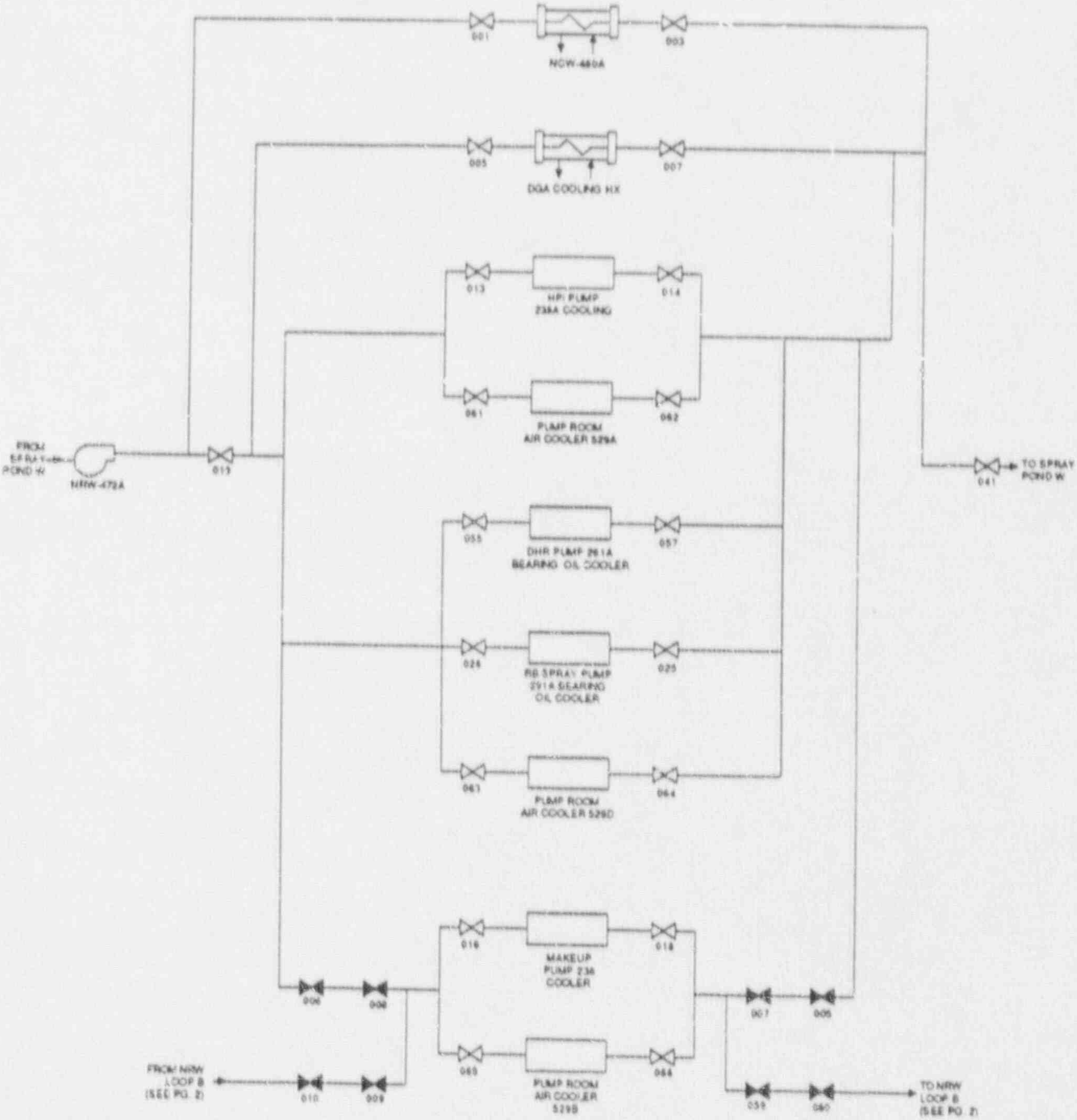

Figure 3.8-1. Rancho Seco Nuclear Service Raw Water System (Page 1 of 2)

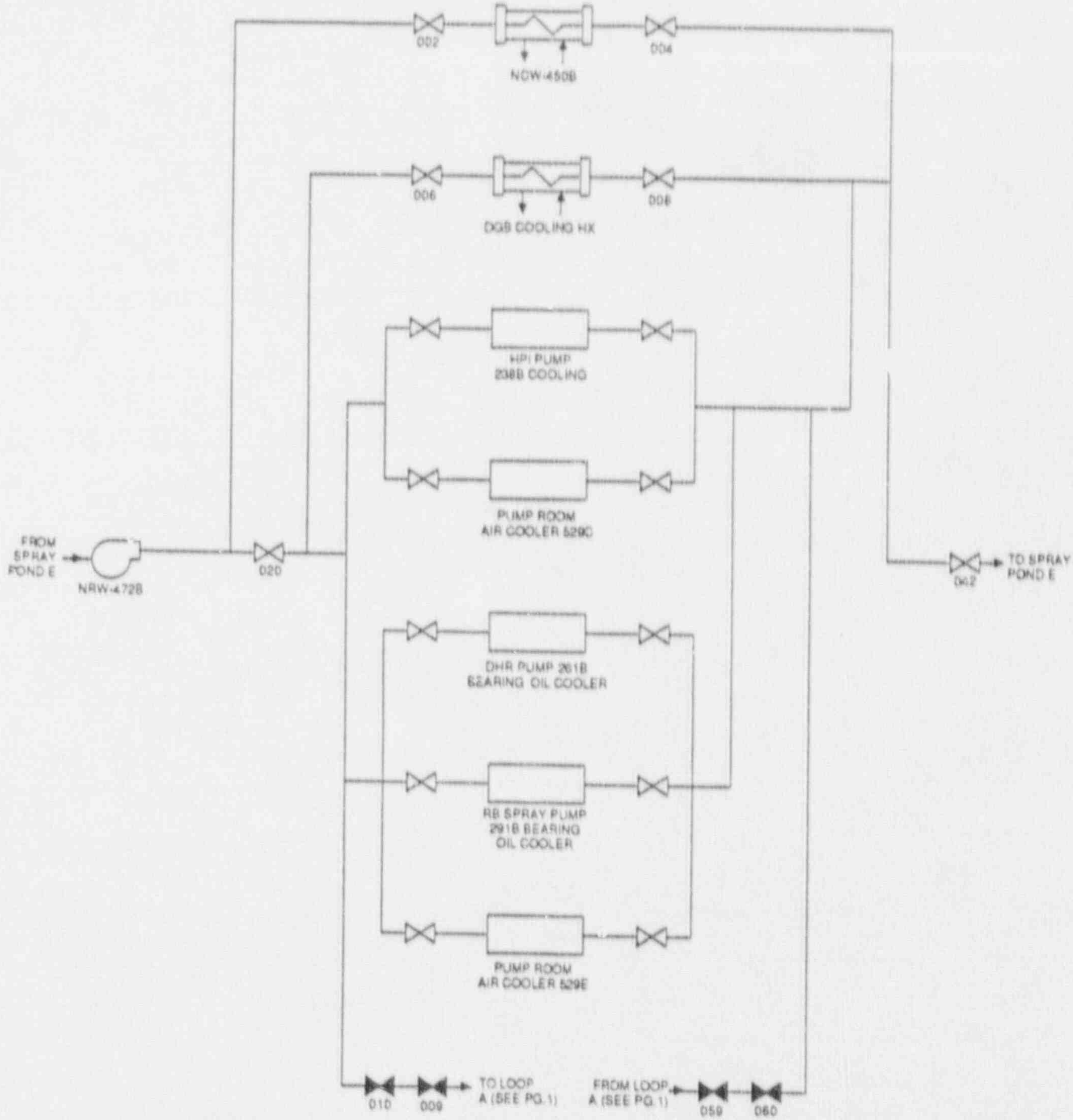

Figure 3.8-1. Rancho Seco Nuclear Service Raw Water System (Page 2 of 2)

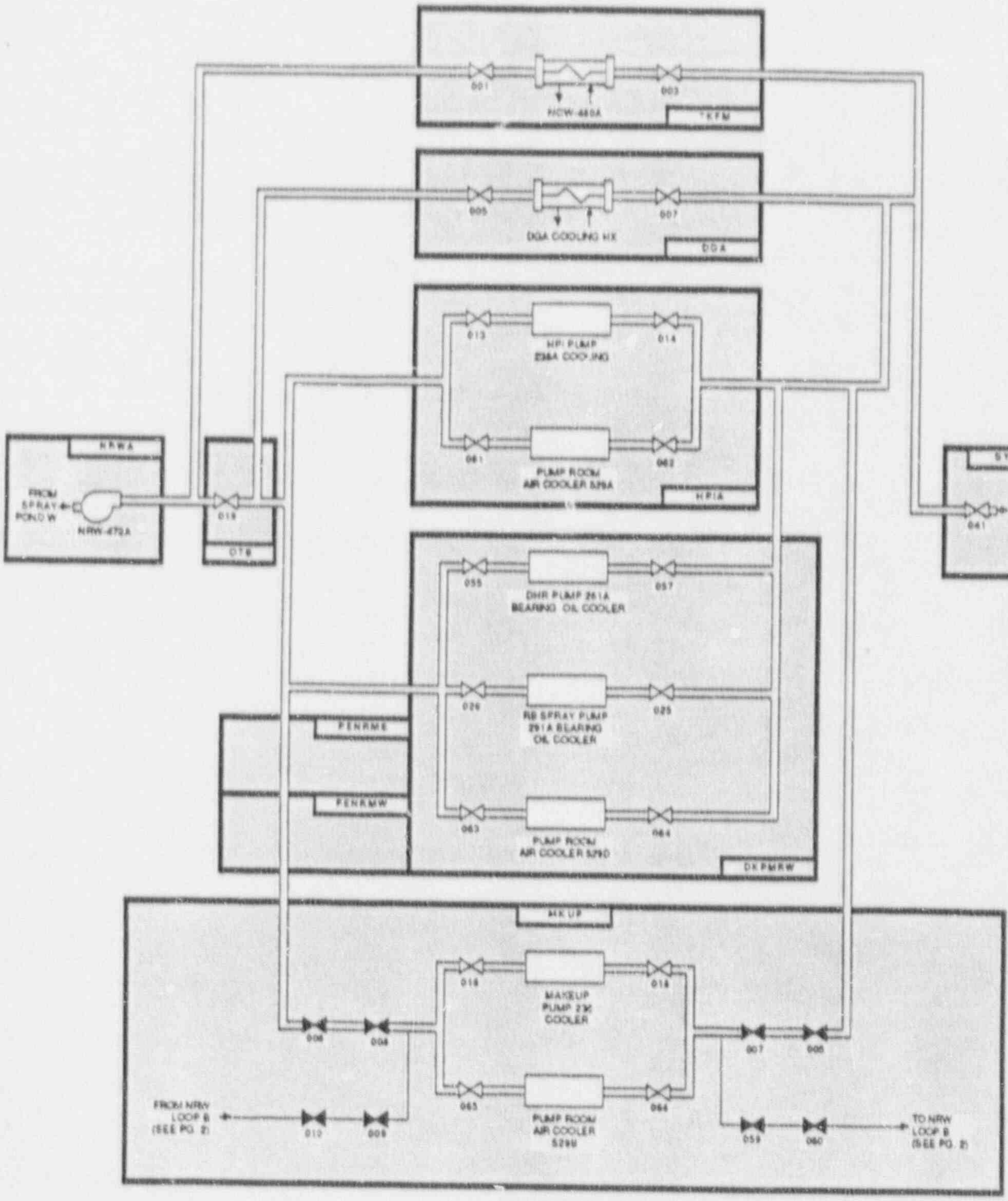

Figure 3.8-2. Rancho Seco Nuclear Service Raw Water System Showing Component Locations (Page 1 of 2)

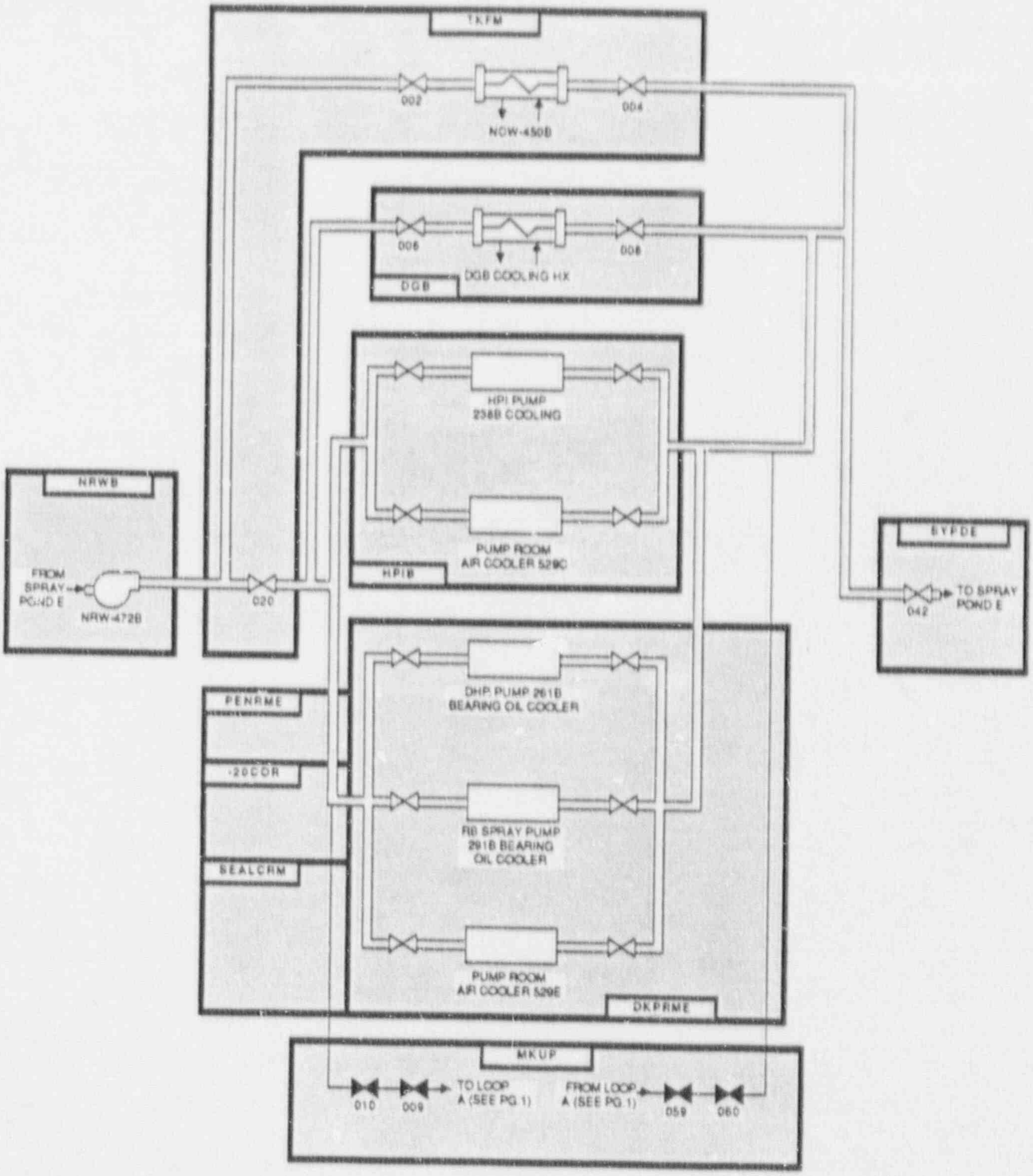

Figure 3.8-2. Rancho Seco Nuclear Service Raw Water System Showing Component Locations (Page 2 of 2)

Table 3.8-1. Rancho Seco Nuclear Service Raw Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
NRW-472A	MDP	NRWA	BUS 4A	4160	4KVRMW	A
NRW-472B	MDP	NRWB	BUS 4B	4160	4KVRME	B

3.9 CONTAINMENT COOLING SYSTEMS

3.9.1 System Function

The containment cooling systems consist of the Reactor Building Spray (RBS) system and the Reactor Building Emergency Cooling Units (RBCU). These systems cool the containment atmosphere and reduce containment pressure following a loss of coolant accident.

3.9.2 System Definition

The Reactor Building Spray system consists of redundant loops that contain a motor driven pump, a motor driven valve, a series of spray nozzles inside containment, a spray additive tank, and necessary piping and controls.

The Reactor Building Cooling Units are four independent units consisting of a cooling coil, and a direct-driven fan enclosed in a common housing.

Simplified drawings of the RBS system are shown in Figures 3.9-1 and 3.9-2. A summary of data on selected containment cooling system components is presented in Table 3.9-1.

3.9.3 System Operation

The containment cooling systems normally are in standby. Cooling operation is initiated automatically after a 5 minute delay, by a high reactor building pressure of 30 psig. The RBS and RBCU systems have a combined capacity of 200 percent of the containment design cooling requirements.

3.9.4 System Success Criteria

Success of the containment cooling systems is based on removal of 100% of the required heat (240 x 10^6 Btu/hr) from the containment. This requirement is met by any of the following combinations (Ref. 1 and 2):

- 2 of 2 independent RBS trains providing its rated spray flow.
- 1 of 2 RBS trains providing it rated spray flow and 2 of 4 RBCUs operating.
- 4 of 4 RBCUs operating.

3.9.5 Component Information

A. Reactor Building Spray Pumps 291A and 291B
   1. Rated flow: 1,500 gpm at 410 ft. head (178 psid)
   2. Rated Capacity: 50%

B. Reactor Building Cooling Units 500 A, B, C, and D
   1. Peak heat load: 60 x 10^6 Btu/hr each
   2. Rated Capacity: 25% each

3.9.6 Support Systems and Interfaces

A. Control Signals
   1. An SFAS Signal will start the RBS pumps and RBCUs.
   2. Remote Manual
      The RBS pumps and RBCUs can be started by remote manual means from the control room.

B. Motive Power
   1. The RBS pumps and RBCUs are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.

C. Other
   1. The RBCUs are cooled by the Nuclear Service Cooling Water System (see Section 3.7).
   2. The RBS pumps are cooled by the Nuclear Service Raw Water System (see Section 3.8).

3.9.7 Section 3.9 References

1. Rancho Seco Updated Final Safety Analysis Report, Section 6.3.2.2.

2. Rancho Seco Updated Final Safety Analysis Report, Section 6.4.2.3.3.

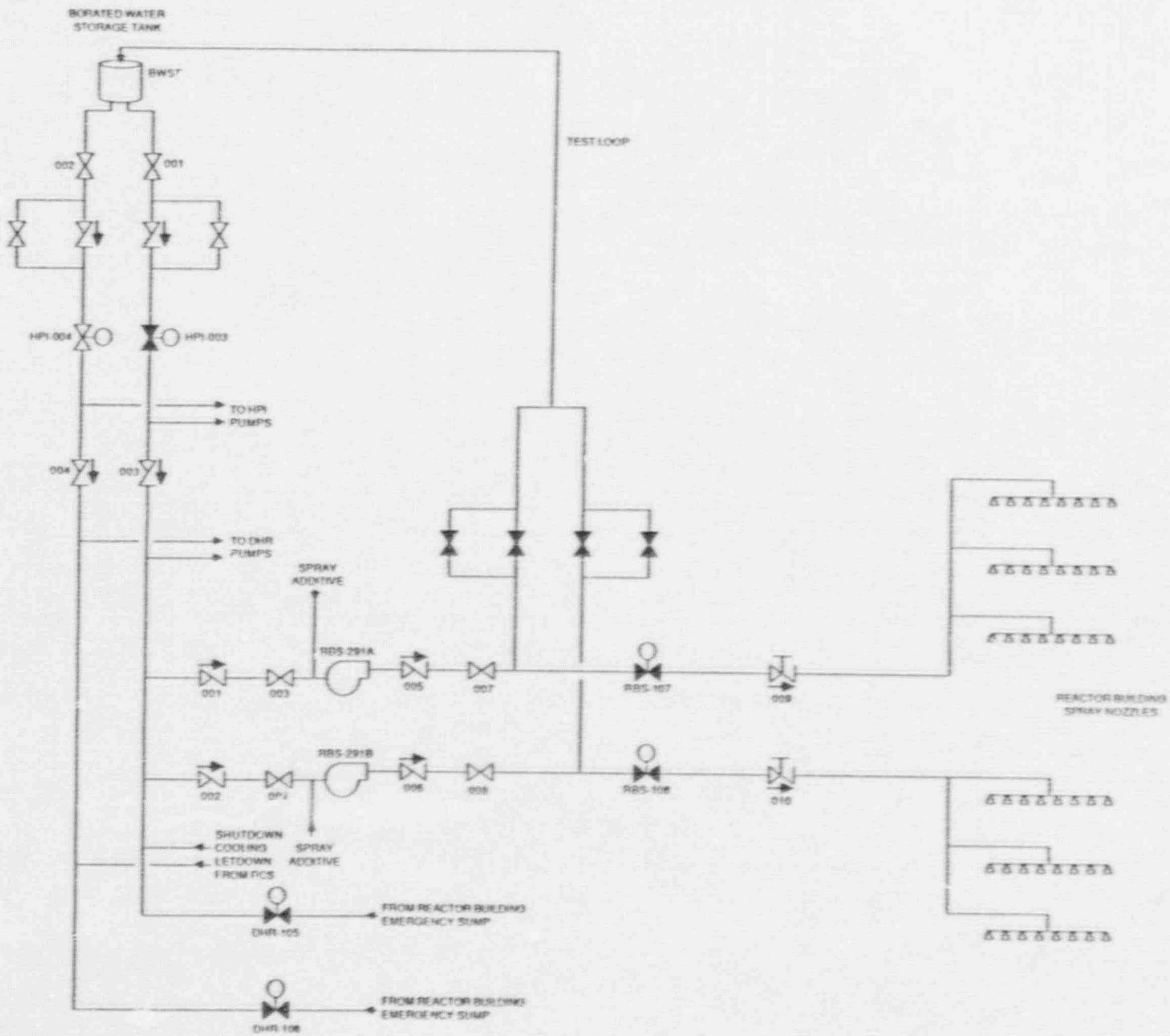

Figure 3.9-1. Ranc' . Seco Reactor Building Spray System

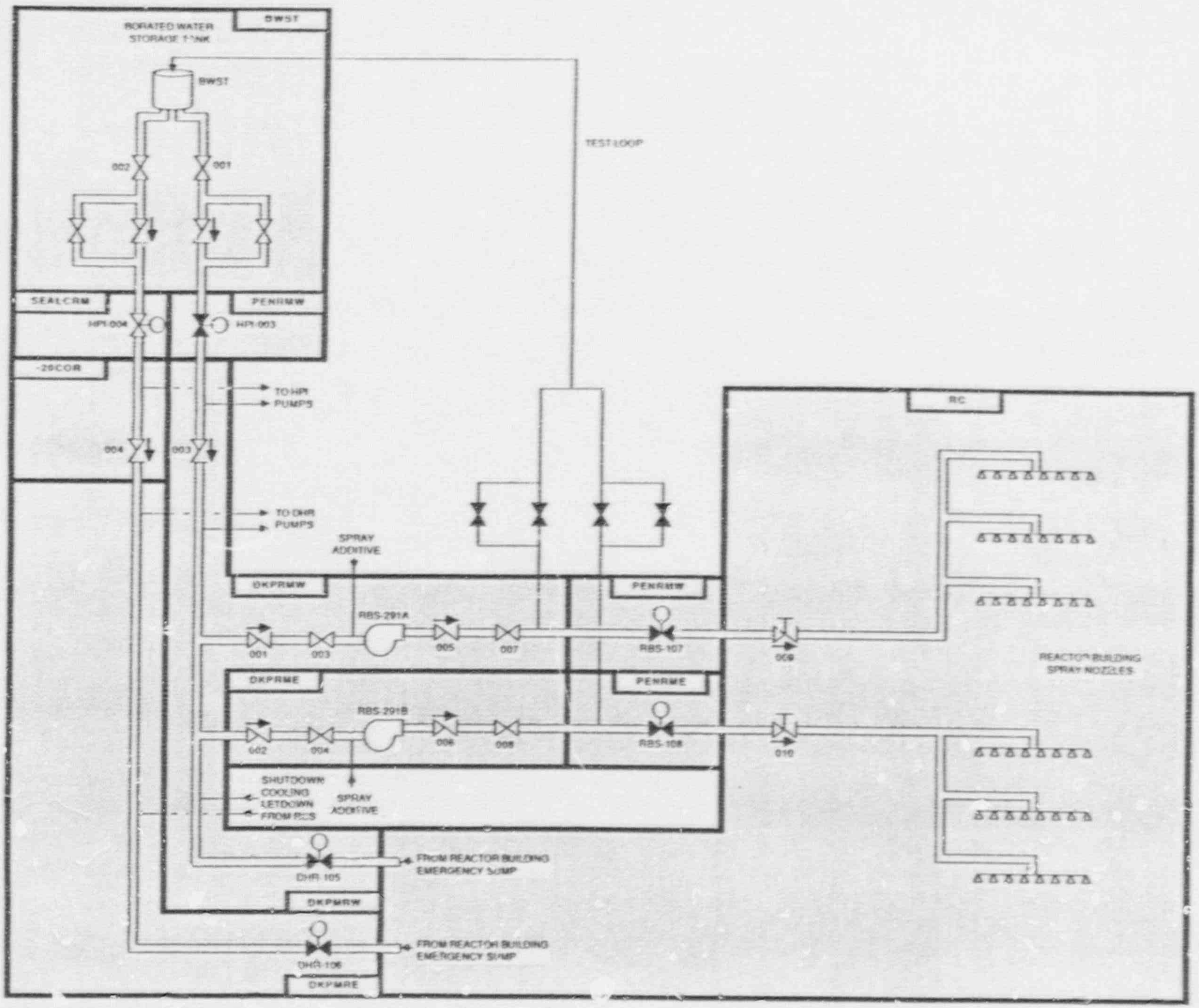

Figure 3.9-2. Rancho Seco Reactor Building Spray System Showing Component Locations

Table 3.9-1. Rancho Seco Containment Cooling System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RBCU-500A	ACU	RC	BUS 3A	480	480VRMW	A
RBCU-500B	ACU	RC	BUS 3B	480	480VRME	B
RBCU-500C	ACU	RC	BUS 3A	480	480VRMW	A
RBCU-500D	ACU	RC	BUS 3B	480	480VRME	B
RBS-107	MOV	PENRMW	MCCS2A1	480	480VRMW	A
RBS-108	MOV	PENRME	MCCS2B1	480	480VRME	B
RBS-291A	MDP	DKPRMW	BUS 3A	480	480VRMW	A
RBS-291B	MDP	DKPRME	BUS 3B	480	480VRME	B

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The Rancho Seco Nuclear Station is located on a 2480-acre site in Sacramento County, California. The Site is approximately 26 miles north-northeast of Stockton and 25 miles southeast of Sacramento. Figure 4-1 is a general view of the plant and vicinity (from Ref. 1).

The major structures at this unit include the containment building, turbine building, auxiliary building, spray towers, service ponds, and intake structure. A site plot plant is shown in Figure 4-2.

The building is a leaktight prestressed, post-tensioned concrete structure. This building houses the reactor vessel, reactor coolant pumps, steam generators, and pressurizer. Pumps, piping, and valving for the reactor coolant system is completely contained within the containment structure. Access to the building is via an equipment hatch or a personnel air lock. Piping and electrical penetration areas are on various levels of the auxiliary building mainly on the south side of the containment. The diesel generators are housed on the southwest side of the containment in the auxiliary building.

The turbine building, located west of the containment, houses the turbine generator and the associated power generating auxiliaries.

The auxiliary building is located around one-third of the reactor containment. The auxiliary building contains much of the plants safety related equipment, including the auxiliary feedwater pumps, high pressure injection pumps, DHR pumps and heat exchangers, makeup pump, cooling water pumps, and motor control centers supplying power to safety system components.

The intake structure, cooling towers, and spray ponds are all located northwest of the containment.

4.2 FACILITY LAYOUT DRAWINGS

Figures 4-3 through 4-10 are simplified floor plan drawings for Rancho Seco. Some outlying buildings are not shown on these drawings. An elevation drawing of the auxiliary building is shown in Figure 4-11. 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 II, Oak Ridge National Laboratory, Nuclear Safety Information Center, January 1972.

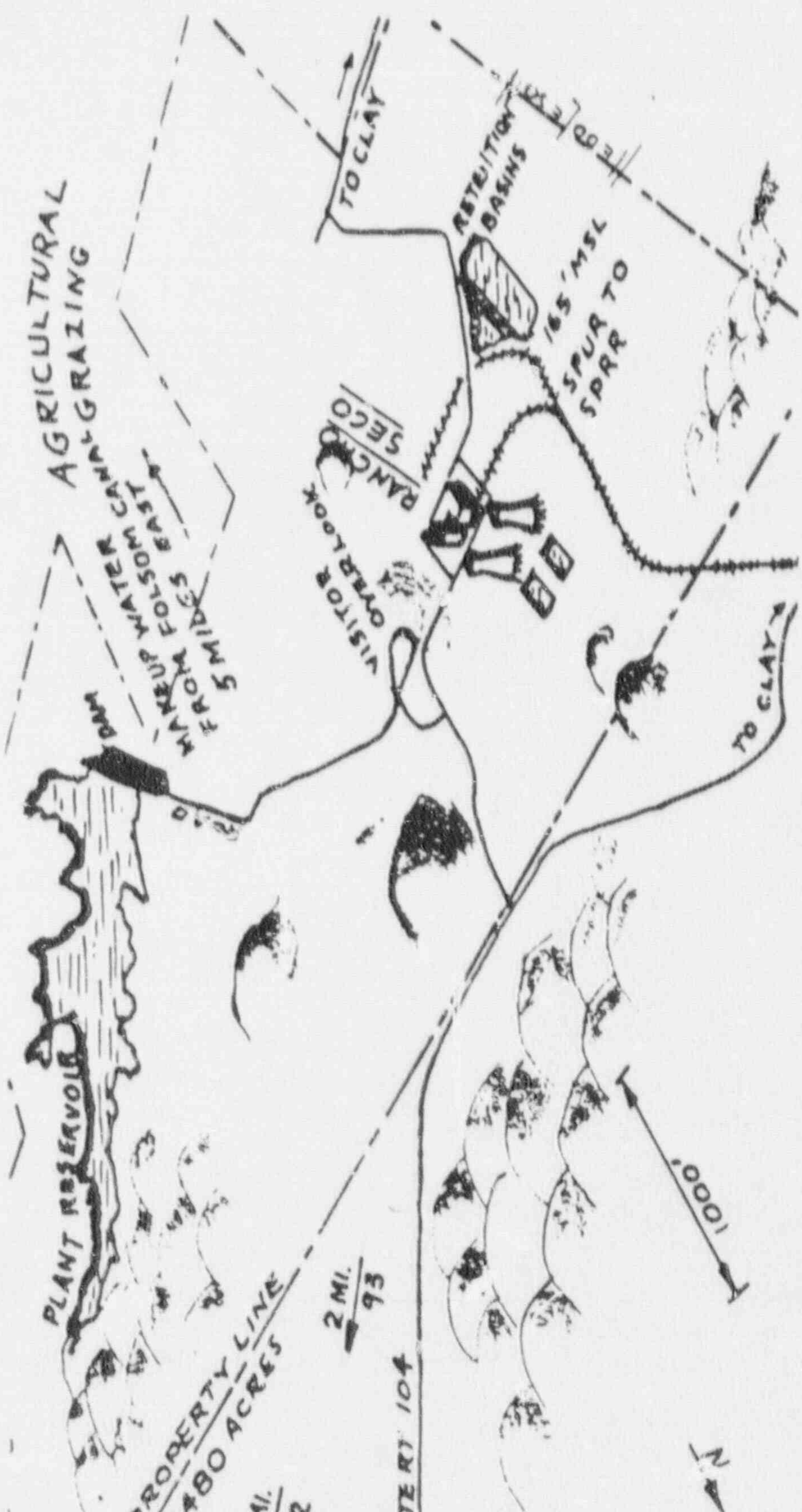

Figure 4-1. General View of the Rancho Seco Nuclear Power Plant and Vicinity

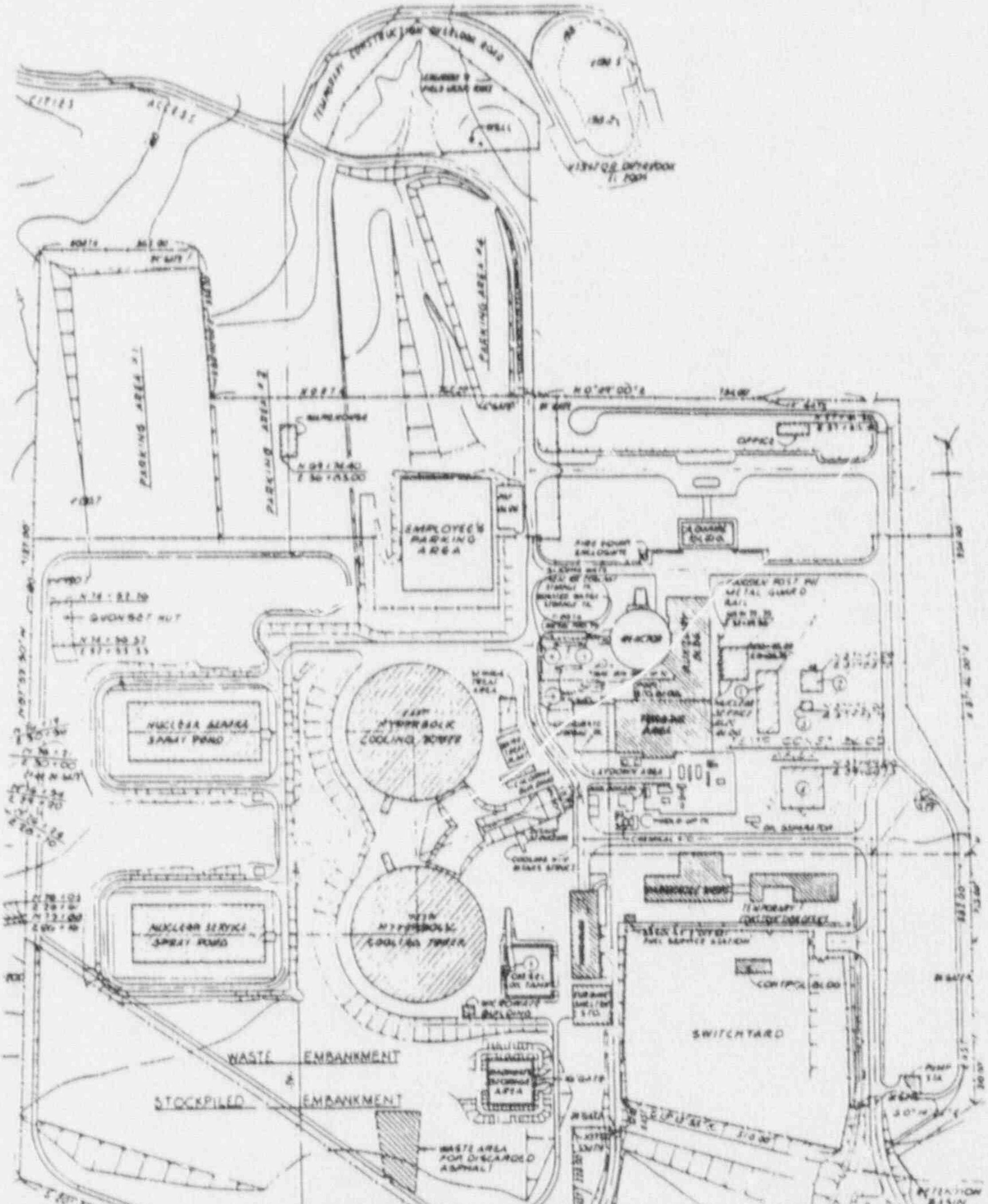

Figure 4-2. Rancho Seco Plot Plan

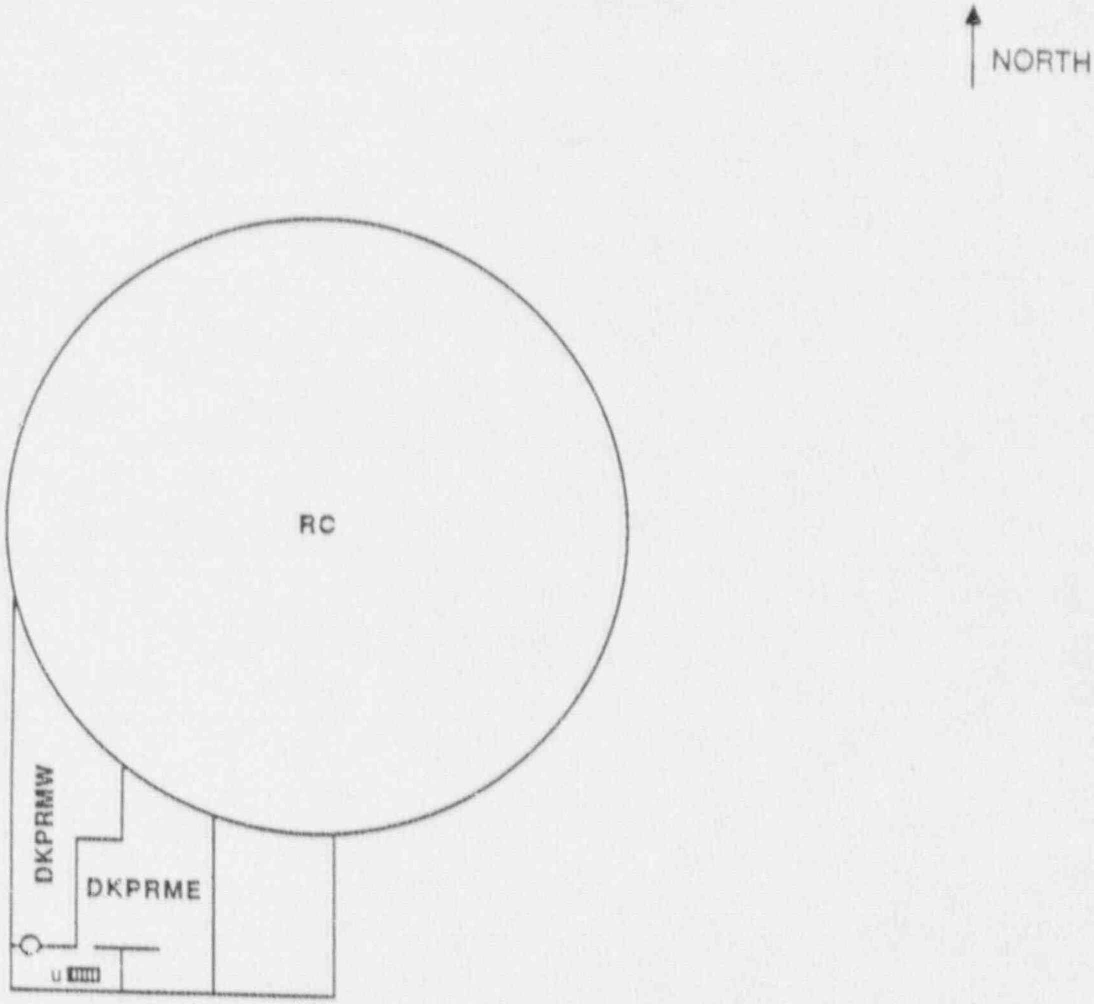

Figure 4-3. Rancho Seco Containment and Auxiliary Buildings, Elevation -47 ft.

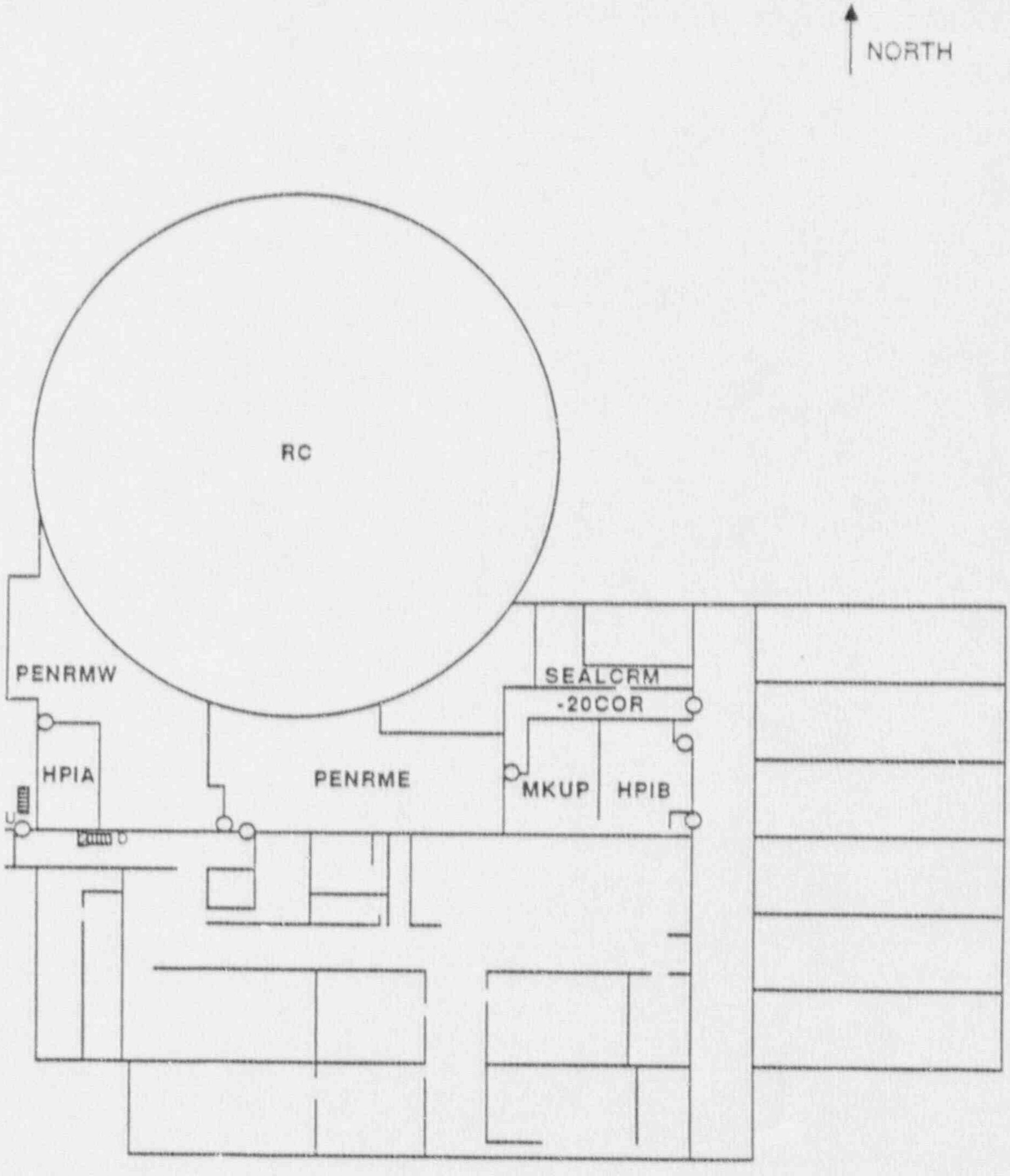

Figure 4-4. Rancho Seco Containment and Auxiliary Buildings, Elevation -20 ft.

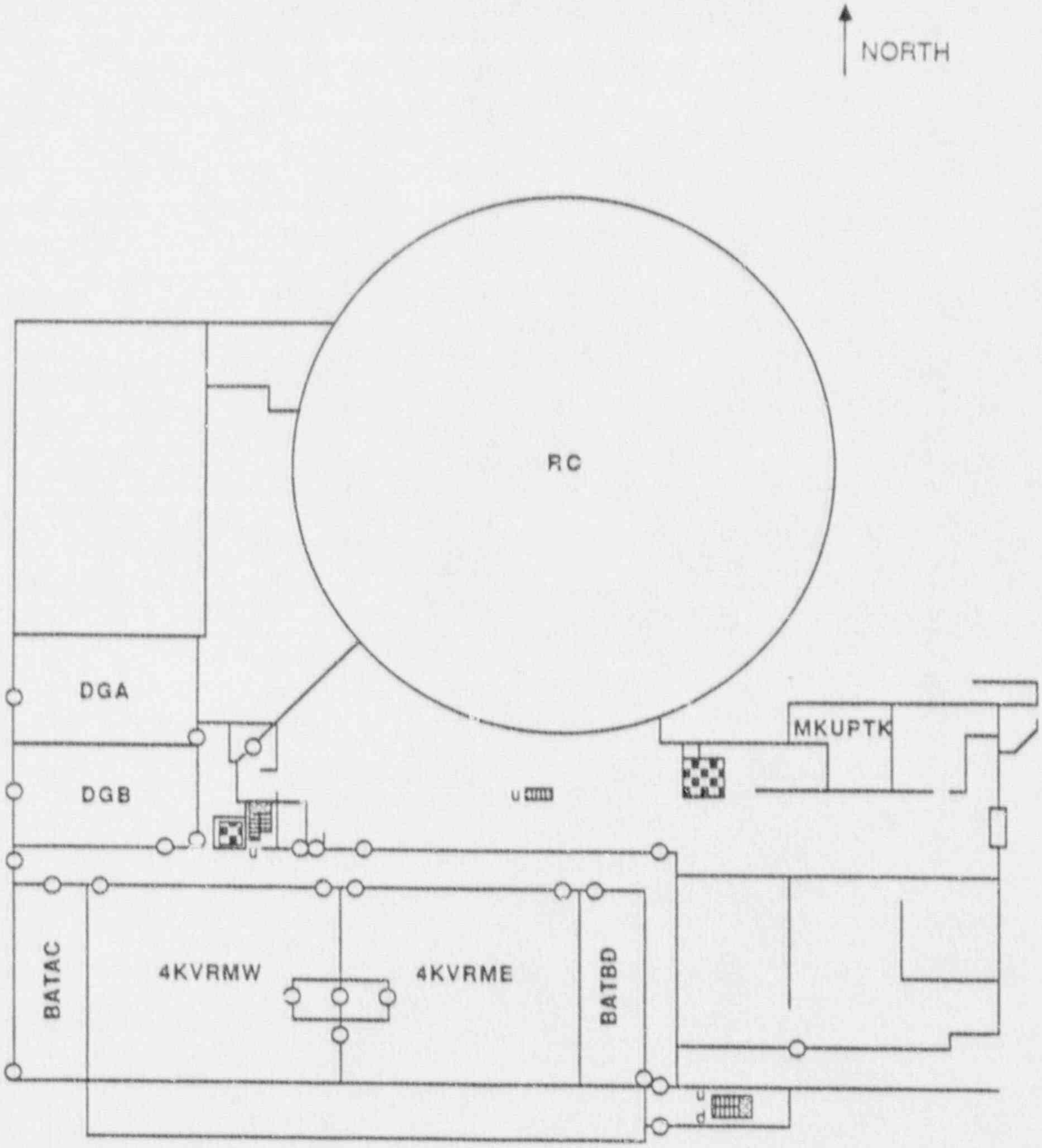

Figure 4-5. Rancho Seco Containment and Auxiliary Buildings, Elevation 0 ft. (Sea Level)

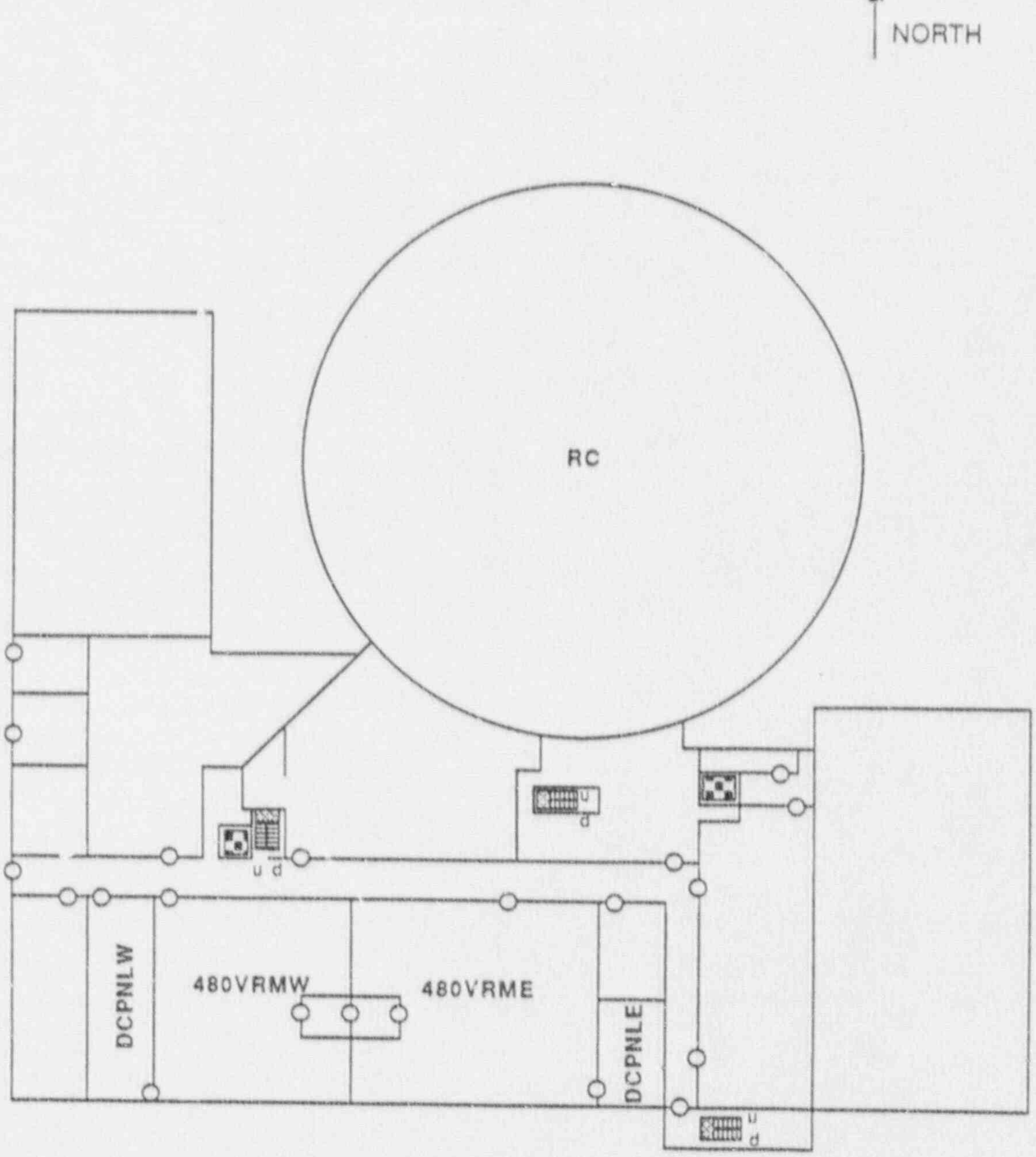

Figure 4-6. Rancho Seco Containment and Auxiliary Buildings, Elevation 20 ft.

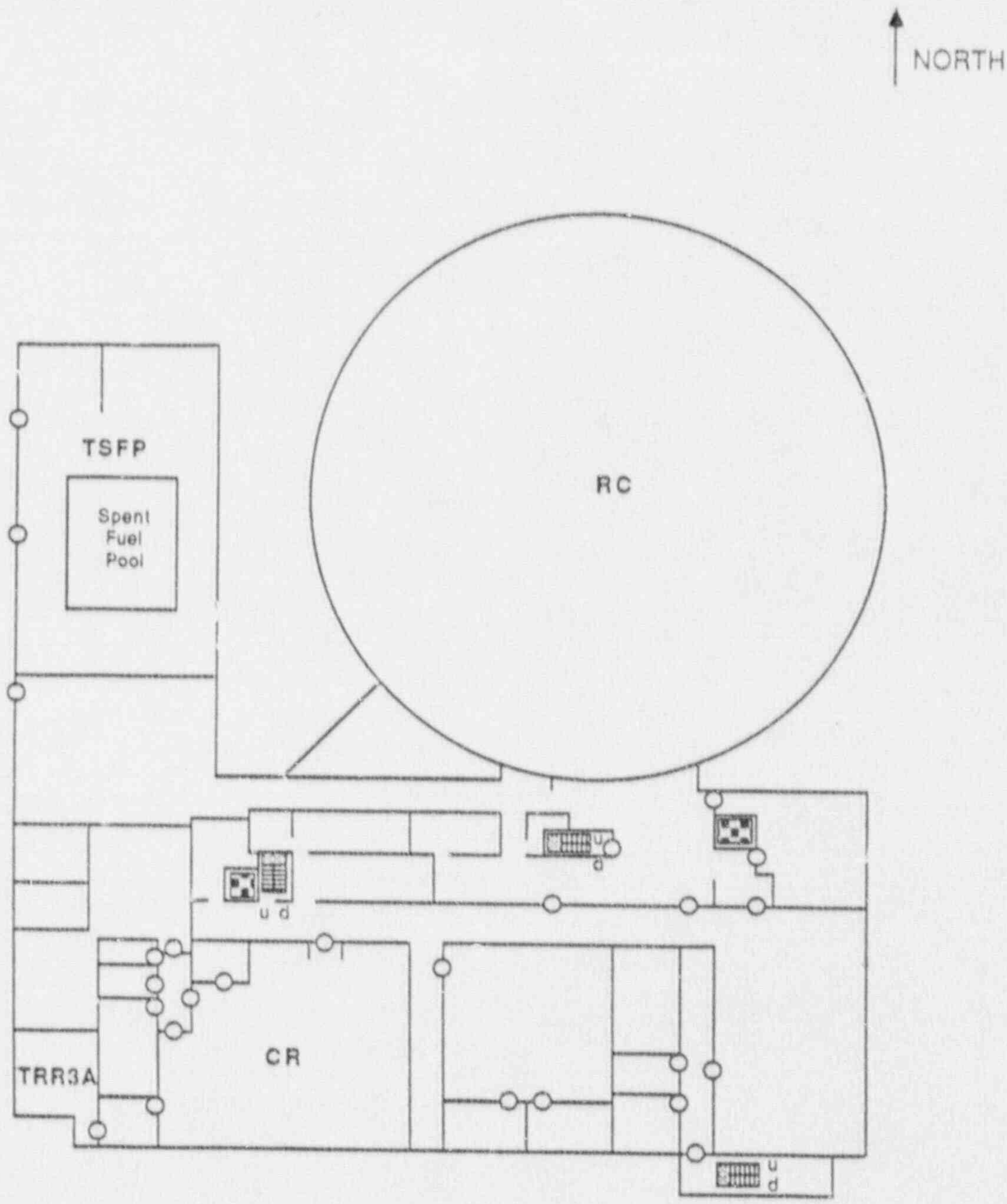

Figure 4-7. Rancho Seco Containment and Auxiliary Buildings, Elevation 40 ft.

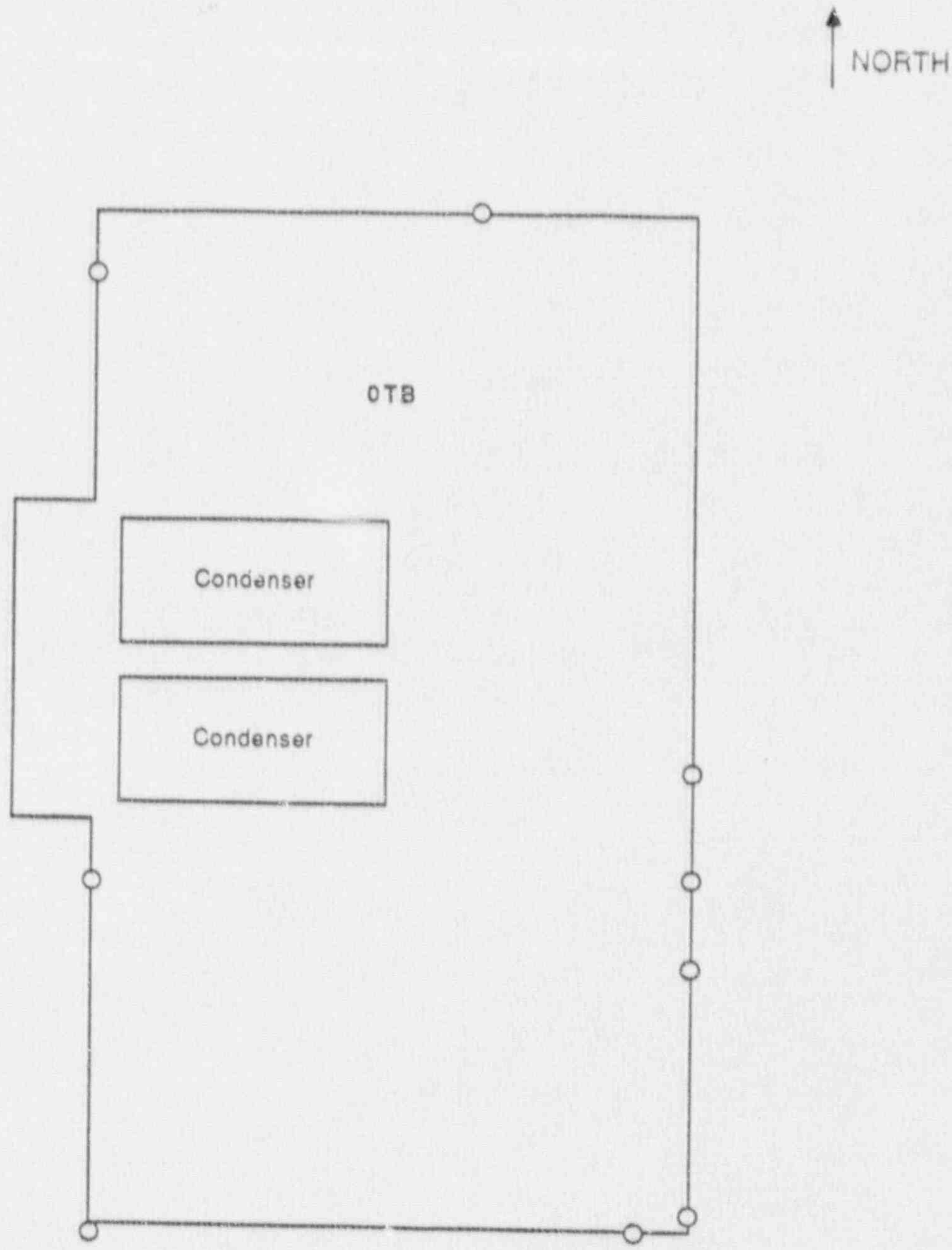

Figure 4-8. Rancho Seco Turbine Building, Elevation 0 ft. (Sea Level)

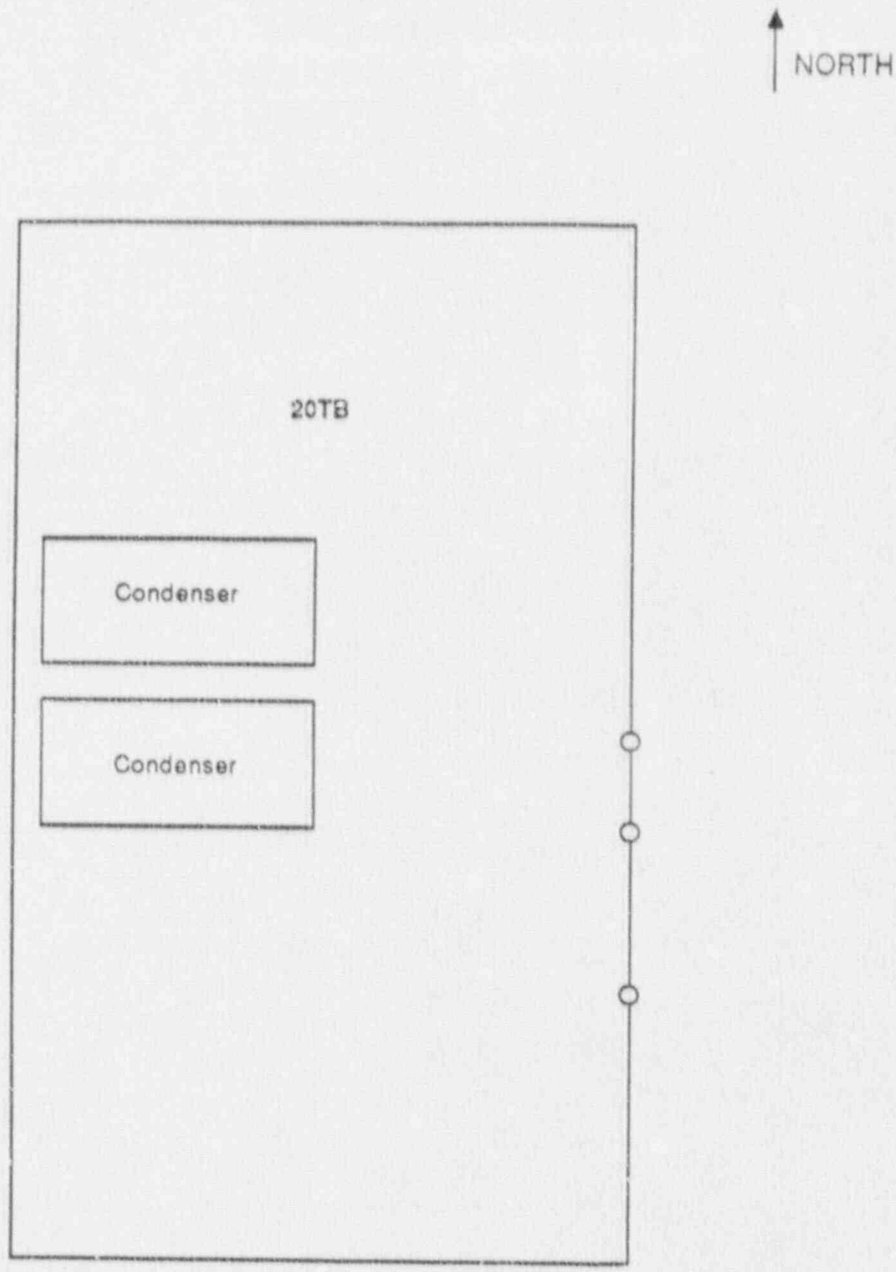

Figure 4-9. Rancho Seco Turbine Building, Elevation 20 ft.

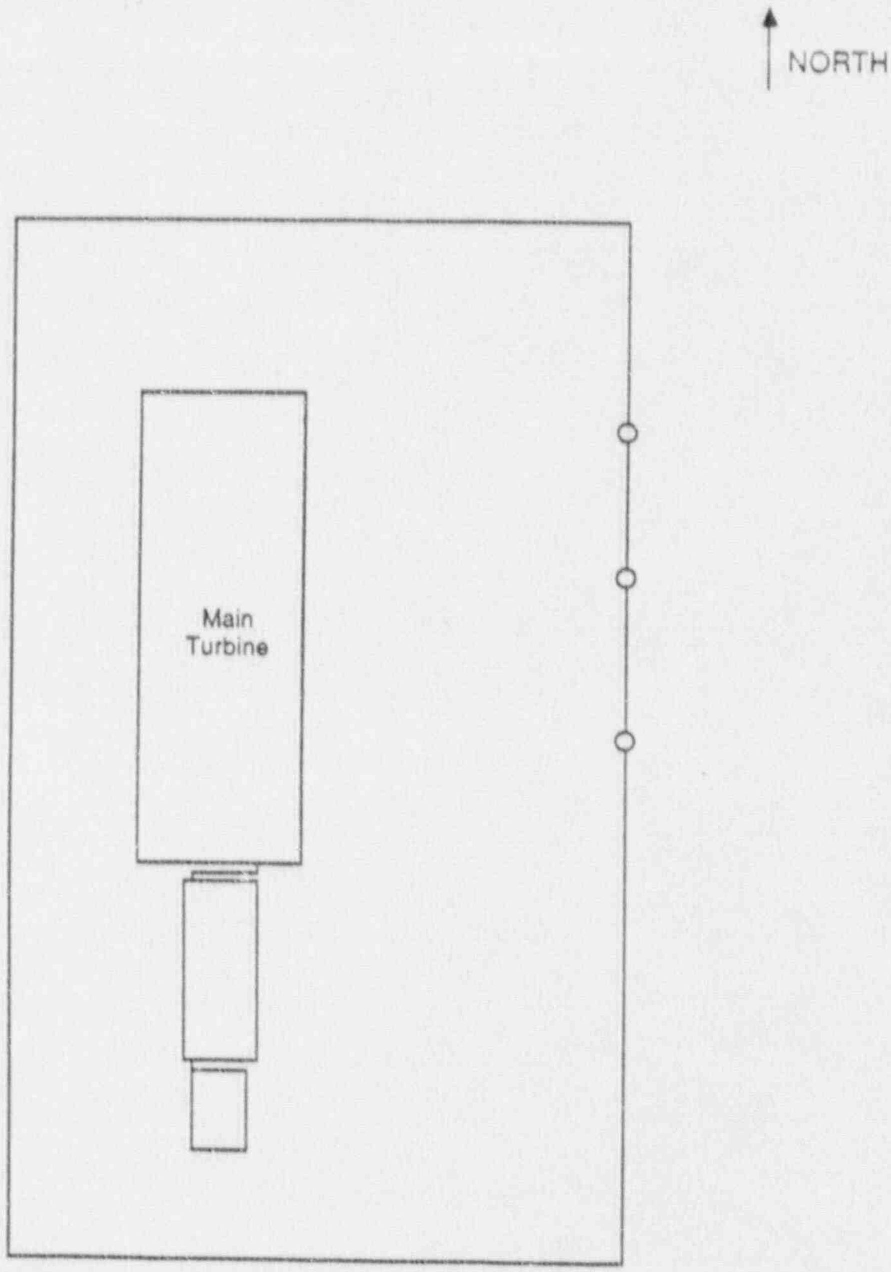

Figure 4-10. Rancho Seco Turbine Building, Elevation 40 ft.

Table 4-1. Definition of Rancho Seco Building and Location Codes

	Codes	Descriptions
1.	4KVRME	4160V Switchgear Room, located on the 0' elevation of the Auxiliary Building - east
2.	4KVRMW	4160V Switchgear Room, located on the 0' elevation of the Auxiliary Building - west
3.	480VRME	480V Switchgear Room, located on the 20' elevation of the Auxiliary Building - east
4.	480VRMW	480V Switchgear Room, located on the 20' elevation of the Auxiliary Building - west
5.	-20COR	Corridor, located on the -20' elevation of the Auxiliary Building
6.	20TB	Turbine Building - 20' elevation
7.	ABROOF	Auxiliary Building Roof - 60' elevation
8.	AFWCAGE	Auxiliary Feedwater Cage, located on the 20' elevation in the Turbine Building
9.	BATAC	Battery Room A and C, located on the 0' elevation of the Auxiliary Building
10.	BATBD	Battery Room B and D, located on the 0' elevation of the Auxiliary Building
11.	BWST	Borated Water Storage Tank in area TKFM
12.	CR	Control Room, located on the 40' elevation of the Auxiliary Building
13.	CST	Condensate Storage Tank in area TKFM
14.	DCPNLE	DC Switchgear Room, located 20' elevation of the Auxiliary Building - east Panels B and D
15.	DCPNLW	DC Switchgear Room, located 20' elevation of the Auxiliary Building - west Panels A and C
16.	DGA	Diesel Generator Room A, located on the 0' elevation of the Auxiliary Building
17.	DGB	Diesel Generator Room B, located on the 0' elevation of the Auxiliary Building

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

Codes	Descriptions
18. DKPRME	Decay Heat Pump Room, located on the -47' elevation of the Auxiliary Building - east
19. DKPRMW	Decay Heat Pump Room, located on the -47' elevation of the Auxiliary Building - west
20. FUELPMPA2	Pit for Diesel Fuel Transfer Pumps above Diesel Storage Tank A2 (underground)
21. FUELPMPB2	Pit for Diesel Fuel Transfer Pumps above Diesel Storage Tank B2 (underground)
22. HPIA	Decay Heat Pump Room A, located on the -47' elevation of the Auxiliary Building - east
23. HPIB	Decay Heat Pump Room B, located on the -47' elevation of the Auxiliary Building - east
24. MMJUP	Makeup Pump Room, located on the -20' elevation of the Auxiliary Building
25. MKUPTK	Makeup Tank Room, located on the 0" elevation of the Auxiliary Building
26. NEWDGA2	Area includes new Diesel Generat[illegible] and its Control Room in Diesel Generator Building
27. NEWDGB2	Area includes new Diesel Generator B2 and its Control Room in Diesel Generator Building
28. NRWA	Nuclear Service Raw Water Pump House A
29. NRWB	Nuclear Service Raw Water Pump House B
30. NSEB	Nuclear Service Electrical Building
31. OTB	Turbine Building - 0' elevation
32. PENRME	Penetration Room, located on the -20' elevation of the Auxiliary Building - east
33. PENRMW	Penetration Room, located on the -20' elevation of the Auxiliary Building - west
34. RADIATRA2	Radiator A2 area next to area NEWDGA2 outside of Diesel Generator Building

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

Codes	Descriptions
35. RADIATRB2	Radiator A2 area next to area NEWDGB2 outside of Diesel Generator Building
36. RC	Reactor Containment
37. SEALCRM	Seal Cooler Room, located on the -20 elevation of the Auxiliary Building
38. SYPDE	Spray Pond - east
39. SYPDW	Spray Pond - west
40. TFR3AN	Transformer Room for 480V Bus 3A - west of Control Room
41. TKFM	Tank Farm Area - northwest of Reactor Containment
42. TSFP	Spent fuel pool operating floor, located on the 40' elevation of the Spent Fuel Building

Table 4-2. Partial Listing of Components by Location at Rancho Seco

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
480VRME	EP	BUS 3B	BUS
480VRME	EP	MCCS2B1	BUS
480VRME	EP	BUS 3B	BUS
480VRMW	EP	BUS 3A	BUS
480VRMW	EP	MCCS2A1	BUS
480VRMW	EP	BUS 3A	BUS
4KVRME	EP	CB4B	CB
4KVRME	EP	BUS4B	BUS
4KVRME	EP	TR43B2	XFMR
4KVRMW	EP	CB4A	CB
4KVRMW	EP	BUS4A	BUS
AFWCAGE	AFW	AFW-826	MOV
AFWCAGE	AFW	AFW-827	MOV
AFWCAGE	AFW	AFW-801	MOV
AFWCAGE	AFW	AFW-319	MDP
AFWCAGE	AFW	AFW-318	MDP
AFWCAGE	AFW	AFW-318	TDP
BATAC	EP	BATT A	BATT
BATAC	EP	BATT C	BATT
BATBD	EP	BATT B	BATT
BATBD	EP	BATT D	BATT
BWST	ECCS	BWST	TK
CST	AFW	CST	TK
CST	AFW	CST	TK
CST	AFW	CST	TK
CST	AFW	CST	TK
DCPNLE	EP	BC-H4BB	BC
DCPNLE	EP	BC-H4BBD	BC
DCPNLE	EP	BC-H4BD	BC
DCPNLE	EP	PANEL B	BUS

Table 4-2. Partial Listing of Components by Location at Rancho Seco (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
DCPNLE	EP	PANEL D	BUS
DCPNLE	EP	PANEL B	BUS
DCPNLE	EP	PANEL B	BUS
DCPNLE	EP	PANEL D	BUS
DCPNLE	EP	PANEL D	BUS
DCPNLE	EP	PANEL S1B	BUS
DCPNLE	EP	PANEL S1D	BUS
DCPNLW	EP	BC-H4BA	BC
DCPNLW	EP	BC-H4BAC	BC
DCPNLW	EP	BC-H4BC	BC
DCPNLW	EP	PANEL A	BUS
DCPNLW	EP	PANEL C	BUS
DCPNLW	EP	PANEL A	BUS
DCPNLW	EP	PANEL A	BUS
DCPNLW	EP	PANEL C	BUS
DCPNLW	EP	PANEL C	BUS
DCPNLW	EP	PANEL S1A	BUS
DCPNLW	EP	PANEL S1C	BUS
DGA	EP	DGA	DG
DGB	EP	DGB	DG
DKPRME	CCS	RBS-291B	MDP
DKPRME	ECCS	DHR-106	MOV
DKPRME	ECCS	HPI-006	MOV
DKPRME	ECCS	DHR-261B	MDP
DKPRME	ECCS	HPI-006	MOV
DKPRMW	CCS	RBS-291A	MDP
DKPRMW	ECCS	DHR-105	MOV
DKPRMW	ECCS	HPI-005	MOV
DKPRMW	ECCS	HPI-005	MOV
DKPRMW	ECCS	DHR-261B	MDP

Table 4-2. Partial Listing of Components by Location at Rancho Seco (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
HPIA	ECCS	HPI-238A	MDP
HPIB	ECCS	HPI-238B	MDP
MKUP	ECCS	HPI-236	MDP
MKUP	ECCS	HPI-508	MOV
MKUP	ECCS	HPI-508	MOV
MKUP	ECCS	HPI-508	MOV
MKUP	ECCS	HPI-508	MOV
NEWDGA2	EP	DG A2	DG
NEWDGB2	EP	DG B2	DG
NRWA	NRW	NRW-472A	MDP
NRWB	NRW	NRW-472B	MDP
NSEB	EP	BATT SOA2	BATT
NSEB	EP	BATT SOB2	BATT
NSEB	EP	BATT SOC2	BATT
NSEB	EP	BATT SOD2	BATT
NSEB	EP	PANEL SOA2	BUS
NSEB	EP	PANEL SOB2	BUS
NSEB	EP	PANEL SOC2	BUS
NSEB	EP	PANEL SOD2	BUS
NSEB	EP	PANEL SOA2	BUS
NSEB	EP	PANEL SOB2	BUS
NSEB	EP	PANEL SOC2	BUS
NSEB	EP	PANEL SO[illegible]	BUS
NSEB	EP	PANEL SOA2	BUS
NSEB	EP	PANEL SOB2	BUS
NSEB	EP	PANEL SOC2	BUS
NSEB	EP	PANEL SOD2	BUS
NSEB	EP	BC-H4BA2	BC
NSEB	EP	BC-H4BA2C2	BC
NSEB	EP	BC-H4BB2	BC

Table 4-2. Partial Listing of Components by Location at Rancho Seco (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
NSEB	EP	BC-H4BB2D2	BC
NSEB	EP	BC-H4BC2	BC
NSEB	EP	BC-H4BD2	BC
NSEB	EP	MCCS2A3	BUS
NSEB	EP	MCCS2B3	BUS
NSEB	EP	BUS 3B2	BUS
NSEB	EP	BUS 3B2	BUS
NSEB	EP	BUS 3A2	BUS
NSEB	EP	BUS 3A2	BUS
NSEB	EP	TR 43A2	XFMR
NSEB	EP	TR 43B2A	XFMR
NSEB	EP	BUS 4B2	BUS
NSEB	EP	BUS 4A2	BUS
NSEB	EP	CB 4A2	CB
NSEB	EP	CB 4B2	CB
PENRME	CCS	RBS-108	MOV
PENRME	ECCS	DHR-040	MOV
PENRME	ECCS	HPI-008	MOV
PENRME	ECCS	DHR-046	MOV
PENRME	ECCS	DHR-047	MOV
PENRME	ECCS	DHR-260B	HX
PENR[illegible]	ECCS	HPI-810	MOV
PENRME	ECCS	HPI-812	MOV
PENRME	NCW	NCW-010	MOV
PENRME	NCW	NCW-012	MOV
PENRME	NCW	NCW-016	MOV
PENRME	NCW	NCW-018	MOV
PENRME	NCW	NCW-006	MOV
PENRME	NCW	NCW-008	MOV
PENRMW	CCS	RBS-107	MOV

Table 4-2. Partial Listing of Components by Location at Rancho Seco (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
PENRMW	ECCS	HPI-003	MOV
PENRMW	ECCS	DHR-039	MOV
PENRMW	ECCS	HPI-007	MOV
PENRMW	ECCS	DHR-260A	HX
PENRMW	ECCS	HPI-811	MOV
PENRMW	ECCS	HPI-604	MOV
PENRMW	ECCS	HPI-809	MOV
PENRMW	NCW	NCW-011	MOV
PENRMW	NCW	NCW-017	MOV
PENRMW	NCW	NCW-019	MOV
PENRMW	NCW	NCW-005	MOV
PENRMW	NCW	NCW-007	MOV
PENRMW	NCW	NCW-009	MOV
RC	AFW	SGB	SG
RC	AFW	SGA	SG
RC	AFW	SGA	SG
RC	AFW	SGB	SG
RC	CCS	RBCU-500A	ACU
RC	CCS	RBCU-500B	ACU
RC	CCS	RBCU-500C	ACU
RC	CCS	RBCU-500D	ACU
RC	ECCS	SUMP	TK
RC	ECCS	SUMP	TK
RC	ECCS	RCS-VESS	RV
RC	ECCS	RCS-VESS	RV
RC	RCS	DHR-001	MOV
RC	RCS	DHR-002	MOV
RC	RCS	RCS-VESS	RV
RC	RCS	RCS-505	SRV
RC	RCS	RCS-511	PORV

Table 4-2. Partial Listing of Components by Location at Rancho Seco (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RC	RCS	RCS-2S	MOV
RC	RCS	RCS-23	MOV
RC	RCS	RCS-5	MOV
RC	RCS	RCS-6	MOV
SEALCRM	ECCS	HPI-004	MOV
TKFM	AFW	AFW-577	MOV
TKFM	AFW	AFW-527	AOV
TKFM	AFW	AFW-528	AOV
TKFM	AFW	AFW-578	MOV
TKFM	AFW	AFW-569	MOV
TKFM	AFW	AFW-596	MOV
TKFM	AFW	AFW-532	MOV
TKFM	AFW	AFW-531	MOV
TKFM	AFW	AFW-581	MOV
TKFM	AFW	AFW-582	MOV
TKFM	NCW	NCW-482A	MDP
TKFM	NCW	NCW-480A	HX
TKFM	NCW	NCW-482B	MDP
TKFM	NCW	NCW-480B	HX
TRR3A	EP	TR43A1	XFMR
UNKNOWN	EP	INV 1A	BUS
UNKNOWN	EP	INV 1B	BUS
UNKNOWN	EP	INV 1C	BUS
UNKNOWN	EP	INV 1D	BUS

5. BIBLIOGRAPHY FOR RANCHO SECO

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2. NUREG-1195, "Loss of Integrated Control Systems Power and Overcooling Transient at Rancho Seco on December 26, 1985," USNRC, February 1986.

3. NUREG-1286, "Safety Evaluation Report Related to the Restart of Rancho Seco Nuclear Generating Station Unit 1, Following the Event of December 26, 1985," USNRC, March 1988.

4. NUREG/CR-0456, "Rancho Seco Building Wake Effects on Atmospheric Diffusion," National Oceanographic and Atmospheric Administration, December 1978.

5. NUREG/CR-1286, "Rancho Seco Wake Effects on Atmospheric Diffusion: Simulation in a Meteorological Wind Tunnel," Colorado State University, January 1980.

6. NUREG/CR-2348, "In-plant Source Term Measurements at Rancho Seco," EG&G Idaho, Inc., October 1981.

7. NUREG/CR-2749, Volume 9, "Socioeconomic Impacts at Nuclear Generating Stations: Rancho Seco Case Study," Mountain West Research, July 1982.

8. NUREG/CR-3013, "Review of the Rancho Seco Nuclear Generating Station Unit No. 1 Auxiliary Feedwater System Reliability Analysis," Brookhaven National Laboratory, April 1983.

9. NUREG/CR-4286, "Evaluation of Radioactive Liquid Effluent Releases from Rancho Seco Nuclear Power Plant," Oak Ridge National Laboratory, March 1986.

10. NUREG/CR-4768, "Methodology and Application of Surrogate Plant PRA Analysis to the Rancho Seco Power Plant," Pacific Northwest Laboratory, July 1987.

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)

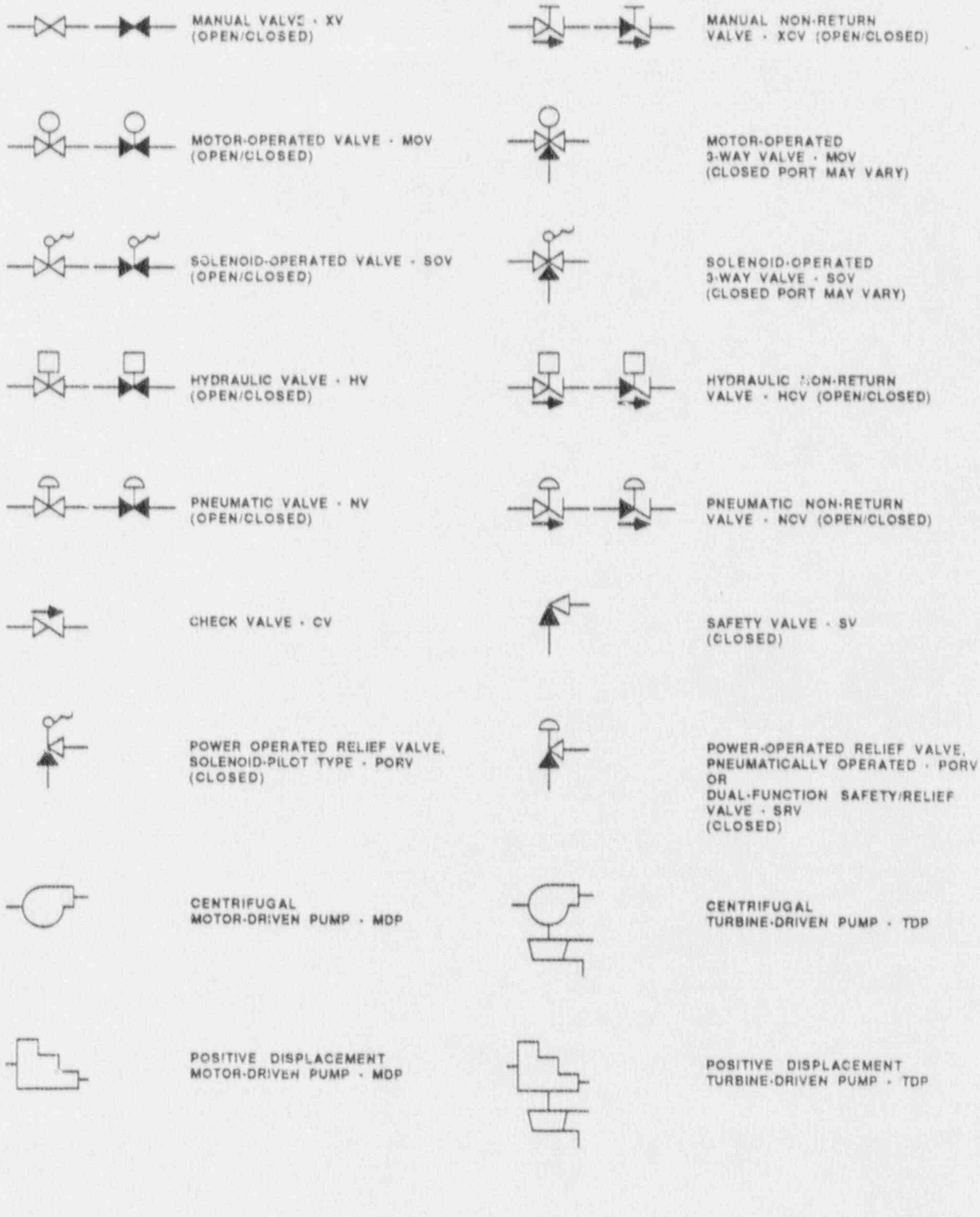

Figure A-1. Key To Symbols In Fluid System Drawings

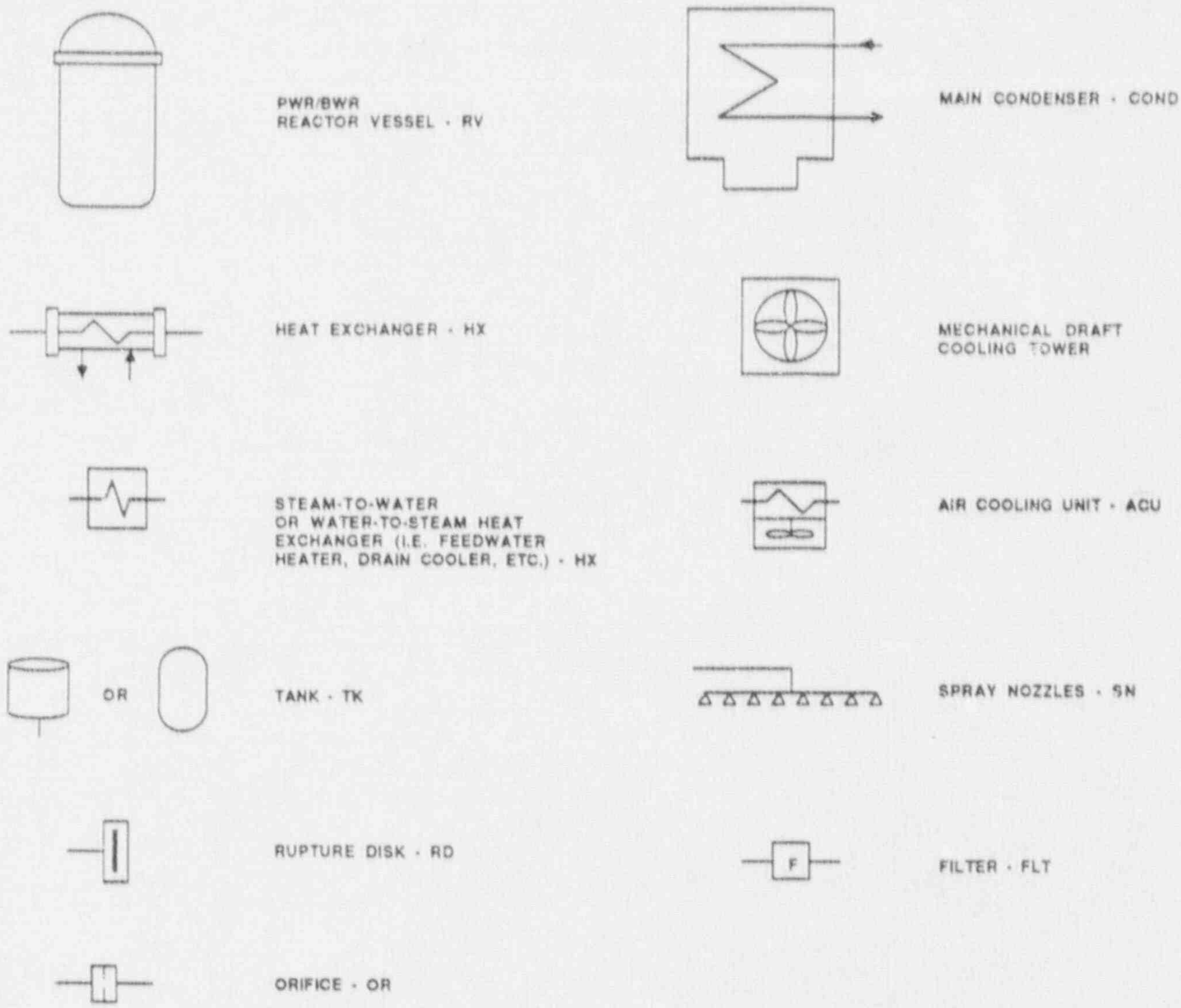

Figure A-1. Key To Symbols In Fluid System Drawings
(Continued)

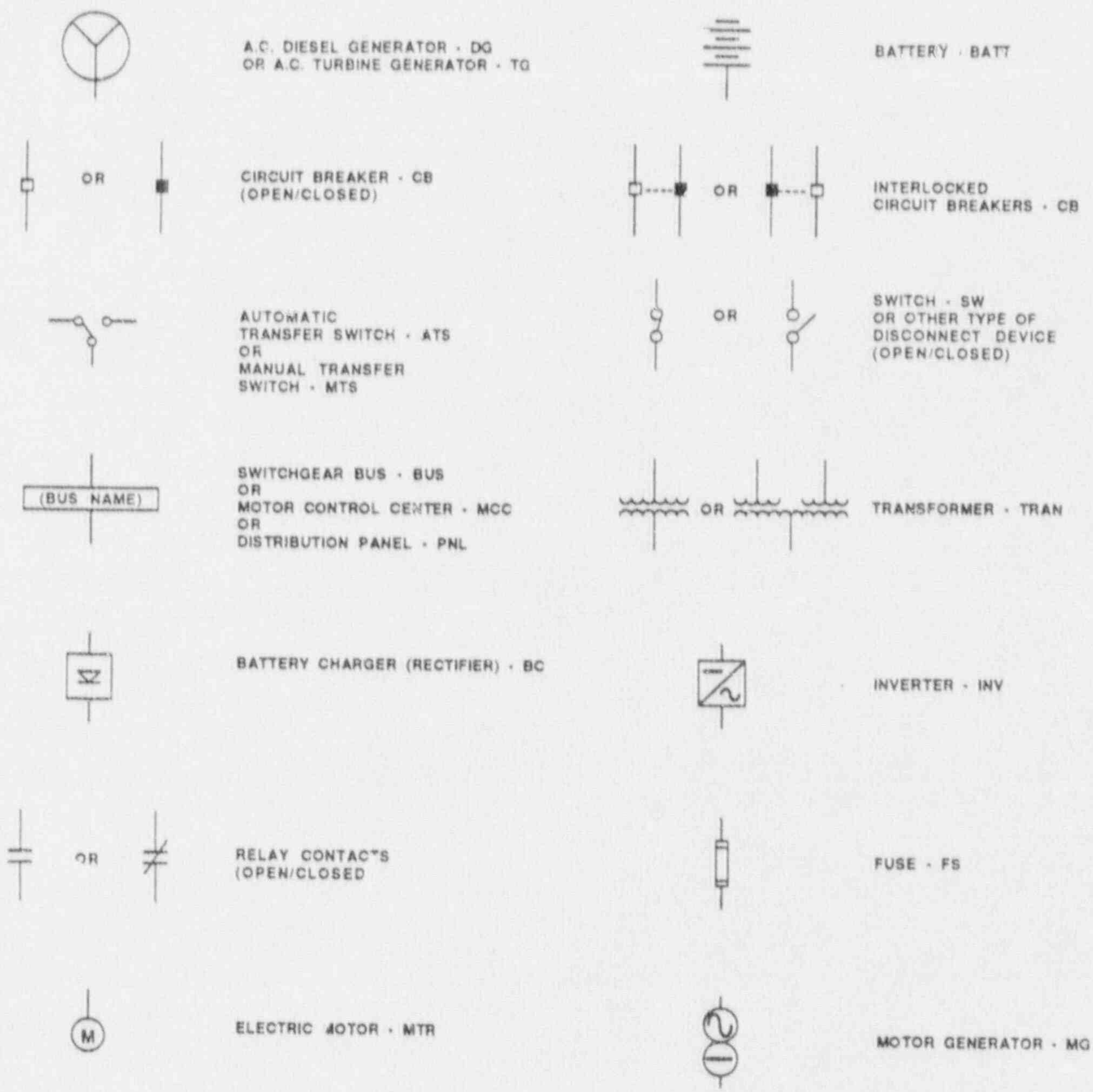

Figure A-2. Key To Symbols In Electrical System Drawings

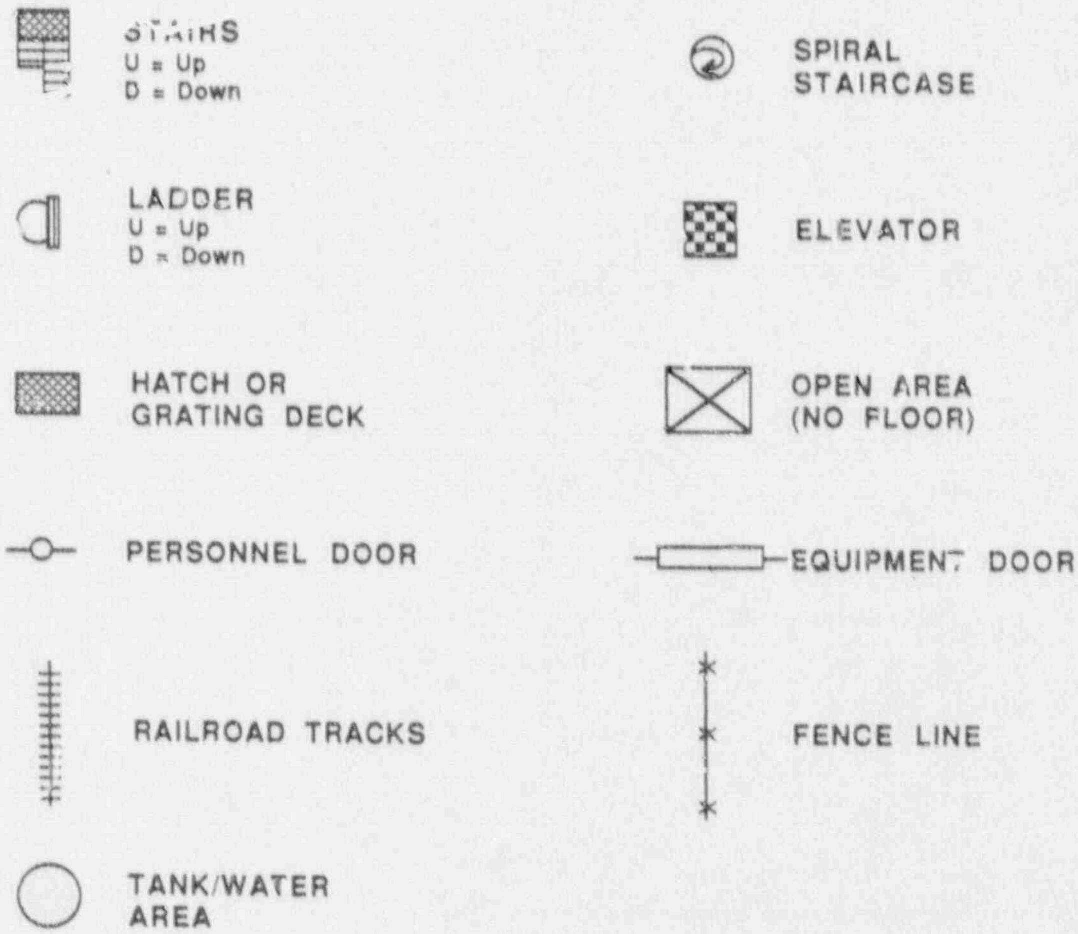

Figure A-3. Key To Symbols In Facility Layout Drawings

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
AFW	Auxiliary Feedwater System
ECCS	Emergency Core Cooling System (including HPI and LPI Systems)
EP	Electric Power System
NCW	Nuclear Service Cooling Water System
NRW	Nuclear Service Raw Water System
CCS	Containment Cooling Systems (including reactor building spray system and reactor building emergency cooling units)

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	H[illegible]V
Safety valve	[illegible]
Dual function safety/relief valve	SRV
Power-operated relief valve (pneumatic or solenoid-operated)	PO[illegible]V
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)	UPS
Motor generator	MG
Circuit breaker	CB
Switch	SW
Automatic transfer switch	ATS
Manual transfer switch	MTS