NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

DAVIS-BESSE

50-346

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50-346

Editor: Peter Lobner
Author: Peter Lobner

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF FIGURES (continued

LIST OF TABLES

CAUTION

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

NOTICE

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

Mr. Mark Rubin
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Engineering and Systems Technology
Mail stop 7E4
Washington, D.C. 20555

With copy to:

Mr. Peter Lobner
Manager, Systems Engineering Division
Science Applications International Corporation
10210 Campus Point Drive
San Diego, CA 92131
(619) 458-2673

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.

DAVIS-BESSE
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	1/89	Original report

DAVIS-BESSE SYSTEM SOURCEBOOK

This sourcebook contains summary information on Davis-Besse. 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 Davis-Besse nuclear power plant is listed below:

- Docket number	50-346
- Operator	Toledo Edison Company
- Location	Oak Harbor, Ohio
- Commercial operation date	11/77
- Reactor type	PWR
- NSSS vendor	Babcock & Wilcox
- Number of loops	2
- Power (MWt/MWe)	2772/906
- 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 Davis-Besse 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
- Rancho Seco
- Crystal River
- Bellefonte 1 & 2

Davis-Besse is different from other Babcock & Wilcox PWR plants in that:

- Only Davis-Besse and Bellefonte have a "raised loop" RCS.
- The Davis-Besse AFW system uses only turbine-driven pumps.
- Davis-Besse has separate charging and HPI pumps. The HPI pumps are not capable of providing RCS makeup at normal RCS pressure.

3. SYSTEM INFORMATION

This section contains descriptions of selected systems at Davis-Besse in terms of general function, operation, system success criteria, major components, and support system requirements. A summary of major systems at Davis-Besse 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 Davis Besse 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	5
- Auxiliary Feedwater (AFW) and Secondary Steam Relief (SSR) Systems	Same	3.2	9.2.7
- Emergency Core Cooling Systems (ECCS)			
- High-Pressure Injection & Recirculation	Same	3.3	6.3
- Low-pressure Injection & Recirculation	Same	3.3	6.3
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Same	3.3	9.3.5
- Main Steam and Power Conversion Systems	Main Steam Supply System, Condensate and Feed Water System, Circulating Water System	X	10.3 10.4
- Other Heat Removal Systems	None identified	X	
Reactor Coolant Inventory Control Systems			
- Chemical and Volume Control System (CVCS) (Charging System)	Makeup and Purification System, Chemical Addition System	3.4 X	9.3.4 9.3.6
- ECCS	See ECCS, above	-	-

Table 3-1. Summary of Davis Besse Systems Covered in this Report (Continued)

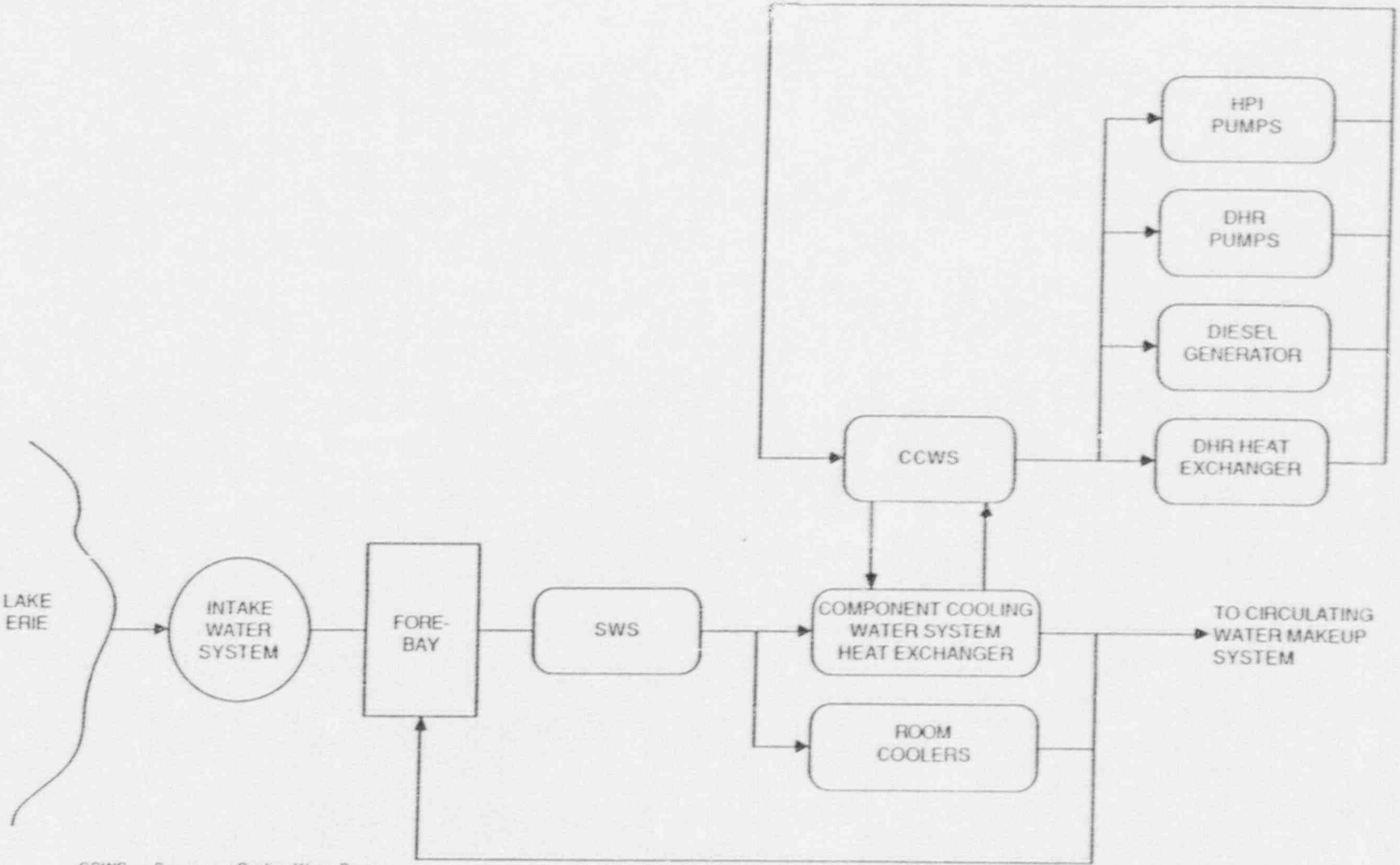
Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Containment Systems			
- Containment	Same	X	6
- Containment Heat Removal Systems			
- Containment Spray System	Same	X	6.2.2
- Containment Fan Cooler System	Containment Air Cooling System	X	6.2.2
Containment Normal Ventilation Systems	See Containment Air Cooling System	X	6.2.2
- Combustible Gas Control Systems	Containment Hydrogen Dilution System, Hydrogen Purge System	X	6.2.5
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	4
- Control Rod System	Control Rod Drive Control System	X	4.2.3
- Boration Systems	See Makeup & Purification System, above	-	-
Instrumentation & Control (I&C) Systems			
- Reactor Protection System (RPS)	Same	3.5	7.2
- Engineered Safety Feature Actuation System (ESFAS)	Safety Features Actuation System, Steam and Feedwater Line Rupture Control System, Generator Level Control System	3.5	7.3
- Remote Shutdown System	Auxiliary Shutdown Panel	3.5	7.4.1.6

Table 3-1. Summary of Davis Besse Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Instrumentation & Control (I&C) Systems (continued)			
- Other I&C Systems	Various systems	X	7.6 to 7.13
Support Systems			
- Class 1E Electric Power System	Same	3.6	8.2, 8.3
- Non-Class 1E Electric Power System	Same	3.6	8.2, 8.3
- Diesel Generator Auxiliary Systems	Same	3.6	9.5.4, 9.5.5, 9.5.6, 9.5.7
- Component Cooling Water (CCW) System	Same	3.7	9.2.2
- Service Water System (SWS)	Same	3.8	9.2.1
- Other Cooling Water Systems	Non-identified	X	
- Fire Protection Systems	Same	X	9.5.1
- Room Heating, Ventilating, and Air-Conditioning (HVAC) Systems	Control Room Air Conditioning System, Auxiliary Building Ventilation System, Fuel Area Handling Ventilation System, Turbine Building Ventilation System	X	9.4
- Instrument and Service Air Systems	Station and Instrument Air System	X	9.3.1

Table 3-1. Summary of Davis Besse Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
- Refueling and Spent Fuel Systems	Same	X	9.1
- Radioactive Waste Systems	Same	X	11
- Radiation Protection Systems	Same	X	12



CCWS = Component Cooling Water System
DHR = Decay Heat Removal
HPI = High Pressure Injection
SWS = Service Water System

Figure 3-1. Cooling Water Systems Functional Diagram for Davis-Besse

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 "raised loop" RCS similar to Davis Besse is shown in Figure 3.1-1. A simplified diagram of the RCS and important system interfaces is shown in Figure 3.1-2. 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 spray systems operates in order to complete a heat transfer path to the ultimate heat sink.

The RCS is equipped with a High Point Vent System which provides vents on each of the two hot legs and on the pressurizer. This system vents noncondensable gases to aid in refilling the RCS and to promote natural circulation flow following a transient or small LOCA and loss of normal circulation. Redundant solenoid isolation valves are remotely operated from the control room. Orifices and line sizing limit the flow rate through these vent paths.

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: 11,440 ft3, including pressurizer
  2. Normal operating pressure: 2185 psig

B. Pressurizer
  1. Normal water volume: 800 ft3
  2. Normal steam volume: 700 ft3

C. Safety Valves (2)
  1. Set pressure: 2435 psig
  2. Relief capacity: 336,000 lb/hr each

D. Power-Operated Relief Valve
  1. Set pressure: 2400 psig
  2. Relief capacity: unknown
  3. Type: Electromatic (solenoid-controlled, pilot-operated)

E. Steam Generators (2)
  1. Type: Once-through
  2. Primary-side volume: 2030 ft3

F. Pressurizer Heaters
  1. Capacity: 252 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. Each AC division supplies one-half of the Class 1E heater load.
  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.

C. Backup Main Coolant Pump Seal Cooling
On each pump, an integral heat exchanger supplied by the CCW system provides enough cooling capacity to prevent excessive seal heating if seal injection is lost.

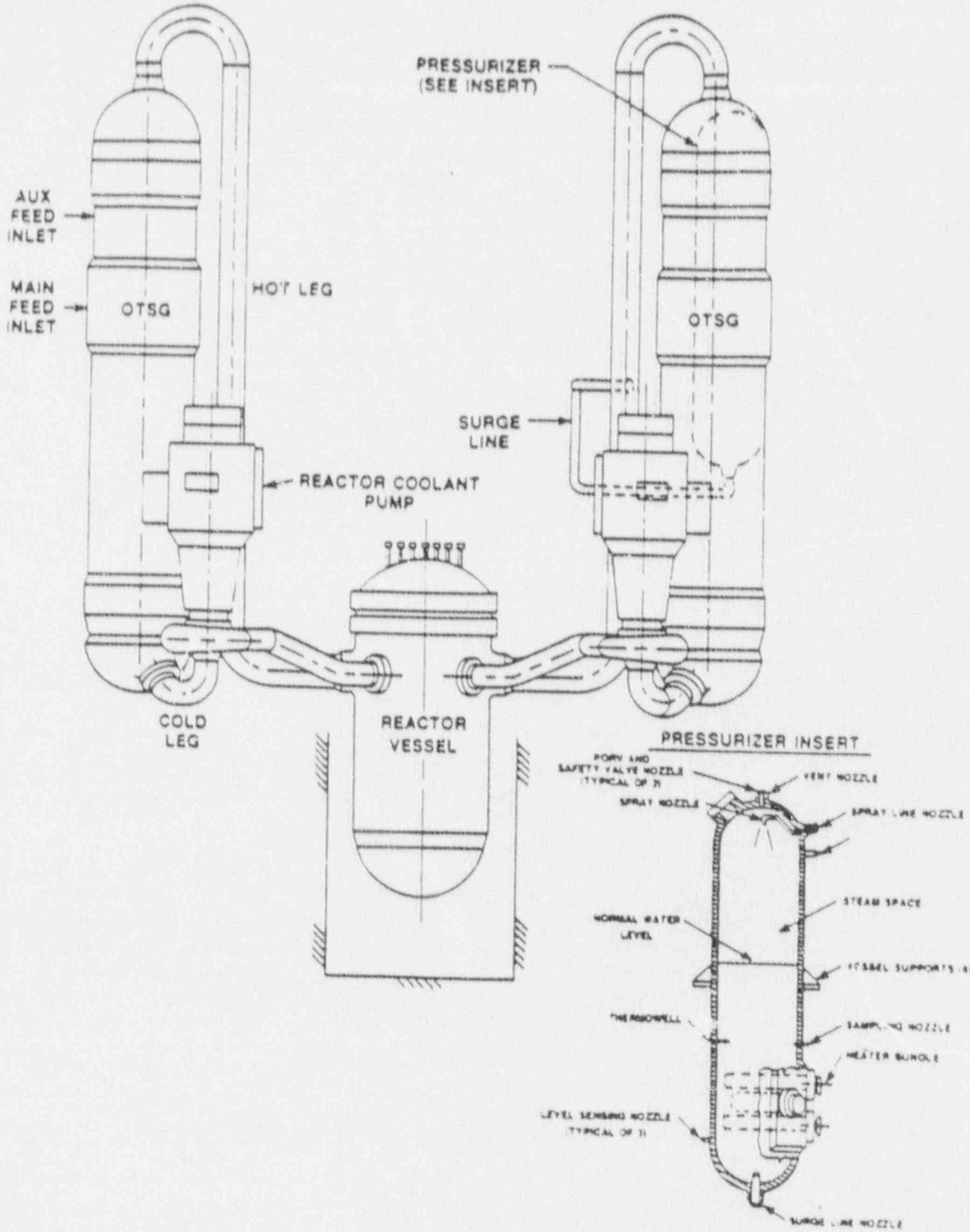


Figure 3.1-1. Elevation View of a Raised-Loop Babcock & Wilcox RCS

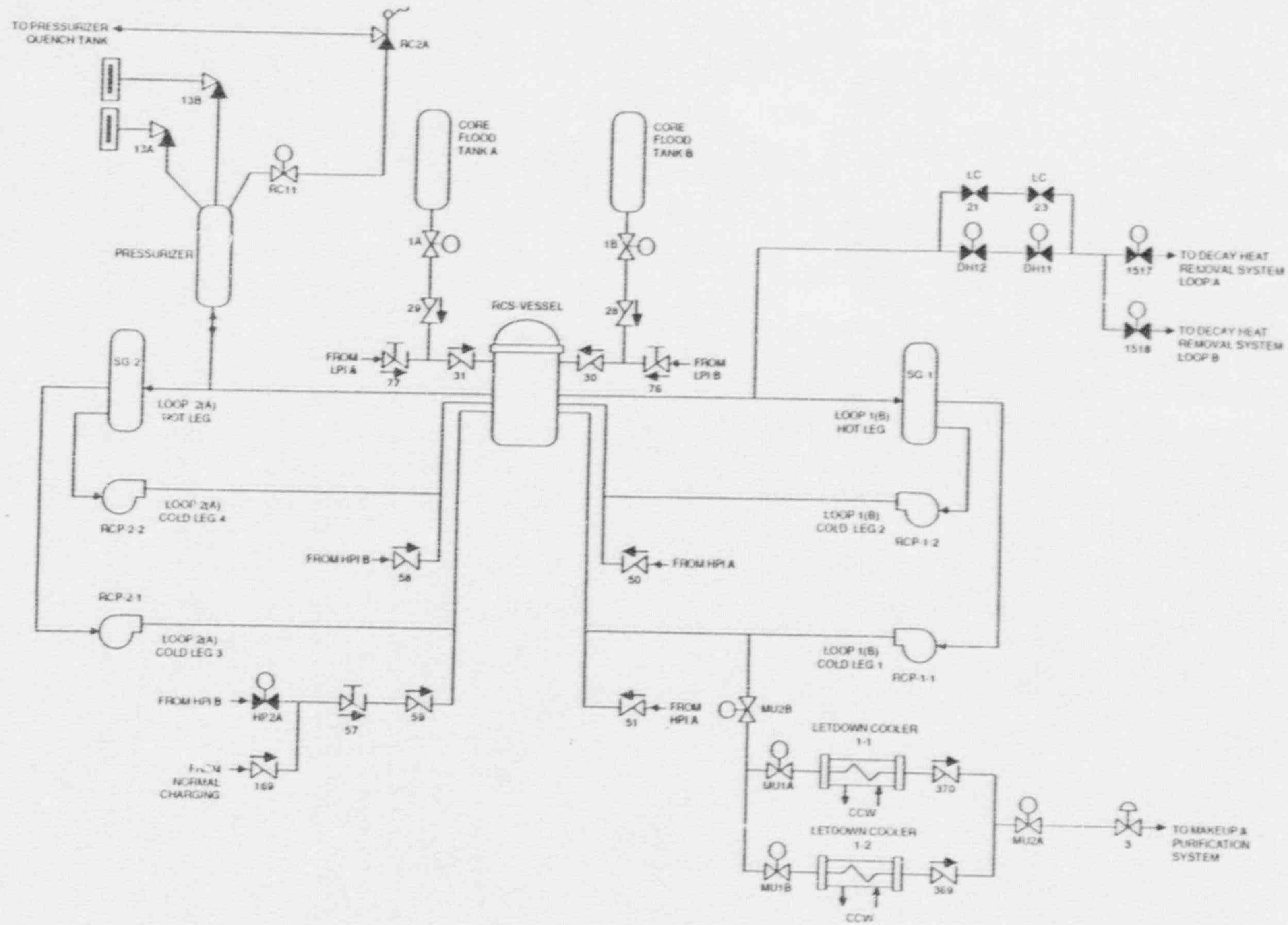


Figure 3.1-2. Davis Besse Reactor Coolant System

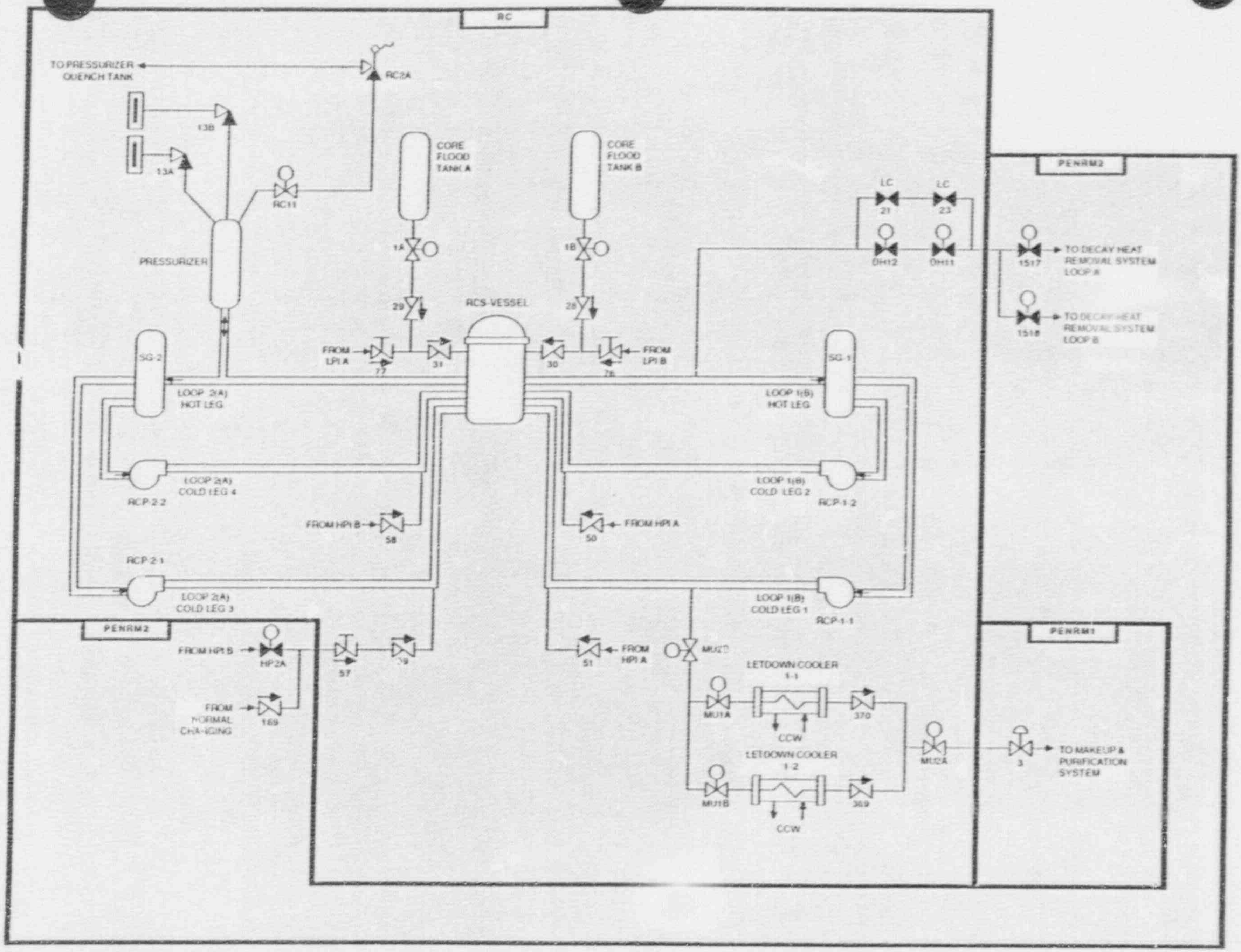


Figure 3.1-3. Davis Besse Reactor Coolant System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
DH11	MOV	RC	MCC-F11A	480	ELECTPENRM2	B
DH12	MOV	RC	MCC-E11B	480	585ABHALL	A
MU1A	MOV	RC	MCC-F12A	480	LVSGRM2	B
MU1B	MOV	RC	MCC-F12A	480	LVSGRM2	B
MU2A	MOV	RC	MCC-E11B	480	585ABHALL	A
MU2B	MOV	RC	MCC-E11B	480	585ABHALL	A
PZR-HTR-A	HTR	RC	MCC-E12A	480	LVSGRM1	A
PZR-HTR-B	HTR	RC	MCC-F12A	480	LVSGRM2	B
RC11	MOV	RC	MCC-F12A	480	LVSGRM2	B
RC2A	SOV	RC	PNL-DBP	125	LVSGRM2	2
RCS-VESSEL	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. A separate startup feedwater pump provides steam generator makeup during startup and shutdown of the plant.

3.2.2 System Definition

The AFW system consists of two turbine-driven pumps. The normal water source for the pumps is the condensate storage tank. Alternate sources of water are the Service Water System, the deaerator storage tanks, and the fire water system. Each pump is normally aligned to supply one of two steam generators, but can be aligned to supply the opposite steam generator through a crosstie containing a normally closed motor-operated valve. The turbine-driven pumps receive their steam supply from both steam generators and exhaust to the atmosphere.

The SSR system includes nine safety valves and one power-operated pressure control valve 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 by the Steam and Feedwater Line Rupture Control System (SFRCS) when needed to maintain the secondary coolant inventory in the steam generators. The system can also be manually started from the control room, and the turbine driven pump can be started and controlled locally. Operation of the AFW system is independent of the Integrated Control System (ICS).

AFW pump 1-1 is normally aligned to feed steam generator 1-1. Similarly, pump 1-2 is normally aligned to feed SG 1-2. Both pumps can be aligned to feed the opposite steam generator. This realignment takes place when a faulted steam generator is detected and isolated by the SFRCS. Each turbine-driven AFW pump is supplied with steam from both steam generators.

During AFW operation, level in the steam generators is maintained automatically by a safety-grade steam generator level control system which modulates turbine speed as needed to maintain SG level.

Both AFW pumps are normally supplied via a common header from the condensate storage tank. The service water system is the preferred backup water source for the AFW system (see Section 3.8). Alternate water sources for the AFW system are the fire protection system (see Figure 3.2-3) and the deaerator storage tanks.

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 a power-operated pressure control valve on each main steam line.

3.2.4 Sys·m Success Criteria

For u.e 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):

- Makeup of 800 gpm to either steam generator provides adequate decay heat removal from the Reactor Coolant System.
- Either AFW pump can provide adequate flow.
- Either the condensate storage tank, or the Service Water System is an adequate source of water for the AFW pumps. No credit was taken for water from the fire protection system or the deaerator storage tanks.

3.2.5 Component Information

A. Steam turbine-driven AFW pumps 1-1 and 1-2
   1. Rated flow: 1050 gpm @ 1050 psi head
   2. Rated capacity: 100% (Ref. 1)
   3. Type: Centrifugal

B. Condensate storage tanks (2)
   1. Capacity: 250,000 gallons each

C. Deaerator storage tanks
   1. Capacity: 128,000 gallons

D. Secondary steam relief valves
   1. Nine safety valves per main steam line
   2. One power-operated pressure control valve 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 by the Steam and Feedwater Line Rupture Control System (SFRCS) as described in Section 3.5.
      b. AFW flow control
         The pump speed (i.e. governor setting) is controlled by the safety-grade steam generator level control system described in Section 3.5.
      c. Water source switch-over
         When an AFW pump low suction pressure is sensed, this will automatically cause the steam supply to the turbine to be inhibited and the pump suction shifted to the service water system. When suction pressure is restored, steam is automatically readmitted to the turbine.
      d. Pump discharge realignment
         The SFRCS will automatically isolate a faulted (i.e. low pressure) steam generator by closing the respective isolation valve (AFW599 or AFW608). The associated AFW pump is automatically realigned to feed the opposite steam generator by opening valve AFW 3869 or AFW 3871 as appropriate (Refs. 1, 2).

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 fr m the fire protection system must be done manually.

B. Motive Power
   1. AFW motor-operated valves are Class 1E AC and DC loads as described in Section 3.6. Note that DC powered valves AFW106, AFW360 and AFW3870 are all associated with AFW pump 1-1 supplying steam generator 1-1. The remaining valves in the system require AC power. Operation of AFW pump 1-2 requires AC power or local manual actions to open its steam supply valve AFW107. All cross-ties also require AC power or local manual actions (Ref. 1).
   2. The power supply paths for isolation valves AFW599 and AFW608 have series circuit breakers (actually series magnetic contactors) in two different motor control centers. Operation of these valves requires that both sets of contactors be closed. This design feature appears to be intended to reduce the probability of a spurious closure of the steam generator isolation valves.

C. Other
   1. Lubrication and cooling are provided locally for pumps and the turbine drive. The pump cooling system is shown in Figure 3.2-4.
   2. Both AFW pumps require minimum flow protection which is provided by the normally open recirculation flow path shown in Figure 3.2-4.
   3. AFW pump room ventilation is discussed in Section 3.9.
   4. Control air requirements to support operation of the atmospheric steam dump valves is not known.

3.2.7 Section 3.2 References

1. Youngblood, R. and Papzoglou, I.A., "Review of the Davis-Besse Unit No. 1 Auxiliary Feedwater System Reliability Analysis", NUREG/CR-3530, Brookhaven National Laboratory, February 1984.

2. NUREG-1154, "Loss of Main and Auxiliary Feedwater Event at the Davis Besse Plant on June 9, 1985", USNRC, July 1985.

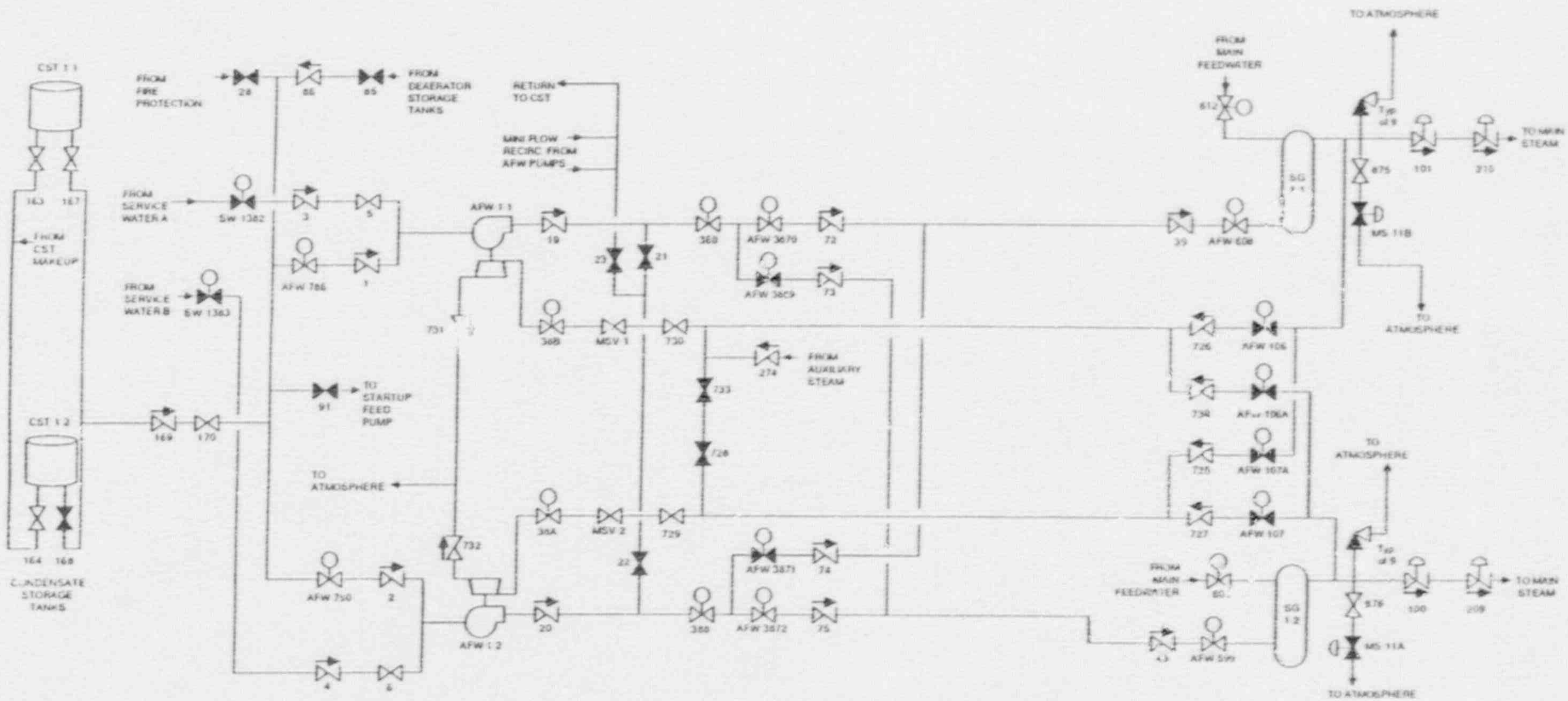


Figure 3.2-1. Davis Besse Auxiliary Feedwater and Secondary Steam Relief Systems

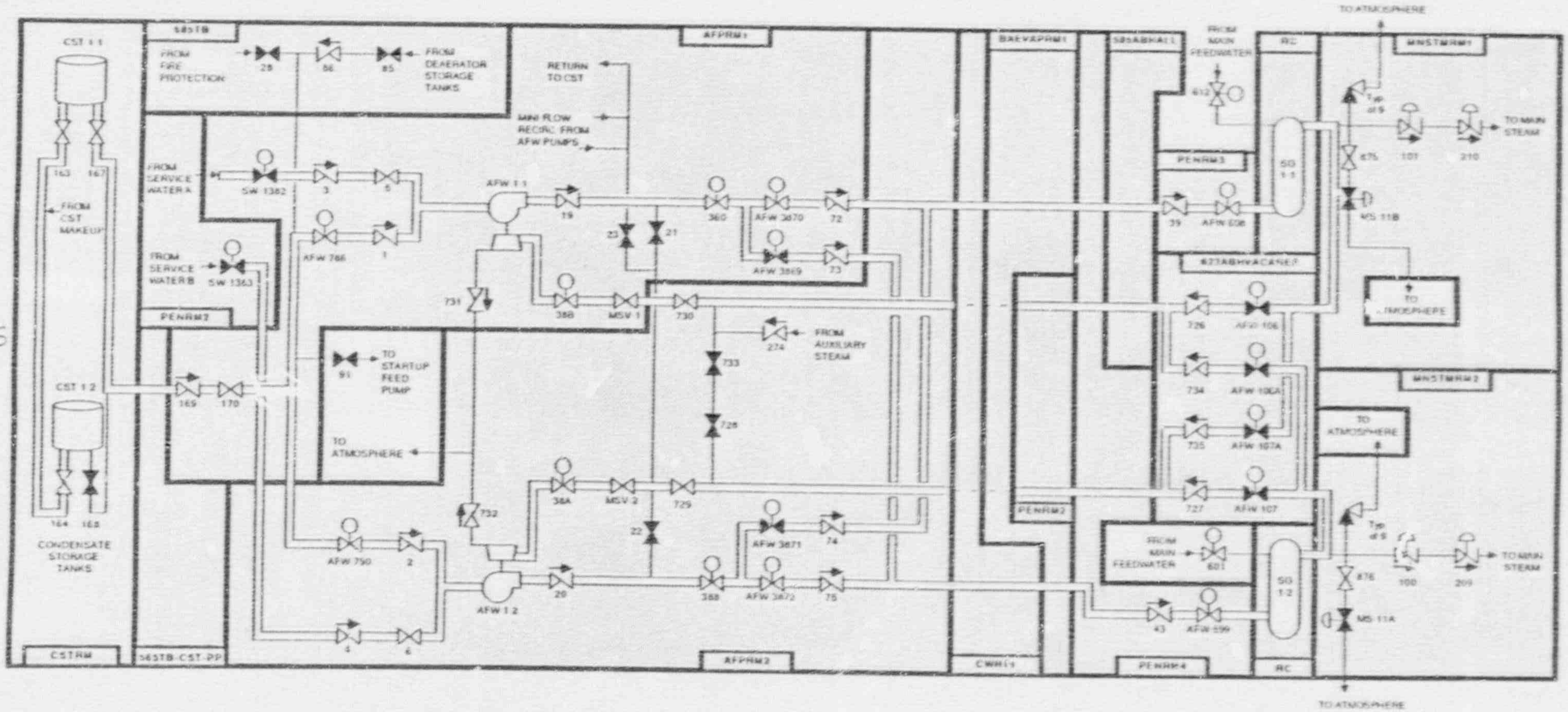


Figure 3.2-2. Davis Besse Auxiliary Feedwater and Secondary Steam Relief Systems Showing Component Locations

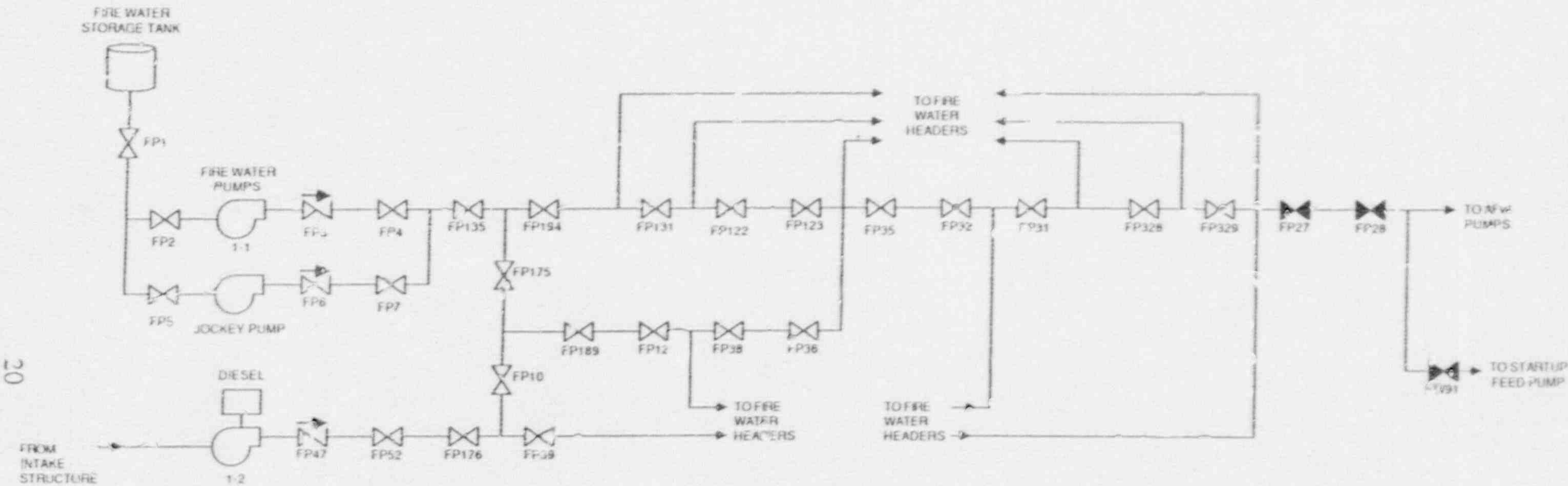


Figure 3.2-3. Davis Besse Fire Water Supply to the AFW System

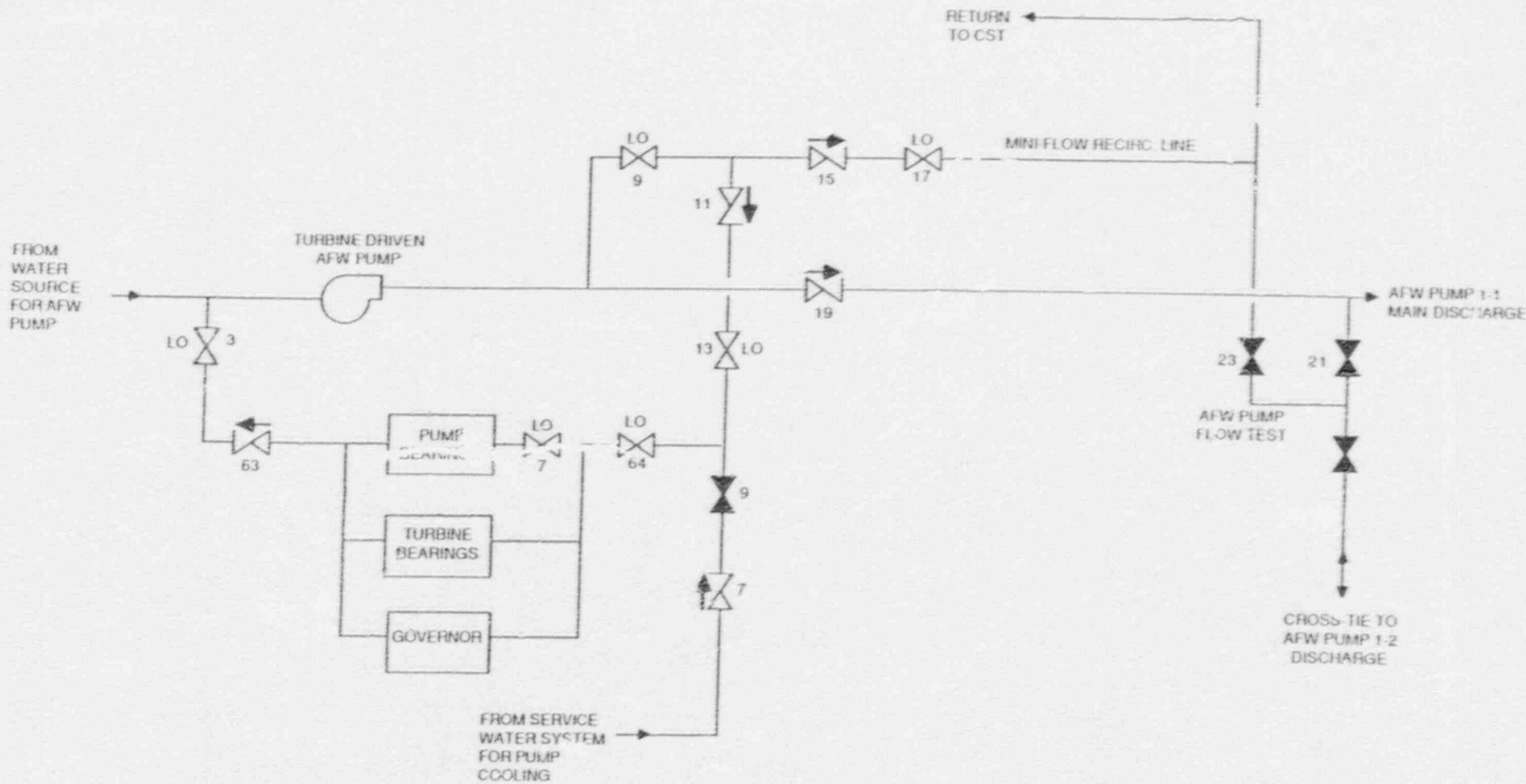


Figure 3.2-4. Davis Besse AFW Pump Cooling And Minimum Flow And Full Flow Recirculation Features

Table 3.2-1. Davis Besse Auxiliary Feedwater System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
AFW1-1	TDP	AFPRM1				
AFW1-2	TDP	AFPRM2				
AFW106	MOV	623ABHVACAREA	DC-MCC1	125	LVSGRM1	A
AFW106A	MOV	623ABHVACAREA	MCC-E12B	480	DGRM1	A
AFW106A	MOV	623ABHVACAREA	MCC-E12B	480	DGRM1	A
AFW107	MOV	623ABHVACAREA	MCC-F11A	480	ELECTPENRM2	B
AFW107A	MOV	623ABHVACAREA	MCC-F11B	480	MCCF11BRM	B
AFW360	MOV	AFPRM1	DC-MCC1	125	LVSGRM1	A
AFW3869	MOV	AFPRM1	MCC-E11E	480	CRDRM	A
AFW3870	MOV	AFPRM1	DC-MCC1	125	LVSGRM1	A
AFW3871	MOV	AFPRM2	MCC-F12A	480	LVSGRM2	B
AFW3871	MOV	AFPRM2	MCC-F12A	480	LVSGRM2	B
AFW3872	MOV	AFPRM2	MCC-F12B	480	DGRM2	B
AFW388	MOV	AFPRM2	MCC-F12A	480	LVSGRM2	B
AFW599	MOV	PENRM4	MCC-F11A	480	ELECTPENRM2	B
AFW608	MOV	PENRM3	MCC-E12E	480	PPTUN	A
AFW729	XV	AFPRM2				
AFW730	XV	AFPRM2				
AFW786	MOV	AFPRM1	MCC-E11D	480	MKUPCOR	A
AFW790	MOV	AFPRM2	MCC-F12A	480	LVSGRM2	B
CST1-1	TK	CSTRM				
CST1-2	TK	CSTRM				
MS11A	NV	MNSTMRM1	ICS			A/B
MS11B	NV	MNSTMRM2	ICS			A/B
SW1382	MOV	AFPRM1	MCC-E12A	480	LVSGRM1	A
SW1383	MOV	PENRM2	MCC-F11C	480	PENRM2	B

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 containment spray system and fan cooler systems.

3.3.2 System Definition

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

- Passive core flood tanks (accumulators)
- High pressure injection (HPI) system
- Low pressure injection (LPI) system

The HPI system provides the high pressure coolant injection capability. The decay heat removal (DHR) pumps perform the low pressure injection function. The Borated Water Storage Tank (BWST) is the water source for both the high and low pressure injection systems. 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 component cooling water system by the RHR heat exchangers.

Simplified drawings of the high pressure injection system are shown in Figures 3.3-1 and 3.3-2. The low pressure injection/recirculation system is shown in Figures 3.3-3 and 3.3-4. Interfaces between the accumulators, 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). A safety feature actuation system (SFAS, see Section 3.5) automatically starts the two HPI pumps, and the two LPI pumps. All pumps are aligned to take suction on the BWST.

The shutoff head of the HPI pumps is less than normal RCS operating pressure, therefore the RCS must depressurize somewhat in order to receive makeup from the HPI pumps (Ref. 1). For small breaks, operator action can be taken to augment the RCS depressurization by utilizing the secondary steam dump capability and the auxiliary feedwater (AFW) system (i.e., depressurization due to rapid heat transfer from the RCS).

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 the functions of emergency coolant injection, and emergency coolant recirculation be accomplished. The ECI system success criteria for a small LOCA inside containment are the following (Ref. 1):

- At least one HPI pump or both makeup pumps take a suction on the BWST and inject into the RCS cold legs
- Heat is removed via the steam generators by the auxiliary feedwater and secondary steam relief systems (to reduce RCS pressure)

If the above system success criteria are met, then the following ECR success criterion for a small LOCA will apply:

- At least one DHR pump is aligned and takes suction on the containment sump, and directs flow to the suction side of the corresponding HPI pump which returns the water to the RCS. This is the high pressure recirculation flow path (Ref. 2, Section 6.3.1.4).

The ECI system success criteria for a large LOCA inside containment are the following (Ref. 2, Section 6.3.2.11).

- At least one core flood tank injects into the RCS, and
- At least one HPI pump take a suction on the BWST and inject into the RCS cold legs, and
- At least one DHR pump take a suction on the BWST and inject into the RCS cold legs

ECR for a large LOCA can be established by realigning the suction of one DHR pump to the containment sump.

3.3.5 Component Information

A. High pressure injection pumps 1-1 and 1-2
   1. Rated flow: 500 gpm @ 2700 ft head (1170 psid)
   2. Rated capacity: 100%
   3. Discharge pressure at shutoff head: 1625 psig
   4. Type: centrifugal

B. Low pressure injection (decay heat removal) pumps 1-1 and 1-2
   1. Rated flow: 3000 gpm @ 350 ft. head (152 psid)
   2. Rated capacity: 100%
   3. Discharge pressure at shutoff head: 186 psig
   4. Type: centrifugal

C. Core flood tanks (2)
   1. Accumulator total volume: 1410 ft3
   2. Minimum water volume: 1040 ft3
   3. Normal operating pressure: 600 psig
   4. Nominal boric acid concentration: 1800 ppm

D. Borated water storage tank
   1. Capacity: 550,000 gallons
   2. Minimum water volume: 482,778 gallons
   3. Design pressure: Atmospheric
   4. Minimum boron concentration: 1800 ppm

E. DHR coolers 1-1 and 1-2
   1. Design duty: 30 x 106 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 HPI and DHR pump and the DHR coolers are served from redundant loops of the CCW system (see Section 3.7).
   2. An external circulating lube oil system is provided for the HPI pump thrust bearings. The forced lube oil system for each HPI pump utilizes two oil pumps, one AC powered and one supplied from 125 VDC. Normal operation utilizes the AC pump. Power sources for these lube oil pumps are listed below:

HPI Pump	AC lube pump	DC lube pump
1-1	MCC-E12E	DC-MCC1
1-2	MCC-F12A	DC-MCC2

   3. ECCS pump room ventilation is discussed in Section 3.9.

3.3.7 Section 3.3. References

1. NUREG-0565, "Generic Evaluation of Small Break Loss-of-Coolant Accident Behavior in Babcock and Wilcox Designed 177-FA Operating Plant", USNRC, January 1980.

2. Davis-Besse Updated Final Safety Analysis Report.

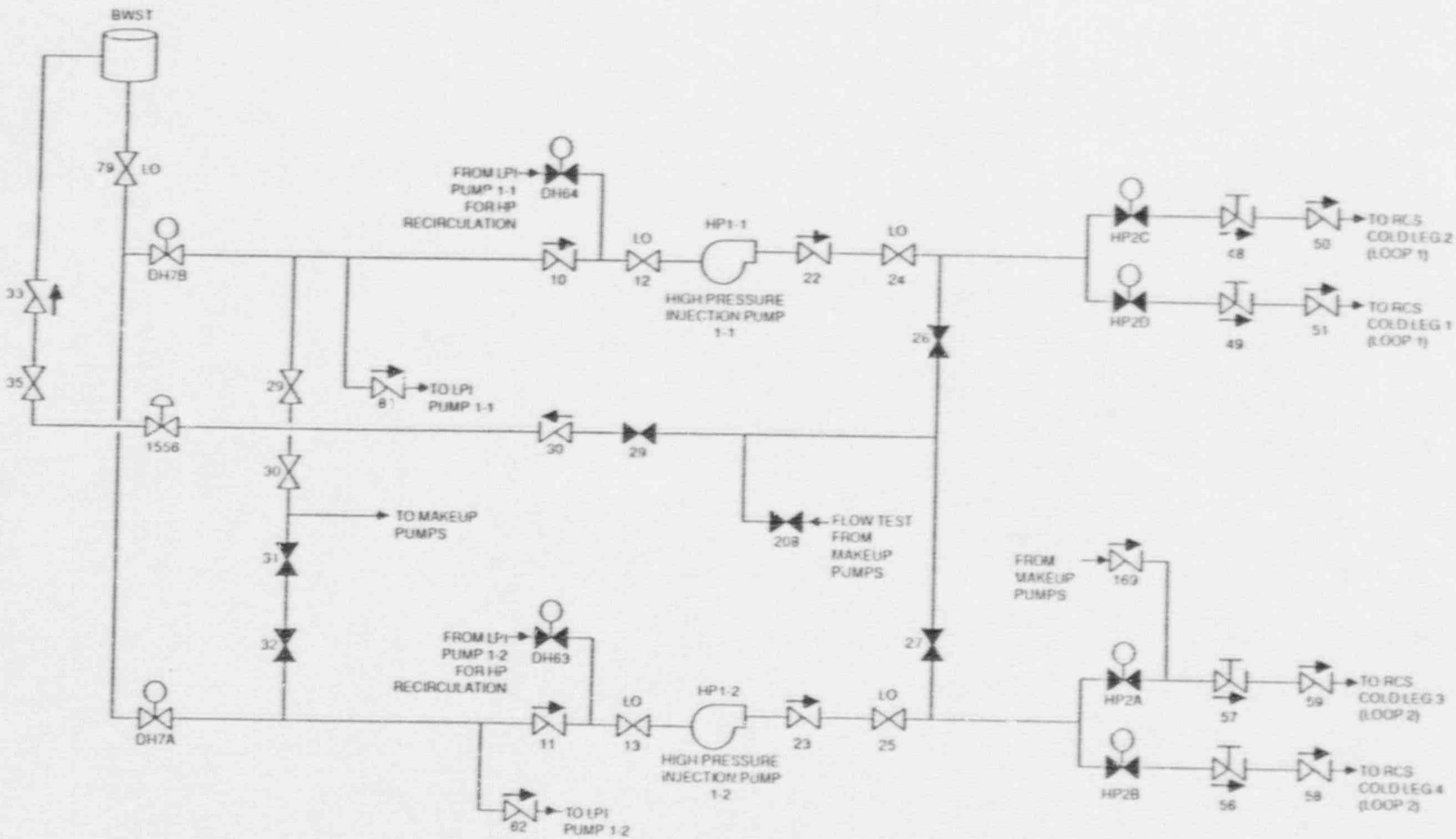


Figure 3.3-1 Davis-Besse High Pressure Injection System

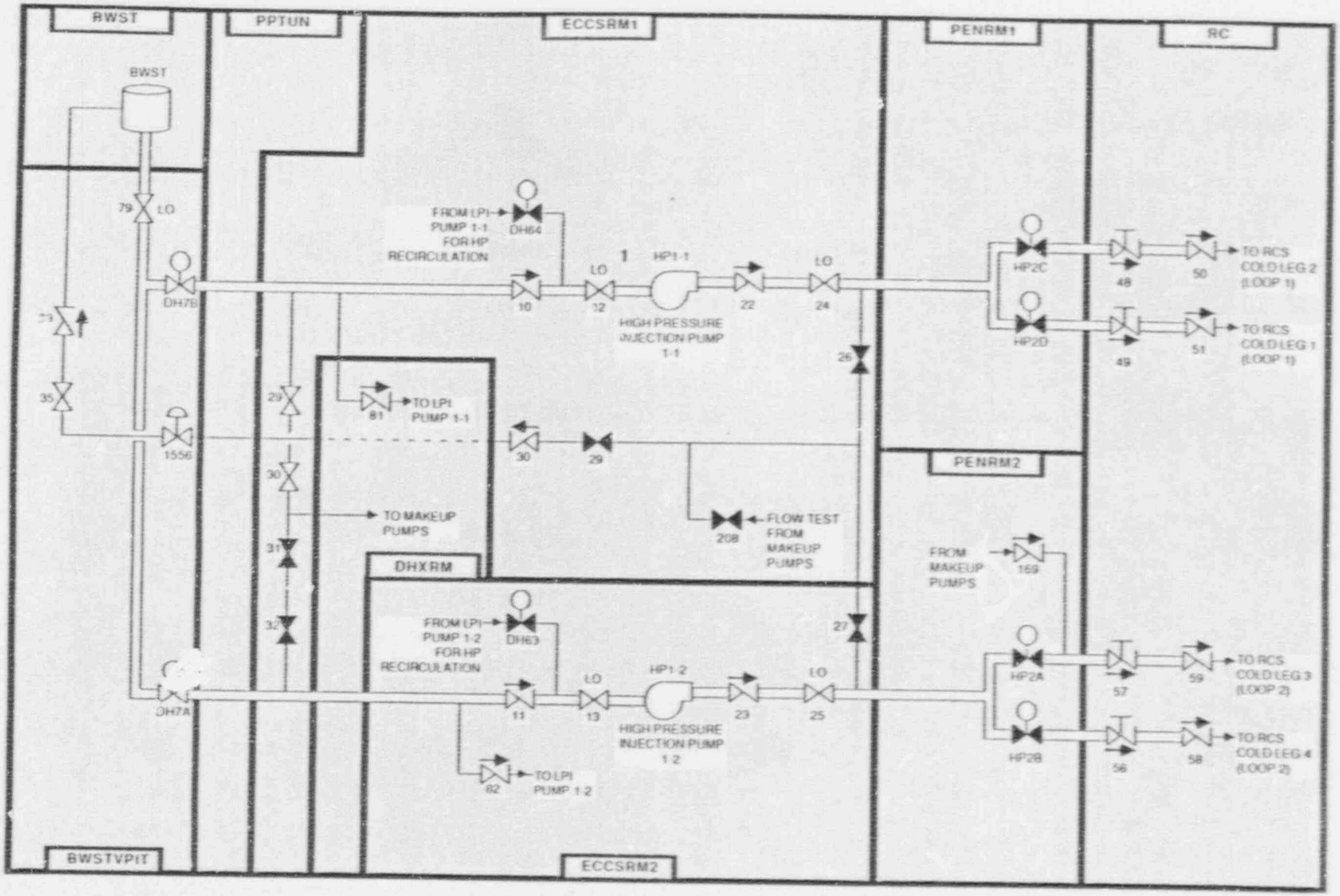


Figure 3.3-2. Davis-Besse High Pressure Injection System Showing Component Locations

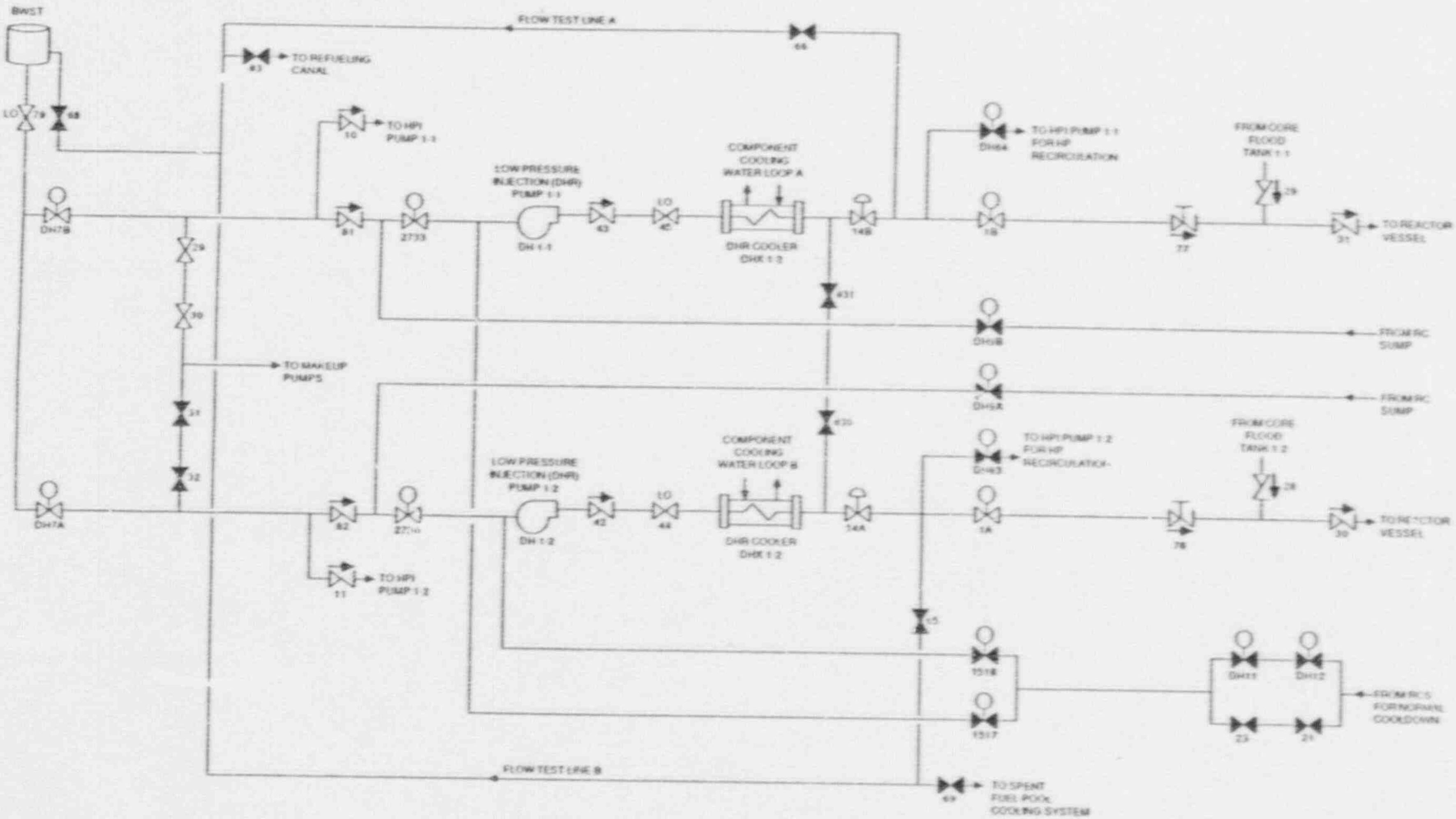


Figure 3.3-3. Davis-Besse Low Pressure Injection/Recirculation System

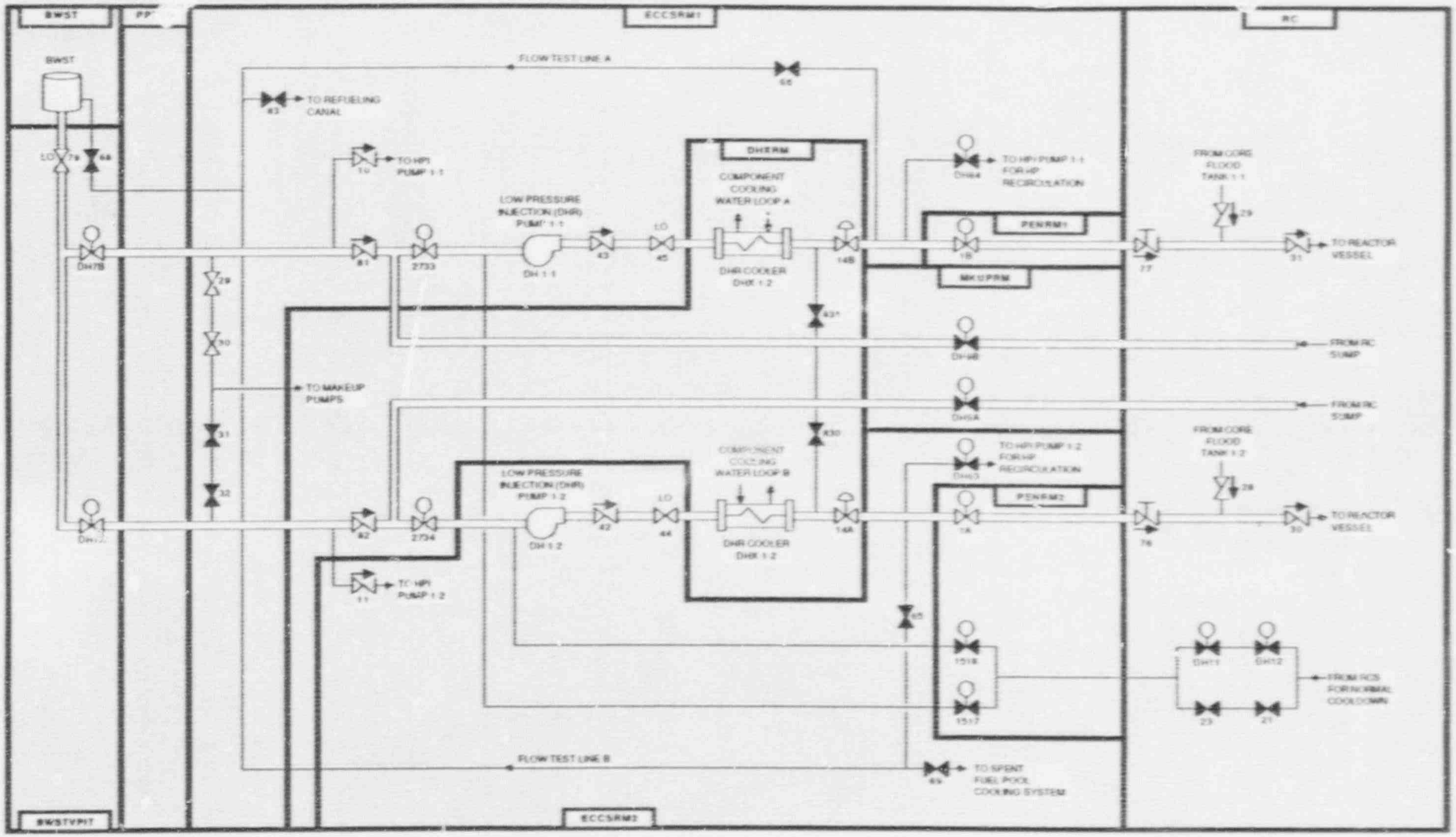


Figure 3.3-4. Davis-Besse Low Pressure Injection/Recirculation System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP
	PP	PENRM1				
DH1-1	MDP	ECCSRM1	BUS-C1	4160	HVSGRM1	A
DH1-2	MDP	ECCSRM2	BUS-D1	4160	HVSGRM2	B
DH14A	NV	DHXRM	UNKNOWN			
DH14B	NV	DHXRM	UNKNOWN			
DH1A	MOV	PENRM2	MCC-F11C	480	PENRM2	B
DH1B	MOV	PENRM1	MCC-E11A	480	565ABHALL	A
DH2733	MOV	ECCSRM2	MCC-E11A	480	565ABHALL	A
DH2734	MOV	DHXRM	MCC-F11C	480	PENRM2	B
DH63	MOV	ECCSRM2	MCC-F11E	480	PPTUN	B
DH64	MOV	ECCSRM1	MCC-E11E	480	CRDRM	A
DH9A	MOV	MKUPRM	MCC-F11C	480	PENRM2	B
DH9B	MOV	MKUPRM	MCC-E11A	480	565ABHALL	A
DHX 1-2	HX	DHXRM				
DHX1-1	HX	DHXRM				
HP2A	MOV	PENRM2	MCC-F11C	480	PENRM2	B
HP2B	MOV	PENRM2	MCC-F11C	480	PENRM2	B
HP2C	MOV	PENRM1	MCC-E11A	480	565ABHALL	A
HP2D	MOV	PENRM1	MCC-E11A	480	565ABHALL	A
HPI1-1	MDP	ECCSRM1	BUS-C1	4160	HVSGRM1	A
HPI1-2	MDP	ECCSRM2	BUS-D1	4160	HVSGRM2	B

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. The makeup function is assumed to be required to maintain the plant in a long-term hot shutdown condition. The makeup system is not considered to be part of the Emergency Core Cooling System (ECCS, see Section 3.3).

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 of a small side stream of reactor coolant for purification and provides seal water injection to the reactor coolant pump seals.

The functions of the makeup and purification system are performed by the following components: (a) the charging 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, and (h) various heat exchangers and demineralizers.

Simplified drawings of the makeup and purification system, focusing on the makeup portion of the system, are shown in Figures 3.4-1 to 3.4-4. A summary of data on selected makeup system components is presented in Table 3.4-1.

3.4.3 System Operation

During normal plant operation, one makeup pump is running with its suction aligned to the makeup tank. The letdown flow from RCS cold leg 1 is cooled in 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 the tube side of the regenerative heat exchanger. One makeup line into cold leg 3 is provided. 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

The following success criterion is assumed for post-transient makeup:

- 1 of 2 centrifugal makeup pumps

3.4.5 Component Information

A. Makeup pumps 1-1 and 1-2
   1. Rated flow: 150 @ 2514 psid
   2. Rated capacity: 100% (based on makeup function)
   3. Type: centrifugal

B. Borated Water Storage Tank (BWST)
   1. Capacity: 550,000 gallons
   2. Minimum water volume: 482,778 gallons
   3. Boron concentration: 1,800 minimum
   4. Operating pressure: atmospheric

C. Makeup Tank
   1. Volume: 600 ft3
   2. Nominal Water Volume: 400 ft3 (about 3000 gallons)
   3. Operating pressure: 15 to 35 psig

D. Boric Acid Addition Tanks
   1. Capacity: 6893 gallons
   2. Operating pressure: 15 psig

E. Boric Acid Pumps (2)
   1. Rated capacity: 25 gpm @ 140 ft head (61 psid)
   2. Type: centrifugal

F. Demineralized Water Storage Tank (DWST)
   1. Capacity: 30,000 gallons
   2. Operating pressure: atmospheric

G. Demineralized Water Transfer Pumps (2)
   1. Capacity: 200 gpm @ unknown head
   2. Type: centrifugal

3.4.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. During normal operation, the makeup pumps are automatically controlled by the pressurizer level control system.
      b. The SFAS automatically isolates the nonessential CCW header which supplies the makeup pumps and the makeup pumps are shut down.
   2. Remote Manual
      The makeup pumps can be actuated by remote manual means from the control room.

B. Motive Power
   1. The makeup 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 makeup pumps are cooled by the nonessential loop of the component cooling water system.
   2. Pump lubrication is provided locally.
   3. The method of makeup pump room ventilation has not been determined.

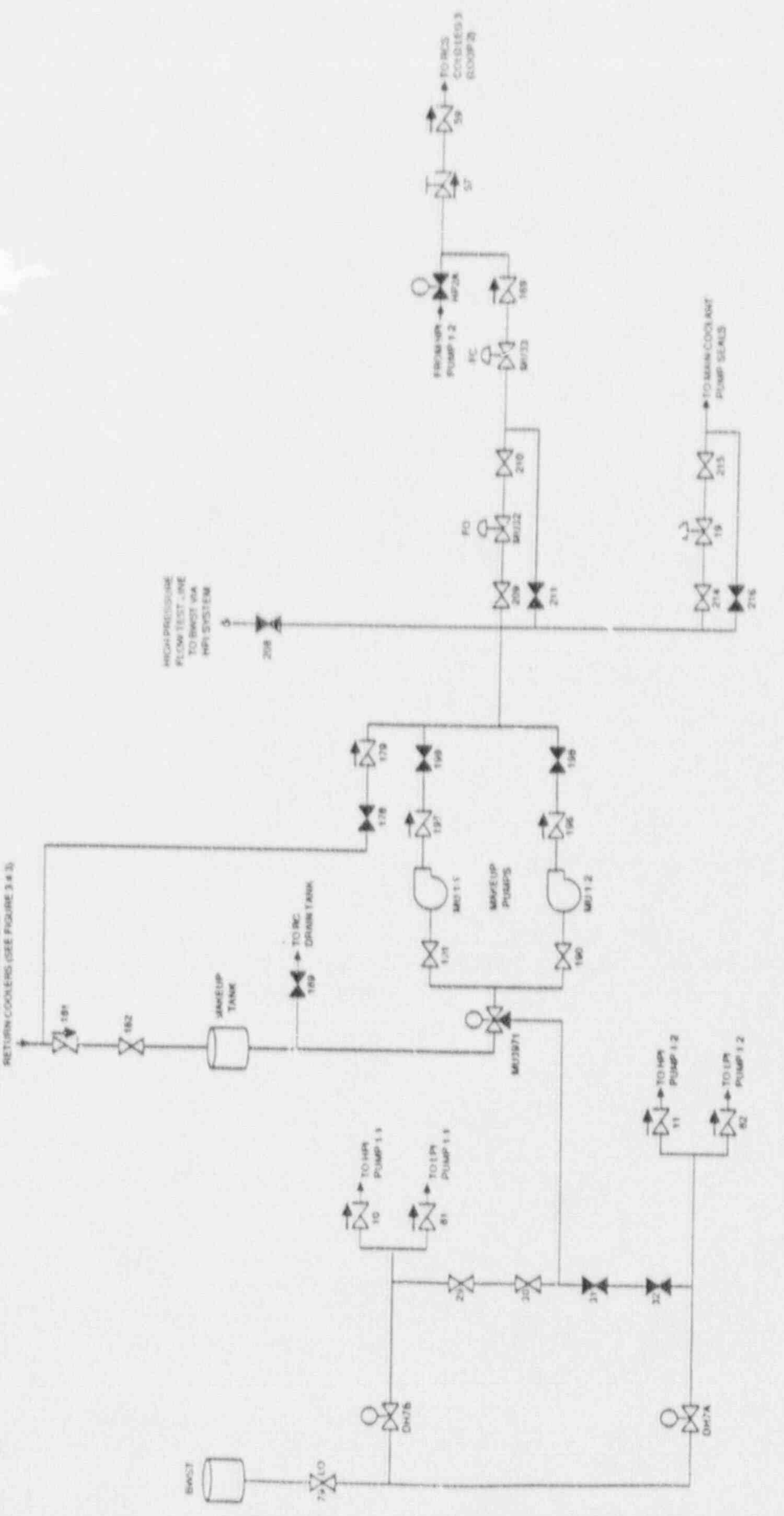


Figure 3.4-1. Davis-Besse Makeup System

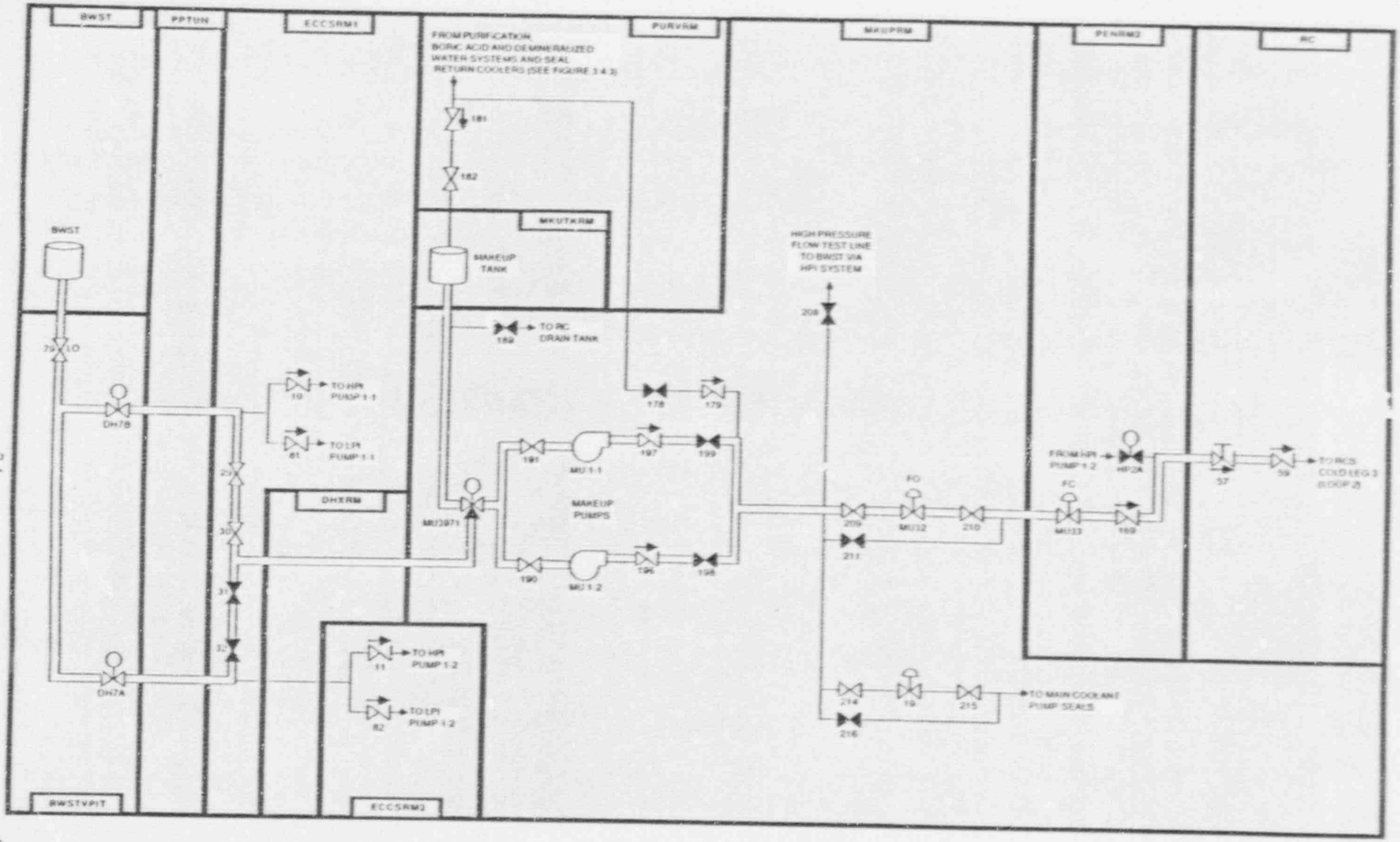


Figure 3.4-2. Davis-Besse Makeup System Showing Component Locations

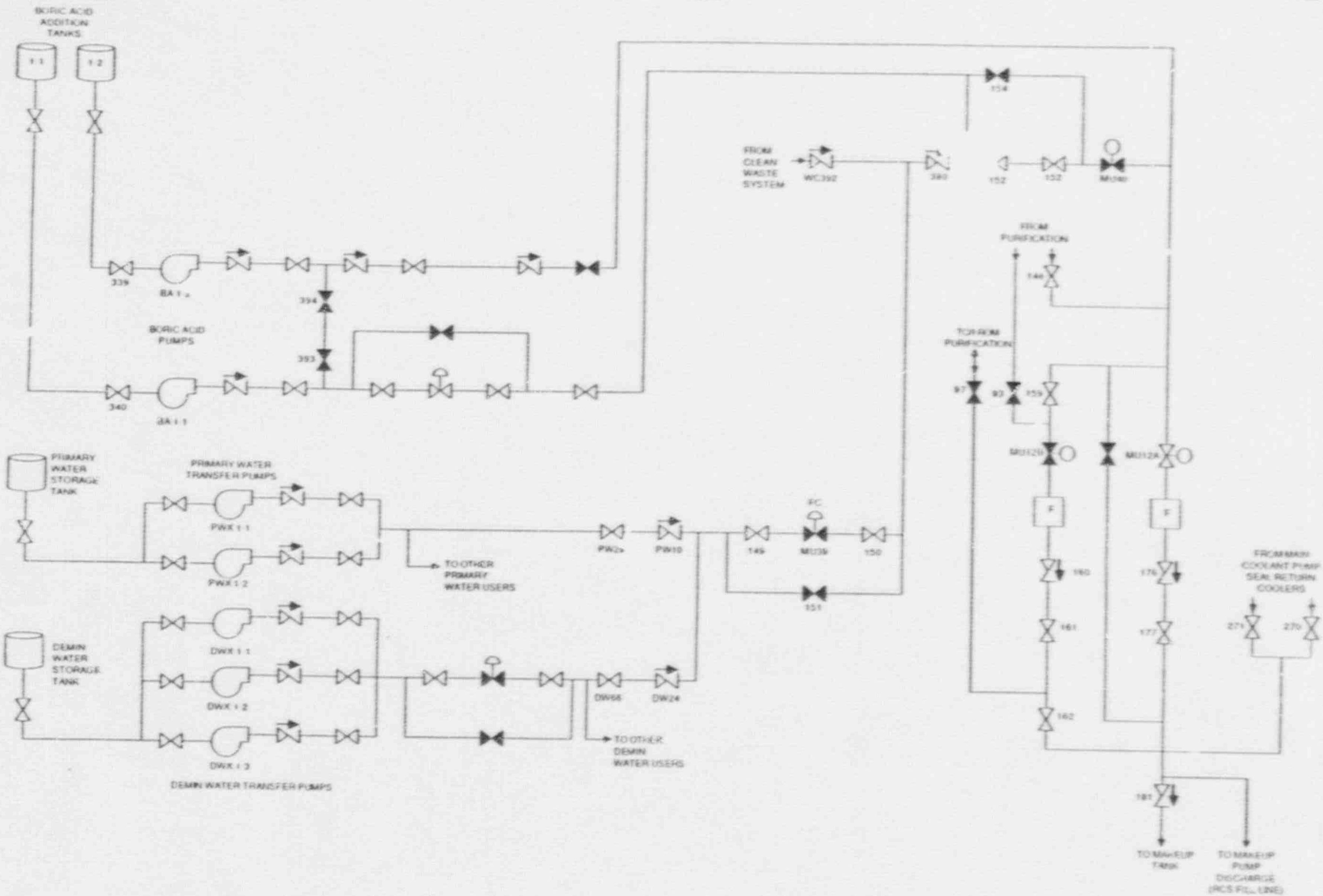


Figure 3.4-3. Davis Besse Normal Water Sources for Makeup System

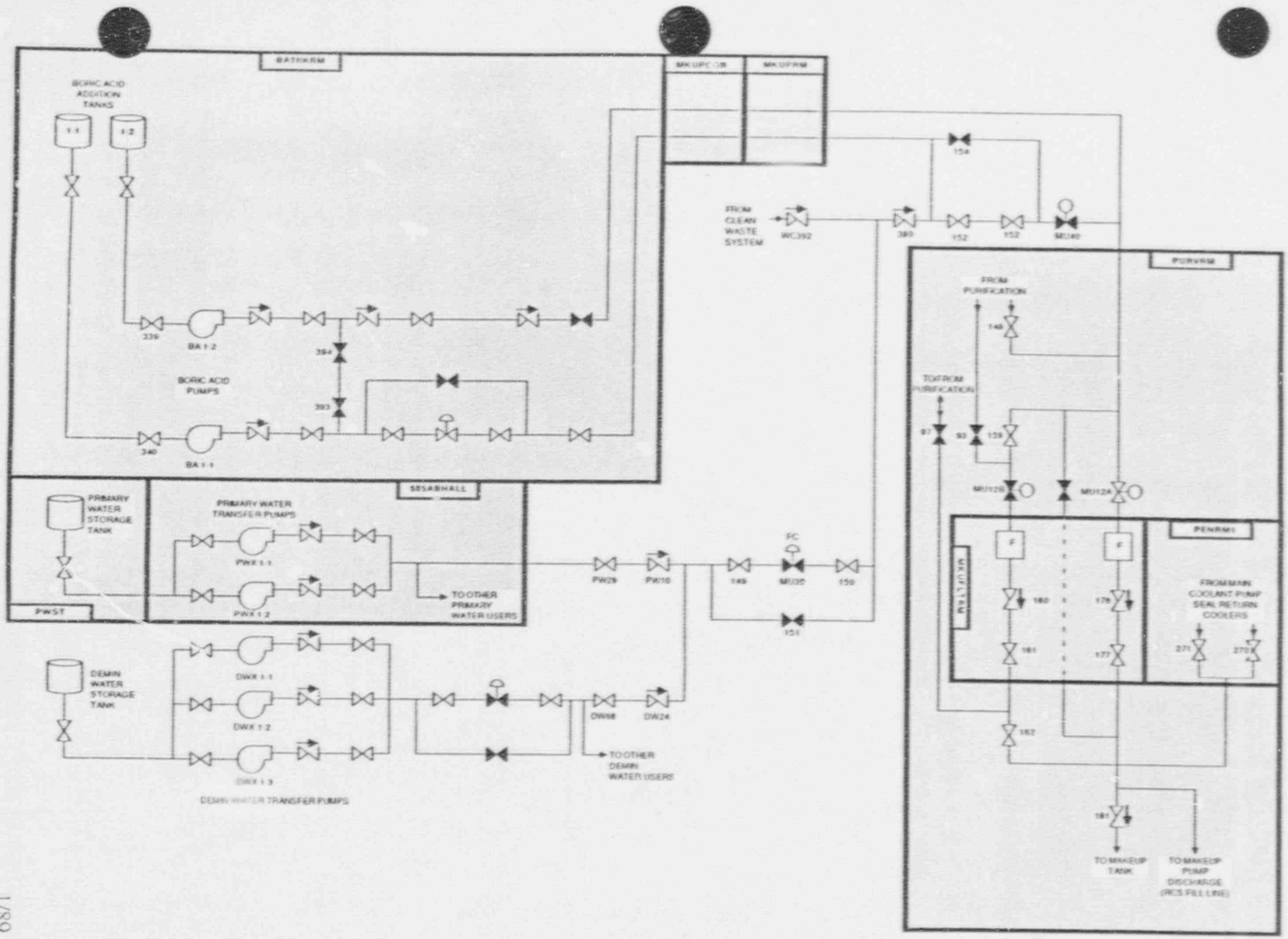


Figure 3.4-4. Davis Besse Normal Water Sources for Makeup System Showing Component Locations

Table 3.4-1. Davis Besse Makeup and Purification System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BA-TK1-1	TK	BATNKRM				
BA-TK1-2	TK	BATNKRM				
BA1-1	MDP	BATNKRM	MCC-E11D	480	MKUPCOR	A
BA1-2	MDP	BATNKRM	MCC-F11D	480	MKUPCOR	B
BWST	TK	BWST				
DH7A	MOV	BWSTVPIT	MCC-F11B	480	MCCF11BRM	B
DH7B	MOV	BWSTVPIT	MCC-E11A	480	565ABHALL	A
DWST	TK	UNKNOWN				
DWX1-1	MDP	UNKNOWN	UNKNOWN			
DWX1-2	MDP	UNKNOWN	UNKNOWN			
DWX1-3	MDP	UNKNOWN	UNKNOWN			
MU1-1	MDP	MKUPRM	BUS-C1	4160	HVSGRM1	A
MU1-2	MDP	MKUPRM	BUS-D1	4160	HVSGRM2	B
MU32	NV	MKUPRM	UNKNOWN			
MU33	NV	PENRM2	UNKNOWN			
MU3971	MOV	MKUPRM	MCC-E11D	480	MKUPCOR	A
MU3971	MOV	MKUPRM	MCC-E11D	480	MKUPCOR	A
MU40	MOV	UNKNOWN	MCC-E11A	480	565ABHALL	A
PWST	TK	PWST				
PWX1-1	MDP	585ABHALL	MCC-E11C	480	585ABHALL	A
PWX1-2	MDP	585ABHALL	MCC-F11B	480	MCCF11BRM	B

3.5 INSTRUMENTATION AND CONTROL (I & C) SYSTEMS

3.5.1 System Function

The instrumentation and control systems include the Reactor Protection System (RPS), Anticipatory Reactor Trip System (ARTS), the Safety Features Actuation System (SFAS), the Steam and Feedwater Line Rupture Control System (SFRCS), the Steam Generator Level Control System and systems for the display of plant information to the operators. The RPS, SFAS and SFRCS monitor the reactor plant, and alert the operator to take corrective action before specified limits are exceeded. The RPS will initiate an automatic reactor trip (scram) to rapidly shutdown the reactor when plant conditions exceed one or more specified limits. The SFAS and SFRCS will automatically actuate selected safety systems based on the specific limits or combinations of limits that are exceeded. A remote shutdown capability is provided to ensure the reactor can be brought to a safe condition in the event the main 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 ARTS is an input to the RPS. The SFAS and SFRCS includes sensor and transmitter units, logic units and relays that interface with the control circuits for the many different sets of components that can be actuated by the these systems. 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 (1, 2, 3, and 4), 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 (Ref. 1, Section 7.2):

- Manual
- Overpower
- High neutron flux (flow-biased 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

In addition, the Anticipatory Reactor Trip System (ARTS) provides a trip input to the RPS based on the following (Ref. 1, Section 7.4):

- Loss of both main feedwater pumps
- Main turbine trip
- Steam and Feedwater Line Rupture Control System (SFRCS) trip

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 has four input instrument channels (1, 2, 3 and 4) and a 2-out-of-four trip logic that is designed to be failsafe (i.e. a channel will trip upon loss of control power). The four input logic channels monitor the following plant parameters (Ref. 1, Section 7.3):

- Containment radiation level
- Containment pressure
- RCS pressure
- Essential bus voltag
- BWST level

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) containment isolation, (4) containment spray actuation, (5) containment fan cooler actuation, (6) CCW system actuation, (7) service water system actuation, (8) emergency ventilation system actuation, (9) BWST low level alarm, and (10) diesel generator and load sequencer actuation. The control room operators can manually trip the SFAS logic subsystems.

C. SFRCS

The SFRCS is an automatic actuation system that performs the following functions (Ref. 1, Section 7.4):

- Auxiliary Feedwater System actuation based on the following:
  - Loss of both main feedwater pumps
  - Loss of all main coolant pumps
  - Main feedwater or main steam line rupture as determined by:
    - Main steam pressure drops to 591.6 psig, or
    - Steam generator pressure more than 197.6 psig above main feedwater pressure
- AFW feed isolation to a faulted steam generator (Ref. 2)
- Main steam or feedwater line isolation following detection of a steam or feed line breach
- Anticipatory Reactor Trip System (ARTS) input

The SFRCS has two redundant, independent actuation channels. Within each actuation channel, one logic channel is AC powered and one is DC powered. Both logic channels must trip in order to actuate most components controlled by the SFRCS actuation channel.

The SFRCS is a failsafe (deenergize to trip) system, therefore loss of control power will cause the logic to trip.

D. Steam Generator Level Control System
When auxiliary feedwater is required, essential level control is provided to maintain the steam generator at an uncompensated level of 99 inches.

E. Auxiliary Shutdown Panel (ASP)
Plant operators can establish and maintain a safe hot shutdown condition from the ASP when the main control room is not habitable. The following controls are provided on this panel to accomplish hot shutdown (Ref. 1):

- Pressurizer heater controls and control transfer switches (to or from the Main Control Boards)
- Auxiliary feed pump governor controls and control transfer switches (to or from the Main Control boards)
- Service water isolation valve switches and control transfer switches (to or from the Main Control Boards)

Inasmuch as the station can be maintained in a safe hot shutdown condition from the outside the control room until access to the control room is regained, the need for taking the station to a cold shutdown condition from outside the control room is not anticipated. However, the ability to bring the station to a cold shutdown condition from outside the control room exists with the present station design. Through local controls, all necessary functions can be performed outside the control room.

3.5.4 System Success Criteria

1. RPS
The RPS uses hindrance logic (normal = 1, trip = 0) in both the input and output logic. Therefore, a channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). A reactor scram will occur upon loss of control power to the RPS. A reactor scram usually is implemented by the scram circuit breakers which must open in response to a scram signal. Typically, there are two series scram circuit breakers in the power path to the scram rods. In this case, one of two circuit breakers must open. Details of the scram system for Davis-Besse have not been determined.
2. SFAS and SFRCS
A single component usually receives a signal from only one actuation system output train. SFAS and SFRCS Trains A and B must be available in order to automatically actuate the respective components listed in A, above. The Davis-Besse USAR (Ref. 1) states that these systems are failsafe (i.e. use hindrance input logic with normal = 1, trip = 0); therefore, the input logic channels will trip on loss of control power. It is not clear if control power is needed for the SFAS and SFRCS to send an actuation signal from the output logic to the respective actuated component
3. 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 remote shutdown panel or a motor control center). To make these judgments, 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 Y1, Y2, Y3 and Y4.
2. SFAS
The SFAS input instrument channels are powered from 120 VAC essential distribution panels Y1, Y2, Y3 and Y4. The SFAS A and B output logic main power sources have not been identified, however, some SFAS solenoid valves are known to be powered from 125 VDC essential distribution panels D1P and D2P.
3. SFRCS
The SFRCS instrument channels are powered from 120 VAC essential distribution panels Y1 and Y2. The power sources for SFRCS DC-powered logic channels have not been identified.
4. Steam Generator Water Level Control System
Control power source has not been identified.
5. Auxiliary Shutdown Panel
The auxiliary shutdown panel is powered from 120 VAC essential distribution panels Y1 and Y2.
6. Operator Instrumentation
Operator instrumentation displays are powered from 120 VAC and/or 125 VDC essential distribution panels.

B. Control Room Emergency Ventilation System
1. The emergency ventilation system for the control room area is discussed in Section 3.9.

3.5.6 Section 3.5 References

1. Davis Besse Updated Final Safety Analysis Report, Section 7.4.1.6.

2. NUREG-1154, "Loss of Main and Auxiliary Feedwater Event at the Davis Besse Plant on June 9, 1985", USNRC, July 1985.

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 two 4160 buses, designated C1 and D1. There are two standby diesel generators connected to the buses. Diesel generator 1 is connected to bus C1, and diesel generator 2 is connected to bus D1. There are also two 480 VAC load center buses, designated E1 and F1. Bus 1E is connected to 4160 bus C1 through a transformer, and bus F1 is connected to 4160 bus D1. Various motor control centers receive their power from the 480 VAC buses

Emergency power for vital instruments, control, and emergency lighting is supplied by four 125 VDC station batteries. The batteries energize four DC distribution centers, designated D1P, D1N, D2P, and D2N. 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. Additional details of the 480 VAC distribution system are shown in Figure 3.6-2. The 125 VDC and 120 VAC distribution systems are shown in Figure 3.6-3. A summary of data on selected electric power system components is presented in Table 3.6-1. A partial listing of electrical sources and loads is presented in Table 3.6-2.

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 345 kV switching station. The normal source for 4160 buses C1 and D1 is the 345 kV system, via two station auxiliary transformers and two 13.8 kV buses. 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 one hour.

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 "AC/A" contains components receiving electric power either directly or indirectly from 4160 bus C1. Load group "AC/B" contains components powered either directly or indirectly from 4160 bus D1. Components receiving DC power or 120 VAC power are assigned to load groups "1" to "4", based on the battery power source.

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 (2)
   1. Maximum continuous rating: 2600 kW
   2. 2 hour rating: 2860 kW
   3. Rated voltage: 4160 VAC
   4. Manufacturer: General Motors

B. Batteries (4)
   1. Rated Voltage: 125 VDC
   2. Capacity: approximately 1 hour with design loads (Ref 1, Section 8.3.2.1.2)

3.6.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The standby diesel generators are automatically started based 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. Interlocks
   1. The third-of-a-kind CCW and SW pumps are powered from bus CD via interlocked circuit breakers that permit the load to be aligned to either bus C1 or D1, but not both.
   2. Interlocks prevent more than one CCW and SW pump from being powered from a given diesel generator at a given time (i.e. the third-of-a-kind pump cannot be energized if the A and B pumps are operating).

C. Diesel Generator Auxiliary Systems
   1. Diesel Cooling Water System
      Heat is transferred from a jacket water system to the component cooling water system (see Section 3.7).
   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.
   3. Diesel Fuel Oil Transfer and Storage System
      A 5000 gallon "day tank" for each diesel generator provides for approximately 20 hours of operation. The day tanks are automatically replenished from separate underground storage tanks during engine

operation. A fuel oil transfer pump is activated by a level switch on the day tank. This system is shown in Figure 3.6-4.

4. Diesel Lubrication System
   Each diesel generator has its own lubrication system.
5. Combustion Air Intake and Exhaust System
   This system supplies fresh air to the diesel intake, and directs the diesel exhaust outside of the diesel building.
6. Diesel Room Ventilation System
   This system is described in Section 3.9.

D. Other
   Emergency ventilation systems for AC switchgear and battery rooms are discussed in Section 3.9.

3.6.7 Section 3.6 References

1. Davis Besse Updated FSAR, Toledo Edison Company.

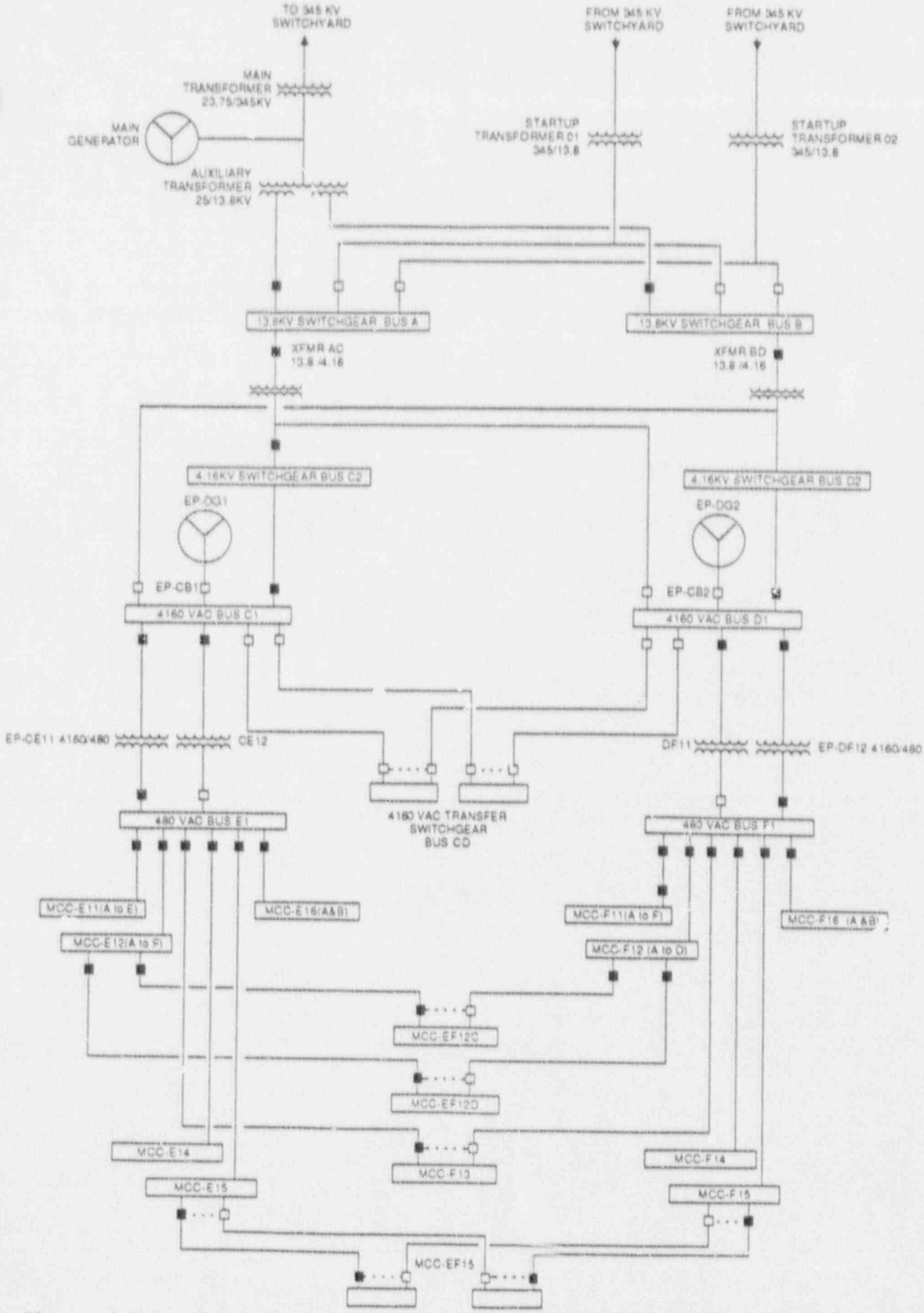
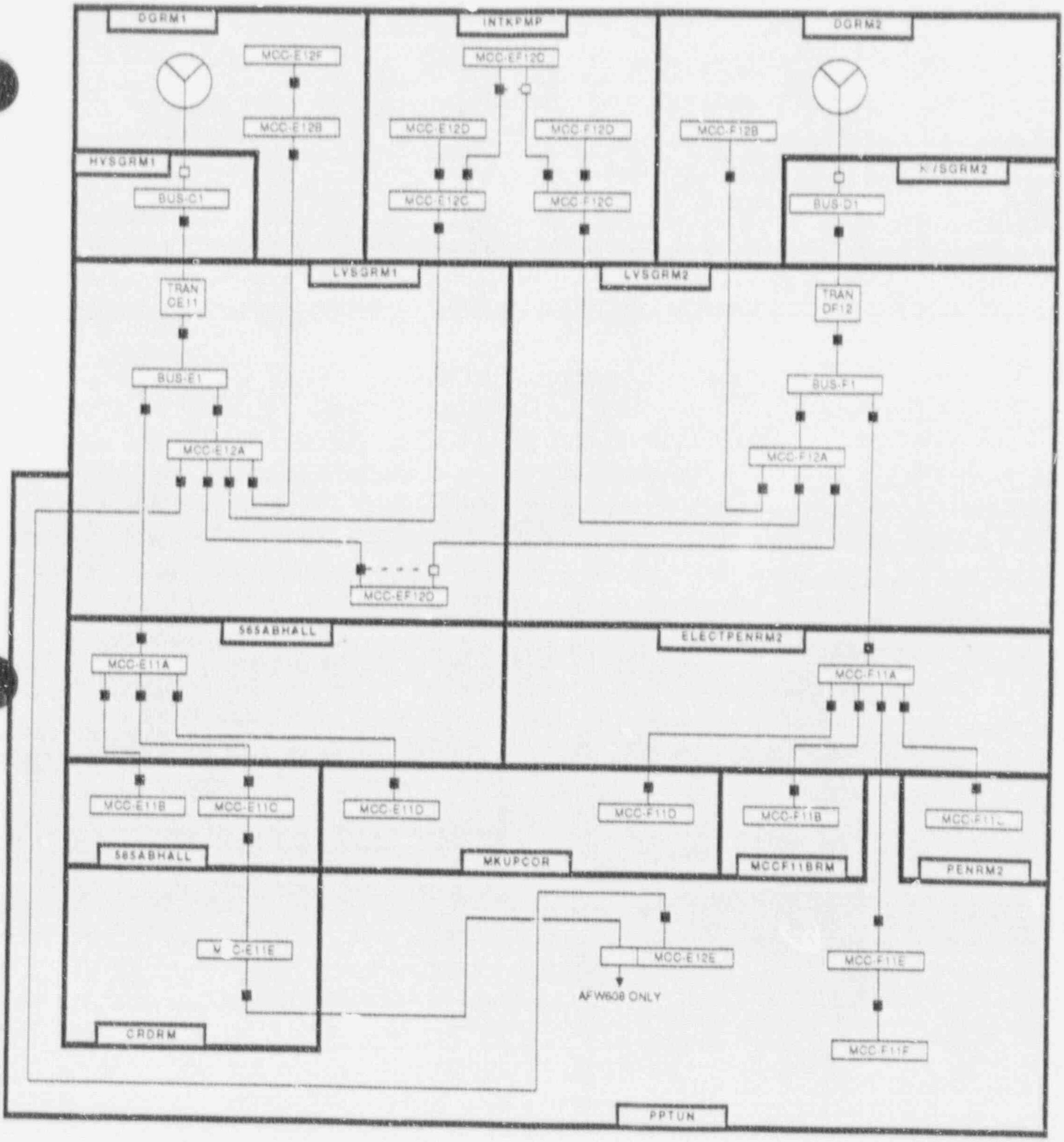


Figure 3.6-1. Davis-Besse 4160 and 480 VAC Electric Power System.



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS.

Figure 3.6-2. Davis-Besse Details of 480 VAC Electric Power Distribution

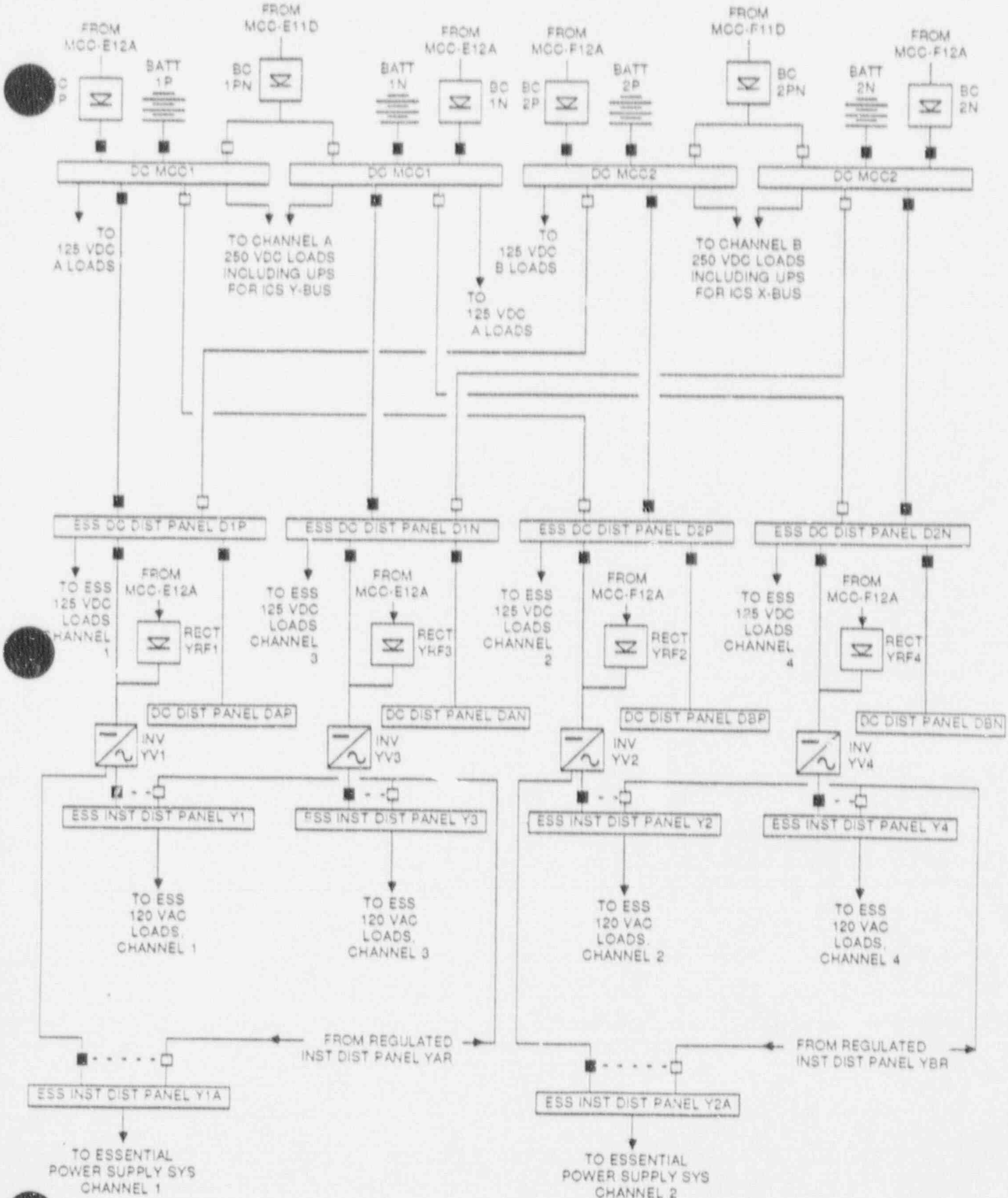


Figure 3.6-3. Davis-Besse 125 and 250 VDC and 120 VAC Electric Power Systems

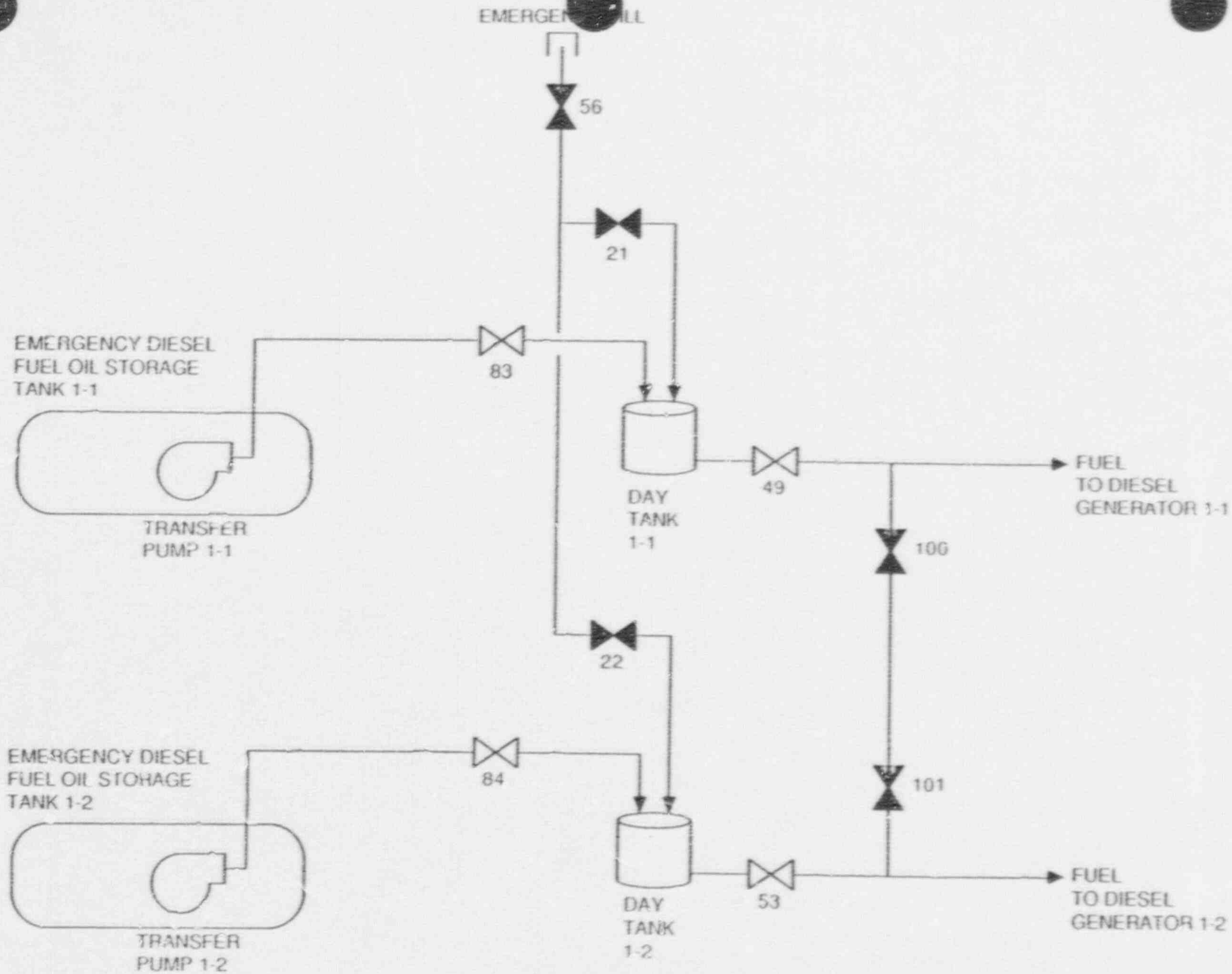


Figure 3.6-4. Davis Besse Diesel Generator Fuel Oil Storage and Transfer System

Table 3.6-1. Davis Besse Electric Power System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BATT-1N	BAT	BATTRMA				A
BATT-1P	BAT	BATTRMA				A
BATT-2N	BAT	BATTRMB				B
BATT-2P	BAT	BATTRMB				B
BC-1N	BC	LVSGRM1	MCC-E12A	480	LVSGRM1	A
BC-1P	BC	LVSGRM1	MCC-E12A	480	LVSGRM1	A
BC-1PN	BC	LVSGRM1	MCC-E11D	480	MKUPCOR	A
BC-2N	BC	LVSGRM2	MCC-F12A	480	LVSGRM2	B
BC-2P	BC	LVSGRM2	MCC-F12A	480	LVSGRM2	B
BC-2PN	BC	LVSGRM2	MCC-F11D	480	MKUPCOR	B
BUS-C1	BUS	HVSGRM1	EP-DG1	4160	DGRM1	A
BUS-D1	BUS	HVSGRM2	EP-DG2	4160	DGRM2	B
BUS-E1	BUS	LVSGRM1	EP-CE11	480	LVSGRM1	A
BUS-F1	BUS	LVSGRM2	EP-DF12	480	LVSGRM2	B
DC-MCC1	MCC	LVSGRM1	BATT-1P	125	BATTRMA	A
DC-MCC1	MCC	LVSGRM1	BATT-1N	125	BATTRMA	A
DC-MCC1	MCC	LVSGRM1	BC-1P	125	LVSGRM1	A
DC-MCC1	MCC	LVSGRM1	BC-1N	125	LVSGRM1	A
DC-MCC1	MCC	LVSGRM1	BC-1PN	125	LVSGRM1	A
DC-MCC2	MCC	LVSGRM2	BATT-2P	125	BATTRMB	B
DC-MCC2	MCC	LVSGRM2	BATT-2N	125	BATTRMB	B
DC-MCC2	MCC	LVSGRM2	BC-2P	125	LVSGRM2	B
DC-MCC2	MCC	LVSGRM2	BC-2N	125	LVSGRM2	B
DC-MCC2	MCC	LVSGRM2	BC-2PN	125	LVSGRM2	B
EP-CB1	CB	HVSGRM1				
EP-CB2	CB	HVSGRM2				
EP-CE11	TRAN	LVSGRM1	BUS-C1	4160	HVSGRM1	A
EP-DF12	TRAN	LVSGRM2	BUS-D1	4160	HVSGRM2	B

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
EP-DG1	DG	DGRM1				
EP-DG2	DG	DGRM2				
INV-YV1	INV	LVSGRM1	PNL-D1P	125	LVSGRM1	1
INV-YV1	INV	LVSGRM1	RECT-YRF1	125	LVSGRM1	1
INV-YV2	INV	LVSGRM2	PNL-D2P	125	LVSGRM2	2
INV-YV2	INV	LVSGRM2	RECT-YRF2	125	LVSGRM2	2
INV-YV3	INV	LVSGRM1	PNL-D1N	125	LVSGRM1	3
INV-YV3	INV	LVSGRM1	RECT-YRF3	125	LVSGRM1	3
INV-YV4	INV	LVSGRM2	PNL-D2N	125	LVSGRM2	4
INV-YV4	INV	LVSGRM2	RECT-YRF4	125	LVSGRM2	4
MCC-E11A	MCC	565ABHALL	BUS-E1	480	LVSGRM1	A
MCC-E11B	MCC	585ABHALL	MCC-E11A	480	565ABHALL	A
MCC-E11C	MCC	585ABHALL	MCC-E11A	480	565ABHALL	A
MCC-E11D	MCC	MKUPCOR	MCC-E11A	480	565ABHALL	A
MCC-E11E	MCC	CRDRM	MCC-E11C	480	585ABHALL	A
MCC-E12A	MCC	LVSGRM1	BUS-E1	480	LVSGRM1	A
MCC-E12B	MCC	DGRM1	MCC-E12A	480	LVSGRM1	A
MCC-E12C	MCC	INTKPMP	MCC-E12A	480	LVSGRM1	A
MCC-E12D	MCC	INTKPMP	MCC-E12C	480	LVSGRM1	A
MCC-E12E	MCC	PPTUN	MCC-E12A	480	LVSGRM1	A
MCC-E12E	MCC	PPTUN	MCC-E11E	480	CRDRM	A
MCC-E12F	MCC	DGRM1	MCC-E12B	480	DGRM1	A
MCC-E14	MCC	LVSGRM1	BUS-E1	480	LVSGRM1	A
MCC-E15	MCC	LVSGRM1	BUS-E1	480	LVSGRM1	A
MCC-EF12C	MCC	INTKPMP	MCC-E12C	480	INTKPMP	A
MCC-EF12C	MCC	INTKPMP	MCC-F12C	480	INTKPMP	B
MCC-EF12D	MCC	LVSGRM1	MCC-E12A	480	LVSGRM1	A
MCC-EF12D	MCC	LVSGRM1	MCC-F12A	480	LVSGRM2	B

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
MCC-EF15	MCC	LVSGRM1	MCC-E15	480	LVSGRM1	A
MCC-EF15	MCC	LVSGRM1	MCC-F15	480	LVSGRM2	B
MCC-F11A	MCC	ELECTPENRM2	BUS-F1	480	LVSGR[illegible]	B
MCC-F11B	MCC	MCCF11BRM	MCC-F11A	480	LVSGRM2	B
MCC-F11C	MCC	PENRM2	MCC-F11A	480	LVSGRM2	B
MCC-F11D	MCC	MKUPCOR	MCC-F11A	480	LBSGRM2	B
MCC-F11F	MCC	PPTUN	MCC-F11E	480	PPTUN	B
MCC-F12A	MCC	LVSGRM2	BUS-F1	480	LVSGRM2	B
MCC-F12B	MCC	DGRM2	MCC-F12A	480	LVSGRM2	B
MCC-F12C	MCC	INTKPMP	MCC-F12A	480	LVSGRM2	B
MCC-F12D	MCC	INTKPMP	MCC-12C	480	INTKPMP	B
MCC-F13	MCC	TB603	BUS-F1	480	LVSGRM2	B
MCC-F13	MCC	TB603	BUS-E1	480	LVSGRM1	A
MCC-F14	MCC	LVSGRM2	BUS-F1	480	LVSGRM2	B
MCC-F15	MCC	LVSGRM2	BUS-F1	480	LVSGRM2	B
PNL-D1N	PNL	LVSGRM1	DC-MCC1	125	LVSGRM1	3
PNL-D1P	PNL	LVSGRM1	DC-MCC1	125	LVSGRM1	1
PNL-D2N	PNL	LVSGRM2	DC-MCC2	125	LVSGRM2	4
PNL-D2P	PNL	LVSGRM2	DC-MCC2	125	LVSGRM2	2
PNL-DAN	PNL	LVSGRM1	PNL-D1N	125	LVSGRM1	3
PNL-DAP	PNL	LVSGRM1	PNL-D1P	125	LVSGRM1	1
PNL-DBN	PNL	LVSGRM2	PNL-D2N	125	LVSGRM2	4
PNL-DBP	PNL	LVSGRM2	PNL-D2P	125	LVSGRM2	2
PNL-ESS-Y1	PNL	LVSGRM1	INV-YV1	120	LVSGRM1	1
PNL-ESS-Y2	PNL	LVSGRM2	INV-YV2	120	LVSGRM2	2
PNL-ESS-Y3	PNL	LVSGRM1	INV-YV3	120	LVSGRM1	3
PNL-ESS-Y4	PNL	LVSGRM2	INV-YV4	120	LVSGRM2	4
PNL-Y1A	PNL	UNKNOWN	INV-YV1	120	LVSGRM1	A

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
PNL-Y2A	PNL	UNKNOWN	INV-YV2	120	LVSGRM2	B
RECT-YRF1	RECT	LVSGRM1	MCC-E12A	480	LVSGRM1	1
RECT-YRF2	RECT	LVSGRM2	MCC-F12A	480	LVSGRM2	2
RECT-YRF3	RECT	LVSGRM1	MCC-E12A	480	LVSGRM1	3
RECT-YRF4	RECT	LVSGRM2	MCC-F12A	480	LVSGRM2	4

TABLE 3.6-2. PARTIAL LISTING OF ELECTRICAL SOURCES AND LOADS AT DAVIS BESSE

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
INV-YV4	120	4	LVSGRM2	EP	PNL-ESS-Y4	PNL	LVSGRM2
BATT-1N	125	A	BATTRMA	EP	DC-MCC1	MCC	LVSGRM1
BATT-1P	125	A	BATTRMA	EP	DC-MCC1	MCC	LVSGRM1
BATT-2N	125	B	BATTRMB	EP	DC-MCC2	MCC	LVSGRM2
BATT-2P	125	B	BATTRMB	EP	DC-MCC2	MCC	LVSGRM2
BC-1N	125	A	LVSGRM1	EP	DC-MCC1	MCC	LVSGRM1
BC-1P	125	A	LVSGRM1	EP	DC-MCC1	MCC	LVSGRM1
BC-1PN	125	A	LVSGRM1	EP	DC-MCC1	MCC	LVSGRM1
BC-2N	125	B	LVSGRM2	EP	DC-MCC2	MCC	LVSGRM2
BC-2P	125	B	LVSGRM2	EP	DC-MCC2	MCC	LVSGRM2
BC-2PN	125	B	LVSGRM2	EP	DC-MCC2	MCC	LVSGRM2
BUS-C1	4160	A	HVSGRM1	CCW	BUS-CD	BUS	ASDPNL
BUS-C1	4160	A	HVSGRM1	CCW	CCW1-1	MDP	CCHXRM
BUS-C1	4160	A	HVSGRM1	ECCS	DH1-1	MDP	ECCSRM1
BUS-C1	4160	A	HVSGRM1	ECCS	HPI1-1	MDP	ECCSRM1
BUS-C1	4160	A	HVSGRM1	EP	EP-CE11	TRAN	LVSGRM1
BUS-C1	4160	A	HVSGRM1	MKUP	MU1-1	MDP	MKUPRM
BUS-C1	4160	A	HVSGRM1	SW	BUS-CD	BUS	ASDPNL
BUS-C1	4160	A	HVSGRM1	SW	SW1-1	MDP	INTKPMP
BUS-CD	4160	A/B	ASDPNL	CCW	CCW1-3	MDP	CCHXRM
BUS-CD	4160	A/B	ASDPNL	SW	SW1-3	MDP	INTKPMP
BUS-D1	4160	B	HVSGRM2	CCW	BUS-CD	BUS	ASDPNL
BUS-D1	4160	B	HVSGRM2	CCW	CCW1-2	MDP	CCHXRM
BUS-D1	4160	B	HVSGRM2	ECCS	DH1-2	MDP	ECCSRM2
BUS-D1	4160	B	HVSGRM2	ECCS	HPI1-2	MDP	ECCSRM2
BUS-D1	4160	B	HVSGRM2	EP	EP-DF12	TRAN	LVSGRM2
BUS-D1	4160	B	HVSGRM2	MKUP	MU1-2	MDP	MKUPRM
BUS-D1	4160	B	HVSGRM2	SW	BUS-CD	BUS	ASDPNL
BUS-D1	4160	B	HVSGRM2	SW	SW1-2	MDP	INTKPMP
BUS-E1	480	A	LVSGRM1	EP	MCC-E11A	MCC	565ABHALL
BUS-E1	480	A	LVSGRM1	EP	MCC-E12A	MCC	LVSGRM1

TABLE 3.6-2. PARTIAL LISTING OF ELECTRICAL SOURCES AND LOADS AT DAVIS BESSE (CONTINUED)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BUS-E1	480	A	LVSGRM1	EP	MCC-E14	MCC	LVSGRM1
BUS-E1	480	A	LVSGRM1	EP	MCC-E15	MCC	LVSGRM1
BUS-E1	480	A	LVSGRM1	EP	MCC-F13	MCC	TB603
BUS-F1	480	B	LVSGRM2	EP	MCC-F11A	MCC	ELECTPENRM2
BUS-F1	480	B	LVSGRM2	EP	MCC-F12A	MCC	LVSGRM2
BUS-F1	480	B	LVSGRM2	EP	MCC-F13	MCC	TB603
BUS-F1	480	B	LVSGRM2	EP	MCC-F14	MCC	LVSGRM2
BUS-F1	480	B	LVSGRM2	EP	MCC-F15	MCC	LVSGRM2
DC-MCC1	125	A	LVSGRM1	AFW	AFW106	MOV	623ABHVACAR EA
DC-MCC1	125	A	LVSGRM1	AFW	AFW360	MOV	AFPRM1
DC-MCC1	125	A	LVSGRM1	AFW	AFW3870	MOV	AFPRM1
DC-MCC1	125	A	LVSGRM1	AFW	AFW3870	MOV	AFPRM1
DC-MCC1	125	3	LVSGRM1	EP	PNL-D1N	PNL	LVSGRM1
DC-MCC1	125	1	LVSGRM1	EP	PNL-D1P	PNL	LVSGRM1
DC-MCC2	125	4	LVSGRM2	EP	PNL-D2N	PNL	LVSGRM2
DC-MCC2	125	2	LVSGRM2	EP	PNL-D2P	PNL	LVSGRM2
EP-CE11	480	A	LVSGRM1	EP	BUS-E1	BUS	LVSGRM1
EP-DF12	480	B	LVSGRM2	EP	BUS-F1	BUS	LVSGRM2
EP-DG1	4160	A	DGRM1	EP	BUS-C1	BUS	HVSGRM1
EP-DG2	4160	B	DGRM2	EP	BUS-D1	BUS	HVSGRM2
ICS		A/B		AFW	MS11A	NV	MNSTMRM1
ICS		A/B		AFW	MS11B	NV	MNSTMRM2
INV-YV1	120	1	LVSGRM1	EP	PNL-ESS-Y1	PNL	LVSGRM1
INV-YV1	120	A	LVSGRM1	EP	PNL-Y1A	PNL	UNKNOWN
INV-YV2	120	2	LVSGRM2	EP	PNL-ESS-Y2	PNL	LVSGRM2
INV-YV2	120	B	LVSGRM2	EP	PNL-Y2A	PNL	UNKNOWN
INV-YV3	120	3	LVSGRM1	EP	PNL-ESS-Y3	PNL	LVSGRM1
MCC-12C	480	B	INTKPMP	EP	MCC-F12D	MCC	INTKPMP
MCC-E11A	480	A	565ABHALL	ECCS	DH1B	MOV	PENRM1
MCC-E11A	480	A	565ABHALL	ECCS	DH2733	MOV	ECCSRM2
MCC-E11A	480	A	565ABHALL	ECCS	DH7B	MOV	BWSTVPIT

TABLE 3.6-2. PARTIAL LISTING OF ELECTRICAL SOURCES AND LOADS AT DAVIS BESSE (CONTINUED)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-E11A	480	A	565ABHALL	ECCS	DH9B	MOV	MKUPRM
MCC-E11A	480	A	565ABHALL	ECCS	HP2C	MOV	PENRM1
MCC-E11A	480	A	565ABHALL	ECCS	HP2D	MOV	PENRM1
MCC-E11A	480	A	565ABHALL	EP	MCC-E11B	MCC	585ABHALL
MCC-E11A	480	A	565ABHALL	EP	MCC-E11C	MCC	585ABHALL
MCC-E11A	480	A	565ABHALL	EP	MCC-E11D	MCC	MKUPCOR
MCC-E11A	480	A	565ABHALL	MKUP	DH7B	MOV	BWSTVPIT
MCC-E11A	480	A	565ABHALL	MKUP	MU40	MOV	UNKNOWN
MCC-E11B	480	A	CRDRM	AFW	AFW608	MOV	PENRM3
MCC-E11B	480	A	585ABHALL	RCS	DH12	MOV	RC
MCC-E11B	480	A	585ABHALL	RCS	MU2A	MOV	RC
MCC-E11B	480	A	585ABHALL	RCS	MU2B	MOV	RC
MCC-E11C	480	A	585ABHALL	EP	MCC-E11E	MCC	CRDRM
MCC-E11C	480	A	585ABHALL	MKUP	PWX1-1	MDP	585ABHALL
MCC-E11C	480	A	585ABHALL	VENT	CCW-FAN-1	FAN	CCHXRM
MCC-E11D	480	A	MKUPCOR	AFW	AFW786	MOV	AFPRM1
MCC-E11D	480	A	MKUPCOR	EP	BC-1PN	BC	LVSGRM1
MCC-E11D	480	A	MKUPCOR	MKUP	BA1-1	MDP	BATNRM
MCC-E11D	480	A	MKUPCOR	MKUP	MU3971	MOV	MKUPRM
MCC-E11D	480	A	MKUPCOR	MKUP	MU3971	MOV	MKUPRM
MCC-E11E	480	A	CRDRM	AFW	AFW3869	MOV	AFPRM1
MCC-E11E	480	A	CRDRM	ECCS	DH64	MOV	ECCSRM1
MCC-E11E	480	A	CRDRM	EP	MCC-E12E	MCC	PPTUN
MCC-E12A	480	A	LVSGRM1	AFW	SW1382	MOV	AFPRM1
MCC-E12A	480	A	LVSGRM1	CCW	CCW5095	MOV	CCHXRM
MCC-E12A	480	A	LVSGRM1	EP	BC-1N	BC	LVSGRM1
MCC-E12A	480	A	LVSGRM1	EP	BC-1P	BC	LVSGRM1
MCC-E12A	480	A	LVSGRM1	EP	MCC-E12B	MCC	DGRM1
MCC-E12A	480	A	LVSGRM1	EP	[illegible]-E12C	MCC	INTKPMP
MCC-E12A	480	A	LVSGRM1	EP	MCC-E12E	MCC	PPTUN
MCC-E12A	480	A	LVSGRM1	EP	MCC-EF12D	MCC	LVSGRM1

TABLE 3.6-2. PARTIAL LISTING OF ELECTRICAL SOURCES AND LOADS AT DAVIS BESSE (CONTINUED)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-E12A	480	1	LVSGRM1	EP	RECT-YRF1	RECT	LVSGRM1
MCC-E12A	480	3	LVSGRM1	EP	RECT-YRF3	RECT	LVSGRM1
MCC-E12A	480	A	LVSGRM1	RCS	PZR-HTR-A	HTR	RC
MCC-E12A	480	A	LVSGRM1	VENT	AFW-FAN-1	FAN	AFPRM1
MCC-E12A	480	A	LVSGRM1	VENT	CR-COND-1	COND	CR
MCC-E12A	480	A	LVSGRM1	VENT	CR-FAN1	FAN	CR
MCC-E12A	480	A	LVSGRM1	VENT	LV-FAN-1	FAN	LVSGRM1
MCC-E12A	480	A	LVSGRM1	VENT	LV-FAN-E1	FAN	LVSGRM1
MCC-E12B	480	A	DGRM1	AFW	AFW106A	MOV	623ABHVACAR EA
MCC-E12B	480	A	DGRM1	AFW	AFW106A	MOV	623ABHVACAR EA
MCC-E12B	480	A	DGRM1	EP	MCC-E12F	MCC	DGRM1
MCC-E12B	480	A	DGRM1	VENT	BATT-FAN-1	FAN	BATTRMA
MCC-E12B	480	A	DGRM1	VENT	DG-FAN-1	FAN	DGRM1
MCC-E12B	480	A	DGRM1	VENT	DG-FAN-2	FAN	DGRM1
MCC-E12C	480	A	LVSGRM1	EP	MCC-E12D	MCC	INTKPMP
MCC-E12C	480	A	INTKPMP	EP	MCC-EF12C	MCC	INTKPMP
MCC-E12C	480	A	INTKPMP	SW	SW1399	MOV	SWPPTNL
MCC-E12C	480	A	INTKPMP	SW	SW2929	MOV	SWPPTNL
MCC-E12C	480	A	INTKPMP	SW	SW2931	MOV	SWPPTNL
MCC-E12E	480	A	PPTUN	AFW	AFW608	MOV	PENRM3
MCC-E12E	480	A	PPTUN	VENT	CR-COND-SBY	COND	CR
MCC-E12E	480	A	PPTUN	VENT	ECCS-FCU-4	FCU	ECCSRM1
MCC-E12E	480	A	PPTUN	VENT	ECCS-FCU-5	FCU	ECCSRM1
MCC-E14	480	A	UNKNOWN	VENT	RC-FCU-1-1	FCU	RC
MCC-E15	480	A	LVSGRM1	EP	MCC-EF15	MCC	LVSGRM1
MCC-EF15	480	A/B	UNKNOWN	VENT	RC-FCU-1-3	FCU	RC
MCC-F11A	480	B	ELECTPENRM2	AFW	AFW107	MOV	623ABHVACAR EA
MCC-F11A	480	B	ELECTPENRM2	AFW	AFW599	MOV	PENRM4
MCC-F11A	480	B	ELECTPENRM2	AFW	AFW599	MOV	PENRM4
MCC-F11A	480	B	ELECTPENRM2	CCW	CCW5096	MOV	CCHXRM
MCC-F11A	480	B	LVSGRM2	EP	MCC-F11B	MCC	MCCF11BRM

TABLE 3.6-2. PARTIAL LISTING OF ELECTRICAL SOURCES AND LOADS AT DAVIS BESSE (CONTINUED)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-F11A	480	B	LVSGRM2	EP	MCC-F11C	MCC	PENRM2
MCC-F11A	480	B	LBSGRM2	EP	MCC-F11D	MCC	MKUPCOR
MCC-F11A	480	B	ELECTPENRM2	RCS	DH11	MOV	RC
MCC-F11A	480	B	LVSGRM2	RP	MCC-F11E	MCC	PPTUN
MCC-F11A	480	B	ELECTPENRM2	VENT	CCW-FAN-2	FAN	CCHXRM
MCC-F11A	480	B	ELECTPENRM2	VENT	CR-COND-2	COND	CR
MCC-F11B	480	B	MCCF11BRM	AFW	AFW107A	MOV	623ABHVACAREA
MCC-F11B	480	B	MCCF11BRM	ECCS	DH7A	MOV	BWSTVPIT
MCC-F11B	480	B	MCCF11BRM	MKUP	DH7A	MOV	BWSTVPIT
MCC-F11B	480	B	MCCF11BRM	MKUP	PWX1-2	MDP	585ABHALL
MCC-F11B	480	B	MCCF11BRM	VENT	CR-FAN2	FAN	CR
MCC-F11C	480	B	PENRM2	AFW	SW1383	MOV	PENRM2
MCC-F11C	480	B	PENRM2	ECCS	DH1A	MOV	PENRM2
MCC-F11C	480	B	PENRM2	ECCS	DH2734	MOV	DHXRM
MCC-F11C	480	B	PENRM2	ECCS	DH9A	MOV	MKUPRM
MCC-F11C	480	B	PENRM2	ECCS	HP2A	MOV	PENRM2
MCC-F11C	480	B	PENRM2	ECCS	HP2B	MOV	PENRM2
MCC-F11D	480	B	MKUPCOR	EP	BC-2PN	BC	LVSGRM2
MCC-F11D	480	B	MKUPCOR	MKUP	BA1-2	MDP	BATNKRM
MCC-F11D	480	B	MKUPCOR	VENT	ECCS-FCU-3	FCU	ECCSRM2
MCC-F11E	480	B	PPTUN	ECCS	DH63	MOV	ECCSRM2
MCC-F11E	480	B	PPTUN	EP	MCC-F11F	MCC	PPTUN
MCC-F11E	480	B	PPTUN	VENT	ECCS-FCU-1	FCU	ECCSRM2
MCC-F11E	480	B	PPTUN	VENT	ECCS-FCU-2	FCU	ECCSRM2
MCC-F12A	480	B	LVSGRM2	AFW	AFW3871	MOV	AFPRM2
MCC-F12A	480	B	LVSGRM2	AFW	AFW3871	MOV	AFPRM2
MCC-F12A	480	B	LVSGRM2	AFW	AFW388	MOV	AFPRM2
MCC-F12A	480	B	LVSGRM2	AFW	AFW790	MOV	AFPRM2
MCC-F12A	480	B	LVSGRM2	EP	BC-2N	BC	LVSGRM2
MCC-F12A	480	B	LVSGRM2	EP	BC-2P	BC	LVSGRM2
MCC-F12A	480	B	LVSGRM2	EP	MCC-EF12D	MCC	LVSGRM1

TABLE 3.6-2. PARTIAL LISTING OF ELECTRICAL SOURCES AND LOADS AT DAVIS BESSE (CONTINUED)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-F12A	480	B	LVSGRM2	EP	MCC-F12B	MCC	DGRM2
MCC-F12A	480	B	LVSGRM2	EP	MCC-F12C	MCC	INTKPMP
MCC-F12A	480	2	LVSGRM2	EP	RECT-YRF2	RECT	LVSGRM2
MCC-F12A	480	4	LVSGRM2	EP	RECT-YRF4	RECT	LVSGRM2
MCC-F12A	480	B	LVSGRM2	RCS	MU1A	MOV	RC
MCC-F12A	480	B	LVSGRM2	RCS	MU1B	MOV	RC
MCC-F12A	480	B	LVSGRM2	RCS	PZR-HTR-B	HTR	RC
MCC-F12A	480	B	LVSGRM2	RCS	RC11	MOV	RC
MCC-F12A	480	B	LVSGRM2	VENT	AFW-FAN-2	FAN	AFPRM2
MCC-F12A	480	B	LVSGRM2	VENT	LV-FAN-2	FAN	LVSGRM2
MCC-F12A	480	B	LVSGRM2	VENT	LV-FAN-E2	FAN	LVSGRM2
MCC-F12B	480	B	DGRM2	AFW	AFW3872	MOV	AFPRM2
MCC-F12B	480	B	DGRM2	VENT	BATT-FAN-2	FAN	BATTRMB
MCC-F12B	480	B	DGRM2	VENT	DG-FAN-3	FAN	DGRM2
MCC-F12B	480	B	DGRM2	VENT	DG-FAN-4	FAN	DGRM2
MCC-F12C	480	B	INTKPMP	EP	MCC-EF12C	MCC	INTKPMP
MCC-F12C	480	B	INTKPMP	SW	SW1395	MOV	SWPPTNL
MCC-F12C	480	B	INTKPMP	SW	SW2930	MOV	SWPPTNL
MCC-F12C	480	B	INTKPMP	SW	SW2932	MOV	SWPPTNL
MCC-F14	480	B	UNKNOWN	VENT	RC-FCU-1-2	FCU	RC
MCC-F15	480	B	LVSGRM2	EP	MCC-EF15	MCC	LVSGRM1
PNL-D1N	125	3	LVSGRM1	EP	INV-YV3	INV	LVSGRM1
PNL-D1N	125	3	LVSGRM1	EP	PNL-DAN	PNL	LVSGRM1
PNL-D1P	125	1	LVSGRM1	EP	INV-YV1	INV	LVSGRM1
PNL-D1P	125	1	LVSGRM1	EP	PNL-DAP	PNL	LVSGRM1
PNL-D2N	125	4	LVSGRM2	EP	INV-YV4	INV	LVSGRM2
PNL-D2N	125	4	LVSGRM2	EP	PNL-DBN	PNL	LVSGRM2
PNL-D2P	125	2	LVSGRM2	EP	INV-YV2	INV	LVSGRM2
PNL-D2P	125	2	LVSGRM2	EP	PNL-DBP	PNL	LVSGRM2
PNL-DBP	125	2	LVSGRM2	RCS	RC2A	SOV	RC
RECT-YRF1	125	1	LVSGRM1	EP	INV-YV1	INV	LVSGRM1

TABLE 3.6-2. PARTIAL LISTING OF ELECTRICAL SOURCES AND LOADS AT DAVIS BESSE (CONTINUED)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
RECT-YRF2	125	2	LVSGRM2	EP	INV-YV2	INV	LVSGRM2
RECT-YRF3	125	3	LVSGRM1	EP	INV-YV3	INV	LVSGRM1
RECT-YRF4	125	4	LVSGRM2	EP	INV-YV4	INV	LVSGRM2
UNKNOWN				CCW	CCW1460	NV	CCHXRM
UNKNOWN				CCW	SW1424	NV	CCHXRM
UNKNOWN				CCW	SW1429	NV	CCHXRM
UNKNOWN				CCW	SW1429	NV	CCHXRM
UNKNOWN				CCW	SW1434	NV	CCHXRM
UNKNOWN				ECCS	DH14A	NV	DHXRM
UNKNOWN				ECCS	DH14B	NV	DHXRM
UNKNOWN				MKUP	DWX1-1	MDP	UNKNOWN
UNKNOWN				MKUP	DWX1-2	MDP	UNKNOWN
UNKNOWN				MKUP	DWX1-3	MDP	UNKNOWN
UNKNOWN				MKUP	MU32	NV	MKUPRM
UNKNOWN				MKUP	MU33	NV	PENRM2

3.7 COMPONENT COOLING WATER (CCW) SYSTEM

3.7.1 System Function

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

3.7.2 System Definition

The CCW system is a closed loop cooling system consisting of two essential cooling loops and a nonessential loop. Each essential loop consists of one pump and one CCW 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 nonessential loop is supplied from one of the essential loops. A third CCW pump and heat exchanger serves as an installed spare. The CCW heat exchangers transfer heat to the Service Water System. A surge tank accommodates expansion, contraction, and inleakage of water.

Simplified drawings of the essential loops of the CCW system are shown in Figures 3.7-1 and 3.7-2. The nonessential loop is shown in Figures 3.7-3 and 3.7-4. A summary of data on selected CCW components is presented in Table 3.7-1.

3.7.3 System Operation

One component cooling water loop (i.e. one CCW pump and heat exchanger) provide the necessary cooling requirements during normal operation. The second CCW loop is in standby. Failure of the primary CCW pump initiates an automatic switchover to the standby CCW loop. The third CCW pump and heat exchanger can be aligned to take the place of the normal pump and heat exchanger in either CCW loop. The third pump normally is electrically disconnected, therefore, manual operations are needed in order to place this pump in service.

Major heat loads supported by the CCW system include the following:

	Essential Loop A	Essential Loop A	Nonessential Loop
Diesel generator heat exchanger	DG1	DG2	
DHR coolers	1-1	1-2	
DHR pump seals	1-1	1-2	
HPI pump seals	1-1	1-2	
Containment gas analyzer	A	B	
Makeup pump oil coolers			X
Letdown coolers			X
Seal return cooler			X
Primary water transfer pumps			X
Emergency instrument air compressor			X
Spent fuel pool heat exchangers			X
Other nonessential loads			X

Makeup water for the CCW system is provided from the primary water storage tank (PWST). Backup water sources include the demineralized water storage tank (DWST) and the service water system.

3.7.4 System Success Criteria

A CCW loop can successfully perform its cooling function if flow is maintained to essential heat loads with one CCW pump, a heat transfer path to the service water system is available, and water inventory in the CCW is maintained.

3.7.5 Component Information

A. Component Cooling Water Pumps 1-1, 1-2 and 1-3
   1. Rated flow: 7860 gpm @ 150 ft head (65 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

B. Component Cooling Heat Exchangers 1-1, 1-2 and 1-3
   1. Design duty: 57 x 10^6 Btu/hr
   2. Type: shell and tube

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. An SFAS signal (see Section 3.5) will start a CCW pump in the standby loop and will close valves to isolate the nonessential loop.
      b. Loss of flow in the normally operating CCW loop will initiate an automatic switchover to the standby CCW loop.
   2. Remote Manual
      The CCW pumps can be actuated by remote manual means from the control room.
   3. Manual
      Manual actions are required to place CCW pump 1-3 and its associated CCW heat exchanger in service.

B. Motive Power
   1. The CCW 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 CCW heat exchangers are cooled by the Service Water System (see Section 3.8).
   2. Lubrication and cooling are provided locally for the CCW pumps.
   3. CCW pump room ventilation is discussed in Section 3.9.

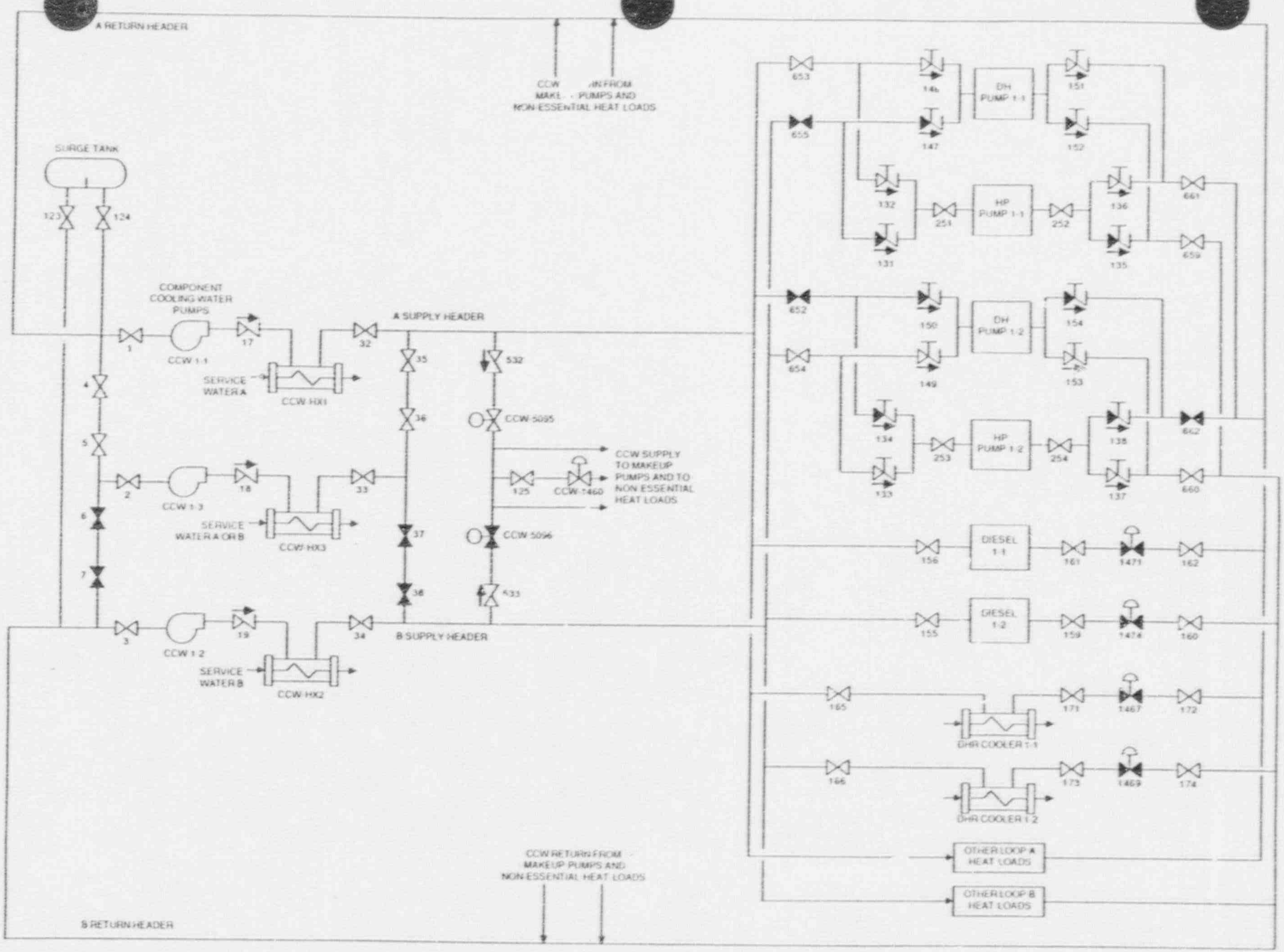


Figure 3.7-1. Davis Besse Component Cooling Water System, Essential Cooling Loops

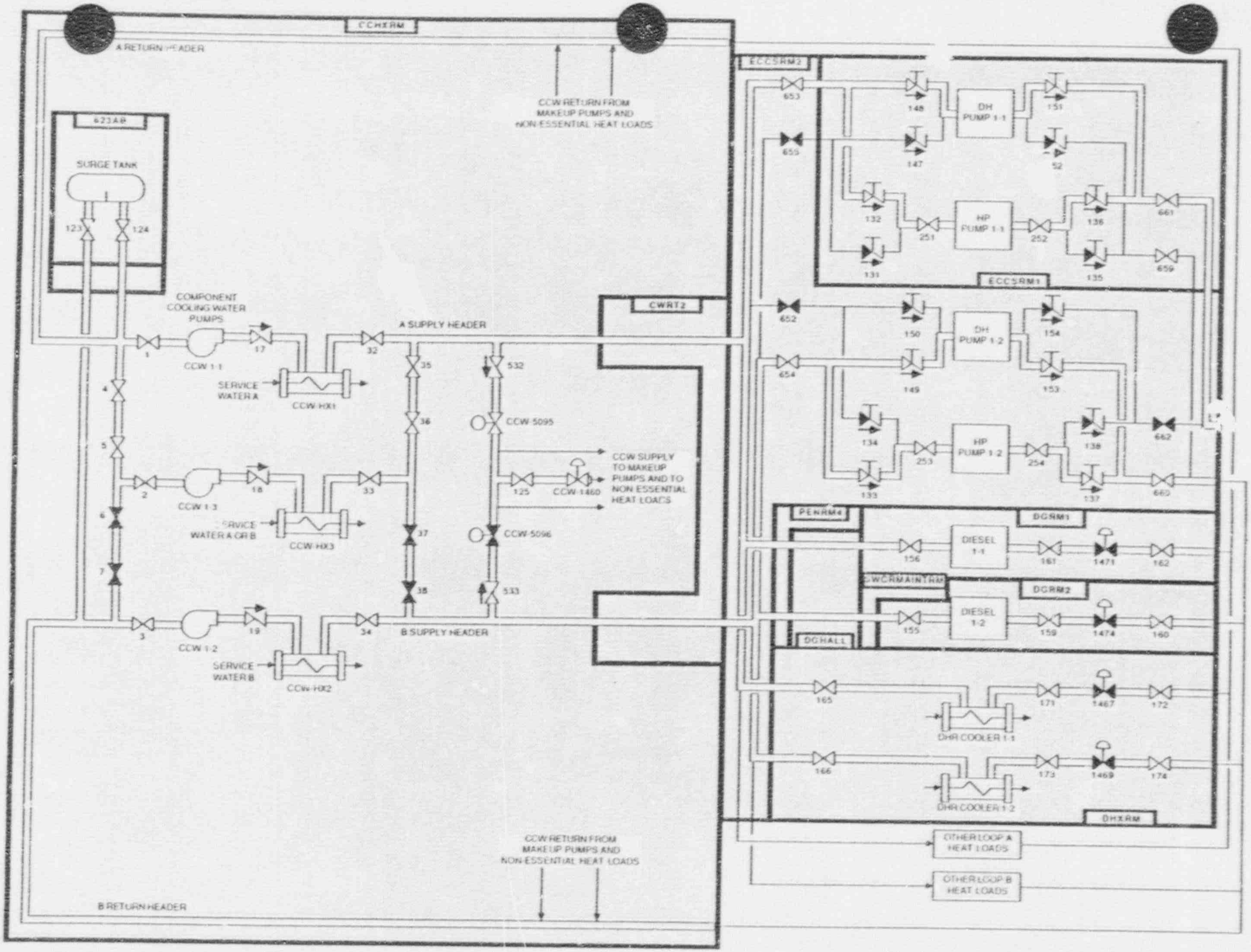


Figure 3.7-2. Davis Besse Component Cooling Water System, Essential Cooling Loops Showing Component Locations

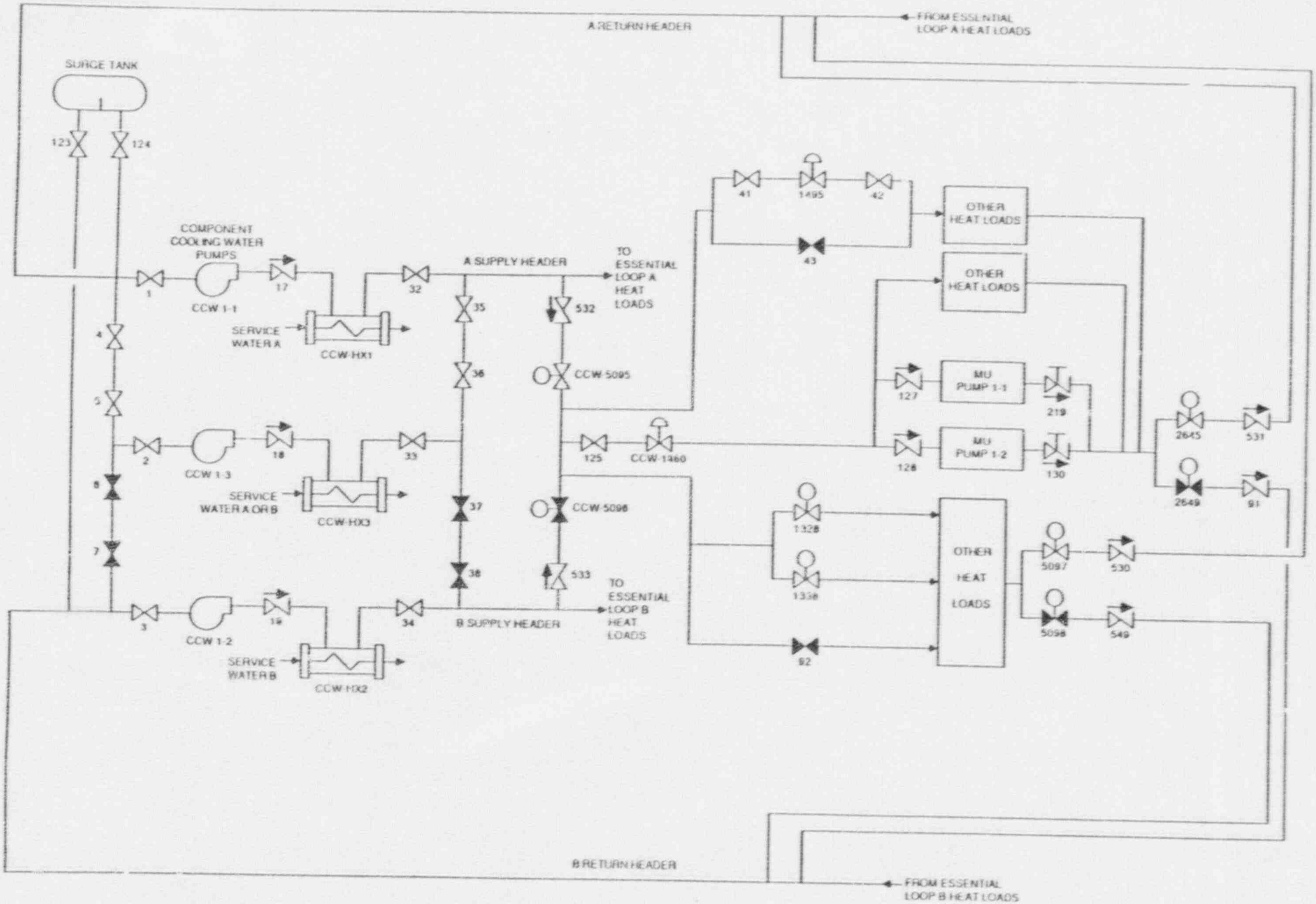


Figure 3.7-3. Davis Besse Component Cooling Water System, Nonessential Cooling Loops

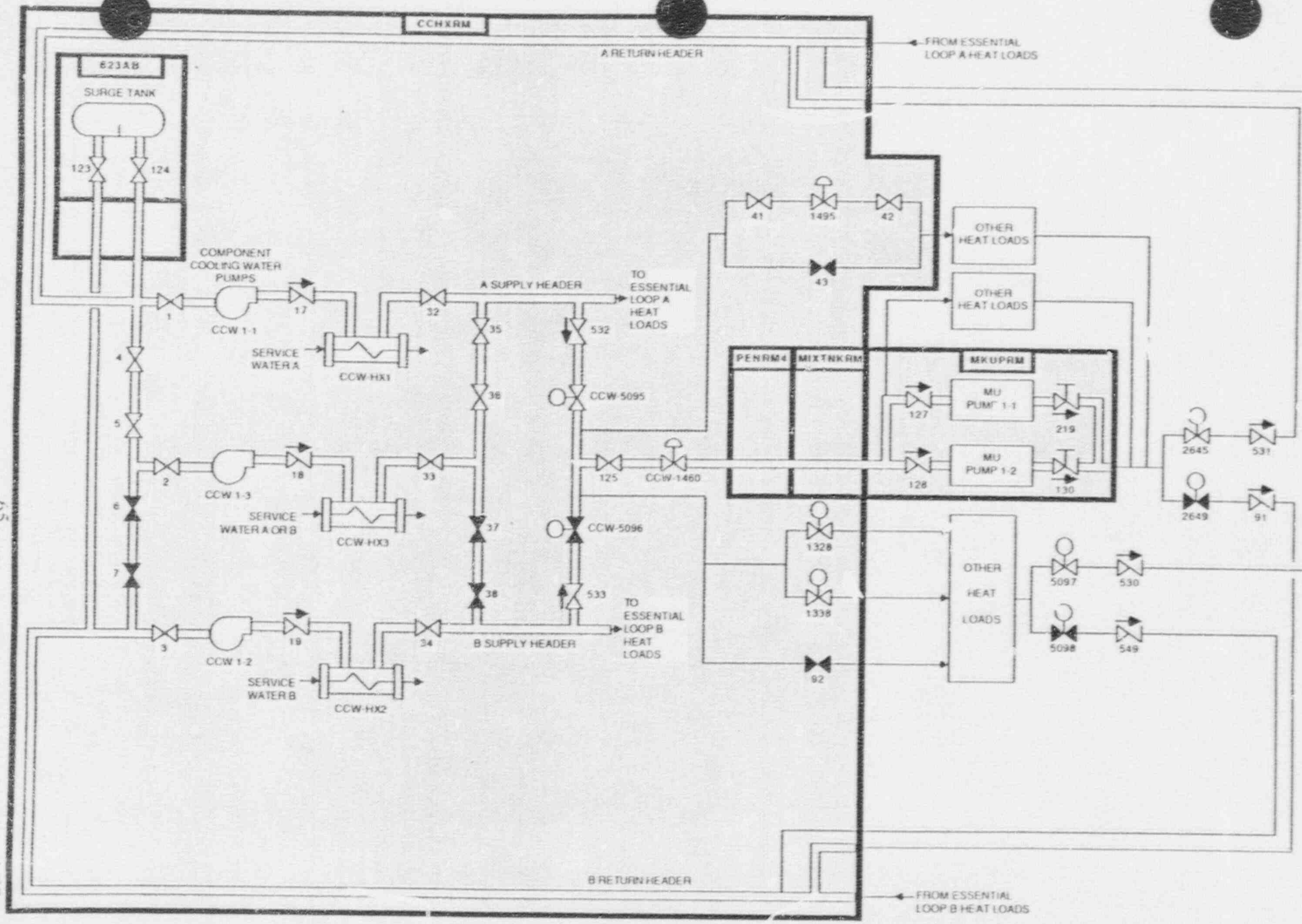


Figure 3.7-4. Davis Besse Component Cooling Water System, Nonessential Cooling Loops Showing Component Locations

Table 3.7-1. Davis Besse Component Cooling Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BUS-CD	BUS	ASDPNL	BUS-C1	4160	HVSGRM1	A
BUS-CD	BUS	ASDPNL	BUS-D1	4160	HVSGRM2	B
CCW1-1	MDP	CCHXRM	BUS-C1	4160	HVSGRM1	A
CCW1-2	MDP	CCHXRM	BUS-D1	4160	HVSGRM2	B
CCW1-3	MDP	CCHXRM	BUS-CD	4160	ASDPNL	A/B
CCW1460	NV	CCHXRM	UNKNOWN			
CCW5095	MOV	CCHXRM	MCC-E12A	480	LVSGRM1	A
CCW5096	MOV	CCHXRM	MCC-F11A	480	ELECTPENRM2	B
SURGE-TANK	TK	623AB				
SW1424	NV	CCHXRM	UNKNOWN			
SW1429	NV	CCHXRM	UNKNOWN			
SW1434	NV	CCHXRM	UNKNOWN			

3.8 SERVICE WATER (SW) SYSTEM

3.8.1 System Function

The Service Water System supplies cooling water from the ultimate heat sink, Lake Erie, to various heat loads in both the primary and secondary portions of the plant. The system is designed to provide a continuous flow of cooling water to these systems and components necessary for plant safety either during normal operation or under abnormal and accident conditions. The system also serves as a backup source of water for the Auxiliary Feedwater System (see Section 3.2).

3.8.2 System Definition

The Service Water System contains two independent headers, each supplied by a single motor-driven pump. A third service water pump serves as an installed spare and can take the place of the normal pump in either SW header. Strainers are provided to remove foreign material from the raw water before it enters the SW pumps.

Simplified drawings of the service water system are shown in Figures 3.8-1 and 3.8-2. A summary of data on selected SW components is presented in Table 3.8-1.

3.8.3 System Operation

During normal operation, two SW pumps are in operation providing cooling water to essential and non-essential loads. The normal source of water is Lake Erie through the intake forebay. If the supply of water from Lake Erie via the intake structure is lost, the forebay will serve as a reservoir and cooling pond to ensure that an adequate heat sink is available for reactor core and component cooling. Essential loads are those required for safe shutdown, and are therefore redundant and are served by separate loops of the SW system. Heat loads and services supported by the SW system include the following:

Heat Load or Service	Normal	Emergency
CCW heat exchangers	X	X
CCW emergency makeup		X
AFW backup water supply		X
ECCS room coolers	X	X
Containment air coolers	X	X
Control room emergency coolers		X
Hydrogen dilution blower coolers		X
Cooling water (CW) heat exchangers	X	
Cooling tower makeup	X	
Other secondary systems	X	

The SW system provides a backup supply of water to the Auxiliary Feedwater System, with SW header A suppling AFW pump 1-1 and SW header B suppling AFW pump 1-2.

3.8.4 System Success Criteria

The SW system water source is either Lake Erie or the intake structure forebay. Equipment supported by a particular SW loop are dependent on that loop having one pump operating. For component cooling, a complete flow path must exist from the SW pump suction to the point of discharge to the ultimate heat sink.

The SW system can serve as a backup supply of AFW even with the normal SW discharge paths closed (i.e. valve SW2929 to SW2932 closed).

3.8.5 Component Information

A. Service Water Pumps 1-1, 1-2 and 1-3
   1. Rated flow: 10,250 gpm @ 160 ft head (69 psid)
   2. Rated capacity: 100%
   3. Type: vertical turbine

B. Ultimate Heat Sink
   1. Lake Erie (normal)
   2. Intake forebay (when intake from Lake Erie is unavailable)

3.8.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      An SFAS signal (see Section 3.5) causes the following:
      a. CCW heat exchanger outlet valves open fully.
      b. Flow to cooling water (CW) heat exchangers is isolated (valves SW1395 and SW1399 close).
      c. Containment fan cooler outlet valves open wide and fans shift to fast.
   2. Remote Manual
      The SW pumps can be actuated by remote manual means from the control room.

B. Motive Power
   The SW 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 SW pumps.
   2. The method of SW pump room ventilation has not been determined.

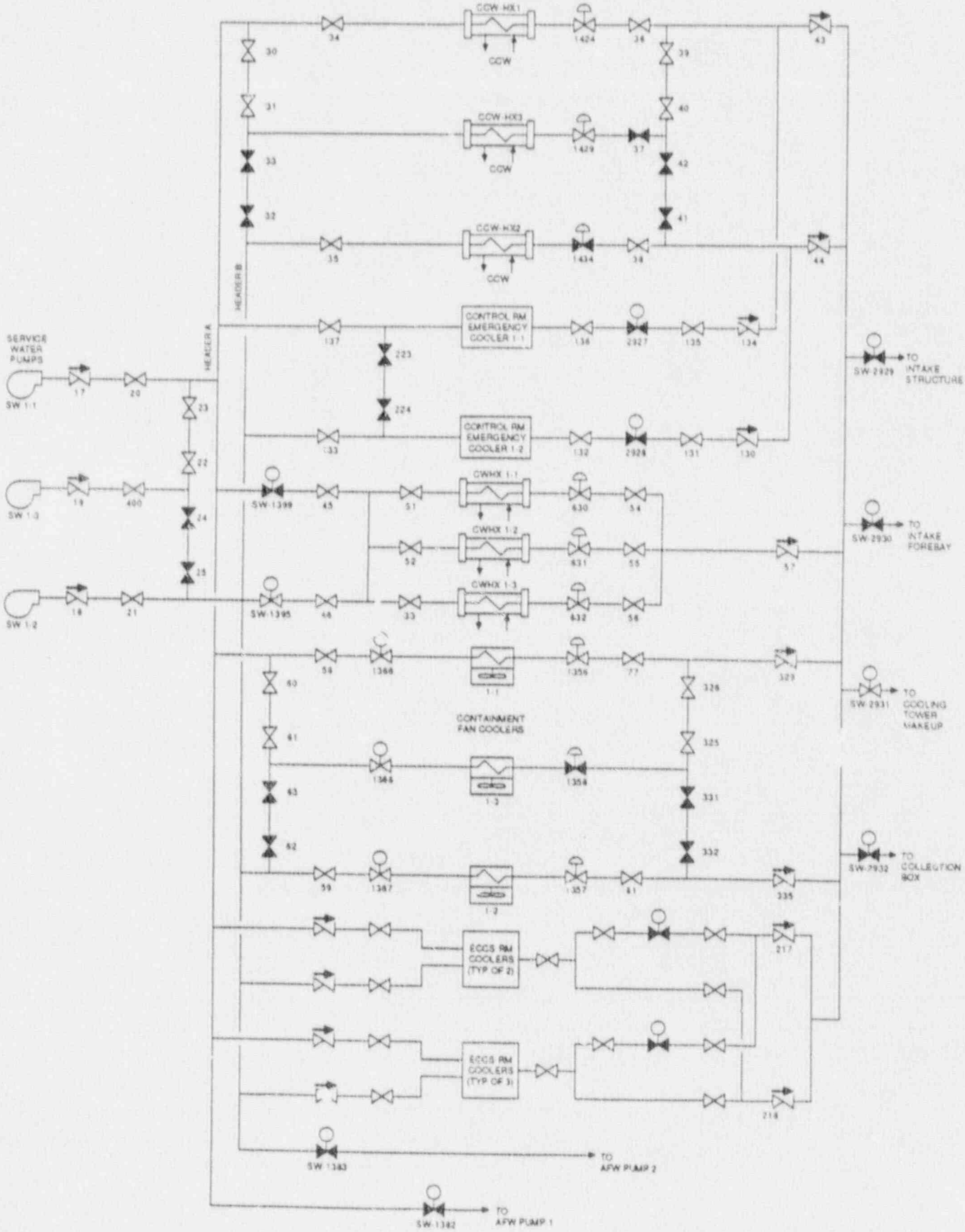


Figure 3.8-1. Davis Besse Service Water System

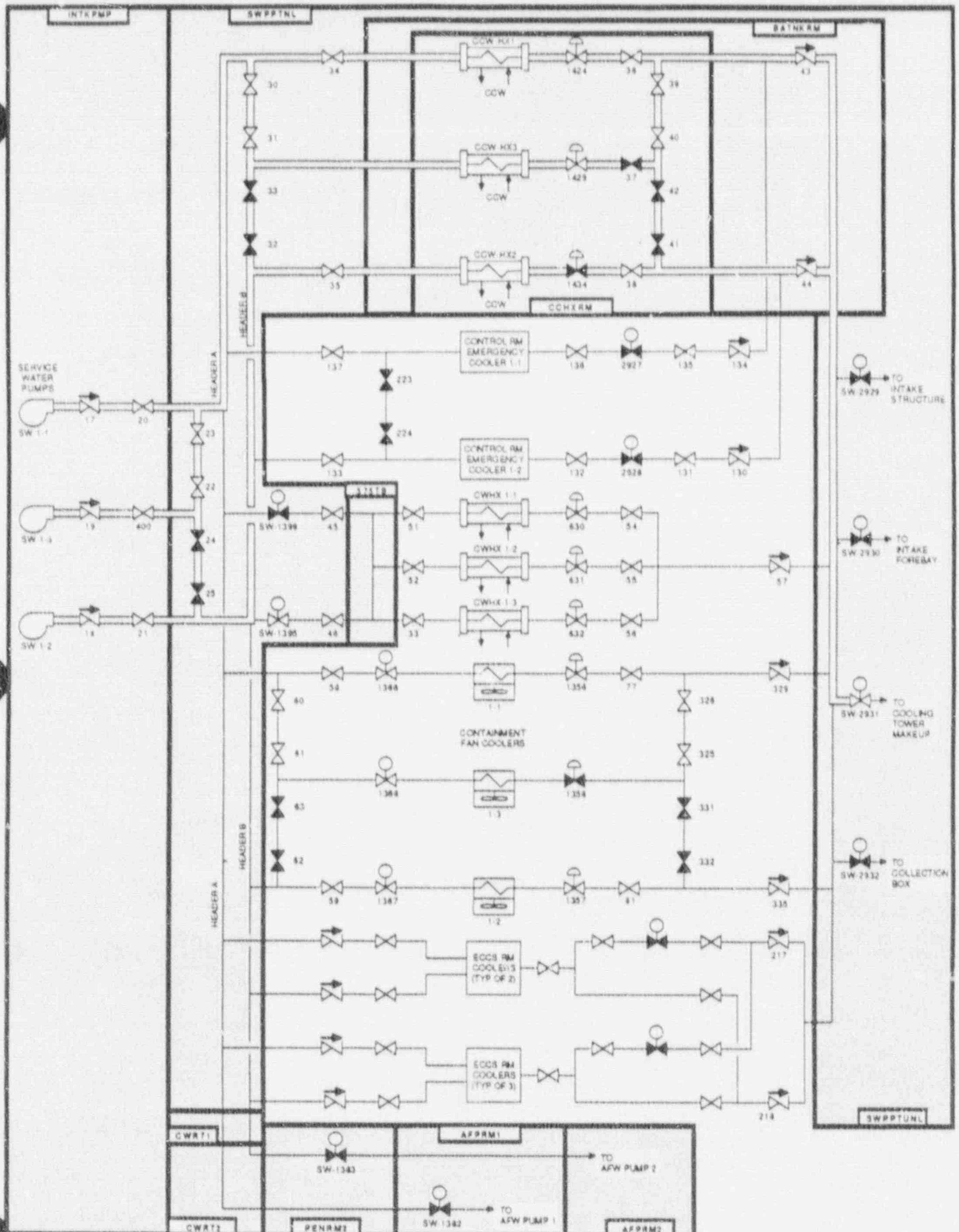


Figure 3.8-2. Davis Besse Service Water System Showing Component Locations

Table 3.8-1. Davis Besse Service Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BUS-CD	BUS	ASDPNL	BUS-C1	4160	HVSGRM1	A
BUS-CD	BUS	ASDPNL	BUS-D1	4160	HVSGRM2	B
SW1-1	MDP	INTKPMP	BUS-C1	4160	HVSGRM1	A
SW1-2	MDP	INTKPMP	BUS-D1	4160	HVSGRM2	B
SW1-3	MDP	INTKPMP	BUS-CD	4160	ASDPNL	A/B
SW1395	MOV	SWPPTNL	MCC-F12C	480	INTKPMP	B
SW1399	MOV	SWPPTNL	MCC-E12C	480	INTKPMP	A
SW2929	MOV	SWPPTNL	MCC-E12C	480	INTKPMP	A
SW2930	MOV	SWPPTNL	MCC-F12C	480	INTKPMP	B
SW2931	MOV	SWPPTNL	MCC-E12C	480	INTKPMP	A
SW2932	MOV	SWPPTNL	MCC-F12C	480	INTKPMP	B

3.9 EQUIPMENT AND CONTROL ROOM EMERGENCY VENTILATION SYSTEMS

3.9.1 System Function

The equipment and control room emergency ventilation systems maintain environmental conditions in various areas of the plant within limits based on equipment qualification and/or human habitability requirements. These systems transfer heat from the room air to the ultimate heat sink (i.e. to atmosphere) or to a secondary heat transport system.

3.9.2 System Definition

The equipment and control room emergency ventilation systems include a variety of fans, fan-coil cooling units and condensing units that usually serve limited areas of the plant and operate when the normal heating, ventilating and air-conditioning (HVAC) systems are unavailable. Some emergency ventilation systems also may provide for normal room cooling and/or ventilation. A summary of data on selected emergency ventilation system components is presented in Table 3.9-1.

3.9.3 System Operation

Emergency room ventilation systems for the following plant areas are described in this section:

- Auxiliary feedwater pump rooms
- ECCS pump rooms
- Makeup pump room
- Component cooling water heat exchanger and pump room
- Service water pump room
- Electrical switchgear rooms
- Battery rooms
- Diesel generator rooms
- Main control room
- Containment

A. Auxiliary Feedwater Pump Rooms
AFW pump room ventilation is provided by two Class 1E fans.

B. ECCS Pump Rooms
The two ECCS pump rooms are ventilated by a total of five fan-cooling units. Units 1, 2 and 3 normally are supplied with cooling water from the service water B header. Units 4 and 5 normally are supplied from the SW A header. All units can be supplied from the opposite SW header if needed. Each fan cooling unit is rated at 50 percent capacity.

C. Makeup Pump Room
None identified.

D. Component Cooling Water Heat Exchanger and Pump Room
The CCW pump room appears to be ventilated by two Class 1E fans.

E. Service Water Pump Room
None identified.

F. Electrical Switchgear Rooms
   1. Each low voltage switchgear room is ventilated by a Class 1E fan, with a full-capacity emergency ventilation fan as backup.
   2. No emergency ventilation system has been identified for the high voltage switchgear rooms.

G. Battery Rooms
Each battery room is ventilated by an independent Class 1E fan that exhausts through the auxiliary building roof.

H. Diesel Generator Rooms
Each diesel generator room is ventilated by two 50 percent capacity fans that are interlocked with the diesel generator. The fans operate any time the diesel is running.

I. Control Room
Emergency control room ventilation and cooling is provided by two emergency vent fans and two emergency condensing units. A third standby condensing unit is available. All are powered from the Class 1E AC system. Condensing unit 1 normally is supplied with cooling water from SW header A and condensing unit 2 is supplied from SW header B. A supply-side cross-connect allows each condensing unit to be aligned to the opposite SW header.

J. Containment
Three fan cooler units are provided for normal containment-cooling and for emergency cooling in conjunction with the containment spray system and ECCS systems. The FCUs are cooled by the Service Water System (see Section 3.8). Upon receipt of an SFAS signal, all fans shift to fast and the SW outlet valve from each unit is fully open.

3.9.4 System Success Criteria

Loss of a room ventilation subsystem eventually may cause the associated equipment in the room to fail due to extreme environmental conditions. An individual fan cooler unit will fail to perform its cooling function if motive power to the fan is lost, or if the heat sink is unavailable.

3.9.5 Component Information

A. Containment Fan Cooler Units 1-1, 1-2 and 1-3
   1. Type: forced air-to-water cooler
   2. Rated capacity: 75×10^6 Btu/hr each

3.9.6 Support Systems and Interfaces

A. Control signals
Various control features are noted in the descriptions of ventilation subsystems operation, above.

B. Motive Power
All emergency ventilation system components are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.

C. Service Water

The ECCS pump room coolers, the control room emergency condensing units and the containment fan cooler units require cooling water supplied by the service water system (see Section 3.8).

Table 3.9-1. Davis Besse Equipment and Control Room Emergency Ventilation System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
AFW-FAN-1	FAN	AFPRM1	MCC-E12A	480	LVSGRM1	A
AFW-FAN-2	FAN	AFPRM2	MCC-F12A	480	LVSGRM2	B
BATT-FAN-1	FAN	BATTRMA	MCC-E12B	480	DGRM1	A
BATT-FAN-2	FAN	BATTRMB	MCC-F12B	480	DGRM2	B
CCW-FAN-1	FAN	CCHXRM	MCC-E11C	480	585ABHALL	A
CCW-FAN-2	FAN	CCHXRM	MCC-F11A	480	ELECTPENRM2	B
CR-COND-1	COND	CR	MCC-E12A	480	LVSGRM1	A
CR-COND-2	COND	CR	MCC-F11A	480	ELECTPENRM2	B
CR-COND-SBY	COND	CR	MCC-E12E	480	PPTUN	A
CR-FAN1	FAN	CR	MCC-E12A	480	LVSGRM1	A
CR-FAN2	FAN	CR	MCC-F11B	480	MCCF11BRM	B
DG-FAN-1	FAN	DGRM1	MCC-E12B	480	DGRM1	A
DG-FAN-2	FAN	DGRM1	MCC-E12B	480	DGRM1	A
DG-FAN-3	FAN	DGRM2	MCC-F12B	480	DGRM2	B
DG-FAN-4	FAN	DGRM2	MCC-F12B	480	DGRM2	B
ECCS-FCU-1	FCU	ECCSRM2	MCC-F11E	480	PPTUN	B
ECCS-FCU-2	FCU	ECCSRM2	MCC-F11E	480	PPTUN	B
ECCS-FCU-3	FCU	ECCSRM2	MCC-F11D	480	MKUPCOR	B
ECCS-FCU-4	FCU	ECCSRM1	MCC-E12E	480	PPTUN	A
ECCS-FCU-5	FCU	ECCSRM1	MCC-E12E	480	PPTUN	A
LV-FAN-1	FAN	LVSGRM1	MCC-E12A	480	LVSGRM1	A
LV-FAN-2	FAN	LVSGRM2	MCC-F12A	480	LVSGRM2	B
LV-FAN-E1	FAN	LVSGRM1	MCC-E12A	480	LVSGRM1	A
LV-FAN-E2	FAN	LVSGRM2	MCC-F12A	480	LVSGRM2	B
RC-FCU-1-1	FCU	RC	MCC-E14	480	UNKNOWN	A
RC-FCU-1-2	FCU	RC	MCC-F14	480	UNKNOWN	B
RC-FCU-1-3	FCU	RC	MCC-EF15	480	UNKNOWN	A/B

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The Davis Besse Nuclear Station is located on a site of approximately 954 acres of land in Ottawa County, in northwestern Ohio. The city of Sandusky Ohio is about 20 miles ESE of the site, and the Toledo incorporated limits are about 20 miles WNW. The site is bounded on the north and east by Lake Erie. Figure 4-1 (from Ref 1) is a general view of the plant and vicinity.

The major structures at this unit include the containment building, turbine building, auxiliary building, a service building, the intake structure and the cooling tower. A site plot plan is shown in Figure 4-2 and more details of station arrangement are shown in Figure 4-3.

The containment structure is a freestanding cylindrical steel containment vessel enclosed by a separate reinforced concrete shield building. The containment 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 southeast and southwest sides of the containment. The diesel generators are housed on the north side of the containment in the auxiliary building.

The turbine building, located east of the containment, houses the turbine generator and the associated power generating auxiliaries. The adjacent office building contains the condensate storage tanks. The circulating water pump house contains the circulating water pumps for main condenser cooling.

The auxiliary building is located around three-quarters of the reactor containment. The auxiliary building contains much of the plant's safety related equipment, including the auxiliary feedwater pumps, high pressure injection pumps, DHR pumps and heat exchangers, containment spray pumps, makeup pumps, component cooling water pumps and heat exchangers, and motor control centers supplying power to safety system components.

The intake structure is located east of the reactor complex, on the intake canal which connects to Lake Erie. The intake pump house on the intake canal houses the service water pumps.

4.2 FACILITY LAYOUT DRAWINGS

Figures 4-4 through 4-11 are simplified building layout drawings for Davis Besse. Some outlying buildings are not shown on these drawings. A section drawing of the Auxiliary Building is shown in Figure 4-12. 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, January 1972.

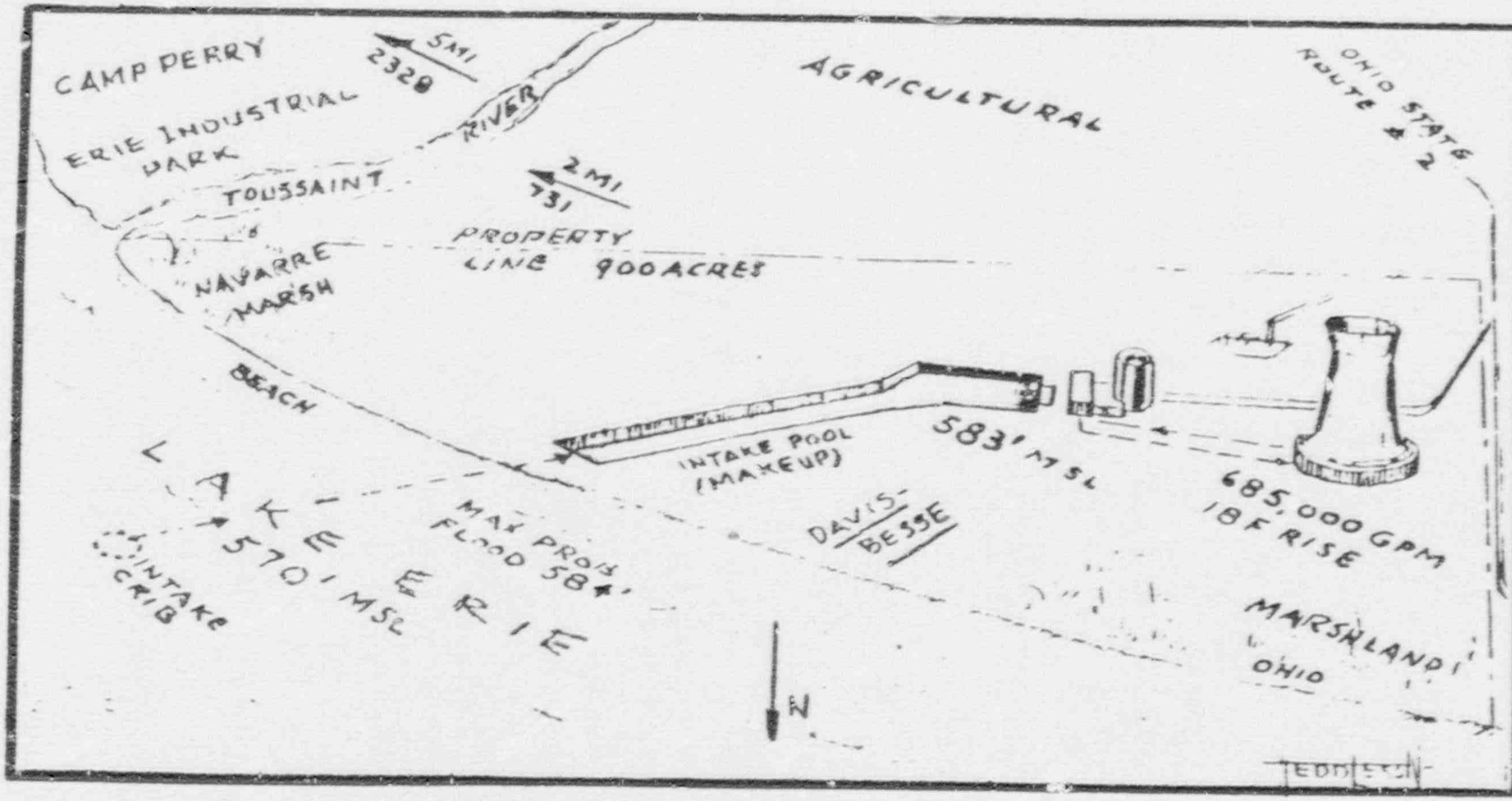


Figure 4-1. General View of the Davis Besse Nuclear Power Plant and Vicinity

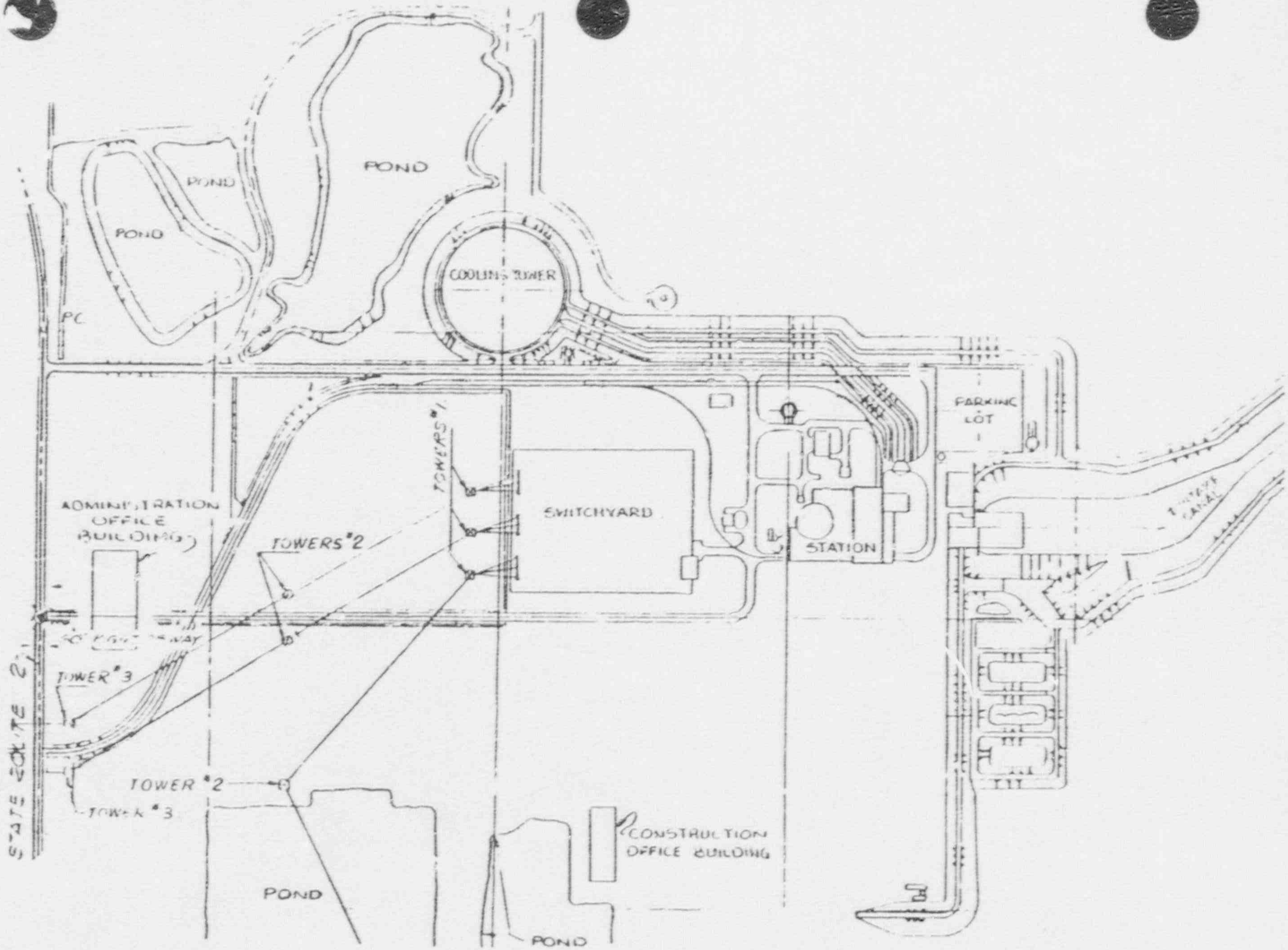


Figure 4-2. Davis-Besse Plot Plan

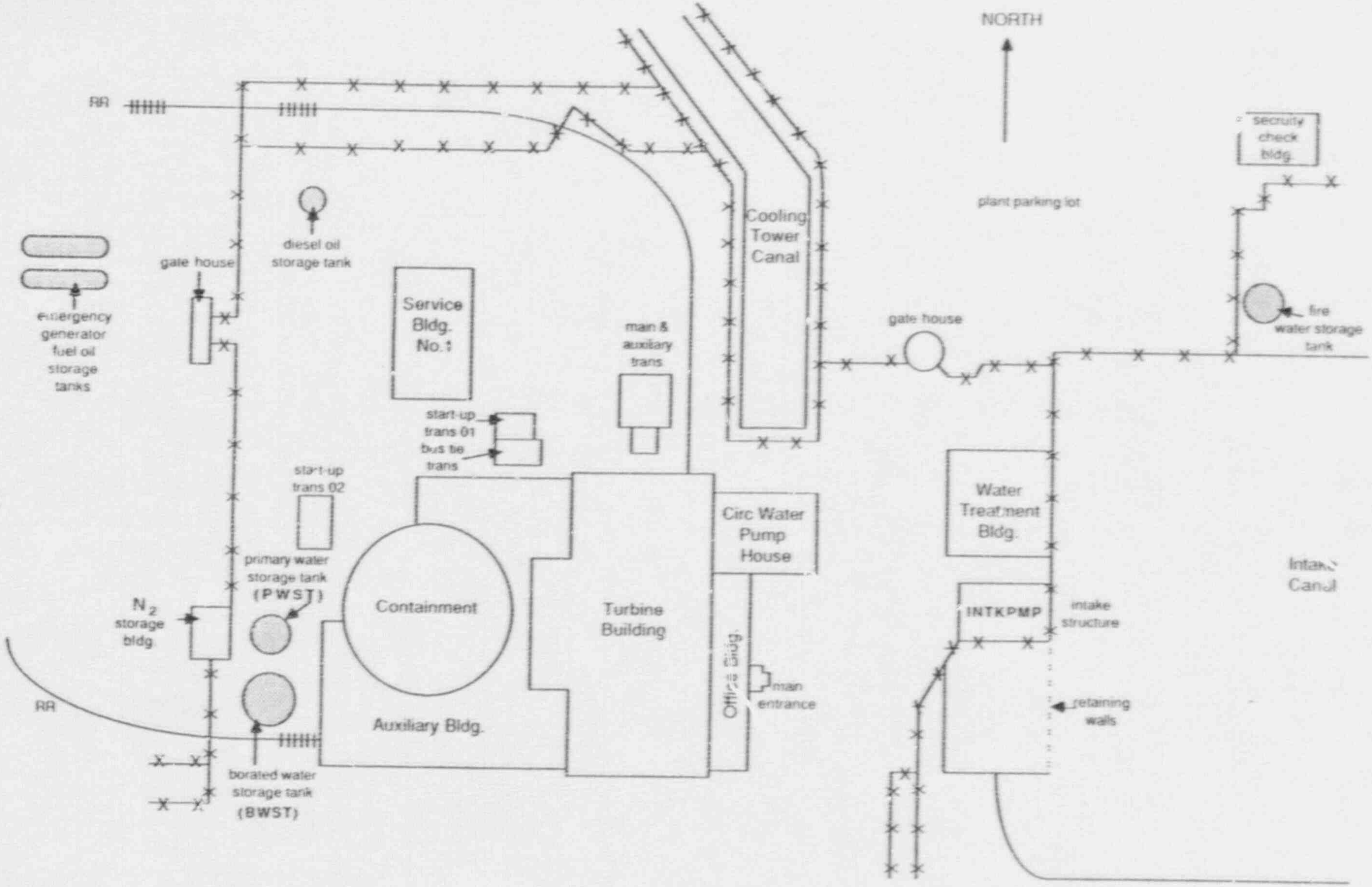


Figure 4-3. Davis-Besse General Station Arrangement

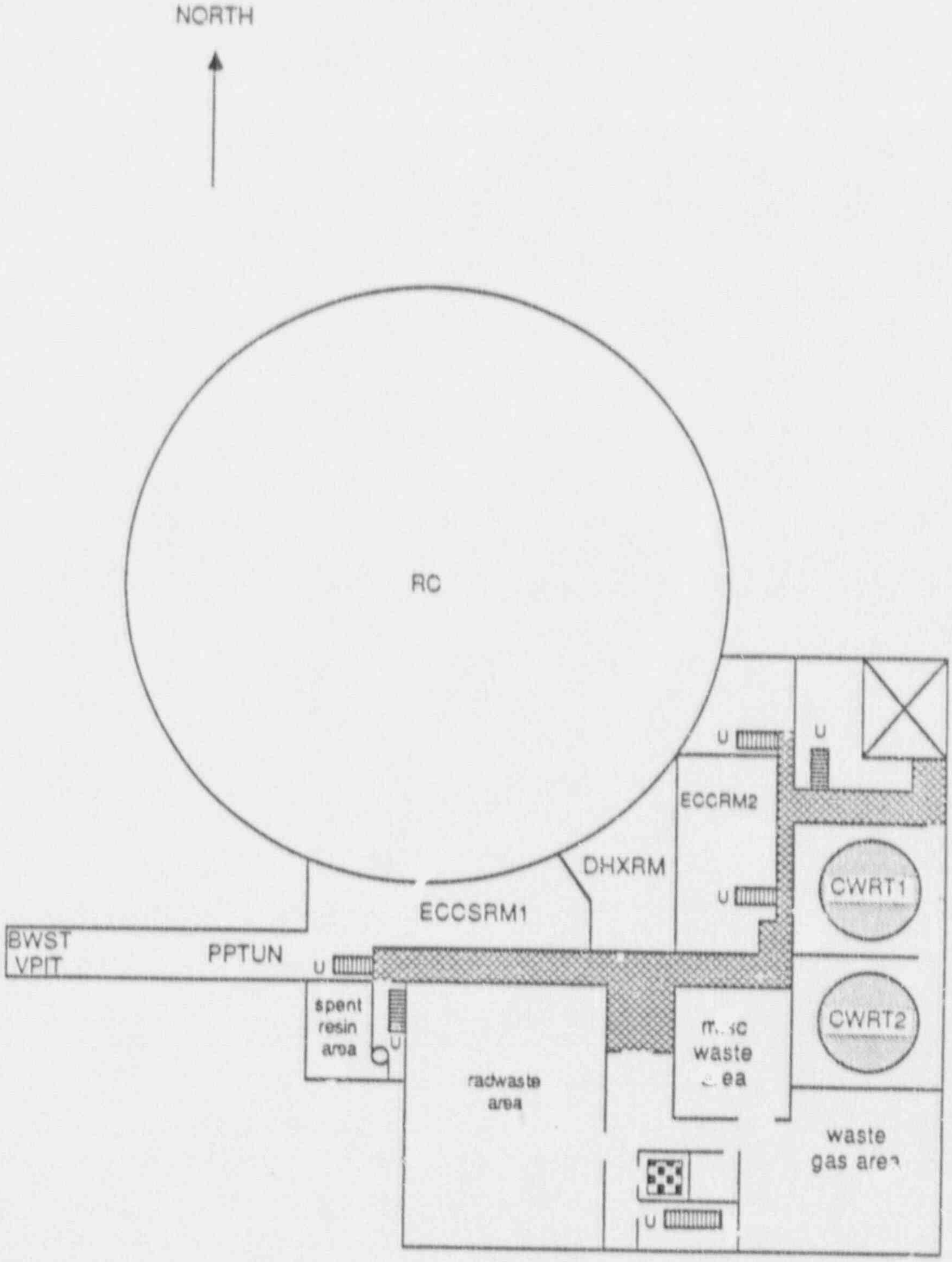


Figure 4-4. Davis-Besse Containment and Auxiliary Buildings, Elevation 545 feet

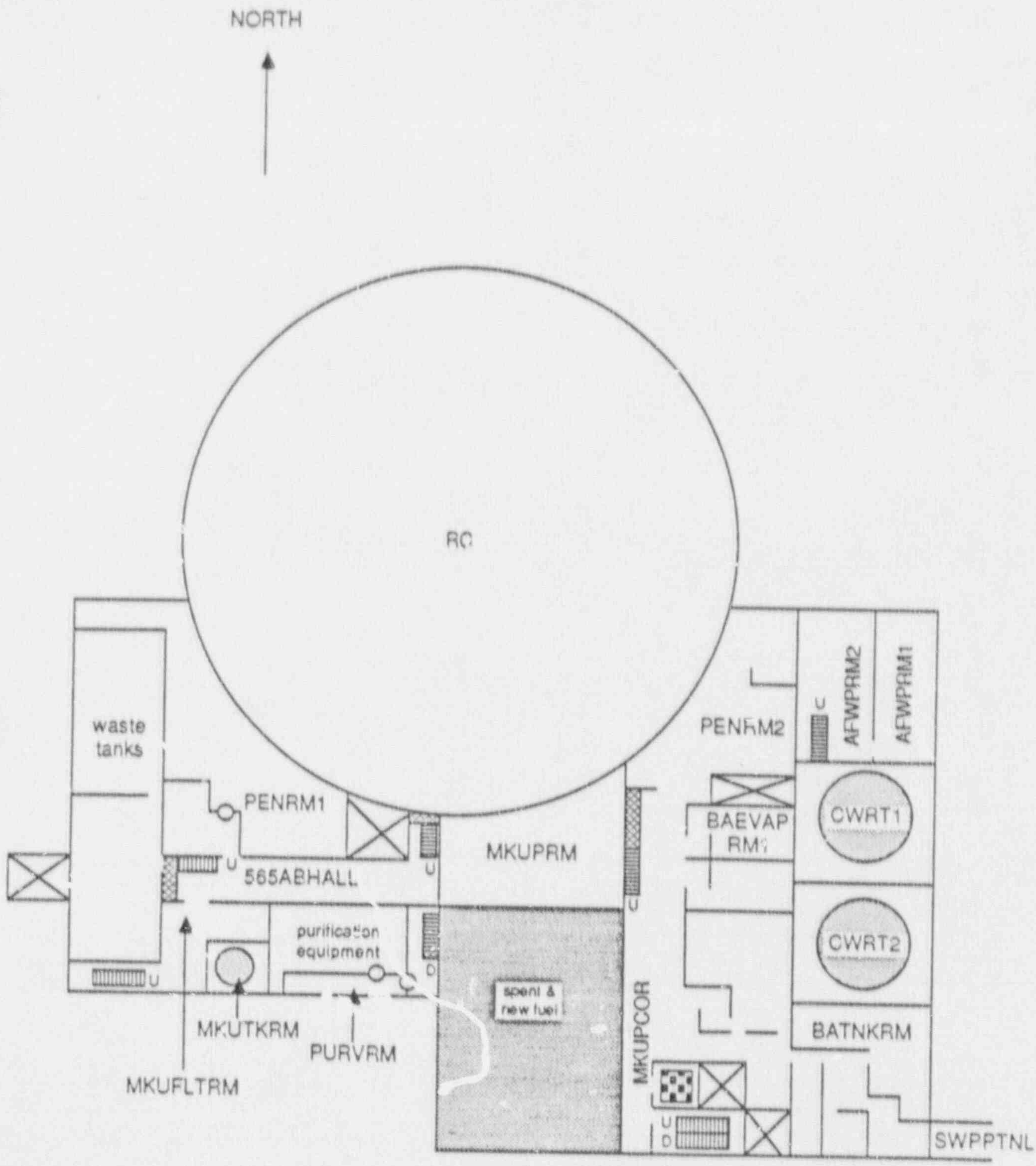


Figure 4-5. Davis-Besse Containment and Auxiliary Buildings, Elevation 565 feet

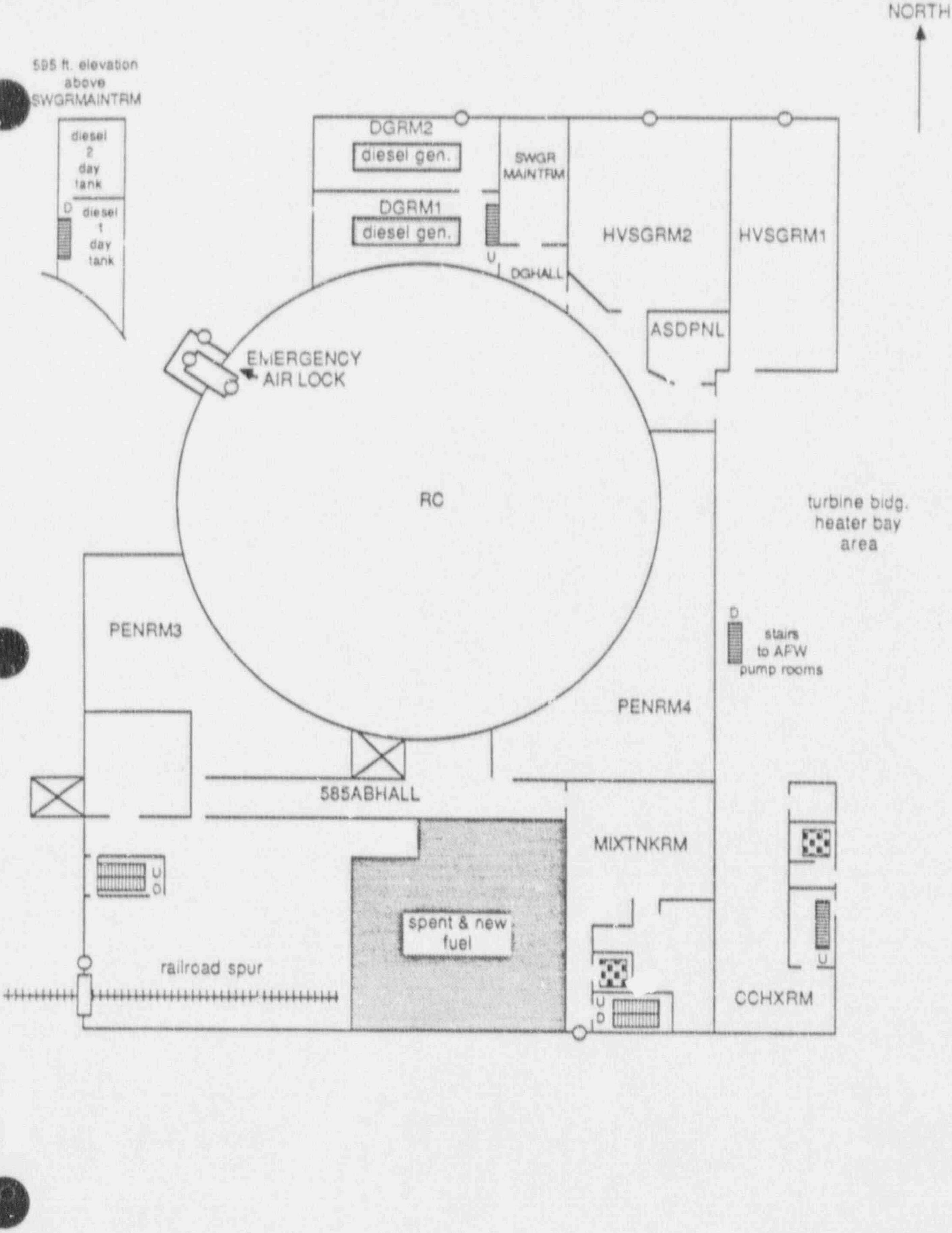


Figure 4-6. Davis-Besse Containment and Auxiliary Buildings, Elevation 585 to 595 feet

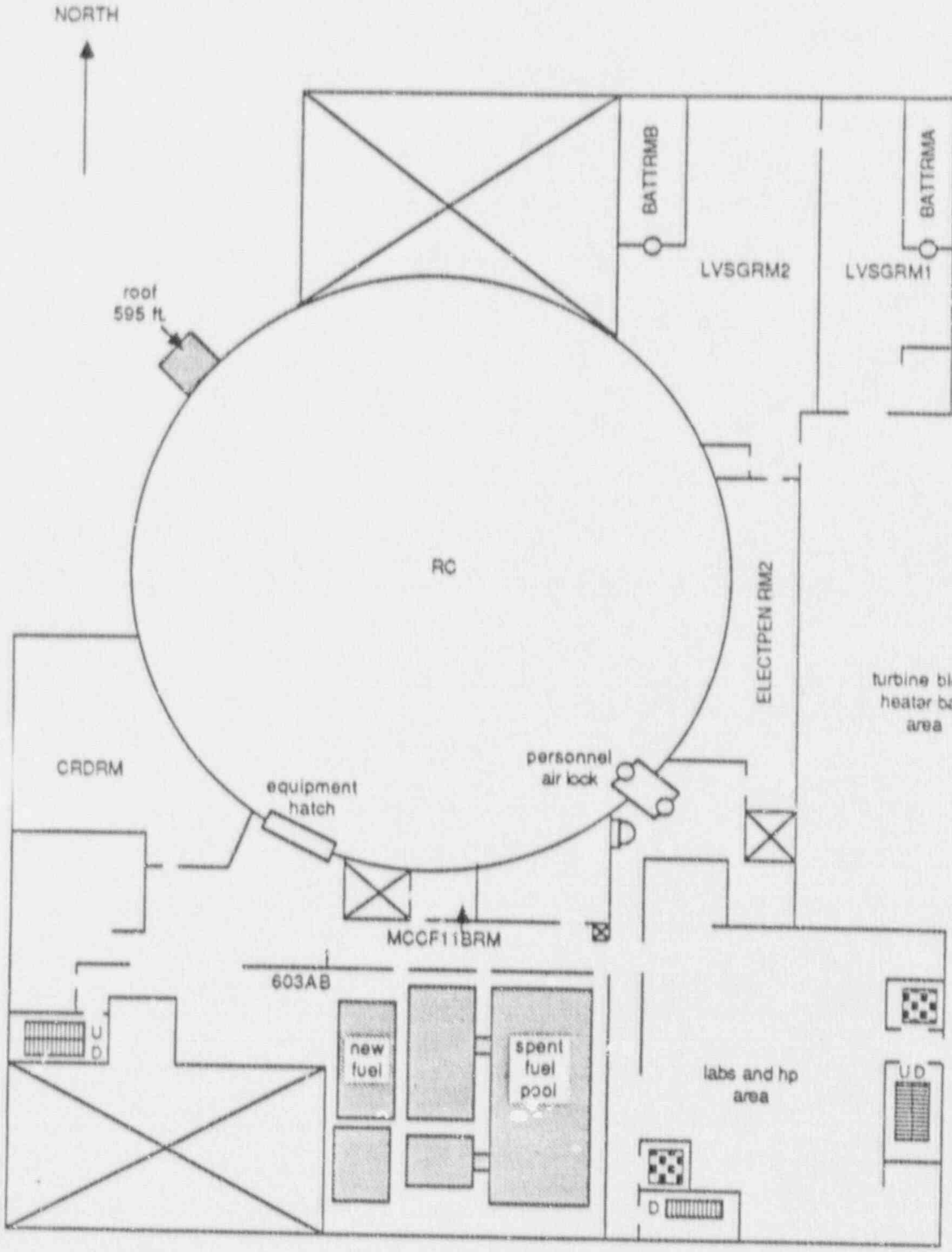


Figure 4-7. Davis-Besse Containment and Auxiliary Buildings, Elevation 603 feet

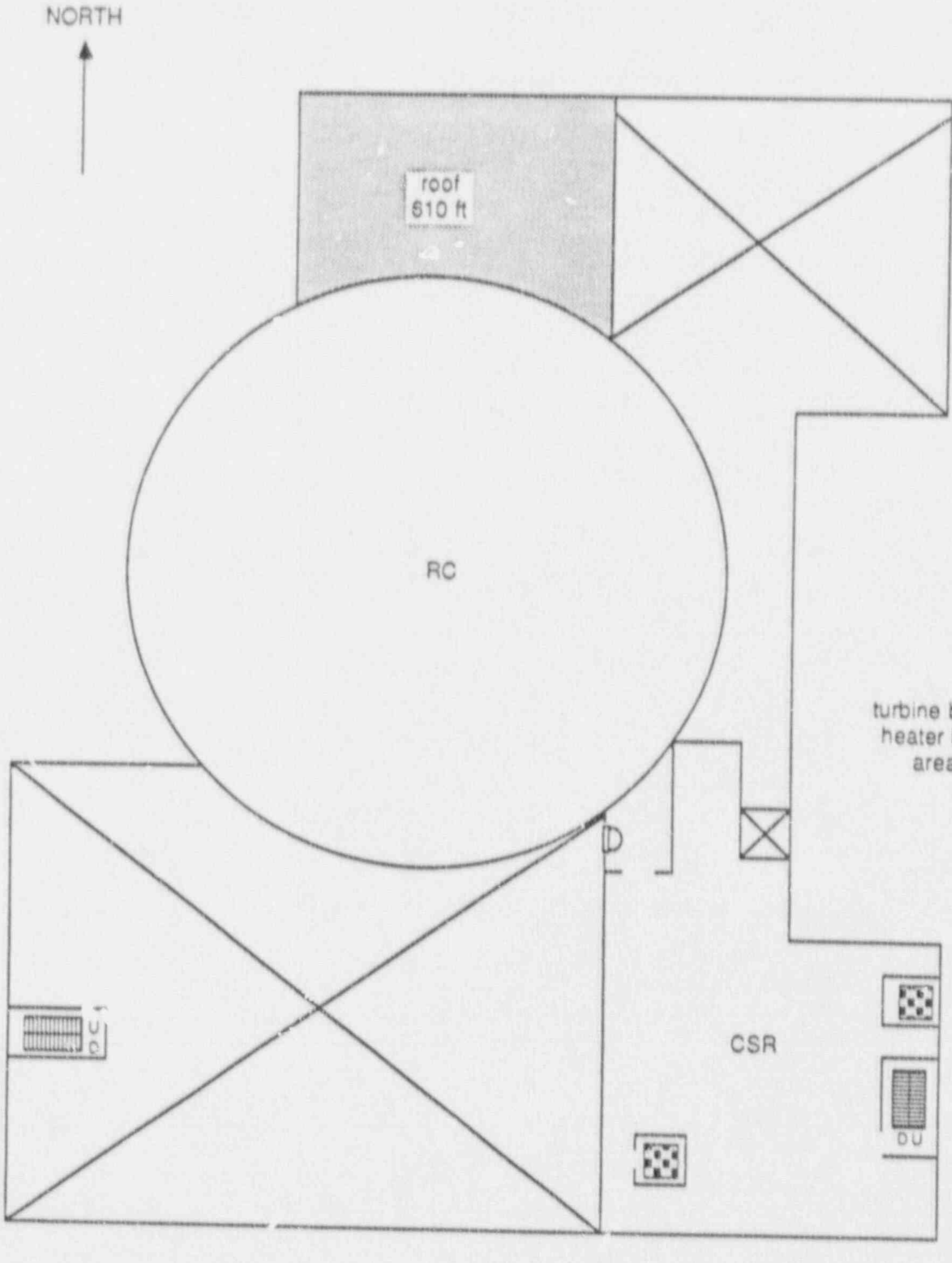


Figure 4-8. Davis-Besse Containment and Auxiliary Buildings, Elevation 613 feet

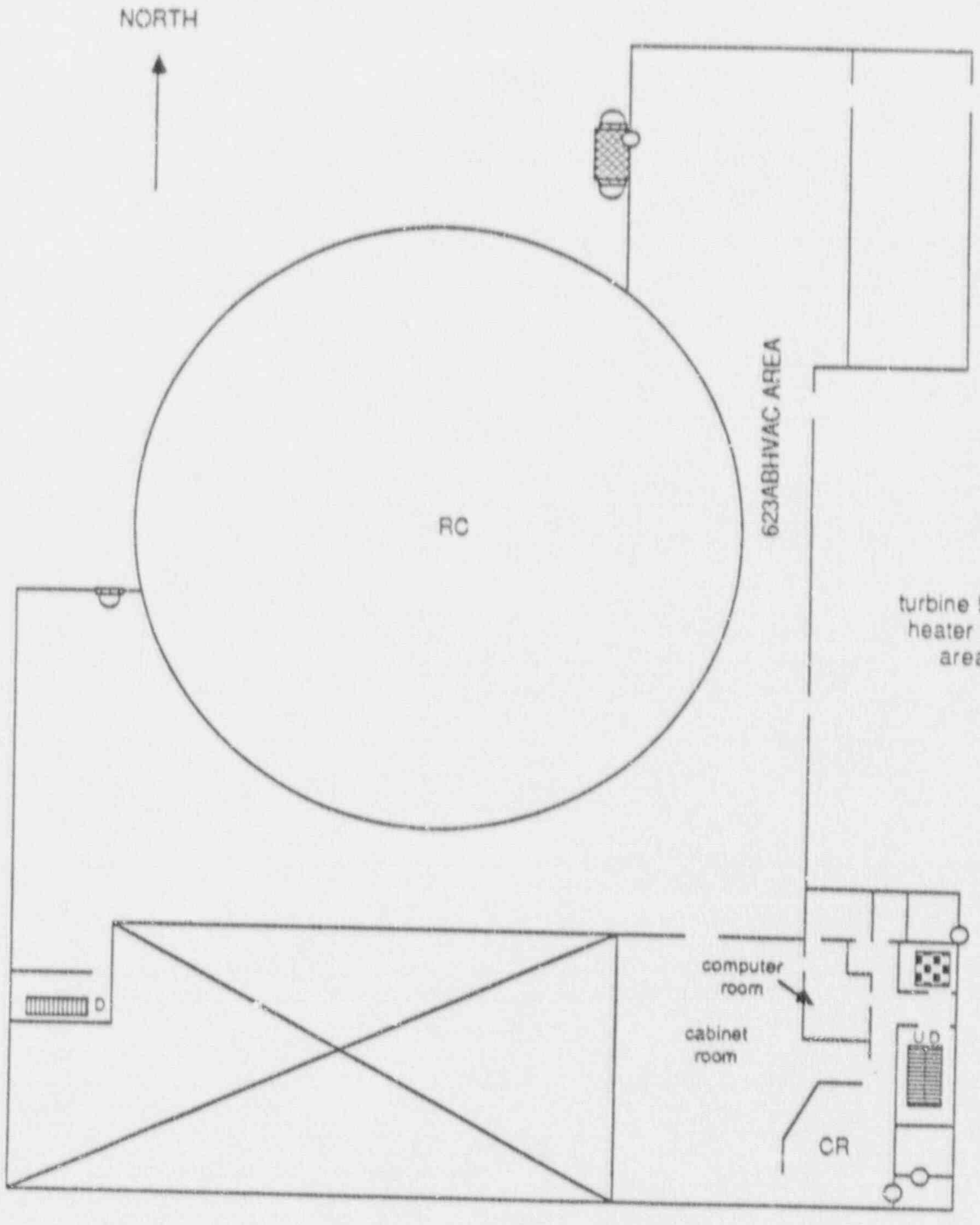


Figure 4-9. Davis-Besse Containment and Auxiliary Buildings, Elevation 623 feet

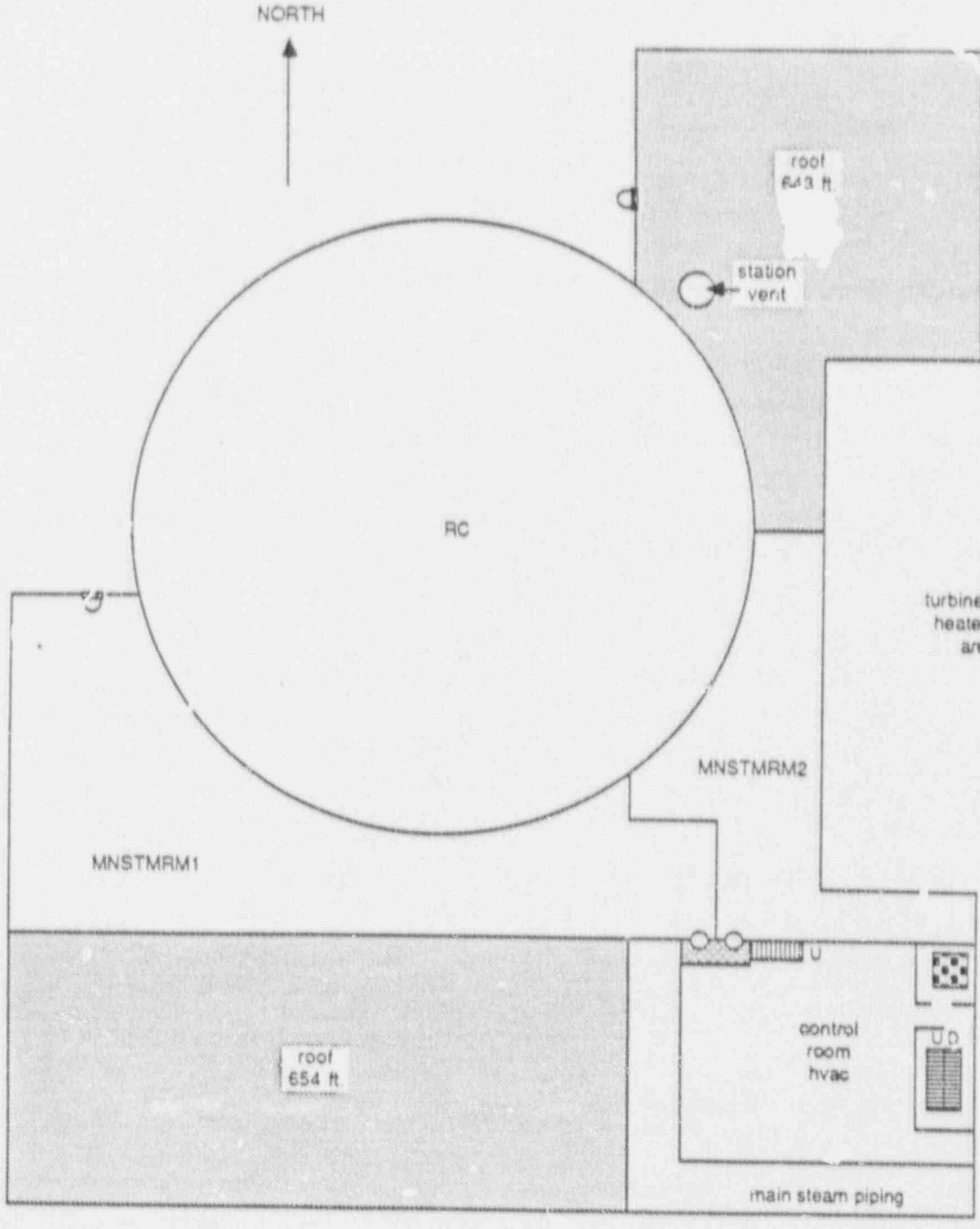


Figure 4-10. Davis-Besse Containment and Auxiliary Buildings, Elevation 638 to 643 feet

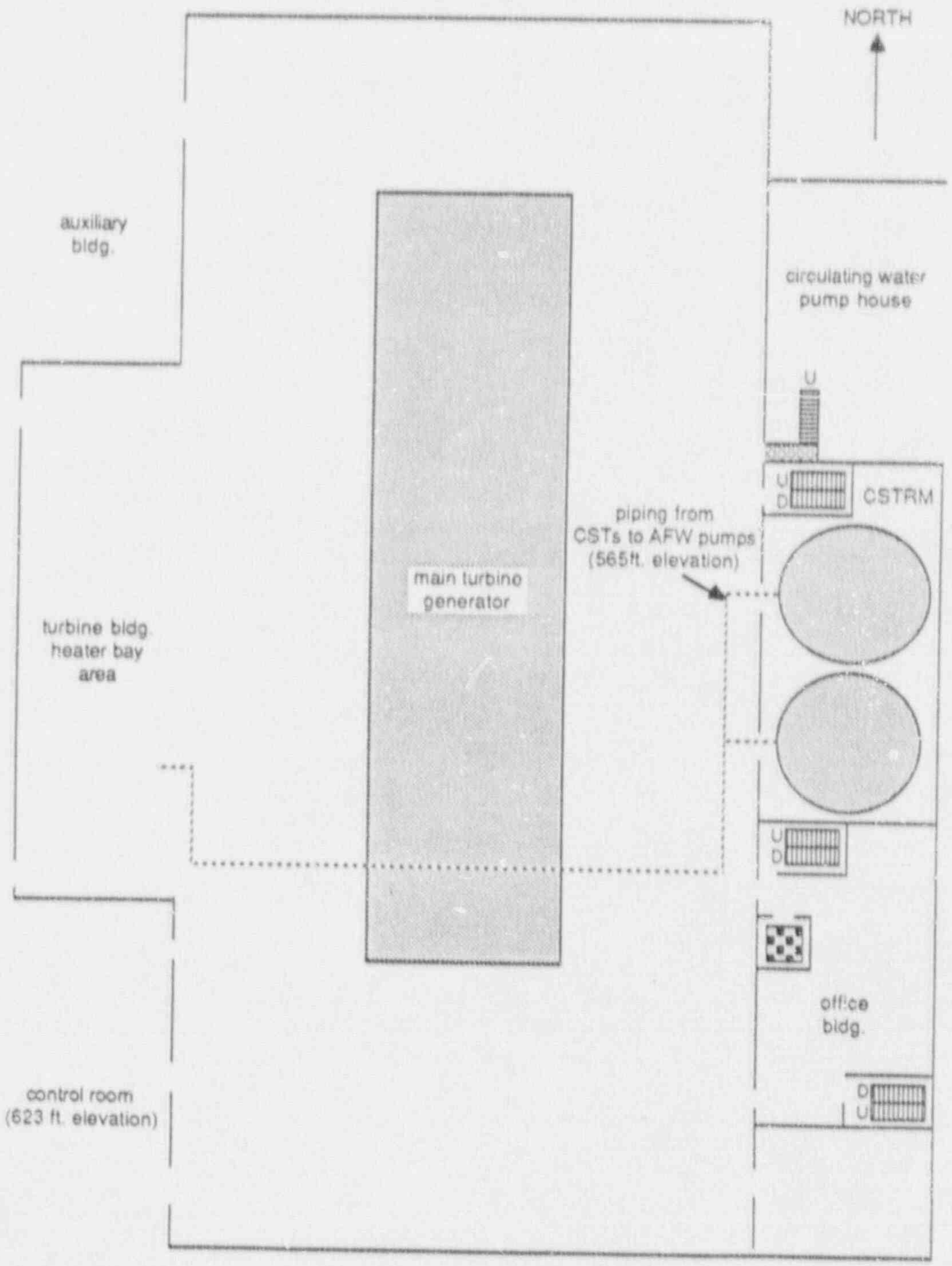


Figure 4-11. Davis-Besse Turbine Building, Elevation 565 to 623 feet (typical)

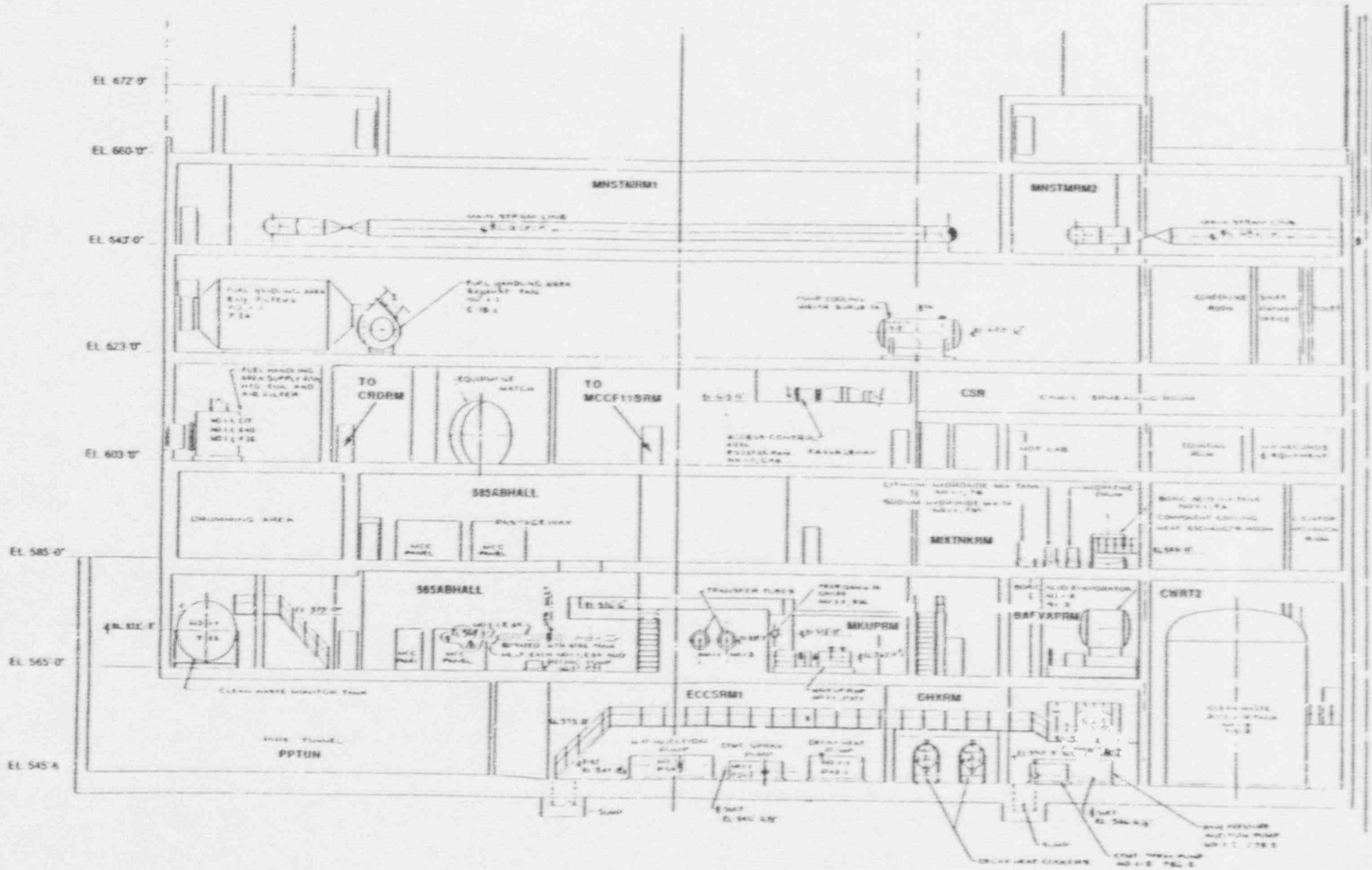


Figure 4-12. Davis-Besse Auxiliary Building Section

Table 4-1. Definition of Davis Besse Building and Location Codes

	Codes	Descriptions
1.	565ABHALL	565' elevation of the Auxiliary Building- hallway
2.	565TB-CST-PP	565' elevation - area in the Turbine Building where the Piping from the Condensate Storage Tank to the Auxiliary Feedwater Pumps is accessible
3.	575TB	575' elevation of the Turbine Building
4.	585ABHALL	585' elevation of the Auxiliary Building - hallway
5.	603AB	603' elevation of the Auxiliary Building
6.	623ABHVACAREA	623' elevation of the Auxiliary Building - Heating Ventilation Air Conditioning Area
7.	AFPRM1	Auxiliary Feedwater Pump Room No. 1, located on the 565' elevation of the Auxiliary Building
8.	AFPRM2	Auxiliary Feedwater Pump Room No. 2, located on the 565' elevation of the Auxiliary Building
9.	ASDPNL	Auxiliary Shutdown Panel, located on the 585' elevation of the Auxiliary Building
10.	BAEVAPRM1	Boric Acid Evaporator Room No. 1, located on the 565' elevation of the Auxiliary Building
11.	BATNKRM	Boric Acid Tank and Pump Room, located on the 565' elevation of the Auxiliary Building
12.	BATTRMA	Battery Room A in Low Voltage Switchgear Room No. 1
13.	BATTRMB	Battery Room B in Low Voltage Switchgear Room No. 2
14.	BWST	Borated Water Storage Tank, located outside - west of the Auxiliary Building
15.	BWSTVPIT	Borated Water Storage Tank Valve Pit, located between BWST and Pipe Tunnel in the Auxiliary Building
16.	CCHXRM	Component Cooling Heat Exchanger Room, located on the 585' elevation of the Auxiliary Building
17.	CR	Control Room, located on the 623' elevation of the Auxiliary Building

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

Codes	Descriptions
18. CRDRM	Control Rod Drive Equipment Room, located on the 603' elevation of the Auxiliary Building
19. CSR	Cable Spreading Room, located on the 613' elevation of the Auxiliary Building
20. CSTRM	Condensate Storage Tank Room, located on the 585' to 638' elevation of the Turbine Building
21. CWRT1	Clean Waste Receiver Tank Room No. 1, located on the 565' elevation of the Auxiliary Building
22. CWRT2	Clean Waste Receiver Tank Room No. 2, located on the 565' elevation of the Auxiliary Building
23. DGHALL	Hallway to Diesel Generators, located on the 585' elevation of the Auxiliary Building
24. DGRM1	Diesel Generator No. 1, located on the 585' elevation of the Auxiliary Building
25. DGRM2	Diesel Generator No. 2, located on the 585' elevation of the Auxiliary Building
26. DHXRM	Decay Heat Exchanger Room, located on the 545' elevation of the Auxiliary Building
27. ECCSRM1	Emergency Core Cooling Equipment Room No. 1, located on the 545' elevation of the Auxiliary Building
28. ECCSRM2	Emergency Core Cooling Equipment Room No. located on the 545' elevation of the Auxiliary Building
29. ELECTPENRM2	Electrical Penetration Room No. 2, located on the 603' elevation of the Auxiliary Building
30. HVSGRM1	High Voltage Switchgear Room No. 1, located on the 585' elevation of the Auxiliary Building
31. HVSGRM1	High Voltage Switchgear Room No. 2, located on the 585' elevation of the Auxiliary Building
32. INTKPMP	Water Intake Structure - east of Turbine Building
33. LVSGRM1	Low Voltage Switchgear Room No. 1, located on the 603' elevation of the Auxiliary Building

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

Codes	Descriptions
34. LVSGRM2	Low Voltage Switchgear Room No. 2, located on the 603' elevation of the Auxiliary Building
35. MCCF11BRM	Motor Control Center F11B, located on the 603' elevation of the Auxiliary Building
36. MIXTNKRM	Mixing Tank Room, located on the 585' elevation of the Auxiliary Building
37. MKUPCOR	Hallway leading to Makeup Pump Room, located on the 565' elevation of the Auxiliary Building
38. MKUPRM	Makeup Pump Room, located on the 565' elevation of the Auxiliary Building
39. MNSTMRM1	Main Stream Room No. 1, located on the 643' elevation of the Auxiliary Building
40. MNSTMRM2	Main Stream Room No. 2, located on the 643' elevation of the Auxiliary Building
41. PENRM1	Penetration Room No. 1, located on the 565' elevation of the Auxiliary Building
42. PENRM2	Penetration Room No. 2, located on the 565' elevation of the Auxiliary Building
43. PENRM3	Penetration Room No. 3, located on the 585' elevation of the Auxiliary Building
44. PENRM4	Penetration Room No. 4, located on the 585' elevation of the Auxiliary Building
45. PPTUN	Pipe Tunnel, located on the 545' elevation of the Auxiliary Building
46. RC	Reactor Containment
47. SWGRMAINTRM	Switchgear Maintenance Room, located on the 585' elevation of the Auxiliary Building
48. SWPPTNL	Service Water Pipe Tunnel, located on the 565' elevation between Intake Structure and Turbine Building
49. TB603	Turbine Building, 603' elevation

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
565ABHALL	EP	MCC-E11A	MCC
585ABHALL	EP	MCC-E11B	MCC
585ABHALL	EP	MCC-E11C	MCC
585ABHALL	MKUP	PWX1-1	MDP
585ABHALL	MKUP	PWX1-2	MDP
623AB	CCW	SURGE-TANK	TK
623ABHVACAREA	AFW	AFW106	MOV
623ABHVACAREA	AFW	AFW106A	MOV
623ABHVACAREA	AFW	AFW107A	MOV
623ABHVACAREA	AFW	AFW107	MOV
623ABHVACAREA	AFW	AFW106A	MOV
AFPRM1	AFW	AFW3870	MOV
AFPRM1	AFW	AFW786	MOV
AFPRM1	AFW	AFW3869	MOV
AFPRM1	AFW	SW1382	MOV
AFPRM1	AFW	AFW1-1	TDP
AFPRM1	AFW	AFW3870	MOV
AFPRM1	AFW	AFW356	MOV
AFPRM1	VENT	AFW-FAN-1	FAN
AFPRM2	AFW	AFW3871	MOV
AFPRM2	AFW	AFW790	MOV
AFPRM2	AFW	AFW1-2	TDP
AFPRM2	AFW	AFW3872	MOV
AFPRM2	AFW	AFW3871	MOV
AFPRM2	AFW	AFW388	MOV
AFPRM2	AFW	AFW730	XV
AFPRM2	AFW	AFW730	XV
AFPRM2	AFW	AFW729	XV
AFPRM2	AFW	AFW729	XV
AFPRM2	VENT	AFW-FAN-2	FAN

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE (CONTINUED)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
ASDPNL	CCW	BUS-CD	BUS
ASDPNL	CCW	BUS-CD	BUS
ASDPNL	SW	BUS-CD	BUS
ASDPNL	SW	BUS-CD	BUS
BATNKRM	MKUP	BA1-1	MDP
BATNKRM	MKUP	BA1-2	MDP
BATNKRM	MKUP	BA-TK1-1	TK
BATNKRM	MKUP	BA-TK1-2	TK
BATTRMA	EP	BATT-1P	BAT
BATTRMA	EP	BATT-1N	BAT
BATTRMA	VENT	BATT-FAN-1	FAN
BATTRMB	EP	BATT-2P	BAT
BATTRMB	EP	BATT-2N	BAT
BATTRMB	VENT	BATT-FAN-2	FAN
BWST	ECCS	BWST	TK
BWST	ECCS	BWST	TK
BWST	MKUP	BWST	TK
BWSTVPIT	ECCS	DH7B	MOV
BWSTVPIT	ECCS	DH7A	MOV
BWSTVPIT	MKUP	DH7A	MOV
BWSTVPIT	MKUP	DH7B	MOV
CCHXRM	CCW	CCW1-1	MDP
CCHXRM	CCW	CCW1-2	MDP
CCHXRM	CCW	CCW1-3	MDP
CCHXRM	CCW	SW1424	NV
CCHXRM	CCW	SW1429	NV
CCHXRM	CCW	SW1434	NV
CCHXRM	CCW	SW1429	NV
CCHXRM	CCW	CCW5095	MOV
CCHXRM	CCW	CCW5096	MOV

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE (CONTINUED)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
CCHXRM	CCW	CCW1460	NV
CCHXRM	VENT	CCW-FAN-1	FAN
CCHXRM	VENT	CCW-FAN-2	FAN
CR	VENT	CR-FAN1	FAN
CR	VENT	CR-FAN2	FAN
CR	VENT	CR-COND-1	COND
CR	VENT	CR-COND-2	COND
CR	VENT	CR-COND-SBY	COND
CRDRM	EP	MCC-E11E	MCC
CSTRM	AFW	CST1-1	TK
CSTRM	AFW	CST1-2	TK
DGRM1	EP	EP-DG[illegible]	DG
DGRM1	EP	MCC-E12B	MCC
DGRM1	EP	MCC-E12F	MCC
DGRM1	VENT	DG-FAN-1	FAN
DGRM1	VENT	DG-FAN-2	FAN
DGRM2	EP	EP-DG2	DG
DGRM2	EP	MCC-F12B	MCC
DGRM2	VENT	DG-FAN-3	FAN
DGRM2	VENT	DG-FAN-4	FAN
DHXRM	ECCS	DHX1-1	HX
DHXRM	ECCS	DH14B	NV
DHXRM	ECCS	DHX 1-2	HX
DHXRM	ECCS	DH14A	NV
DHXRM	ECCS	DH2734	MOV
ECCSRM1	ECCS	DH64	MOV
ECCSRM1	ECCS	DH1-1	MDP
ECCSRM1	ECCS	HPI1-1	MDP
ECCSRM1	VENT	ECCS-FCU-4	FCU
ECCSRM1	VENT	ECCS-FCU-5	FCU

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE (CONTINUED)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
ECCSRM2	ECCS	DH2733	MOV
ECCSRM2	ECCS	DH63	MOV
ECCSRM2	ECCS	DH1-2	MDP
ECCSRM2	ECCS	HPI1-2	MDP
ECCSRM2	VENT	ECCS-FCU-1	FCU
ECCSRM2	VENT	ECCS-FCU-2	FCU
ECCSRM2	VENT	ECCS-FCU-3	FCU
ELECTPENRM2	EP	MCC-F11A	MCC
HVSGRM1	EP	BUS-C1	BUS
HVSGRM1	EP	EP-CB1	CB
HVSGRM2	EP	BUS-D1	BUS
HVSGRM2	EP	EP-CB2	CB
INTKPMP	EP	MCC-E12C	MCC
INTKPMP	EP	MCC-E12D	MCC
INTKPMP	EP	MCC-F12C	MCC
INTKPMP	EP	MCC-F12D	MCC
INTKPMP	EP	MCC-EF12C	MCC
INTKPMP	EP	MCC-EF12C	MCC
INTKPMP	SW	SW1-1	MDP
INTKPMP	SW	SW1-2	MDP
INTKPMP	SW	SW1-3	MDP
LVSGRM1	EP	BUS-E1	BUS
LVSGRM1	EP	EP-CE11	TRAN
LVSGRM1	EP	PNL-D1P	PNL
LVSGRM1	EP	PNL-D1N	PNL
LVSGRM1	EP	DC-MCC1	MCC
LVSGRM1	EP	DC-MCC1	MCC
LVSGRM1	EP	DC-MCC1	MCC
LVSGRM1	EP	DC-MCC1	MCC
LVSGRM1	EP	DC-MCC1	MCC

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE (CONTINUED)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
LVSGRM1	EP	BC-1P	BC
LVSGRM1	EP	BC-1N	BC
LVSGRM1	EP	BC-1PN	BC
LVSGRM1	EP	PNL-DAP	PNL
LVSGRM1	EP	INV-YV1	INV
LVSGRM1	EP	INV-YV1	INV
LVSGRM1	EP	RECT-YRF1	RECT
LVSGRM1	EP	PNL-ESS-Y1	PNL
LVSGRM1	EP	PNL-DAN	PNL
LVSGRM1	EP	INV-YV3	INV
LVSGRM1	EP	INV-YV3	INV
LVSGRM1	EP	RECT-YRF3	RECT
LVSGRM1	EP	PNL-ESS-Y3	PNL
LVSGRM1	EP	MCC-E12A	MCC
LVSGRM1	EP	MCC-E14	MCC
LVSGRM1	EP	MCC-E15	MCC
LVSGRM1	EP	MCC-EF12D	MCC
LVSGRM1	EP	MCC-EF12D	MCC
LVSGRM1	EP	MCC-EF15	MCC
LVSGRM1	EP	MCC-EF15	MCC
LVSGRM1	VENT	LV-FAN-1	FAN
LVSGRM1	VENT	LV-FAN-E1	FAN
LVSGRM2	EP	BUS-F1	BUS
LVSGRM2	EP	EP-DF12	TRAN
LVSGRM2	EP	PNL-D2P	PNL
LVSGRM2	EP	PNL-D2N	PNL
LVSGRM2	EP	DC-MCC2	MCC
LVSGRM2	EP	DC-MCC2	MCC
LVSGRM2	EP	DC-MCC2	MCC
LVSGRM2	EP	DC-MCC2	MCC

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE (CONTINUED)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
LVSGRM2	EP	DC-MCC2	MCC
LVSGRM2	EP	BC-2P	BC
LVSGRM2	EP	BC-2N	BC
LVSGRM2	EP	BC-2PN	BC
LVSGRM2	EP	PNL-DBP	PNL
LVSGRM2	EP	INV-YV2	INV
LVSGRM2	EP	INV-YV2	INV
LVSGRM2	EP	RECT-YRF2	RECT
LVSGRM2	EP	PNL-ESS-Y2	PNL
LVSGRM2	EP	PNL-DBN	PNL
LVSGRM2	EP	INV-YV4	INV
LVSGRM2	EP	INV-YV4	INV
LVSGRM2	EP	RECT-YRF4	RECT
LVSGRM2	EP	PNL-ESS-Y4	PNL
LVSGRM2	EP	MCC-F12A	MCC
LVSGRM2	EP	MCC-F15	MCC
LVSGRM2	EP	MCC-F14	MCC
LVSGRM2	VENT	LV-FAN-2	FAN
LVSGRM2	VENT	LV-FAN-E2	FAN
MCCF11BRM	EP	MCC-F11B	MCC
MKUPCOR	EP	MCC-E11D	MCC
MKUPCOR	EP	MCC-F11D	MCC
MKUPRM	ECCS	DH9B	MOV
MKUPRM	ECCS	DH9A	MOV
MKUPRM	MKUP	MU32	NV
MKUPRM	MKUP	MU1-2	MDP
MKUPRM	MKUP	MU1-1	MDP
MKUPRM	MKUP	MU3971	MOV
MKUPRM	MKUP	MU3971	MOV
MNSTMRM1	AFW	MS11A	NV

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE (CONTINUED)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
MNSTMRM2	AFW	MS11B	NV
PENRM1	ECCS		PP
PENRM1	ECCS	HP2C	MOV
PENRM1	ECCS	HP2D	MOV
PENRM1	ECCS	DH1B	MOV
PENRM2	AFW	SW1383	MOV
PENRM2	ECCS	HP2A	MOV
P.'NRM2	ECCS	HP2B	MOV
PENRM2	ECCS	DH1A	MOV
PENRM2	EP	MCC-F11C	MCC
PENRM2	MKUP	MU33	NV
PENRM3	AFW	AFW608	MOV
'ENRM3	AFW	AFW608	MOV
PE RM4	AFW	AFW599	MOV
FENRM4	AFW	AFW599	MOV
PPTUN	EP	MCC-E12E	MCC
PPTUN	EP	MCC-F11F	MCC
PPTUN	EP	MCC-E12E	MCC
PPTUN	RP	MCC-F11E	MCC
PWST	MKUP	PWST	TK
RC	RCS	RCS-VESSEL	RV
RC	RCS	DH11	MOV
RC	RCS	RC2A	SOV
RC	RCS	RC11	MOV
RC	RCS	MU2A	MOV
RC	RCS	MU1A	MOV
RC	RCS	MU2B	MOV
RC	RCS	MU1B	MOV
RC	RCS	DH12	MOV
RC	RCS	PZR-HTR-A	HTR

TABLE 4-2. PARTIAL LISTING OF COMPONENTS BY LOCATION AT DAVIS BESSE (CONTINUED)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RC	RCS	PZR-HTR-B	HTR
RC	VENT	RC-FCU-1-1	FCU
RC	VENT	RC-FCU-1-2	FCU
RC	VENT	RC-FCU-1-3	FCU
SWPPTNL	SW	SW1399	MOV
SWPPTNL	SW	SW2931	MOV
SWPPTNL	SW	SW2930	MOV
SWPPTNL	SW	SW1395	MOV
SWPPTNL	SW	SW2929	MOV
SWPPTNL	SW	SW2932	MOV
TB603	EP	MCC-F13	MCC
TB603	EP	MCC-F13	MCC
UNKNOWN	EP	PNL-Y1A	PNL
UNKNOWN	EP	PNL-Y2A	PNL
UNKNOWN	MKUP	MU40	MOV
UNKNOWN	MKUP	DWST	TK
UNKNOWN	MKUP	DWX1-1	MDP
UNKNOWN	MKUP	DWX1-2	MDP
UNKNOWN	MKUP	DWX1-3	MDP

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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 ... ite 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 B 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)

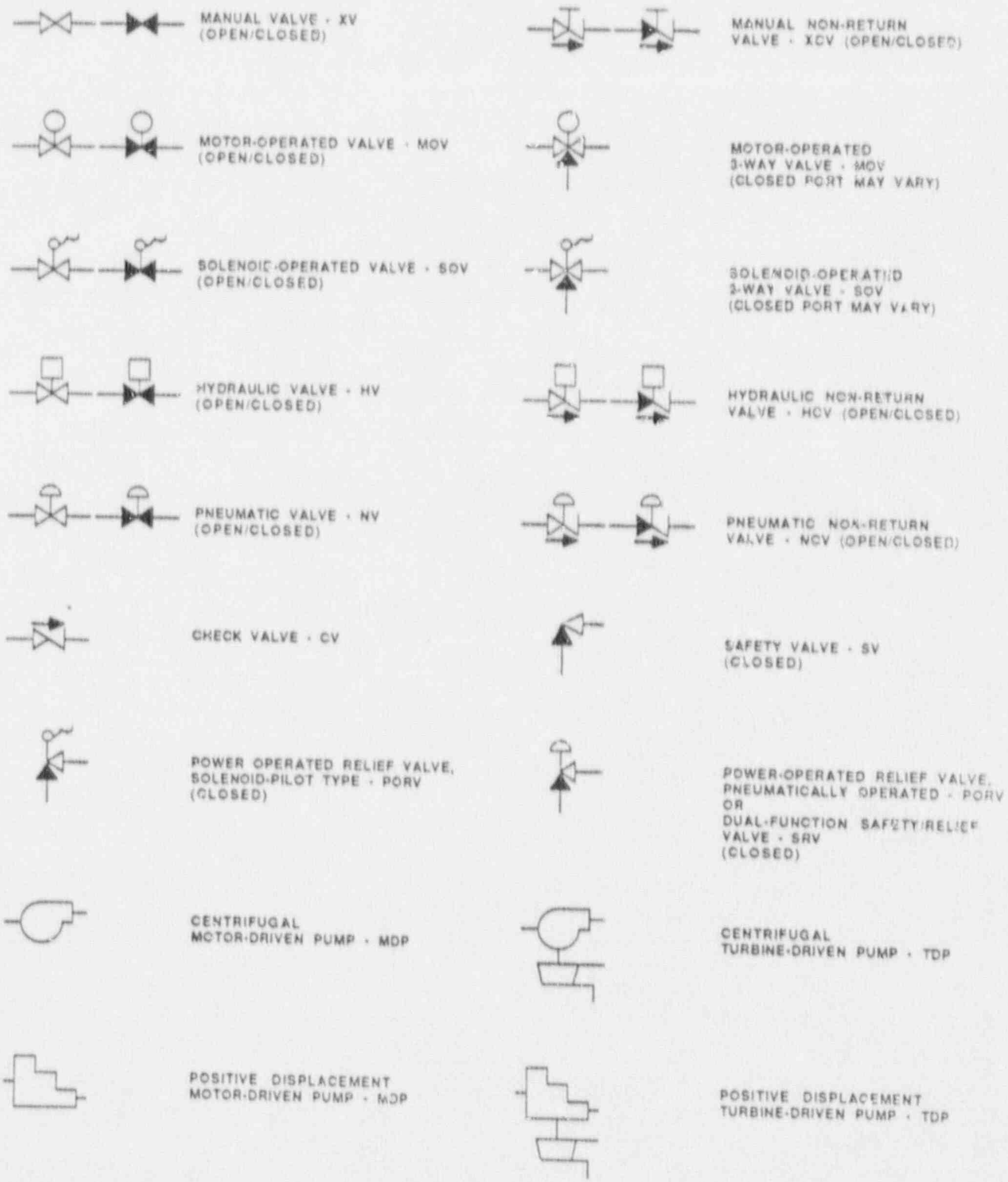

Figure A-1. Key To Symbols In Fluid System Drawings

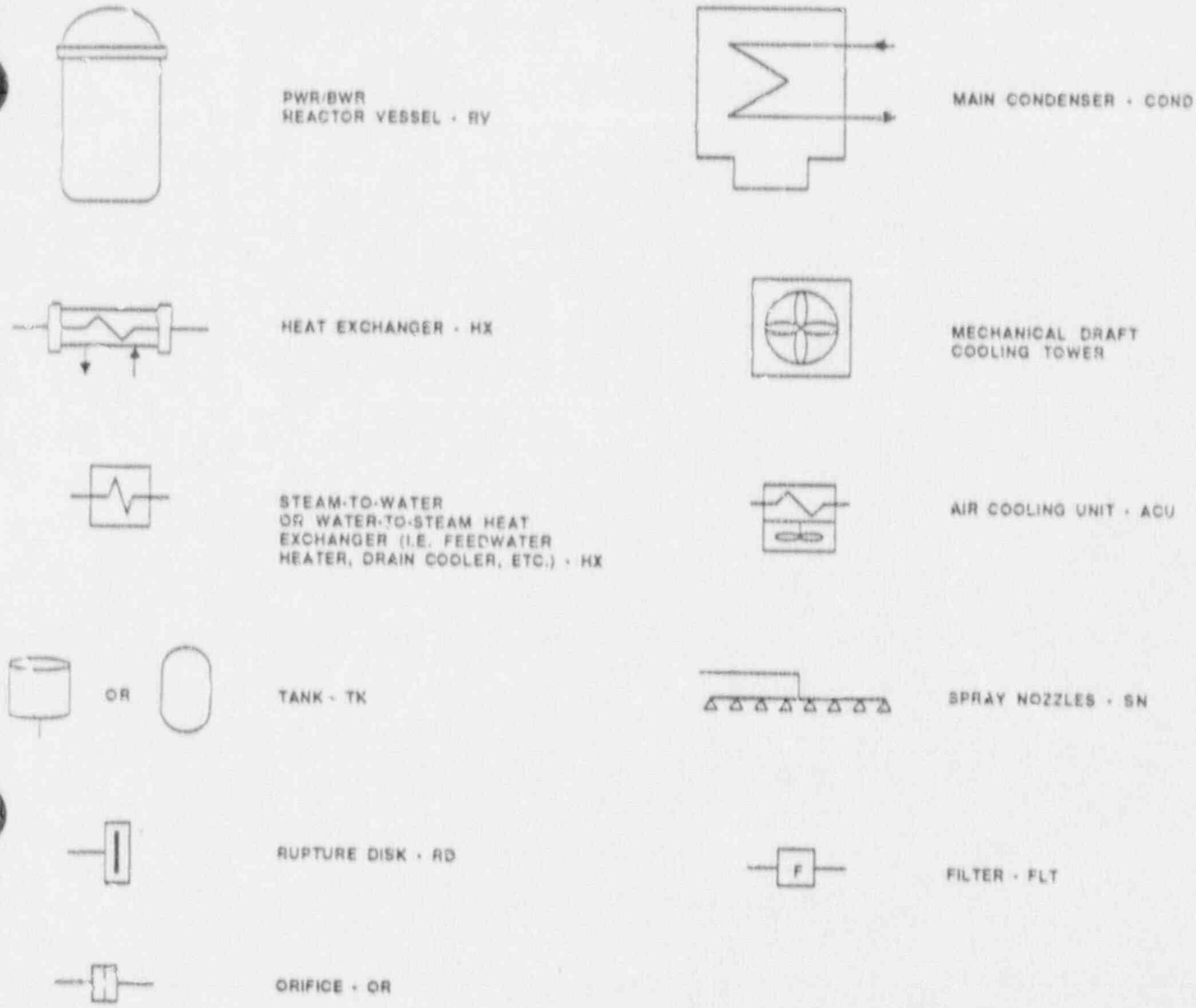

Figure A-1 Key To Symbols In Fluid System Drawings
(Continued)

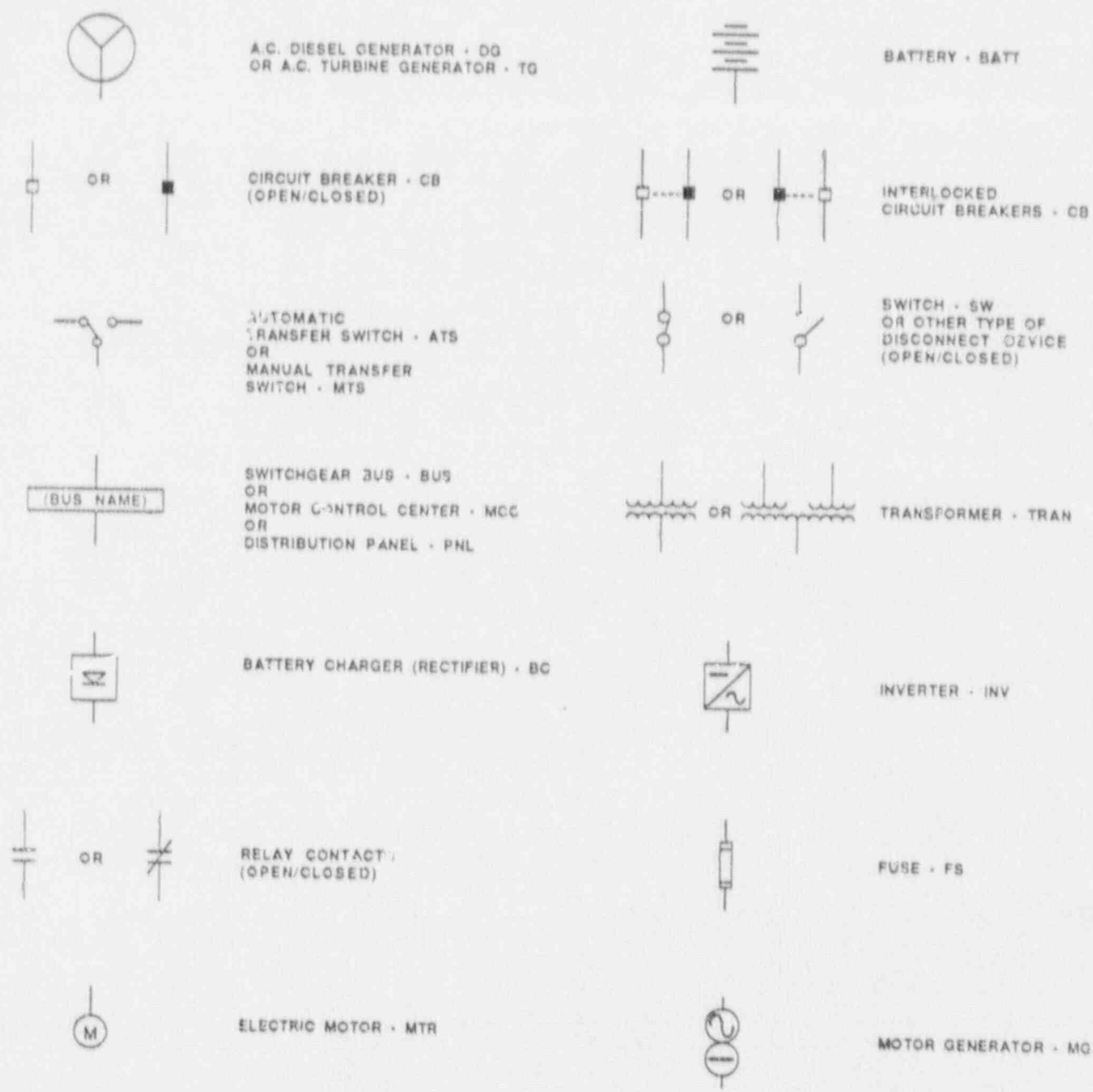

Figure A-2. Key To Symbols In Electrical System Drawings

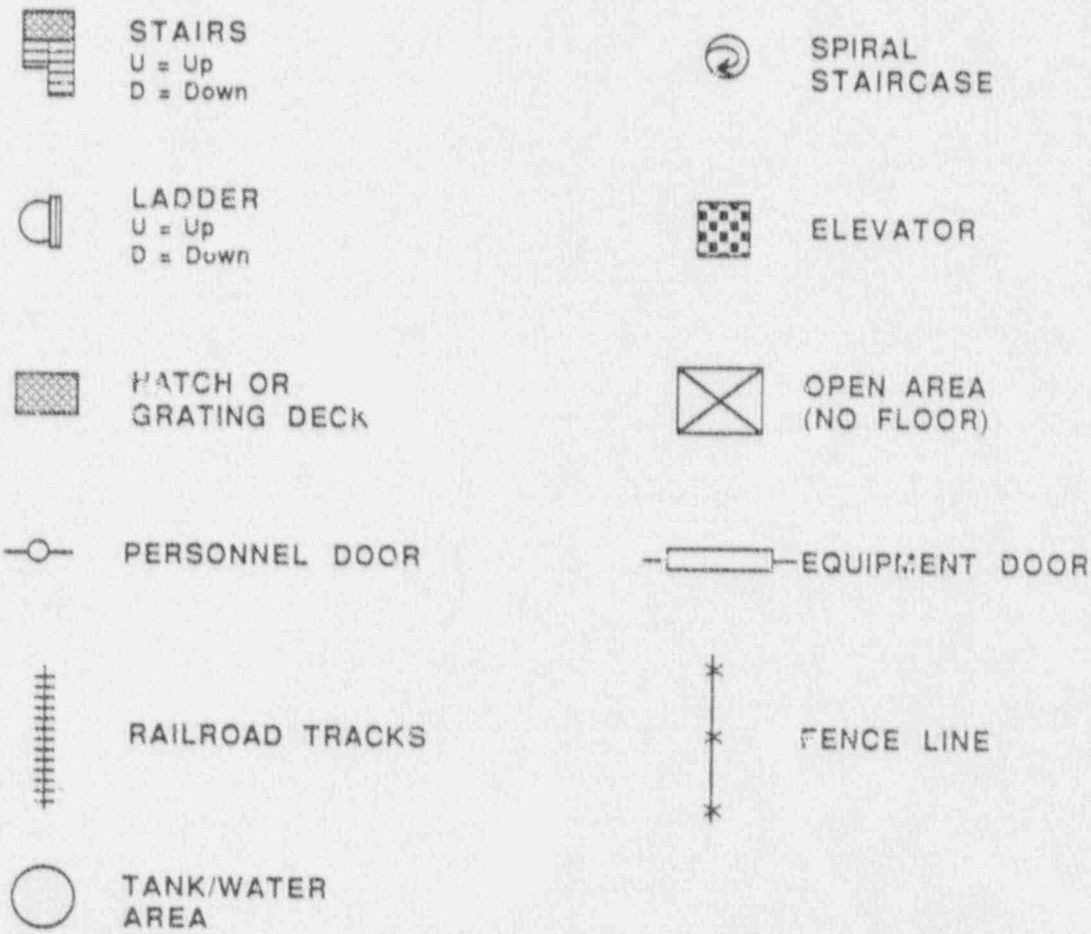

Figure A-3. Key To Symbols In Facility Layout Drawings

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
MKUP	Makeup and Purification System
I&C	Instrumentation and Control System
EP	Electric Power System
CCW	Component Cooling Water System
SW	Service Water System
VENT	Equipment and Control Room Emergency Ventilation Systems

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 distribution component) is the next higher electrical distribution or generating component in a distribution system. A single component may have more than one power source (i.e. a DC bus powered from a battery and a battery charger).

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

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

TABLE B-1. COMPONENT TYPE CODES

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

TABLE B-1. COMPONENT TYPE CODES (Continued)

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