SAIC-89/1529

NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

BEAVER VALLEY 1

50-334

Editor: Peter Lobner
Authors: Peter Lobner, Lewis Goldman
Stephen Finn, and William Horton

Prepared for:

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Contract NRC-03-87-029
FIN D-1763

SAIC

TABLE OF CONTENTS

LIST OF FIGURES

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.

BEAVER VALLEY 1
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	10/89	Original report

BEAVER VALLEY 1 SYSTEM SOURCEBOOK

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

1. SUMMARY DATA ON PLANT

Basic information on the Beaver Valley 1 nuclear power plant is listed below:

- Docket number	50-334
- Operator	Duquesne Light Company
- Location	Pennsylvania, 25 miles northwest of Pittsburgh
- Commercial operation date	12/76
- Reactor type	PWR
- NSSS vendor	Westinghouse
- Number of loops	3
- Power (MWt/MWe)	2652/810
- Architect-engineer	Stone & Webster
- Containment type	Reinforced concrete cylinder with steel liner, subatmosphere

2. IDENTIFICATION OF SIMILAR NUCLEAR POWER PLANTS

The Beaver Valley 1 plant has a Westinghouse PWR three-loop nuclear steam supply system (NSSS) and a subatmospheric containment. Other three-loop Westinghouse plants in the United States are:

- Beaver Valley 2 (also subatmospheric containment)
- San Onofre 1
- Turkey Point 3 and 4
- H.B. Robinson 2
- Surry 1 and 2 (also subatmospheric containment)
- North Anna 1 and 2 (also subatmospheric containment)
- Joseph M. Farley 1 and 2
- Virgil C. Summer 1
- Shearon Harris 1

The following system features at Beaver Valley 1 represent major differences from similar Westinghouse plants, or PWRs in general.

- The residual heat removal (RHR) system is entirely within the reactor containment building.
- Each reactor coolant system (RCS) coolant loop includes two loop isolation valves.
- All post-LOCA containment heat is transferred to the ultimate heat sink via the containment recirculation spray system heat exchangers. No heat exchangers are in the ECCS low-pressure recirculation flow paths.

3. SYSTEM INFORMATION

This section contains descriptions of selected systems at Beaver Valley 1 in terms of general function, operation, system success criteria, major components, and support system requirements. A summary of major systems at Beaver Valley 1 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 Beaver Valley 1 Systems Covered in this Report

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Reactor Heat Removal Systems			
- Reactor Coolant System (RCS)	Same	3.1	4
- Auxiliary Feedwater (AFW) and Secondary Steam Relief (SSR) Systems	Auxiliary Feedwater Subsystem	3.2	10.3.5
- Emergency Core Cooling Systems (ECCS)	Same	3.3	6.3
- High-Pressure Injection & Recirculation	High Head Safety Injection Subsystem (part of CVCS System)	3.3	6.3
- Low-pressure Injection & Recirculation	Low Head Safety Injection Subsystem	3.3	6.3
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Residual Heat Removal (RHR) System	X	9.3
- Main Steam and Power Conversion Systems	Main and Auxiliary Steam Systems, Condensate and Feedwater Systems, Circulating Water System	X X X	10 10 10
- Other Heat Removal Systems	None identified	X	-
Reactor Coolant Inventory Control Systems			
- Chemical and Volume Control System (CVCS) (Charging System)	Same	3.3	9.1
- ECCS	See ECCS, above	-	-

Table 3-1. Summary of Beaver Valley 1 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Containment Systems			
- Containment	Same	X	5
- Containment Heat Removal Systems			
- Containment Spray System	Containment Depressurization System	3.4	6.4
- Containment Fan Cooler System	Containment Air Recirculation Cooling Systems	X	5.4.1
- Containment Normal Ventilation Systems	Containment Ventilation Systems,	X	5.4.1
	Containment Vacuum and Leakage Monitoring Systems,	X	5.4.2
	Containment Depressurization System	X	5.4.3, 6.4
- Combustible Gas Control Systems	Post-DBA Hydrogen Control System	X	6.5
- Other Containment Systems	Supplementary Leak Collection and Release System	X	6.6
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	3
- Control Rod System	Rod Control System	X	7.7.1.2
- Boration Systems	See CVCS, above	-	-

Table 3-1. Summary of Beaver Valley 1 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Instrumentation & Control (I&C) Systems			
- Reactor Protection System (RPS)	Reactor Trip System	3.5	7.2
- Engineered Safety Feature Actuation System (ESFAS)	Engineered Safety Features System	3.5	7.3
- Remote Shutdown System	Shutdown Panel	3.5	7.8.2
- Other I&C Systems	Various Systems	X	7.4, 7.5, 7.6, 7.7
Support Systems			
- Class 1E Electric Power System	Same	3.6	8.1, 8.2, 8.5
- Non-Class 1E Electric Power System	Same	3.6	8.1, 8.2, 8.3, 8.4
- Diesel Generator Auxiliary Systems	Same	3.6	8.5.2, 9.1.4
- Component Cooling Water (CCW) System	Same	X	9.4
- Service Water System (SWS)	River Water System	3.7	9.9
- Other Cooling Water Systems	Fuel Pool Cooling and Purification System,	X	9.5
	Auxiliary River Water System,	X	9.16
	Turbine Plant Cooling Water System	X	10.3.9
- Fire Protection Systems	Same	X	9.10

Table 3-1. Summary of Beaver Valley 1 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Support Systems (continued)			
- Room Heating, Ventilating, and Air-Conditioning (HVAC) Systems	Ventilation Systems	X	9.13
- Instrument and Service Air Systems	Compressed Air System	X	9.8
- Refueling and Spent Fuel Systems	Fuel Handling Systems	X	9.12
- Radioactive Waste Systems	Same	X	11.2
- Radiation Protection Systems	Same	X	11.3

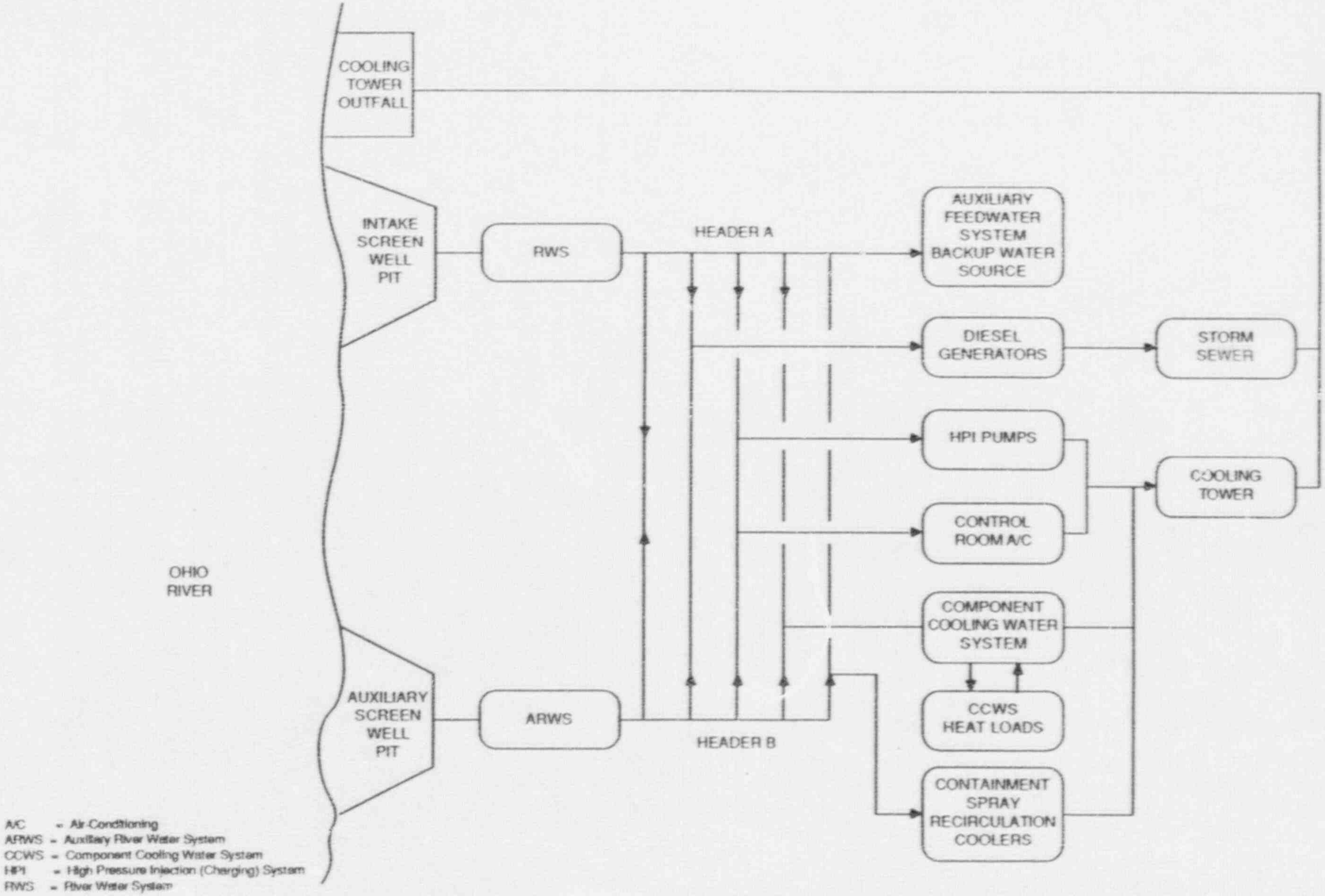

Figure 3-1. Cooling Water Systems Functional Diagram for Beaver Valley 1

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. A simplified diagram of the RCS is shown in Figure 3.1-1. 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 one main coolant pump in each of the three 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 (charging 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 are three power-operated relief valves and three 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 must operate in order to complete a heat transfer path to the ultimate heat sink (see Section 3.4).

3.1.4 System Success Criteria

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

- An unmitigatable LOCA is not initiated.
- If a mitigatable 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: 9716 ft^3, including pressurizer
2. Normal operating pressure: 2250 psia

B. Pressurizer
1. Volume: 1400 ft^3

C. Safety Valves (3)
1. Set pressure: 2485 psig
2. Relief capacity: 345,000 lb/hr each

D. Power-Operated Relief Valves (3)
1. Set pressure: 2335 psig
2. Relief capacity: 210,000 lb/hr each

E. Steam Generators
1. Type: U-Tube
2. Model: Westinghouse 51 Series
3. Primary-side volume: 1080 ft^3

3.1.6 Support Systems and Interfaces

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

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

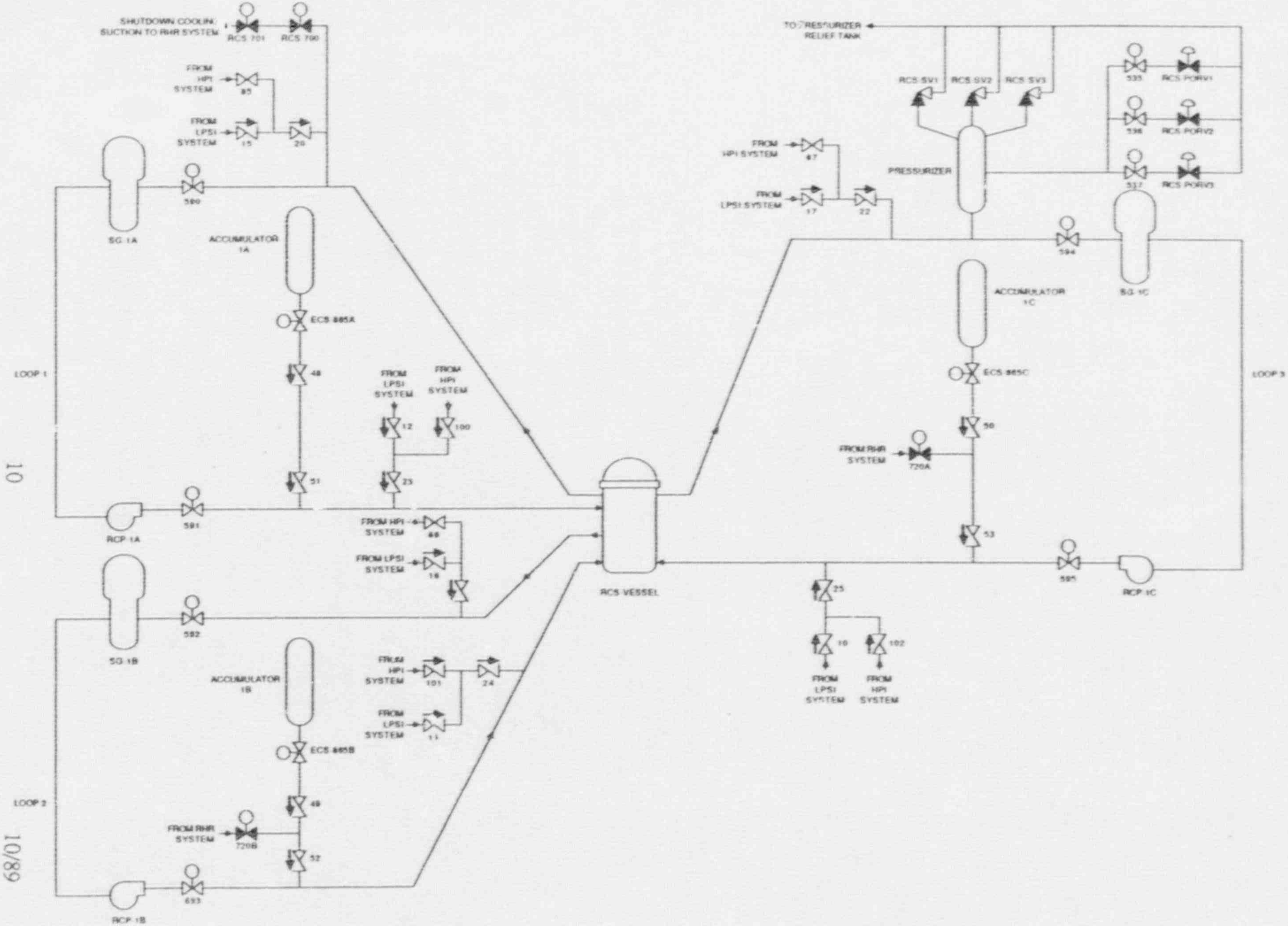

Figure 3.1-1. Beaver Valley 1 Reactor Coolant System

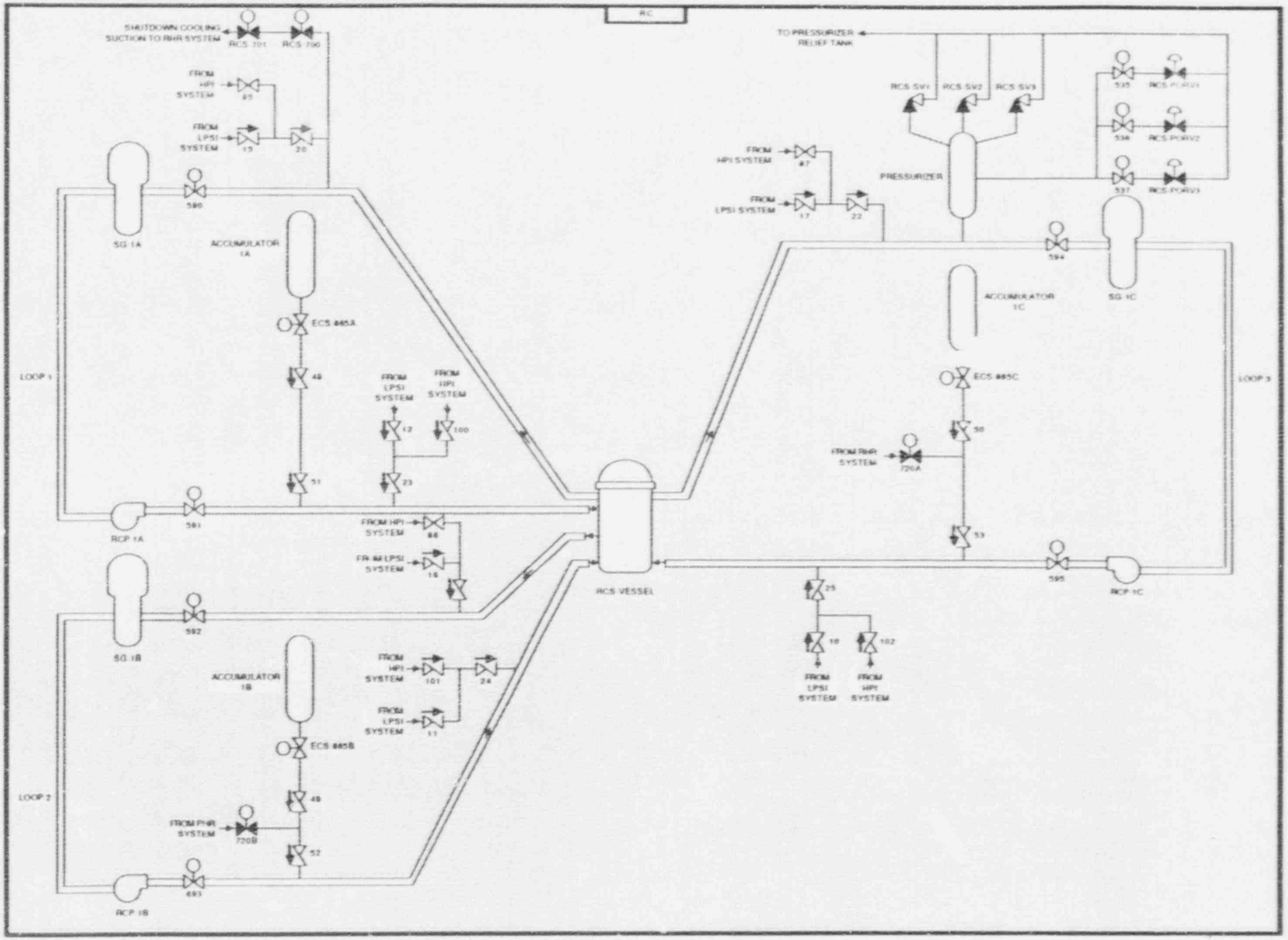

Figure 3.1-2. Beaver Valley 1 Reactor Coolant System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RCS-700	MOV	RC	MCC1-E5	480	MCC1-E5	AC/A
RCS-701	MOV	RC	MCC1-E6	480	MCC1-E6	AC/B
RCS-PORV1	NV	RC				
RCS-PORV2	NV	RC				
RCS-PORV3	NV	RC				
RCS-SV1	NV	RC				
RCS-SV2	NV	RC				
RCS-SV3	NV	RC				
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 SRR system provides a steam vent path from the steam generators to the atmosphere, thereby completing the heat transfer path to an ultimate heat sink when the main steam and power conversion systems are not available. Together, the AFW and SSR systems constitute an open-loop fluid system that provides for heat transfer from the RCS following transients and small-break LOCAs.

3.2.2 System Definition

The AFW system consists of two motor-driven pumps and one steam turbine-driven pump, that draw a suction on the primary plant demineralized water tank (DWST) and supply water to all three steam generators when needed. The AFW pump steam turbine drive is supplied from all three steam generators and exhausts to atmosphere. All AFW pumps can be aligned to take a suction on header "A" of the river water system, which serves as a backup source for the AFW system. The fire protection system is another alternate water source for the AFW system.

The SSR system includes five code safety valves and one power-operated relief valve on each of the three main steam headers. In addition, all three main steam headers can be vented to atmosphere through a single, power-operated residual heat release valve.

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 plant operation, the AFW system is in standby, and is automatically actuated when needed to maintain the secondary coolant inventory in the steam generators. This system also can be manually started from the main control room and the pumps, can be manually started from the local shutdown control panel.

The turbine-driven AFW pump PM2 and motor-driven pump PM3A normally are aligned to supply all steam generators via the "A" AFW header. Pump PM3B is aligned to discharge to the "B" AFW header. Each steam generator is supplied from both the "A" and "B" AFW headers. The control of auxiliary feedwater flow and steam generator water level is accomplished from the main control room by remotely operating control valves 151A through 151F, as appropriate. These valves also can be operated from the local shutdown panel.

The DWST is the primary water source for the AFW system, and is reserved strictly for AFW usage. The DWST inventory is sufficient to maintain the plant in a hot standby condition for eight hours following a reactor trip (Ref 1). Low water level in the DWST will generate an alarm in the control room. It is necessary to open manual valves in the auxiliary feedwater pump room in order to align the AFW pumps to the backup water source; river water system header "A".

When the main condenser is not available as a heat sink, reactor core decay heat is rejected to an ultimate heat sink by venting steam to atmosphere via: (a) code safety valves on each main steam line, (b) a power-operated pressure control valve on each main steam line, or (c) a single, power-operated residual heat release valve which serves all three main steam lines.

3.2.4 System Success Criteria

For the decay heat removal function to be successful, both the AFW system and the SSR system must operate successfully. The AFW success criteria from the FSAR are the following (Ref. 2):

- It is implied that any one AFW pump can provide adequate flow.
- Water must be provided from the DWST or river water system (backup) to the AFW pump suction.
- Makeup to any one steam generator provides adequate decay heat removal from the reactor coolant system.

In NUREG-0611 (Ref. 1) it is stated that for the Beaver Valley 1 plant: "...for normal and transient plant operation, including loss of main feedwater flow, only one pump is required to cool the plant down to the condition where the RHR system can be put into operation to continue safe plant shutdown. However, in the event of a single main steam line or main feed line break that cannot be isolated, either one turbine-driven AFW pump or both motor-driven pumps are required to prevent dryout of the steam generators."

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

3.2.5 Component Information

A. Steam turbine-driven AFW pump PM2
   1. Rated flow: 700 gpm @ 2696 ft head (1167 psid)
   2. Rated capacity: 100% (Ref. 2)

B. Motor driven AFW pumps PM3A and PM3B
   1. Rated flow: 350 gpm @ 2696 ft head (1167 psid)
   2. Rated capacity: 50% (Ref. 2)

C. Demineralized water storage tank
   1. Capacity: 140,000 gallons

D. Secondary steam relief valves
   1. Five code safety valves per main steam line
   2. One power-operated pressure control valve per main steam line (MS101A, MS101B, MS101C)
   3. One power-operated residual heat release valve (MS104) serving all main steam lines

3.2.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The AFW pumps are automatically actuated based on the following signals (Ref 1):

      a. Turbine driven pump PM2
         - 1/3 steam generator lo-lo level (1 out of 3 channel logic)
         - undervoltage

b. Motor-driven pumps PM3A, and PM3B
  - 2/3 steam generator lo-lo level
  - both main feedwater pumps trip
  - safety injection signal
  - turbine-driven AFW pump low discharge pressure following start
  - loss of off site power

Pump PM3A is actuated from safety-related actuation Train A, and Pump PM3B is actuated from Train B. Pump PM2 is started by opening at least one of two parallel steam supply valves, TV-105A and TV-105B which are actuated from Train A and Train B, respectively.

2. Remote manual
The AFW system can be actuated by remote manual means from the main control room

3. Alternate remote manual
AFW pumps and valves can be controlled from a local shutdown panel

B. Motive power
1. The AFW 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. Redundant loads are supplied from separate load groups.

2. Steam supply valves TV-105A and TV-105B are redundant Class 1E DC loads that can be supplied from the station batteries as described in Section 3.6.

3. The AFW turbine-driven pump is supplied from each main steam header, upstream of the main steam isolation valves.

C. Other
Lubrication is provided locally for pumps, pump motors, and the turbine drive. The lubrication system for each pump includes an oil cooler which is cooled by auxiliary feedwater diverted from the discharge of the respective pump.

3.2.7 Section 3.2 References

1. NUREG-0611, "Generic Evaluation of Feedwater Transients and Small Break Loss of Coolant Accidents in Westinghouse-Designed Operating Plants," USNRC, January 1980.

2. Beaver Valley 1 Final Safety Analysis Report, Section 10.3.5.2.

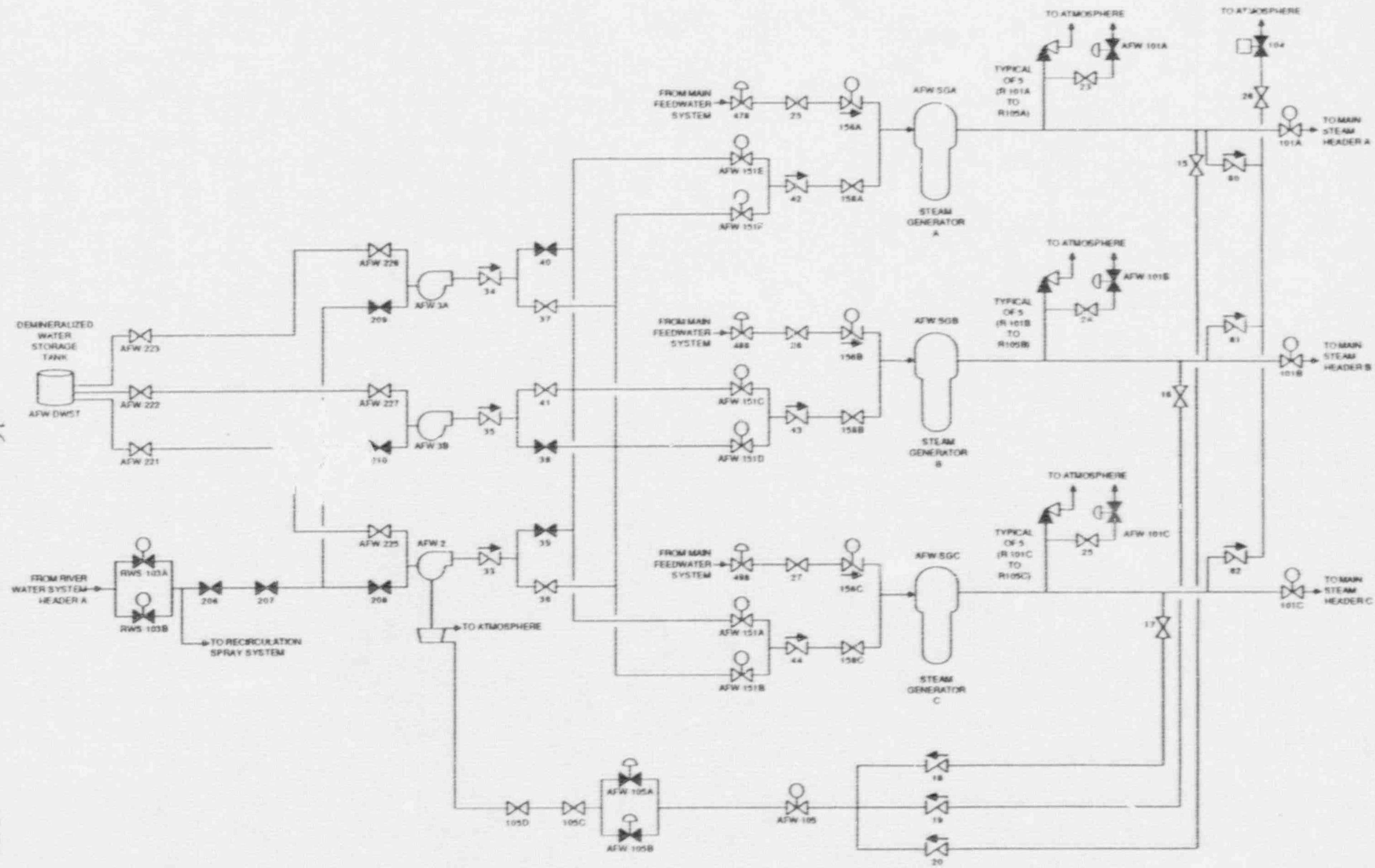

Figure 3.2-1. Beaver Valley 1 Auxiliary Feedwater And Secondary Steam Relief Systems

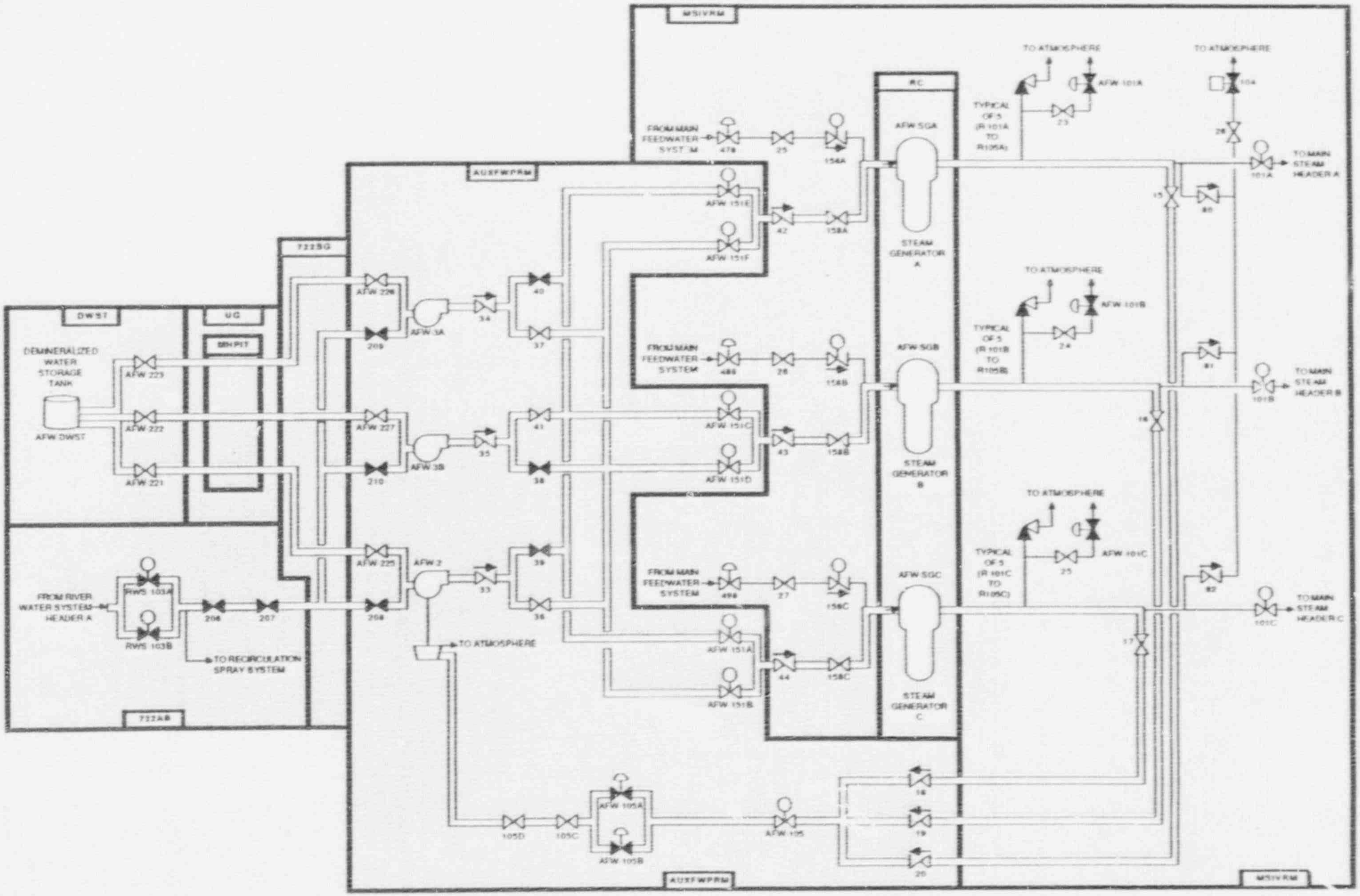

Figure 3.2-2. Beaver Valley 1 Auxiliary Feedwater And Secondary Steam Relief Systems Showing Component Locations

Table 3.2-1. Beaver Valley 1 Auxiliary Feedwater System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
AFW-105	MOV	AUXFWPRM	MCC1-E6	480	MCC1-E6	AC/B
AFW-105A	NV	AUXFWPRM				
AFW-105B	NV	AUXFWPRM				
AFW-151A	MOV	AUXFWPRM	MCC1-E6	480	MCC1-E6	AC/B
AFW-151B	MOV	AUXFWPRM	MCC1-E5	480	MCC1-E5	AC/A
AFW-151C	MOV	AUXFWPRM	MCC1-E6	480	MCC1-E6	AC/B
AFW-151D	MOV	AUXFWPRM	MCC1-E5	480	MCC1-E5	AC/A
AFW-151E	MOV	AUXFWPRM	MCC1-E6	480	MCC1-E6	AC/B
AFW-151F	MOV	AUXFWPRM	MCC1-E5	480	MCC1-E5	AC/A
AFW-2	TDP	AUXFWPRM				
AFW-221	XV	DWST				
AFW-222	XV	DWST				
AFW-223	XV	DWST				
AFW-225	XV	AUXFWPRM				
AFW-226	XV	AUXFWPRM				
AFW-227	XV	AUXFWPRM				
AFW-3A	MDP	AUXFWPRM	BUS-1AE	4160	SGRMAE	AC/A
AFW-3B	MDP	AUXFWPRM	BUS-1DF	4160	SGRMDF	AC/B
AFW-DWST	TANK	DWST				
AFW-SGA	SG	RC				
AFW-SGB	SG	RC				
AFW-SGC	SG	RC				

3.3 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.3.1 System Function

The ECCS is an integrated set of subsystems that perform emergency coolant injection and recirculation functions to maintain reactor core coolant inventory and adequate decay heat removal following a LOCA. The coolant injection function is performed during a relatively short-term period after LOCA initiation, followed by realignment to a recirculation mode of operation to maintain long-term, post-LOCA core cooling. Heat from the reactor core is transferred to the containment. The heat transfer path to the ultimate heat sink is completed by the containment spray systems (see Section 3.4).

3.3.2 System Definition

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

- Safety injection accumulators
- High pressure safety injection (HPSI) system
- Low pressure safety injection (LPSI) system

At Beaver Valley 1, the charging system performs the high pressure safety injection function. The Refueling Water Storage Tank (RWST) is the water source for the high and low pressure safety injection systems. These systems inject into the RCS cold legs.

The emergency coolant recirculation (ECR) function is performed after the ECI function has been successfully completed by realigning the low pressure safety injection system to draw a suction on the reactor containment sump. Recirculation water is returned to the RCS cold legs or hot legs.

Simplified drawings of the low pressure injection/recirculation system are shown in Figures 3.3-1 and 3.3-2. The high pressure injection (charging) 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 three safety injection accumulators will supply borated water to the RCS as soon as RCS pressure drops below accumulator pressure (i.e., about 650 psig). A safety injection signal (SIS) automatically starts the two low pressure safety injection pumps. In addition the charging system is automatically realigned to draw a suction from the RWST and two of three charging pumps are started. These pumps discharge through the Boron Injection Tank (BIT) and thereby inject highly-borated water into the RCS. The charging pumps provide adequate coolant makeup following a small break which does not immediately depressurize the RCS to the accumulator discharge pressure.

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 RWST water level drops to a prescribed low level setpoint, the low pressure safety injection pumps are realigned to draw a suction from the containment sump and deliver water to the RCS hot legs or cold legs. If depressurization of the RCS proceeds slowly, high pressure recirculation can be accomplished by aligning the discharge of the LPSI pumps to the suction of the charging pumps.

3.3.4 System Success Criteria

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

- 2 of 3 safety injection accumulators provide makeup as RCS pressure drops below tank pressure, and
- 1 of 3 high head safety injection charging pumps takes a suction on the RWST and delivers water to the RCS, and
- 1 of 2 low head safety injection pumps takes a suction on the RWST and delivers water to the RCS

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

- At least one low head safety injection pump is realigned for recirculation and takes a suction on the containment sump and injects into the RCS.

ECI success criteria for a small LOCA are the following (Ref. 1):

- 1 of 3 high head safety injection pumps takes a suction on the RWST and delivers water to the RCS.
- RCS pressure reduction by the AFW and SSR systems is successful. This may be augmented by use of a steam dump in some cases.

If the ECI success criteria are met, the following small LOCA ECR success criteria apply (Ref. 1):

- At least one low head safety injection pump takes a suction on the containment sump and discharges to the suction of at least one high head head injection pump which discharges to the RCS.

Heat removal is accomplished solely by containment spray; there are no heat exchangers associated with the ECCS system.

3.3.5 Component Information

A. Low pressure safety injection pumps PM1A and PM1B
   1. Rated flow: 3000 gpm @ 257 ft head (111 psid)
   2. Rated capacity: 100%
   3. Type: vertical centrifugal

B. High pressure safety injection (charging) pumps PM1A, PM1B, and PM1C
   1. Rated flow: 150 gpm @ 5800 ft head (2514 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

C. Safety injection accumulators (3)
   1. Accumulator volume: 1450 ft^3
   2. Minimum water volume: 925 ft^3
   3. Nominal operating pressure: 650 psig
   4. Minimum boron concentration: 1900 ppm

D. Ref. eling water storage tank
   1. Capacity: 425,000 gallons
   2. Design Pressure: Atmospheric
   3. inal Boron Concentration: 1900 ppm (estimated)

E. Boron jection tank
   1. Capacity: 900 gallons
   2. Design Pressure: 2735 psig
   3. Nominal Boron Concentration: 21,000 ppm

3.3.6 Support Systems and Interfaces

A. Control signals
   1. Automatic
      The ECCS injection subsystems are automatically actuated by an SIS signal. Conditions initiating an SIS trip are:

      a. Containment high pressure
      b. High differential pressure between any two main steam lines
      c. Pressurizer low pressure coincident with pressurizer low water level
      d. High steam flow in 2 of 3 main steam lines coincident with RCS coolant average temperature (T_{ave}) low or main steam line pressure

   2. Remote manual
      An SIS signal can be initiated by remote manual means from the main control room. The transition from the injection to the recirculation phase of ECCS operation requires remote manual actions.

B. Motive Power
   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 charging pump is cooled from redundant supplies from river water system headers "A" and "B" (see Section 3.7).
   2. The LPSI pumps do not require external cooling water support.
   3. Lubrication is provided locally for the charging and LPSI pumps and motors.

3.3.7 Section 3.3 References

1. Beaver Valley 1 Final Safety Analysis Report, Section 6.3.3.

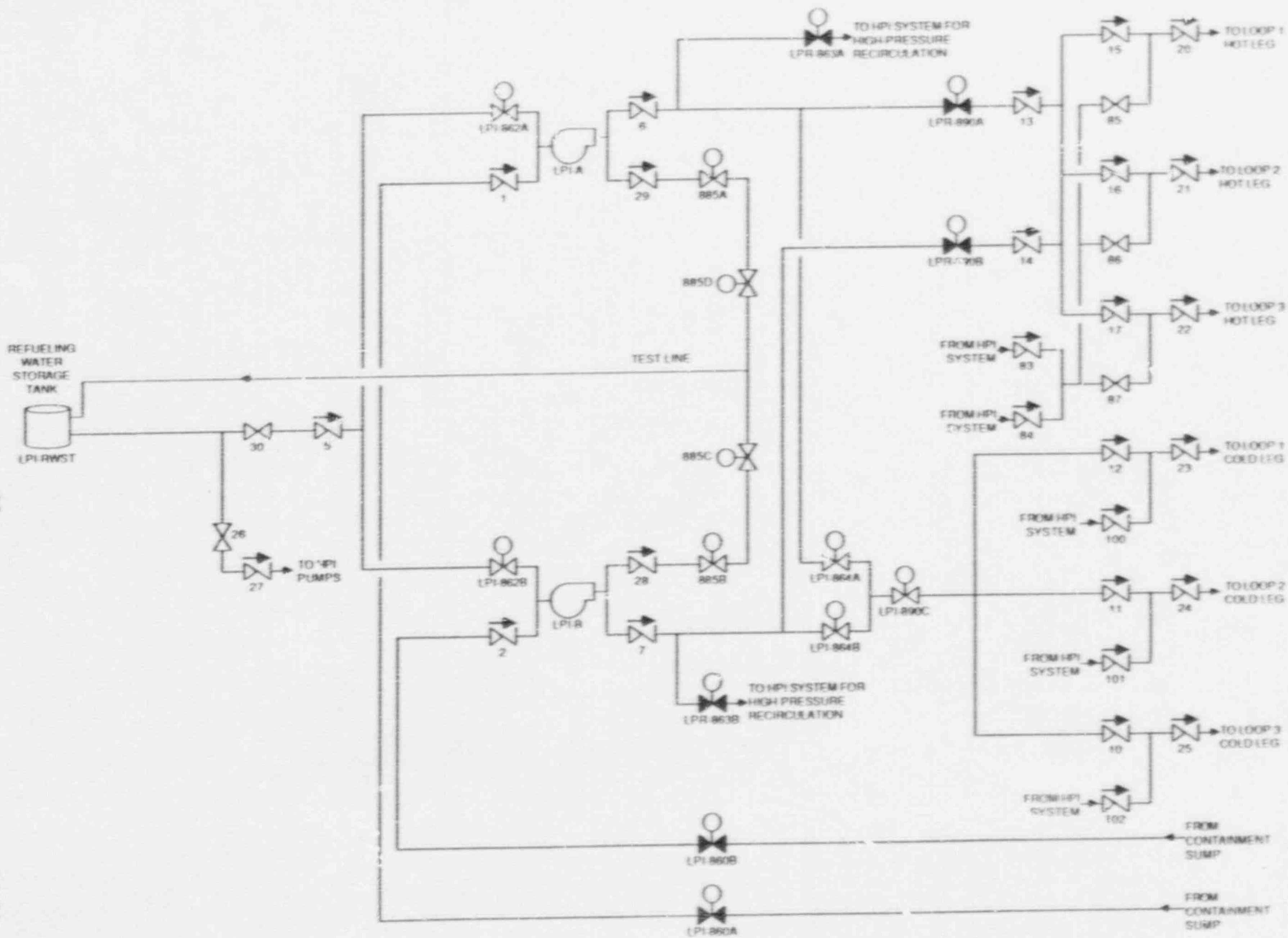

Figure 3.3-1. Beaver Valley 1 Low Pressure Safety Injection/Recirculation

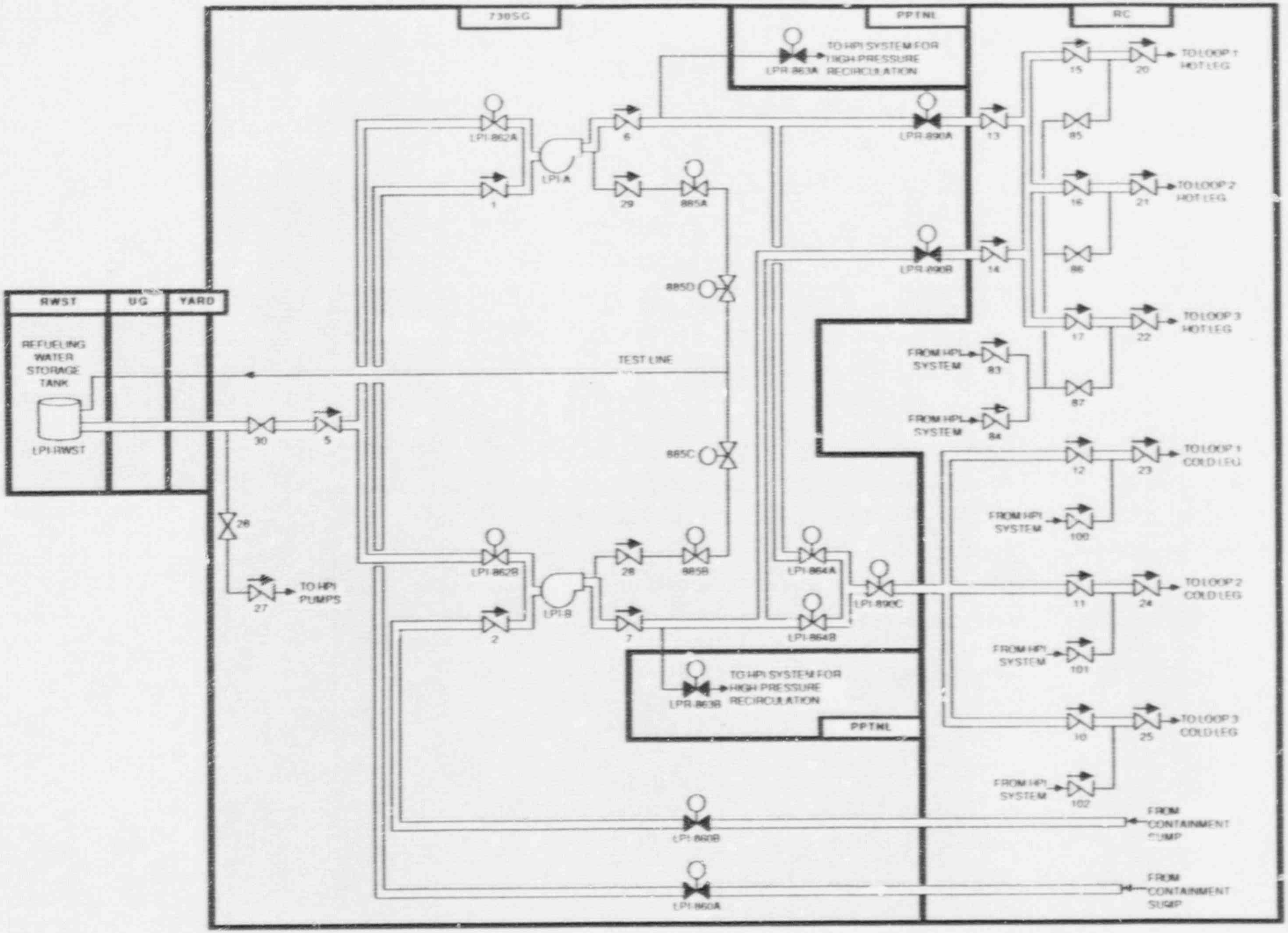

Figure 3.3-2. Beaver Valley 1 Low Pressure Safety Injection/Recirculation System Showing Component Locations

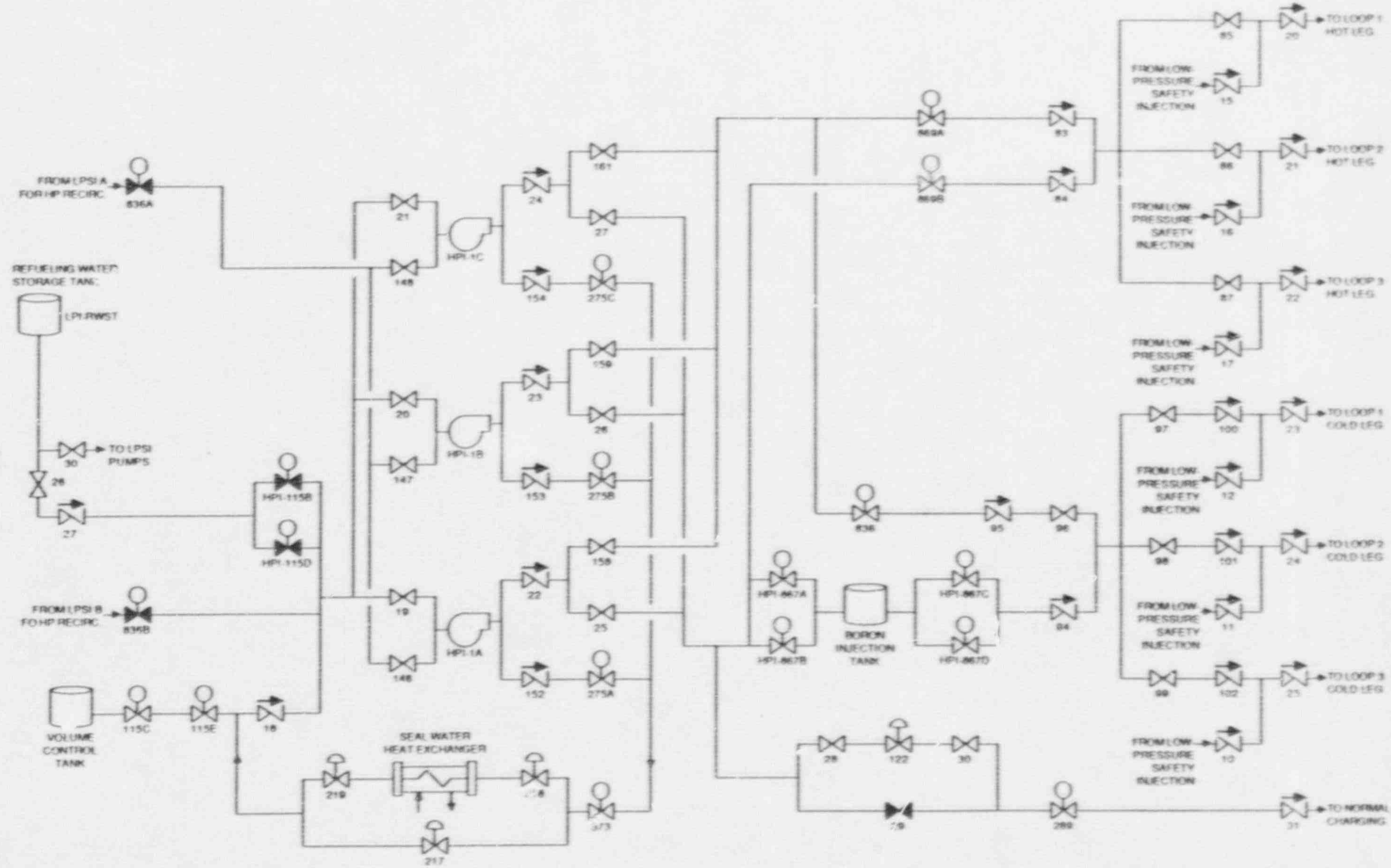

Figure 3.3-3. Beaver Valley 1 High Pressure Injection (Charging) System

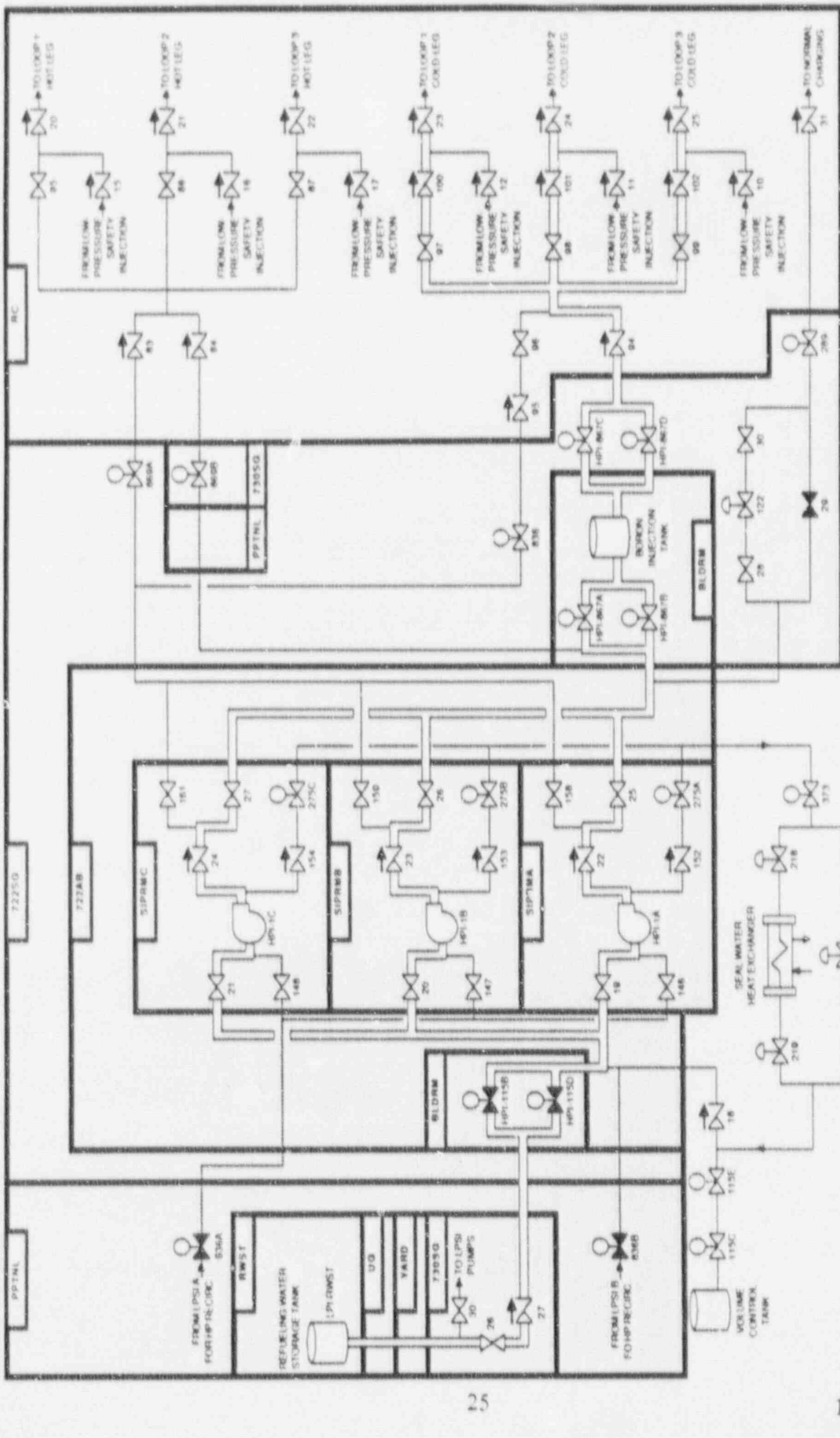

Figure 3.3-4. Beaver Valley 1 High Pressure Injection (Charging) System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
HPI-115B	MOV	BLDRM	MCC1-E3	480	735AB	AC/A
HPI-115D	MOV	BLDRM	MCC1-E4	480	735AB	AC/B
HPI-1A	MDP	SIPRMA	BUS-1AE	4160	SGRMAE	AC/A
HPI-1B	MDP	SIPRMB	BUS-1DF	4160	SGRMDF	AC/B
HPI-1C	MDP	SIPRMC	BUS-1AE	4160	SGRMAE	AC/A
HPI-867A	MOV	BLDRM	MCC1-E5	480	MCC1-E5	AC/A
HPI-867B	MOV	BLDRM	MCC1-E6	480	MCC1-E6	AC/B
HPI-867C	MOV	722SG	MCC1-E5	480	MCC1-E5	AC/A
HPI-867D	MOV	722SG	MCC1-E6	480	MCC1-E6	AC/B
LPI-860A	MOV	730SG	MCC1-E5	480	MCC1-E5	AC/A
LPI-860B	MOV	730SG	MCC1-E6	480	MCC1-E6	AC/B
LPI-862A	MOV	730SG	MCC1-E5	480	MCC1-E5	AC/A
LPI-862B	MOV	730SG	MCC1-E6	480	MCC1-E6	AC/B
LPI-864A	MOV	730SG	MCC1-E5	480	MCC1-E5	AC/A
LPI-864B	MOV	730SG	MCC1-E6	480	MCC1-E6	AC/B
LPI-890C	MOV	730SG	MCC1-E6	480	MCC1-E6	AC/B
LPI-A	MDP	730SG	BUS-1AE	4160	SGRMAE	AC/A
LPI-B	MDP	730SG	BUS-1DF	4160	SGRMDF	AC/B
LPI-RWST	TANK	RWST				
LPR-863A	MOV	PPTNL	MCC1-E5	480	MCC1-E5	AC/A
LPR-863B	MOV	PPTNL	MCC1-E6	480	MCC1-E6	AC/B
LPR-890A	MOV	730SG	MCC1-E5	480	MCC1-E5	AC/A
LPR-890B	MOV	730SG	MCC1-E6	480	MCC1-E6	AC/B
RCS-865A	MOV	RC	MCC1-E6	480	MCC1-E6	AC/B
RCS-865B	MOV	RC	MCC1-E6	480	MCC1-E6	AC/B
RCS-865C	MOV	RC	MCC1-E6	480	MCC1-E5	AC/B

3.4 CONTAINMENT SPRAY (CS) SYSTEM

3.4.1 System Function

The containment spray system is an integrated set of subsystems that perform the functions of containment heat removal and containment pressure control following a loss of coolant accident. In conjunction with the ECCS, the CS system completes the post-LOCA heat transfer path from the reactor core to the ultimate heat sink.

3.4.2 System Definition

There are three containment spray systems at Beaver Valley 1. The quench spray (QS) system operates in a once-through injection mode by taking a suction on the RWST and discharging directly to spray headers inside containment. The "inside" recirculation spray (RSA) and "outside" recirculation spray (RSB) systems operate in a recirculation mode. The pumps in these systems take a suction on the reactor containment sump, and discharge through heat exchangers to spray headers inside containment. The RSA and RSB heat exchangers are served by the river water system.

Simplified drawings of the recirculation spray systems are shown in Figure 3.4-1 and 3.4-2. A summary of data on selected containment spray system components is presented in Table 3.4-1.

3.4.3 System Operation

The quench spray system has redundant pumps that supply chilled, borated water from the RWST to the containment about 60 seconds after receipt of a containment isolation phase B signal. Quench spray operation is terminated when RWST level drops to a prescribed low level setpoint.

About five minutes after receipt of the containment isolation phase B signal, there is adequate water in the containment sump for the recirculation spray pumps to operate. The recirculation spray systems recirculate water from the containment sump through river water-cooled heat exchangers to spray headers inside containment. Two spray pumps are located outside of containment (the "outside" or RSB recirculation spray pumps) and two additional spray pumps are located inside containment (the "inside" or RSA recirculation spray pumps). The recirculation spray coolers are located inside the containment and transfer containment heat to the environment via the river water system.

The quench spray system, together with the recirculation spray systems are capable of reducing the containment pressure to subatmospheric in less than 60 minutes, thus terminating all outleakage from the containment to the environment under any combination of credible events.

3.4.4 System Success Criteria

The containment heat removal function success criteria for a LOCA are the following (Ref. 1):

- 1 of 2 quench spray pumps become effective 60 seconds after receipt of a containment isolation phase B signal.
- 2 of 4 recirculation spray pumps and associated coolers become effective five minutes after receipt of a containment isolation phase B signal.

3.4.5 Component Information

A. Quench Spray Pumps (2)
   1. Rated flow: 2000 gpm @ 285 ft head (124 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

B. Recirculation Spray Pumps (4)
   1. Rated flow: 3,300 gpm @ 260 ft head (113 psid)
   2. Rated capacity: 50%
   3. Type: vertical deep-well turbine

C. Recirculation Spray Coolers (4)
   1. Type: shell and tube
   2. Design duty: 61 x 10^6 Btu/hr

3.4.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The quench spray system is automatically actuated by a containment high-high pressure signal (containment isolation, phase B).
   2. Remote manual
      All containment spray systems can be actuated by remote manual means from the central control room.

B. Motive Power
   The CS 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. Redundant loads are supplied from separate load groups.

C. Cooling Water
   The river water system provides cooling water to the recirculation spray system heat exchangers (see Section 3.7).

D. Other
   Lubrication and pump cooling is provided locally for all CS pumps.

3.4.7 Section 3.4 References

1. Beaver Valley 1 Final Safety Analysis Report, Section 14.3.4.3

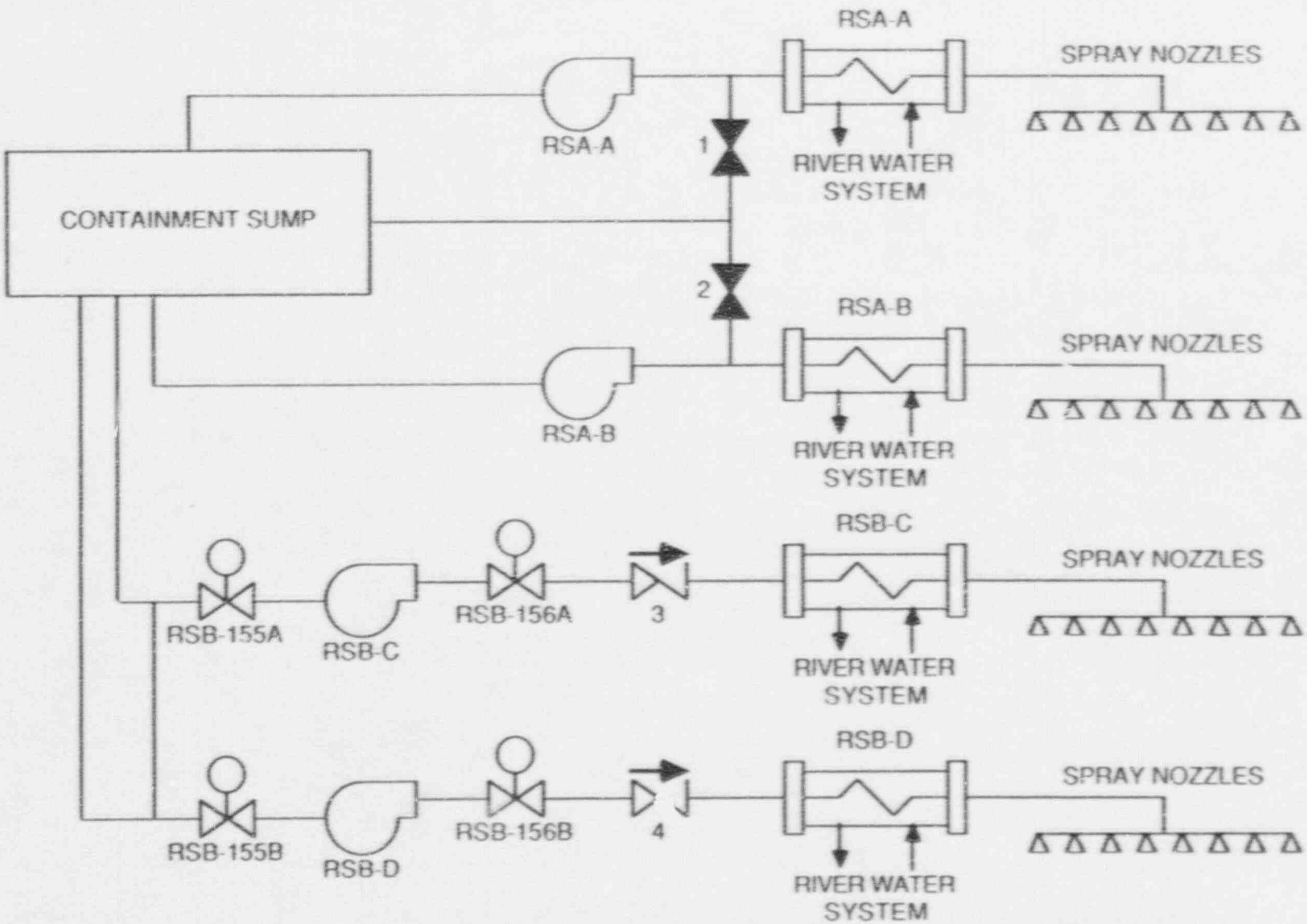

Figure 3.4-1 Beaver Valley 1 Containment Recirculation Spray System

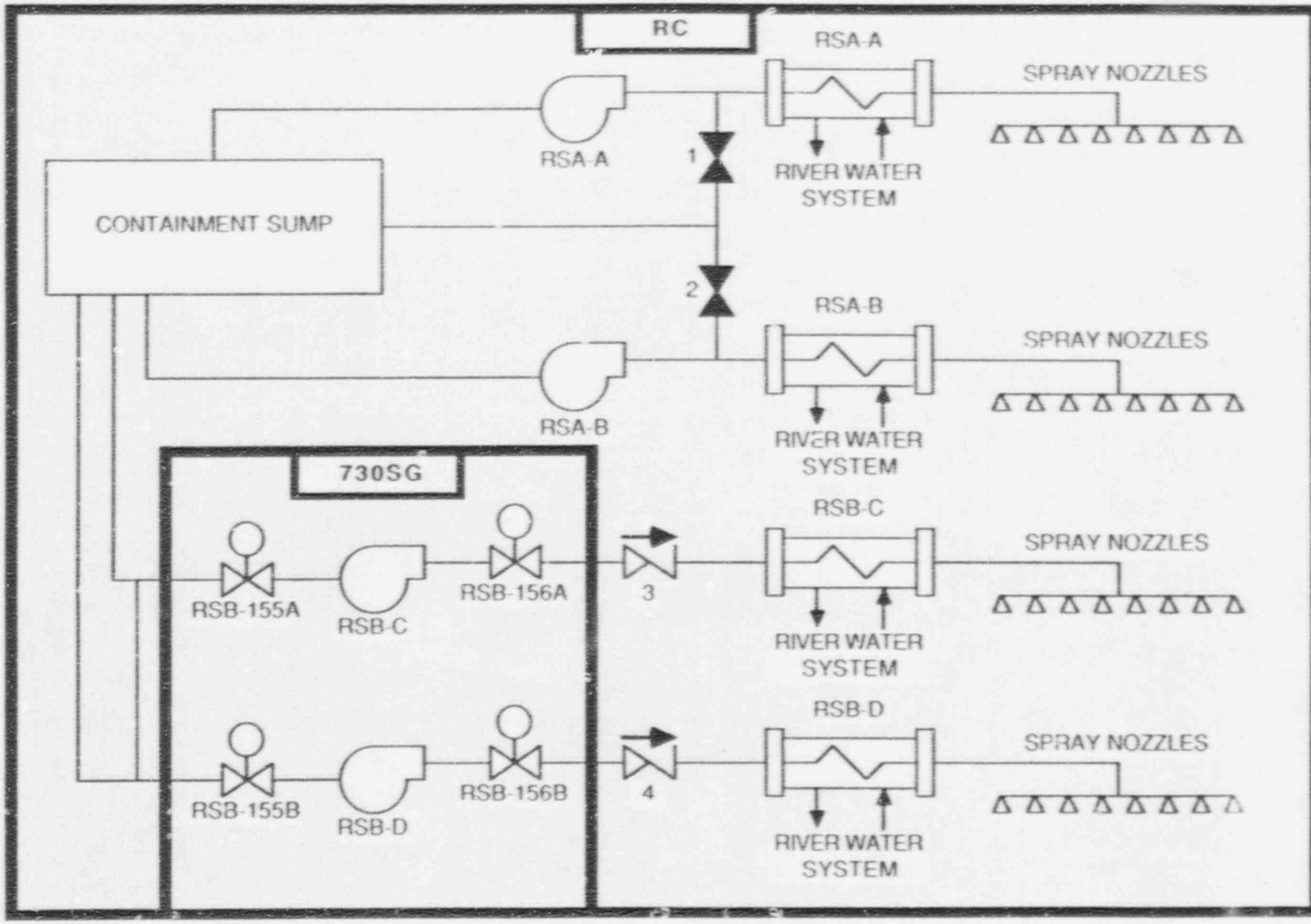

Figure 3.4-2 Beaver Valley 1 Containment Recirculation Spray System Showing Component Locations

Table 3.4-1. Beaver Valley 1 Containment Spray System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RSA-A	MDP	RC	BUS-1N	480	SGRMAE	AC/A
RSA-B	MDP	RC	BUS-1P	480	SGRMDF	AC/B
RSA-HX1A	HX	RC				
RSA-HX1B	HX	RC				
RSB-155A	MOV	730SG	MCC1-E5	480	MCC1-E5	AC/A
RSB-155B	MOV	730SG	MCC1-E6	480	MCC1-E6	AC/B
RSB-156A	MOV	730SG	MCC1-E5	480	MCC1-E5	AC/A
RSB-156B	MOV	730SG	MCC1-E6	480	MCC1-E6	AC/B
RSB-C	MDP	730SG	BUS-1AE	4160	SGRMAE	AC/A
RSB-D	MDP	730SG	BUS-1DF	4160	SGRMDF	AC/B
RSB-HX1C	HX	RC				
RSB-HX1D	HX	RC				

3.5 INSTRUMENTATION AND CONTROL (I & C) SYSTEMS

3.5.1 System Function

The Instrumentation and Control Systems include the Reactor Trip System (RTS), the Engineered Safety Feature Actuation Systems (ESFAS), and systems for the display of plant information to the operators. The RTS and ESFAS 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 ESFAS will automatically actuate selected safety systems based on the specific limits or combinations of limits that are exceeded. A remote shutdown capability is provided to ensure that the reactor can be placed in a safe shutdown condition in the event that the main control room must be evacuated.

3.5.2 System Definition

The RTS includes sensor and transmitter units, logic units, and output trip relays that operate reactor trip circuit breakers to cause a reactor scram. The ESFAS includes independent 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 ESFAS. The remote shutdown capability is provided by a remote shutdown panel and by local co trols (i.e. start-stop push button) that duplicate controls provided in the main control room.

3.5.3 System Operation

A. RTS

The Westinghouse RTS (or Reactor Protection System, RPS) has four input instrument channels (1, 2, 3, and 4), and two output actuation trains (A and B). The output actuation trains combine the input signals and if required coincidence is met, their output causes a scram. RPS inputs are listed below:

- Manual
- High neutron flux (power range)
- Overtemperature delta T
- Overpower delta T
- Low pressurizer pressure
- High pressurizer pressure
- High pressurizer water level
- Low reactor coolant flow
- Monitored electrical supply to reactor coolant pumps (RCPs)
    - undervoltage
    - underfrequency
    - RCP circuit breaker open
- Safety injection signal (SIS)
- Turbine generator trip
- Low feedwater flow
- Low-low steam generator water level
- High neutron flux (intermediate range)
- High neutron flux (source range)
- High positive neutron flux rate (power range)
- High negative neutron flux rate (power range)

The A and B logic trains independently generate a reactor trip command when prescribed parameters are outside the safe operating range. Either RPS train is capable of opening a separate and independent reactor trip circuit breaker to cause a scram. The manual scram A and B circuits bypass the RPS A and B logic trains and send a reactor trip command directly to shunt trip circuitry in the reactor trip circuit breakers.

B. ESFAS
The ESFAS has three to four input instrument channels and two output actuation trains (Ref. 3). In general, the ESFAS "A" train controls equipment powered from Class 1E AC electrical Division A and the ESFAS "B" train controls redundant equipment powered from Division B. An individual component usually receives an actuation signal from only one ESFAS train. The ESFAS generates the following signals: (1) safety injection signal (SIS), (2) auxiliary feedwater actuation, (3) containment isolation, (4) main feedwater line isolation, (5) main steam line isolation, and (6) containment spray actuation. The control room operators can manually trip the various ESFAS logic subsystems. Details regarding ESFAS actuation logic are included in the system description for the actuated system.

C. Remote Shutdown
A shutdown panel (SDP) located two floors below the main control room provides the capability for hot shutdown of the unit should the main control room become uninhabitable. Delayed cold shutdown can be effected without access to the main control room; however, this would require manual operation of valves, use of local controls, etc. Provisions have been made to ensure that events leading to the evacuation of the control room will not render the shutdown panel area uninhabitable. Equipment with duplicate controls available on the shutdown panel is listed in Table 3.5-1 (adapted from Ref. 1). Controls for manual startup of the diesel generators are also provided locally.

For equipment having motor controls outside the control room (which duplicate the functions inside the control room), the controls will be provided with a selector switch which transfers control of the switchgear from the control room to a selected local station. Placing the local selector switch in the local operating position will given an annunciating alarm in the control room and will turn off the motor control position lights on the control room panel.

3.5.4 System Success Criteria

A. RTS
The RTS (Ref. 2) 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. 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 Beaver Valley 1 have not been determined.

B. ESFAS
A single component usually receives a signal from only one ESFAS output train. ESFAS Trains A and B must be available in order to automatically actuate their respective components. ESFAS uses hindrance input logic (normal = 1,

trip = 0) and transmission output logic (normal = 0, trip = 1). In this case, an input channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). Control power is needed for the ESFAS output channels to send an actuation signal. Note that there may be some ESFAS actuation subsystems that utilize hindrance output logic. For these subsystems, loss of control power will cause system or component actuation, as is the case with the RTS. Details of the ESFAS system for Beaver Valley 1 have not been determined.

C. Manually-Initiated Protective Actions
When reasonable time is available, certain protective actions may be performed manually by plant personnel. The control room operators are capable of operating individual components using normal control circuitry, or operating groups of components by manually tripping the RTS or an ESFAS 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 is powered from 120 VAC vital buses 1 to 4 as defined in Section 3.6.
2. ESFAS
The ESFAS input instrument channels most likely are powered from 120 VAC vital buses 1 to 4. The ESFAS Train A and B output logic is powered from 125 VDC batteries 1-1 and 1-2, respectively.

3.5.6 Section 3.5 References

1. Beaver Valley 1 Final Safety Analysis Report, Section 7.4.1.2

2. Beaver Valley 1 Final Safety Analysis Report, Section 7.2.1.6.

3. Beaver Valley 1 Final Safety Analysis Report, Section 7.3.1.

Table 3.5-1. Beaver Valley 1 Equipment with Duplicate Controls Available on the Shutdown Panel

Reactor Coolant System
- Pressurizer Heater Control

Auxiliary Feedwater System and Secondary Steam Relief System
- Auxiliary Feedwater Pumps
- Auxiliary Feedwater Control Valves
- Condenser Steam Dump and Atmospheric Steam Relief Valves

Chemical and Volume Control System
- Charging and Boric Acid Transfer Pumps
- Charging Flow Control Valve
- Letdown Orifice Isolation Valves

Cooling Water Systems
- Component Cooling Water Pumps
- River Water Pumps

Reactor Containment Fan Cooler Units

Control Room Ventilation Unit

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 4160/480 VAC load groups, or divisions, and four 125 VDC/120 VAC load groups. Each 4160/480 VAC load group consists of a diesel generator and distribution equipment needed to supply key AC electrical loads. Each 125 VAC/120 VAC load group includes a battery, battery chargers, inverter and distribution equipment needed to supply DC and instrument loads. A simplified one-line diagram of the Class 1E electric power system is shown in Figure 3.6-1. A summary of data on selected electric power system components is presented in Table 3.5-1. A partial listing of electrical sources and loads is presented in Table 3.5-2.

3.6.3 System Operation

During normal operation, the Class 1E electric power system is supplied by station service power from the main generator, the 138 kV switchyard or a combination of both. The automatic transfer from this preferred power source to 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, and energizing essential post-accident loads within 25 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 120 VAC vital buses normally receive power from motor control centers 1-9 and 1-10 through a rectifier and a vital bus inverter. The corresponding battery and battery charger are not required under this condition. The batteries will supply the vital bus inverters on loss of AC power.

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
- 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. 30-minute rating: 3050 kW
   3. Rated voltage: 4160 VAC
   4. Manufacturer: General Motors

B. Batteries (5)
   1. Type: Lead-acid
   2. Cells: 60

3.6.5 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The standby diesel generators are automatically started based on:
      - Time delay undervoltage on the normal bus
      - Safety injection signal (SIS, see Section 3.3)
      - Opening either series connected normal supply circuit breakers

   2. Remote manual
      The diesel generators can be started, and many distribution circuit breakers can be operated from the main control room.

B. Diesel Generator Auxiliary Systems
   1. Diesel Cooling Water System
      A shell-and-tube heat exchanger transfers heat from a jacket water system to the river water system. Each diesel receives redundant cooling water supplies from the RW "A" and "B" headers.
   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 "day tank" supplies the relatively short-term fuel needs of the diesel. The day tank must be replenished from storage tanks to maintain an uninterrupted supply of fuel to the diesel.
   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 maintains the environmental conditions in the diesel room within limits for which the diesel generator and switchgear have been qualified. This system may be needed for long-term operation of the diesel generator.

C. Switchgear and Battery Room Ventilation Systems
   These systems maintain acceptable environmental conditions in the switchgear and battery rooms, and may be needed for long-term operation of the switchgear. Details on these systems have not been determined.

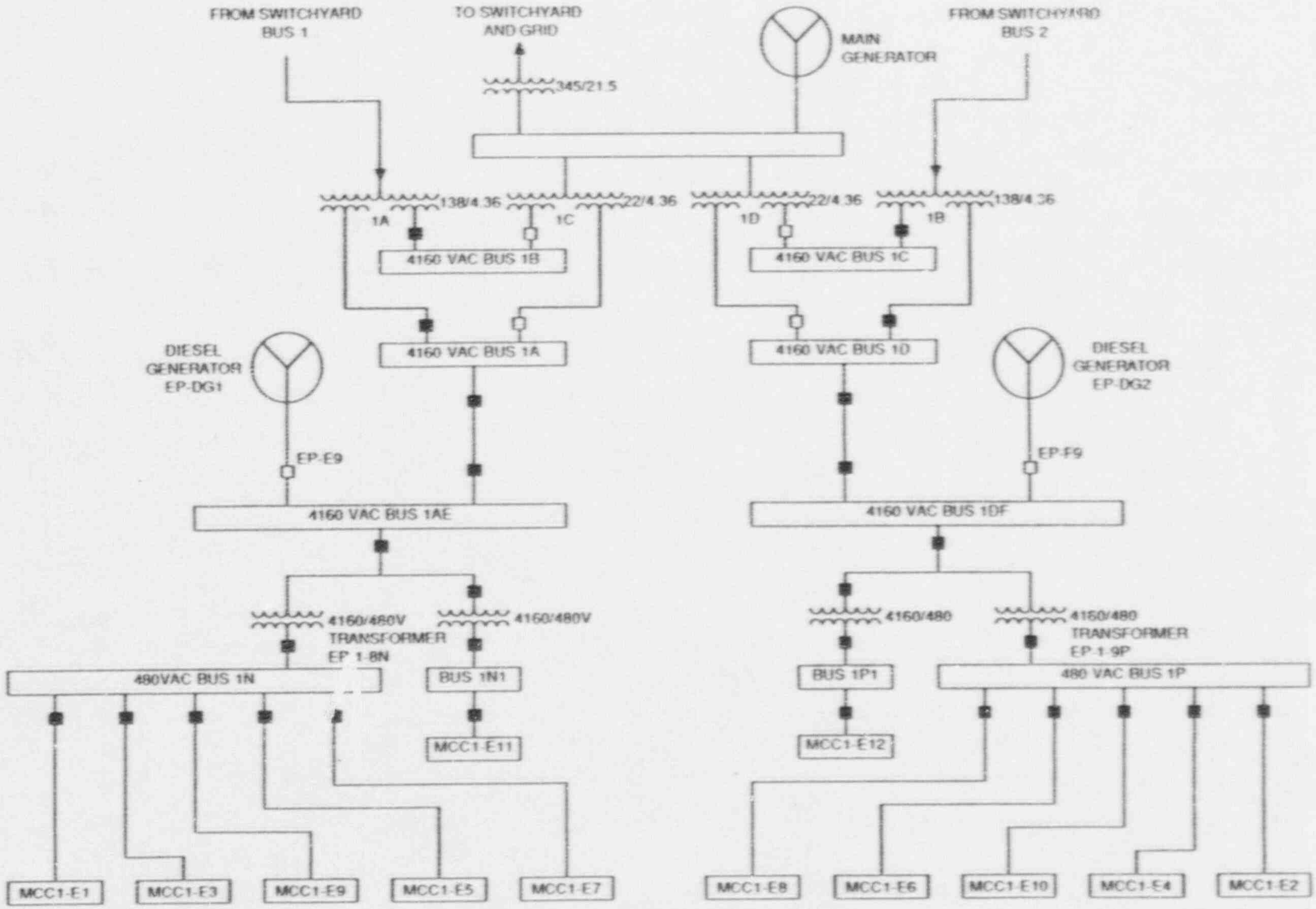

Figure 3.6-1. Beaver Valley 1 4160 and 480 VAC Electric Power Distribution System

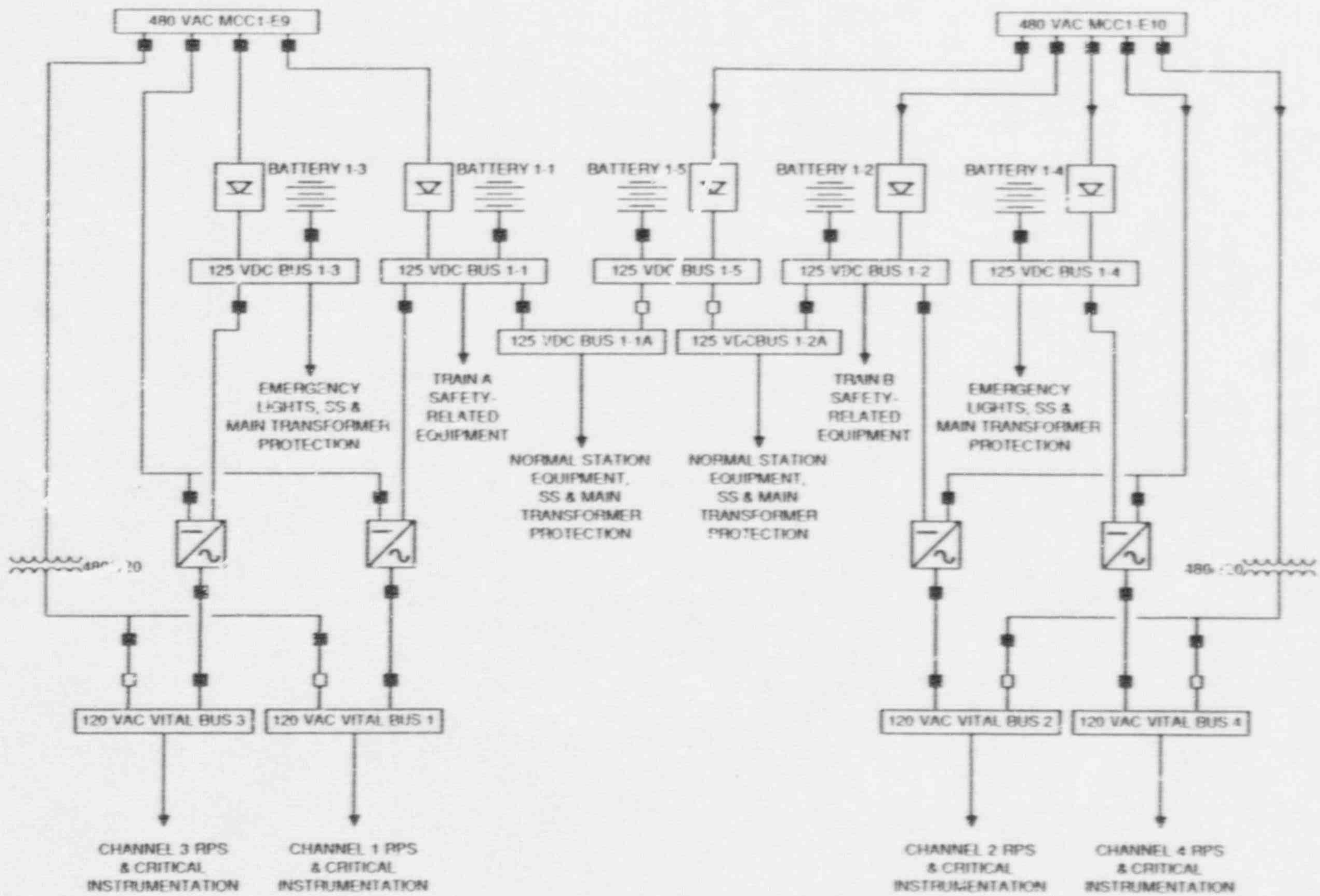

Figure 3.6-2. Beaver Valley 1 125 VDC and 120 VAC Electric Power Distribution System

Table 3.6-1. Beaver Valley 1 Electric Power System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BAT1-1	BATT	BATRM1				DC/1
BAT1-2	BATT	BATRM2				DC/2
BAT1-3	BATT	BATRM3				DC/3
BAT1-4	BATT	BATRM4				DC/4
BUS-1AE	BUS	SGRMAE	DG-1	4160	DGRM1	AC/A
BUS-1DF	BUS	SGRMDF	DG-2	4160	DGRM2	AC/B
BUS-1N	BUS	SGRMAE	XFMR-1-8N	480	SGRMAE	AC/A
BUS-1P	BUS	SGRMDF	XFRM-1-9P	480	SGRMDF	AC/B
BUS1-1	BUS	SGRMAE	BAT1-1	125	BATRM1	DC/1
BUS1-2	BUS	SGRMDF	BAT1-2	125	BATRM2	DC/2
BUS1-3	BUS	SGRMAE	BAT1-3	125	BATRM3	DC/3
BUS1-4	BUS	SGRMDF	BAT1-4	125	BATRM4	DC/4
DG-1	DG	DGRM1				AC/A
DG-2	DG	DGRM2				AC/B
E-LIGHTS-A	LITE	MANY	BUS1-3	125	SGRMAE	DC/3
E-LIGHTS-B	LITE	MANY	BUS1-4	125	SGRMDF	DC/4
INV-VB-1	INV	SGRMAE	BUS1-1	125	SGRMAE	DC/1
INV-VB-2	INV	SGRMDF	BUS1-2	125	SGRMDF	DC/2
INV-VB-3	INV	SGRMAE	BUS1-3	125	SGRMAE	DC/3
INV-VB-4	INV	SGRMDF	BUS1-4	125	SGRMDF	DC/4
MCC1-E1	MCC	INTK	BUS1-N	480	SGRMAE	AC/A
MCC1-E2	MCC	INTK	BUS1-P	480	SGRMDF	AC/B
MCC1-E3	MCC	735AB	BUS1-N	480	SGRMAE	AC/A
MCC1-E4	MCC	735AB	BUS1-P	480	SGRMDF	AC/B
MCC1-E5	MCC	MCC1-E5	BUS1-N	480	SGRMAE	AC/A
MCC1-E6	MCC	MCC1-E6	BUS1-P	480	SGRMDF	AC/B
MCC1-E7	MCC	DGRM1	BUS1-N	480	SGRMAE	AC/A

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
MCC1-E8	MCC	DGRM2	BUS1-P	480	SGRMDF	AC/B
VITAL-BUS-1	BUS	SGRMAE	INV-VB-1	120	SGRMAE	DC/1
VITAL-BUS-2	BUS	SGRMDF	INV-VB-2	120	SGRMDF	DC/2
VITAL-BUS-3	BUS	SGRMAE	INV-VB-3	120	SGRMAE	DC/3
VITAL-BUS-4	BUS	SGRMDF	INV-VB-4	120	SGRMDF	DC/4
XFMR-1-8N	TRAN	SGRMAE	BUS-1AE	4160	SGRMAE	AC/A
XFMR-1-9P	TRAN	SGRMDF	BUS-1DF	4160	SGRMDF	AC/B

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Beaver Valley 1

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BAT1-1	125	DC/1	BATRM1	EP	BUS1-1	BUS	SGRMAE
BAT1-2	125	DC/2	BATRM2	EP	BUS1-2	BUS	SGRMDF
BAT1-3	125	DC/3	BATRM3	EP	BUS1-3	BUS	SGRMAE
BAT1-4	125	DC/4	BATRM4	EP	BUS1-4	BUS	SGRMDF
BUD-1DF	4160	AC/B	SGRMDF	RW	RWS-1B	MDP	INTK
BUD-1DF	4160	AC/B	SGRMDF	RW	RWS-1C	MDP	INTK
BUS-1AE	4160	AC/A	SGRMAE	AFW	AFW-3A	MDP	AUXFWPRM
BUS-1AE	4160	AC/A	SGRMAE	CS	RSB-C	MDP	730SG
BUS-1AE	4160	AC/A	SGRMAE	ECCS	HPI-1A	MDP	SIPRMA
BUS-1AE	4160	AC/A	SGRMAE	ECCS	HPI-1C	MDP	SIPRMC
BUS-1AE	4160	AC/A	SGRMAE	ECCS	LPI-A	MDP	730SG
BUS-1AE	4160	AC/A	SGRMAE	ECCS	LPI-A	MDP	730SG
BUS-1AE	4160	AC/A	SGRMAE	ECCS	RSB-C	MDP	730SG
BUS-1AE	4160	AC/A	SGRMAE	EP	XFMR-1-8N	TRAN	SGRMAE
BUS-1AE	4160	AC/A	SGRMAE	RW	RWS-1A	MDP	INTK
BUS-1AE	4160	AC/A	SGRMAE	RW	RWS-1A	MDP	INTK
BUS-1AE	4160	AC/A	SGRMAE	RW	RWS-9A	MDP	AINTK
BUS-1AE	4160	AC/A	SGRMAE	RW	RWS-9A	MDP	AINTK
BUS-1DF	4160	AC/B	SGRMDF	AFW	AFW-3B	MDP	AUXFWPRM
BUS-1DF	4160	AC/B	SGRMDF	CS	RSB-D	MDP	730SG
BUS-1DF	4160	AC/B	SGRMDF	ECCS	HPI-1B	MDP	SIPRMB
BUS-1DF	4160	AC/B	SGRMDF	ECCS	LPI-B	MDP	730SG
BUS-1DF	4160	AC/B	SGRMDF	ECCS	LPI-B	MDP	730SG
BUS-1DF	4160	AC/B	SGRMDF	ECCS	RSB-D	MDP	730SG
BUS-1DF	4160	AC/B	SGRMDF	EP	XFMR-1-9P	TRAN	SGRMDF
BUS-1DF	4160	AC/B	SGRMDF	RW	RWS-1B	MDP	INTK
BUS-1DF	4160	AC/B	SGRMDF	RW	RWS-1C	MDP	INTK
BUS-1DF	4160	AC/B	SGRMDF	RW	RWS-9B	MDP	AINTK
BUS-1DF	4160	AC/B	SGRMDF	RW	RWS-9B	MDP	AINTK
BUS-1N	480	AC/A	SGRMAE	CS	RSA-A	MDP	RC
BUS-1P	480	AC/B	SGRMDF	CS	RSA-B	MDP	RC
BUS1-1	125	DC/1	SGRMAE	EP	INV-VB-1	INV	SGRMAE

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Beaver Valley 1 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BUS1-2	125	DC/2	SGRMDF	EP	INV-VB-2	INV	SGRMDF
BUS1-3	125	DC/3	SGRMAE	EP	E-LIGHTS-A	LITE	MANY
BUS1-3	125	DC/3	SGRMAE	EP	INV-VB-3	INV	SGRMAE
BUS1-4	125	DC/4	SGRMDF	EP	E-LIGHTS-B	LITE	MANY
BUS1-4	125	DC/4	SGRMDF	EP	INV-VB-4	INV	SGRMDF
BUS1-N	480	AC/A	SGRMAE	EP	MCC1-E1	MCC	INTK
BUS1-N	480	AC/A	SGRMAE	EP	MCC1-E3	MCC	735AB
BUS1-N	480	AC/A	SGRMAE	EP	MCC1-E5	MCC	MCC1-E5
BUS1-N	480	AC/A	SGRMAE	EP	MCC1-E7	MCC	DGRM1
BUS1-P	480	AC/B	SGRMDF	EP	MCC1-E2	MCC	INTK
BUS1-P	480	AC/B	SGRMDF	EP	MCC1-E4	MCC	735AB
BUS1-P	480	AC/B	SGRMDF	EP	MCC1-E6	MCC	MCC1-E6
BUS1-P	480	AC/B	SGRMDF	EP	MCC1-E8	MCC	DGRM2
DG-1	4160	AC/A	DGRM1	EP	BUS-1AE	BUS	SGRMAE
DG-2	4160	AC/B	DGRM2	EP	BUS-1DF	BUS	SGRMDF
INV-VB-1	120	DC/1	SGRMAE	EP	VITAL-BUS-1	BUS	SGRMAE
INV-VB-2	120	DC/2	SGRMDF	EP	VITAL-BUS-2	BUS	SGRMDF
INV-VB-3	120	DC/3	SGRMAE	EP	VITAL-BUS-3	BUS	SGRMAE
INV-VB-4	120	DC/4	SGRMDF	EP	VITAL-BUS-4	BUS	SGRMDF
MCC1-E1	480	AC/A	INTK	RW	RWS-102A1	MOV	INTK
MCC1-E1	480	AC/A	INTK	RW	RWS-102A1	MOV	INTK
MCC1-E1	480	AC/A	INTK	RW	RWS-102A2	MOV	INTK
MCC1-E1	480	AC/A	INTK	RW	RWS-102A2	MOV	INTK
MCC1-E1	480	AC/A	INTK	RW	RWS-102C1	MOV	INTK
MCC1-E1	480	AC/A	INTK	RW	RWS-102C1	MOV	INTK
MCC1-E2	480	AC/B	INTK	RW	RWS-102B1	MOV	INTK
MCC1-E2	480	AC/B	INTK	RW	RWS-102B1	MOV	INTK
MCC1-E2	480	AC/B	INTK	RW	RWS-102B2	MOV	INTK
MCC1-E2	480	AC/B	INTK	RW	RWS-102B2	MOV	INTK
MCC1-E2	480	AC/B	INTK	RW	RWS-102C2	MOV	INTK
MCC1-E2	480	AC/B	INTK	RW	RWS-102C2	MOV	INTK
MCC1-E3	480	AC/A	735AB	ECCS	HPI-115B	MOV	BLDRM

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Beaver Valley 1 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC1-E3	480	AC/A	735AB	RW	RWS-103A	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-103A	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-103A	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-103C	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-103C	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-103C	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-114A	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-114A	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-114B	MOV	722AB
MCC1-E3	480	AC/A	735AB	RW	RWS-114B	MOV	722AB
MCC1-E4	480	AC/B	735AB	ECCS	HPI-115D	MOV	BLDRM
MCC1-E4	480	AC/B	735AB	RW	RWS-103B	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-103B	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-103B	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-103D	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-103D	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-103D	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-106A	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-106A	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-106B	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-106B	MOV	722AB
MCC1-E4	480	AC/B	735AB	RW	RWS-116A	MOV	VALVEPIT
MCC1-E4	480	AC/B	735AB	RW	RWS-116A	MOV	VALVEPIT
MCC1-E4	480	AC/B	735AB	RW	RWS-116B	MOV	VALVEPIT
MCC1-E4	480	AC/B	735AB	RW	RWS-116B	MOV	VALVEPIT
MCC1-E5	480	AC/A	MCC1-E5	AFW	AFW-151B	MOV	AUXFWPRM
MCC1-E5	480	AC/A	MCC1-E5	AFW	AFW-151D	MOV	AUXFWPRM
MCC1-E5	480	AC/A	MCC1-E5	AFW	AFW-151F	MOV	AUXFWPRM
MCC1-E5	480	AC/A	MCC1-E5	CS	RSB-155A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	CS	RSB-156A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	HPI-867A	MOV	BLDRM
MCC1-E5	480	AC/A	MCC1-E5	ECCS	HPI-867C	MOV	722SG

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Beaver Valley 1 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPI-860A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPI-860A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPI-862A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPI-864A	MOV	730SG
MCC1-E5	480	AC/A	MC1-E5	ECCS	LPI-864A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPI-864A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPI-890C	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPR-863A	MOV	PPTNL
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPR-890A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	LPR-890A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	ECCS	RSA-155A	MOV	730SG
MCC1-E5	480	AC/A	MCC1-E5	RCS	RCS-700	MOV	RC
MCC1-E5	480	AC/A	MCC1-E5	RW	RSA-105A	MOV	722SG
MCC1-E5	480	AC/A	MCC1-E5	RW	RSB-105C	MOV	722SG
MCC1-E5	480	AC/A	MCC1-E5	RW	RWS-104A	MOV	722SG
MCC1-E5	480	AC/A	MCC1-E5	RW	RWS-104A	MOV	722SG
MCC1-E5	480	AC/A	MCC1-E5	RW	RWS-104A	MOV	722SG
MCC1-E5	480	AC/A	MCC1-E5	RW	RWS-104C	MOV	722SG
MCC1-E5	480	AC/A	MCC1-E5	RW	RWS-104C	MOV	722SG
MCC1-E5	480	AC/A	MCC1-E5	RW	RWS-104C	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	AFW	AFW-105	MOV	AUXFWPRM
MCC1-E6	480	AC/B	MCC1-E6	AFW	AFW-151A	MOV	AUXFWPRM
MCC1-E6	480	AC/B	MCC1-E6	AFW	AFW-151C	MOV	AUXFWPRM
MCC1-E6	480	AC/B	MCC1-E6	AFW	AFW-151E	MOV	AUXFWPRM
MCC1-E6	480	AC/B	MCC1-E6	CS	RSB-155B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	CS	RSB-156B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	HPI-867B	MOV	BLDRM
MCC1-E6	480	AC/B	MCC1-E6	ECCS	HPI-867D	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-860B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-860B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-862B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-864B	MOV	730SG

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Beaver Valley 1 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-864B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-864B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-890C	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-890C	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-890C	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPI-890C	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPR-863B	MOV	PPTNL
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPR-890B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	LPR-890B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	ECCS	RCS-865A	MOV	RC
MCC1-E6	480	AC/B	MCC1-E6	ECCS	RCS-865B	MOV	RC
MCC1-E6	480	AC/B	MCC1-E6	ECCS	RCS-865C	MOV	RC
MCC1-E6	480	AC/B	MCC1-E6	ECCS	RSB-155B	MOV	730SG
MCC1-E6	480	AC/B	MCC1-E6	RCS	RCS-701	MOV	RC
MCC1-E6	480	AC/B	MCC1-E6	RW	RSA-105B	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	RW	RSB-105D	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	RW	RWS-104B	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	RW	RWS-104B	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	RW	RWS-104B	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	RW	RWS-104D	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	RW	RWS-104D	MOV	722SG
MCC1-E6	480	AC/B	MCC1-E6	RW	RWS-104D	MOV	722SG
MCC1-E7	480	AC/A	DGRM1	RW	DG-113A	MOV	PWPRM
MCC1-E7	480	AC/A	DGRM1	RW	DG-113B	MOV	PWPRM
MCC1-E8	480	AC/B	DGRM2	RW	DG-113C	MOV	PWPRM
MCC1-E8	480	AC/B	DGRM2	RW	DG-113D	MOV	PWPRM
VITAL-BUS-1	120	DC/1	INV-VB-1	RPS	RPS-CHNL-1	I&C	
VITAL-BUS-2	120	DC/2	INV-VB-2	RPS	RPS-CHNL-2	I&C	
VITAL-BUS-3	120	DC/3	INV-VB-3	RPS	RPS-CHNL-3	I&C	
VITAL-BUS-4	120	DC/4	INV-VB-4	RPS	RPS-CHNL-4	I&C	
XFMR-1-8N	480	AC/A	SGRMAE	EP	BUS-1N	BUS	SGRMAE
XFRM-1-9P	480	AC/B	SGRMDF	EP	BUS-1P	BUS	SGRMDF

3.7 RIVER WATER SYSTEM

3.7.1 System Function

The river water (RW) system supports normal operation and cooldown requirements of the plant and provides adequate cooling to essential systems and components following a design basis accident.

The auxiliary river water subsystem is designed to support unit shutdown from 100 percent power and subsequent cooldown of the RCS to less than 200°F, after a postulated loss of the intake structure.

3.7.2 System Definition

The river water system includes primary and auxiliary intake structures on the Ohio River, river water pumps, auxiliary river water pumps, supply headers A and B, effluent headers, and associated distribution control and isolation valves.

Simplified drawings of the RW system are shown in Figure 3.7-1 and 3.7-2. A summary of data on selected RW system components is presented in Table 3.7-1.

3.7.3 System Operation

The river water system normally operates with pumps 1A and/or 1B supplying the river water A and B headers. The third pump, 1C, is a "swing" load that can be supplied from either emergency bus. Normally pump 1C is not connected to either bus, but can be manually connected when needed. The auxiliary river water pumps normally are in standby. Equipment served by the river water system include the following:

- Charging pump lube oil and seal coolers (see Section 3.3)
- Diesel generator heat exchangers (see Section 3.6)
- Containment recirculation spray heat exchangers (see Section 3.4)
- Primary plant component cooling water (CCW) heat exchangers
- Control room air conditioning condensers
- Control room river water cooling coil

The river water "A" header also can serve as a backup water supply for the AFW system (see Section 3.2).

The river water minimum supply requirement following a design basis loss of coolant accident are as follows (Ref. 1):

System	Flow Required (gpm)
(2) Recirculation spray heat exchangers (4000 gpm per Hx)	8000
(1) Diesel generator heat exchanger	400
(1) Charging pump lube oil and seal cooler	50
(1) Control room air conditioner	210
TOTAL	8660

3.7.4 System Success Criteria

The river water flow requirements list above can be met by a single river water pump or auxiliary river water pump.

3.7.5 Component Information

A. River Water Pumps (3)
   1. Rated flow: 9000 gpm @ 155 ft head (67 psid)
   2. Rated capacity: 100%
   3. Type: vertical turbine

B. Auxiliary River Water Pumps (2)
   1. Rated flow: 9000 gpm @ 195 ft head (85 psid)
   2. Rated capacity: 100%
   3. Type: vertical turbine

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. On a containment isolation phase B signal, the river water system is realigned by (1) isolating flow to the component cooling water heat exchangers, and (2) initiating flow through the containment recirculation spray heat exchangers.
      b. The diesel generator cooling water inlet valves are opened automatically by a Safety Injection Signal (SIS) or a loss of normal station power. These signals also start the diesel generators.
   2. Remote Manual
      a. Motor-operated valves and pumps can be operated from the main control room.
      b. The auxiliary river water pumps are started from the main control room. Starting these pumps automatically opens the discharge isolation valves and aligns the pumps to supply the redundant river water headers.

B. Motive Power
The RW 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
Lubrication and seal cooling is provided locally for the river water system pumps.

3.7.7 Section 3.7 References

1. Beaver Valley 1 Final Safety Analysis Report, Section 9.9.3.

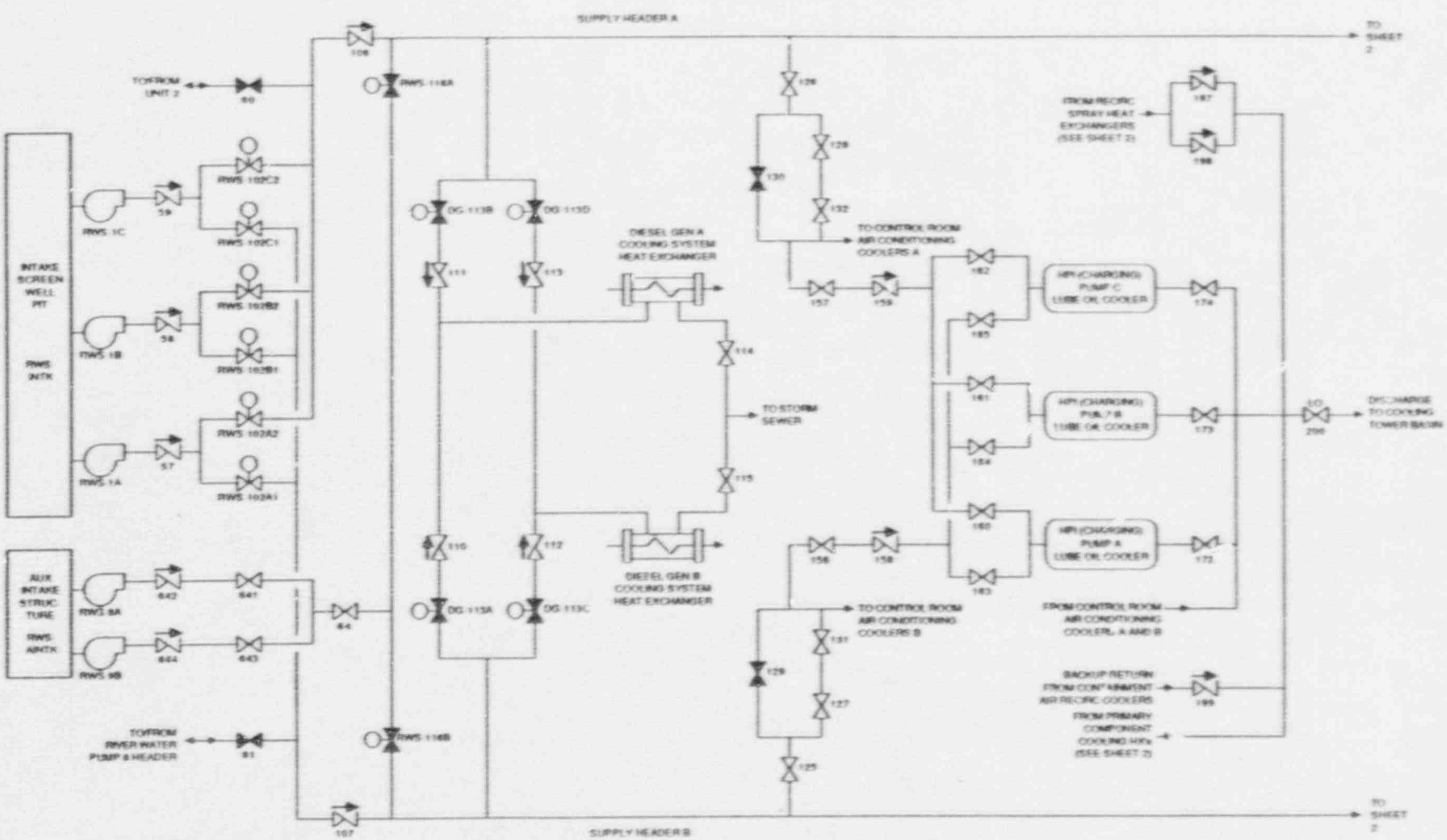

Figure 3.7-1 Beaver Valley 1 River Water System (Sheet 1 of 2)

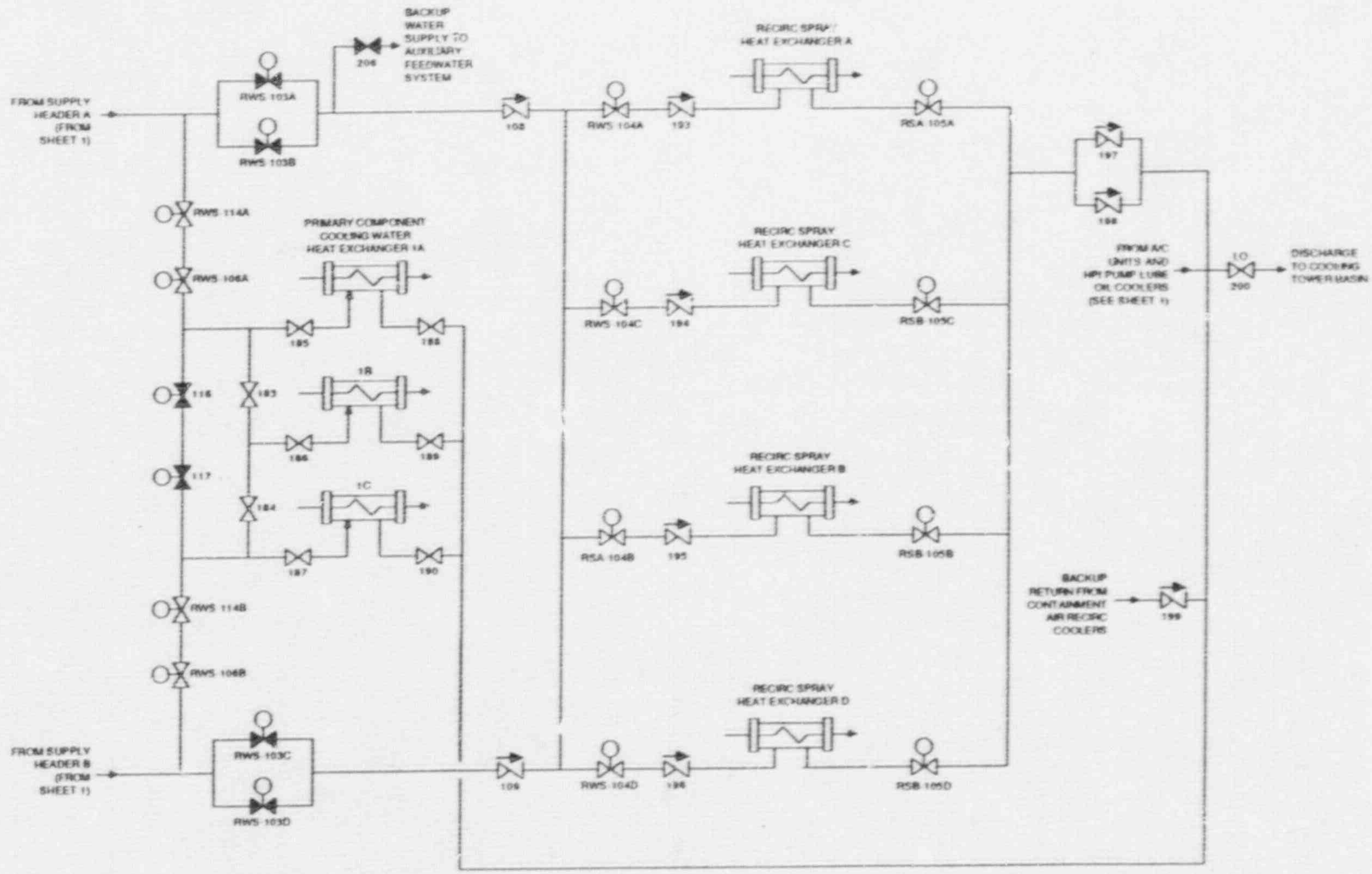

Figure 3.7-1 Beaver Valley 1 River Water System
(Sheet 2 of 2)

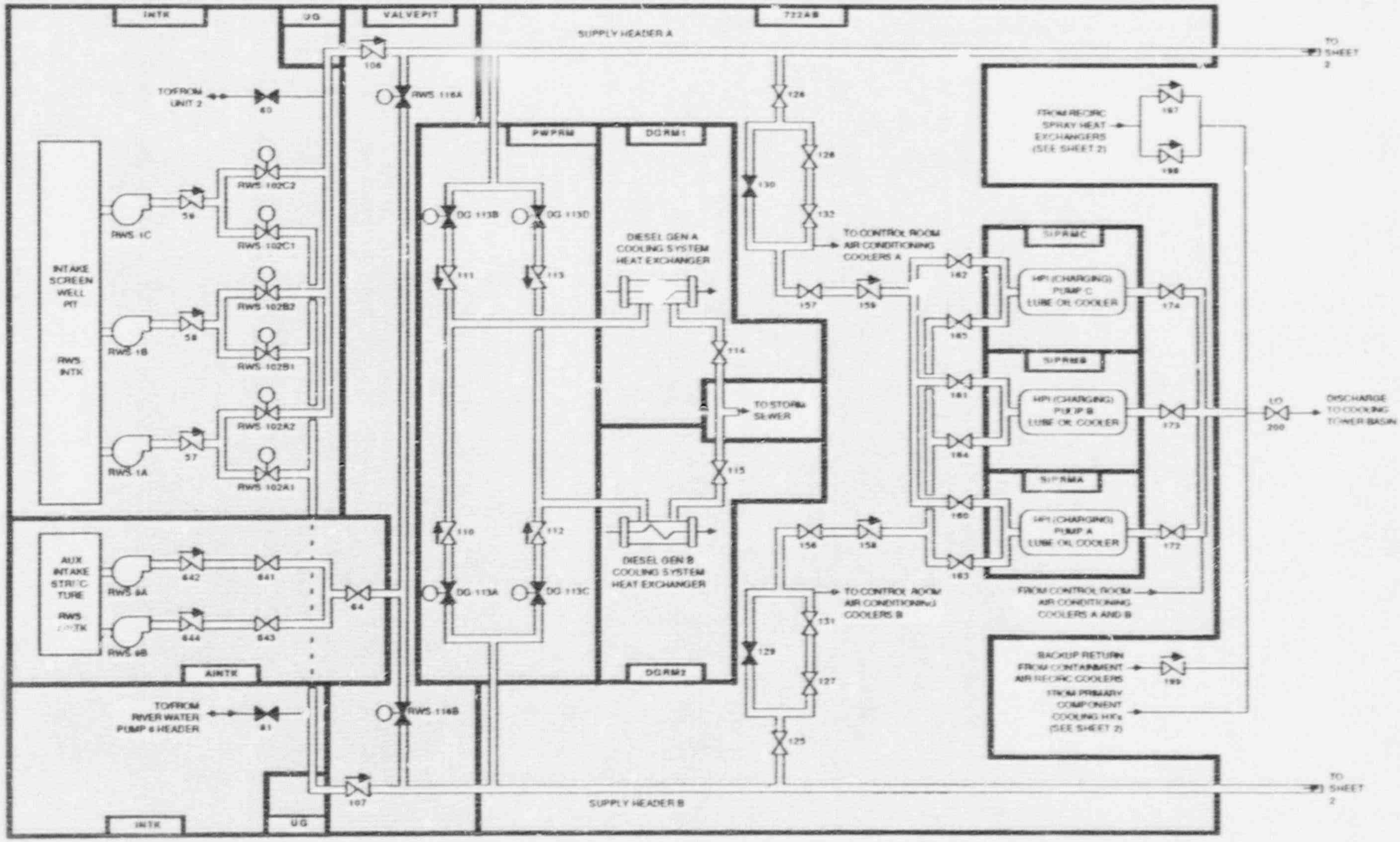

Figure 3.7-2 Beaver Valley 1 River Water System Showing Component Locations (Sheet 1 of 2)

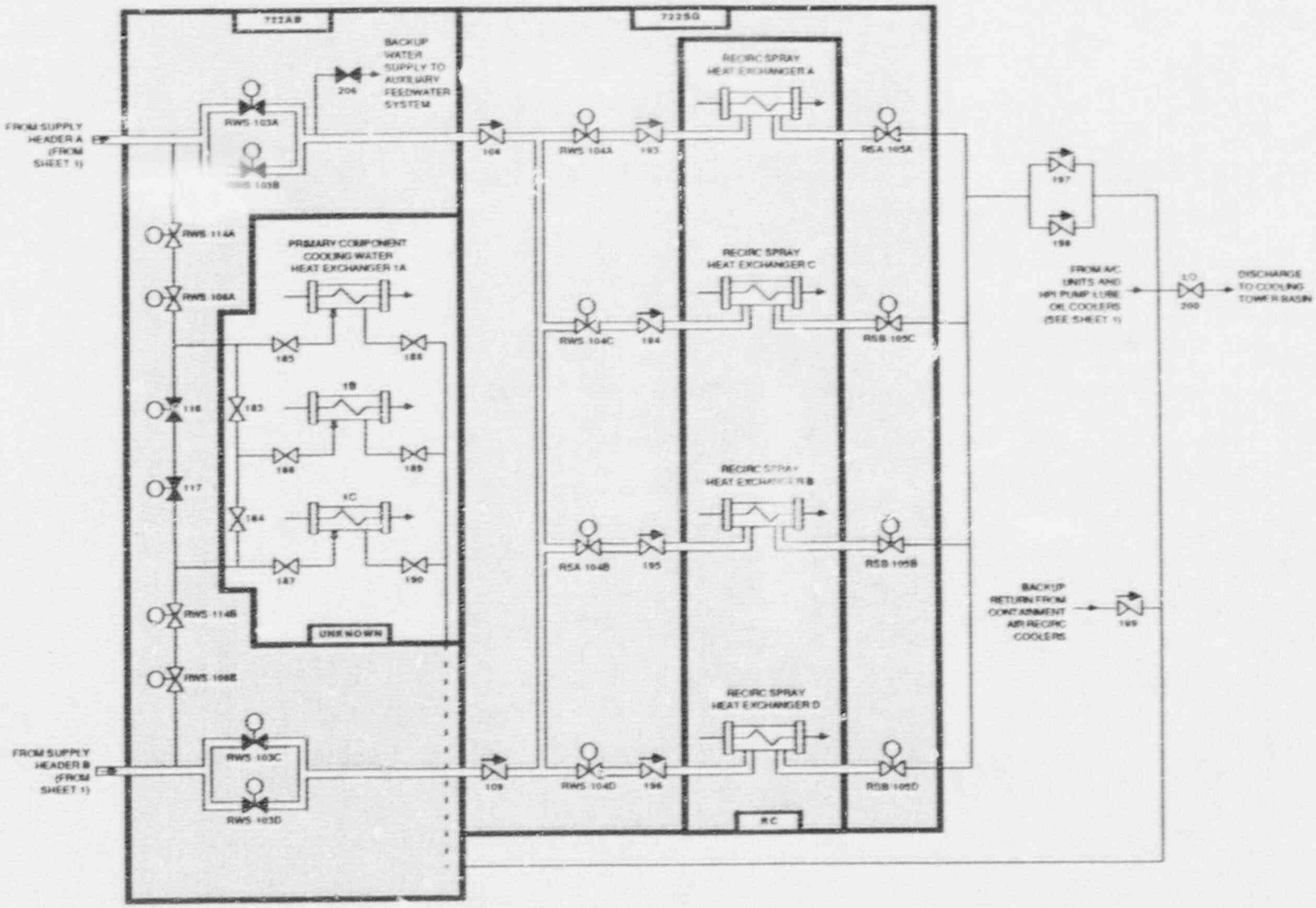

Figure 3.7-2 Beaver Valley 1 River Water System Showing Component Locations (Sheet 2 of 2)

Table 3.7-1. Beaver Valley 1 River Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
DG-113A	MOV	PWPRM	MCC1-E7	480	DGRM1	AC/A
DG-113B	MOV	PWPRM	MCC1-E7	480	DGRM1	AC/A
DG-113C	MOV	PWPRM	MCC1-E8	480	DGRM2	AC/B
DG-113D	MOV	PWPRM	MCC1-E8	480	DGRM2	AC/B
RSA-105A	MOV	722SG	MCC1-E5	480	MCC1-E5	AC/A
RSA-105B	MOV	722SG	MCC1-E6	480	MCC1-E6	AC/B
RSB-105C	MOV	722SG	MCC1-E5	480	MCC1-E5	AC/A
RSB-105D	MOV	722SG	MCC1-E6	480	MCC1-E6	AC/B
RWS-102A1	MOV	INTK	MCC1-E1	480	INTK	AC/A
RWS-102A2	MOV	INTK	MCC1-E1	480	INTK	AC/A
RWS-102B1	MOV	INTK	MCC1-E2	480	INTK	AC/B
RWS-102B2	MOV	INTK	MCC1-E2	480	INTK	AC/B
RWS-102C1	MOV	INTK	MCC1-E1	480	INTK	AC/A
RWS-102C2	MOV	INTK	MCC1-E2	480	INTK	AC/B
RWS-103A	MOV	722AB	MCC1-E3	480	735AB	AC/A
RWS-103A	MOV	722AB	MCC1-E3	480	735AB	AC/A
RWS-103B	MOV	722AB	MCC1-E4	480	735AB	AC/B
RWS-103B	MOV	722AB	MCC1-E4	480	735AB	AC/B
RWS-103C	MOV	722AB	MCC1-E3	480	735AB	AC/A
RWS-103C	MOV	722AB	MCC1-E3	480	735AB	AC/A
RWS-103D	MOV	722AB	MCC1-E4	480	735AB	AC/B
RWS-103D	MOV	722AB	MCC1-E4	480	735AB	AC/B
RWS-104A	MOV	722SG	MCC1-E5	480	MCC1-E5	AC/A
RWS-104A	MOV	722SG	MCC1-E5	480	MCC1-E5	AC/A
RWS-104B	MOV	722SG	MCC1-E6	480	MCC1-E6	AC/B
RWS-104B	MOV	722SG	MCC1-E6	480	MCC1-E6	AC/B
RWS-104C	MOV	722SG	MCC1-E5	480	MCC1-E5	AC/A

Table 3.7-1. Beaver Valley 1 River Water System Data Summary for Selected Components (Continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RWS-104C	MOV	722SG	MCC1-E5	480	MCC1-E5	AC/A
RWS-104D	MOV	722SG	MCC1-E6	480	MCC1-E6	AC/B
RWS-104D	MOV	722SG	MCC1-E6	480	MCC1-E6	AC/B
RWS-106A	MOV	722AB	MCC1-E4	480	735AB	AC/B
RWS-106B	MOV	722AB	MCC1-E4	480	735AB	AC/B
RWS-114A	MOV	722AB	MCC1-E3	480	735AB	AC/A
RWS-114B	MOV	722AB	MCC1-E3	480	735AB	AC/A
RWS-116A	MOV	VALVEPIT	MCC1-E4	480	735AB	AC/B
RWS-116B	MOV	VALVEPIT	MCC1-E4	480	735AB	AC/B
RWS-1A	MDP	INTK	BUS-1AE	4160	SGRMAE	AC/A
RWS-1B	MDP	INTK	BUD-1DF	4160	SGRMDF	AC/B
RWS-1C	MDP	INTK	BUD-1DF	4160	SGRMDF	AC/B
RWS-9A	MDP	AINTK	BUS-1AE	4160	SGRMAE	AC/A
RWS-9B	MDP	AINTK	BUS-1DF	4160	SGRMDF	AC/B

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The Beaver Valley Power Station is located on a 449 acre site on the south bank of the Ohio River in Beaver County, Pennsylvania. The site is approximately 25 miles northwest of Pittsburgh. The power station contains two operating units (Beaver Valley 1 and Beaver Valley 2). This section provides a description of the Beaver Valley Power Station Unit 1 (BVPS-1).

The Nuclear Steam Supply System (NSSS) is a Westinghouse pressurized water reactor with a Westinghouse turbine generator. The balance of plant was designed and constructed by the owner with the aid of Stone and Webster Engineering Corporation.

The major structures at this unit include the containment building, intake structure, auxiliary building, fuel building, decontamination building, turbine building, cooling tower, diesel generator building, and the service building which includes the control building. A general view of the Beaver Valley Site and vicinity is shown in Figure 4-1 (from Ref. 1). Figure 4-2 is a perspective drawing of the Beaver Valley site showing both units (from Ref. 2). A site arrangement drawing is shown in Figure 4-3. Grade elevation at the site varies from 706'6" by the turbine building, to 735'0" by the diesel generator building. Section views of Beaver Valley 1 are shown in Figure 4-4 (looking south) and Figure 4-5 (looking West)

The containment structure contains the reactor vessel, steam generators, pressurizer, the containment spray (CS) heat exchangers and two CS pumps, and RHR pumps and heat exchanger. Pumps, piping and valving for the reactor cooling system is completely contained in the structure. Access to the building is via one of two airlocks - a personnel lock or the equipment hatch. A section view of the containment building is shown in Figure 4-6.

Surrounding about one-half the containment is a penetration building referred to as the Safeguards room. This building house all the piping and electrical feeds to the containment, more specifically the following areas are part of the penetration building.

- Main steam valve area
- Auxiliary feedwater pump room
- Low pressure injection pump area
- Containment spray pump area
- Recombiner area
- East cable vault (MCC1-E5)
- West cable vault (MCC1-E6)

The primary auxiliary building is located at the east side of the penetration building. This structure contains the charging (high pressure safety injection) pumps, the component cooling water heat exchangers and pumps, as well as the clean-up system resin beds, and the radioactive waste handling equipment.

The service building is located north of the primary auxiliary building and the containment structure. The lower level of this three level strucrure contains the RPS trip breakers, the rod control panels, the 4160 VAC switchgear rooms, the DC batteries and switchgear, as well as the emergency shutdown panel, relay panels and communications equipment. The east portion of the middle level of the structure contains the control complex for Unit 1. The other level and the rest of the structure contains offices and maintenance shops.

The spent fuel storage structure is located on the south side of the primary auxiliary building, east of the containment structure. This building contains the spent fuel pool, associated cooling equipment and storage for new fuel. South of the spent fuel building are the diesel generator buildings containing the emergency diesel generators and their associated switchgear.

On the east side of the diesel building is the primary water pump house which houses pipes and pumps for the river water system.

A warehouse is located on the west side of the plant connecting to the west end of the service building. Plant shipping and receiving is located there.

A seismic Category 1 demineralized water storage tank and the refueling water storage tank is located near the containment structure on the west side. Additional demineralized water tanks are located at the North end of the plant.

The turbine building located north of the service building houses the turbine generator and the associated power generating auxiliaries.

The intake structure is outside the main fenced area on the north east side of the plant on the river bank. This structure contains the intake screens, pumps and several motor control centers.

The cooling tower structure (not shown in Figure 4-1) provides the ultimate heat sink and is located on the north east side of the plant.

4.2 FACILITY LAYOUT DRAWINGS

Figures 4-7 through 4-10 are simplified building layout drawings for the Beaver Valley 1 containment, auxiliary building, service building, fuel building and diesel building. The intake structure is shown in Figure 4-11. Major rooms, stairways, elevators, and doorways are shown in the simplified layout drawings, however, many interior walls have been omitted for clarity. Labels printed in uppercase correspond to the location codes listed in Table 4-1 and used in the component data listings and system drawings in Section 3. Some additional labels are included for information and are printed in lowercase type.

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

4.3 SECTION 4 REFERENCES

1. Heddleson, F.A., "Design Data and Safety Features of Commercial Nuclear Power Plants.", ORNL-NSIC-55, Volume III, Oak Ridge National Laboratory, Nuclear Safety Information Center, April 1974.

2. Beaver Valley 2 FSAR, Figure 6.4-1.

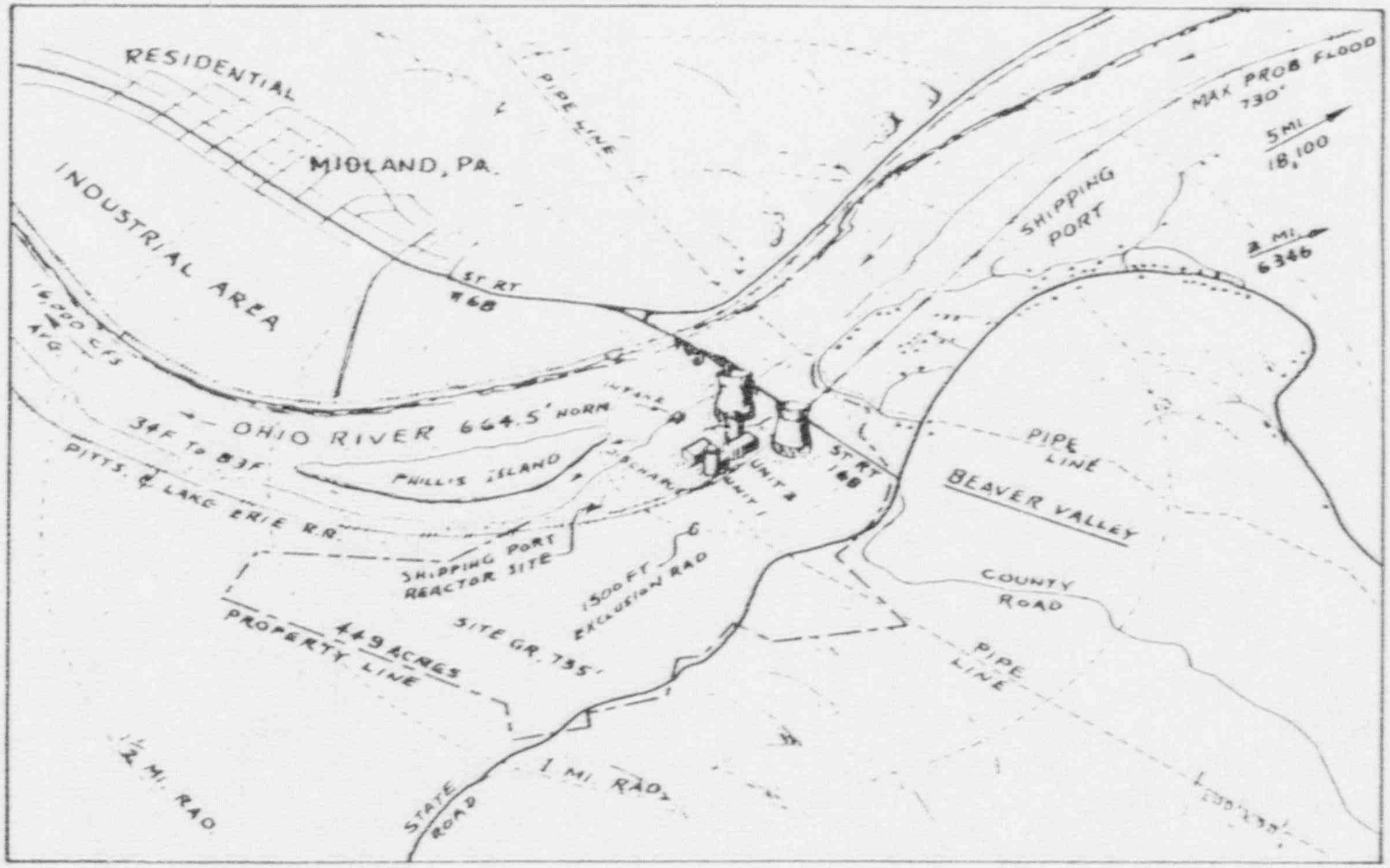

Figure 4-1. General View of the Beaver Valley Site and Vicinity

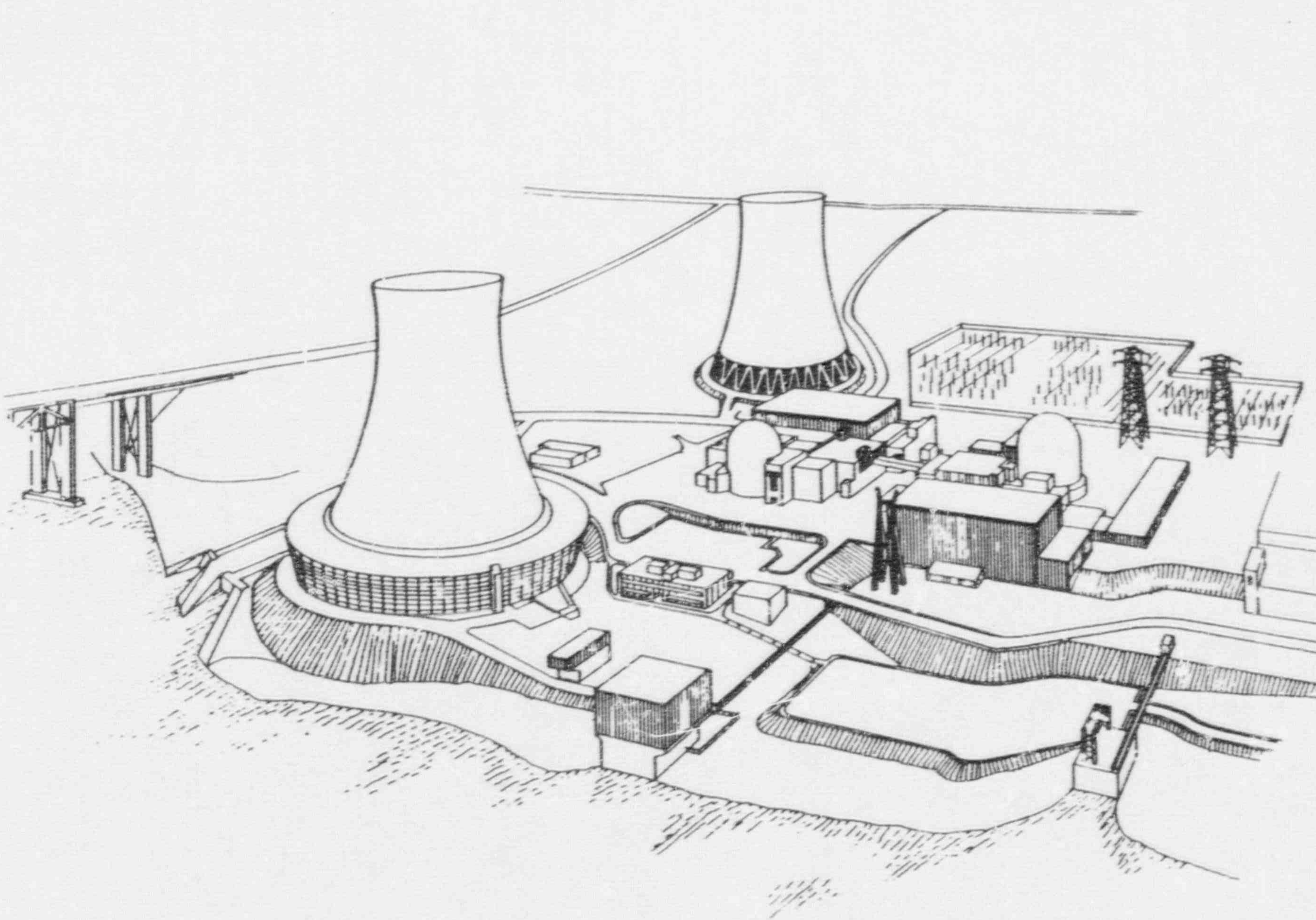

Figure 4-2. Perspective View of the Beaver Valley Site

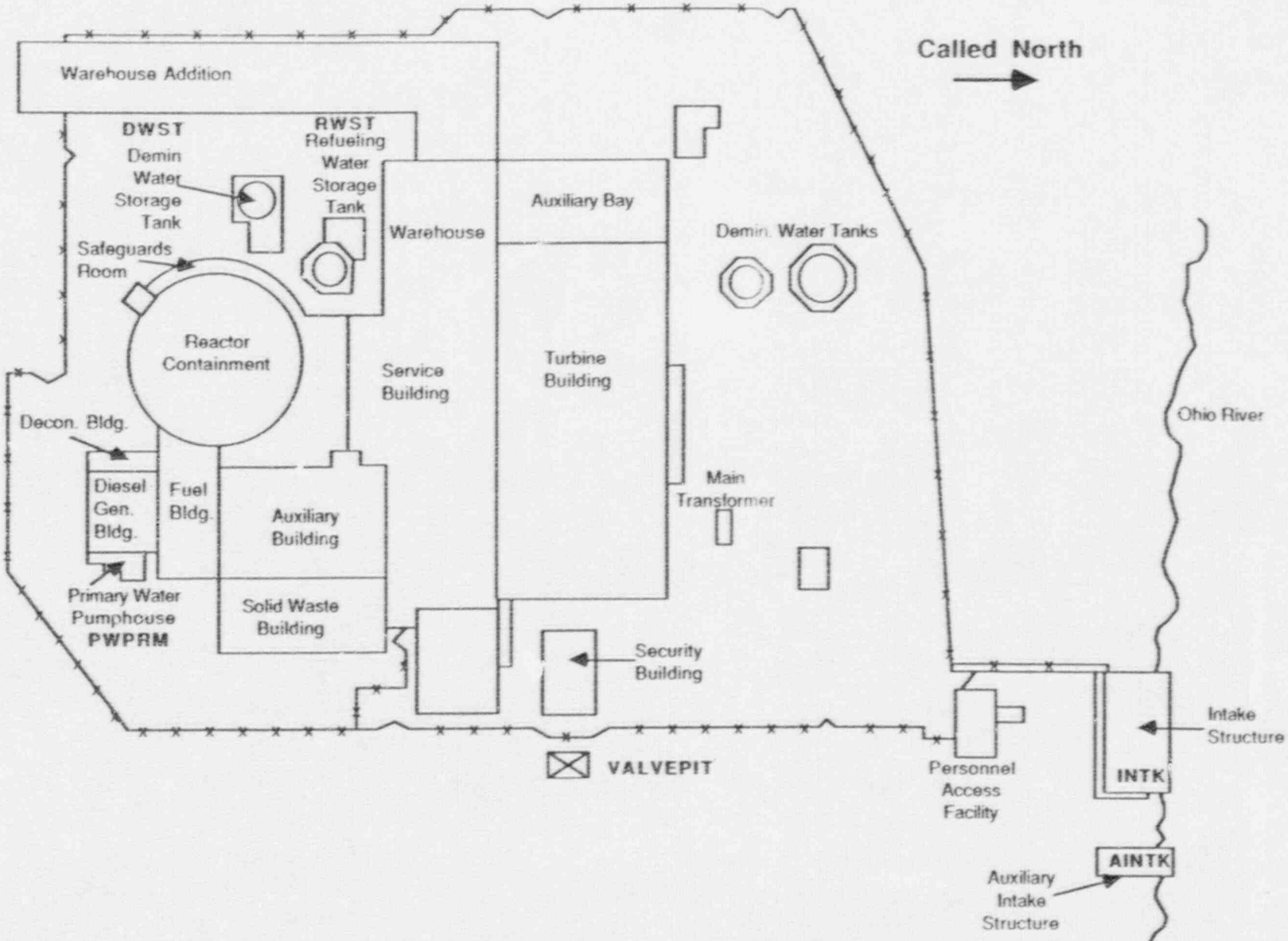

Figure 4-3. Beaver Valley 1 Plot Plan

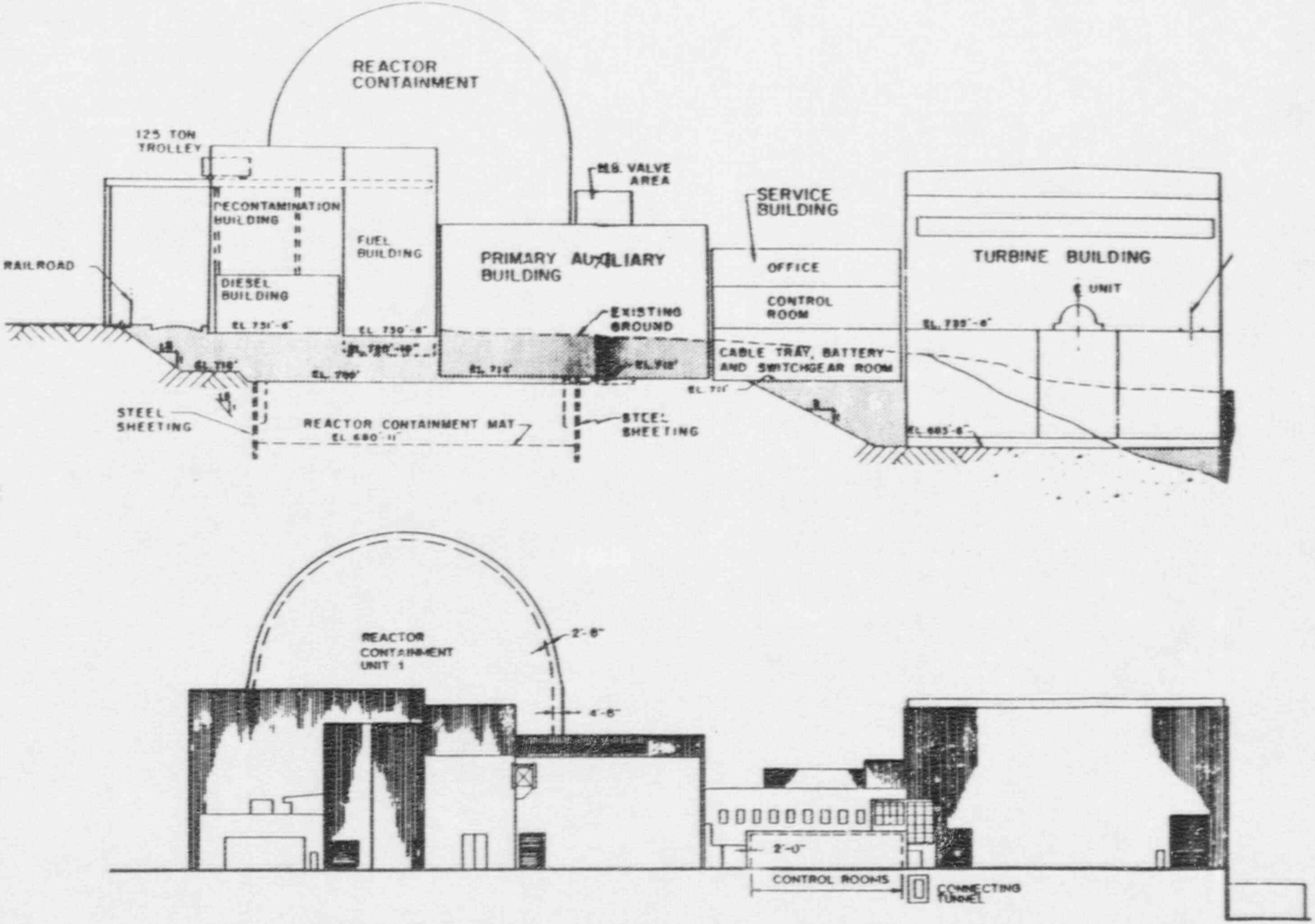

Figure 4-4. Section Views of Beaver Valley 1 Looking West

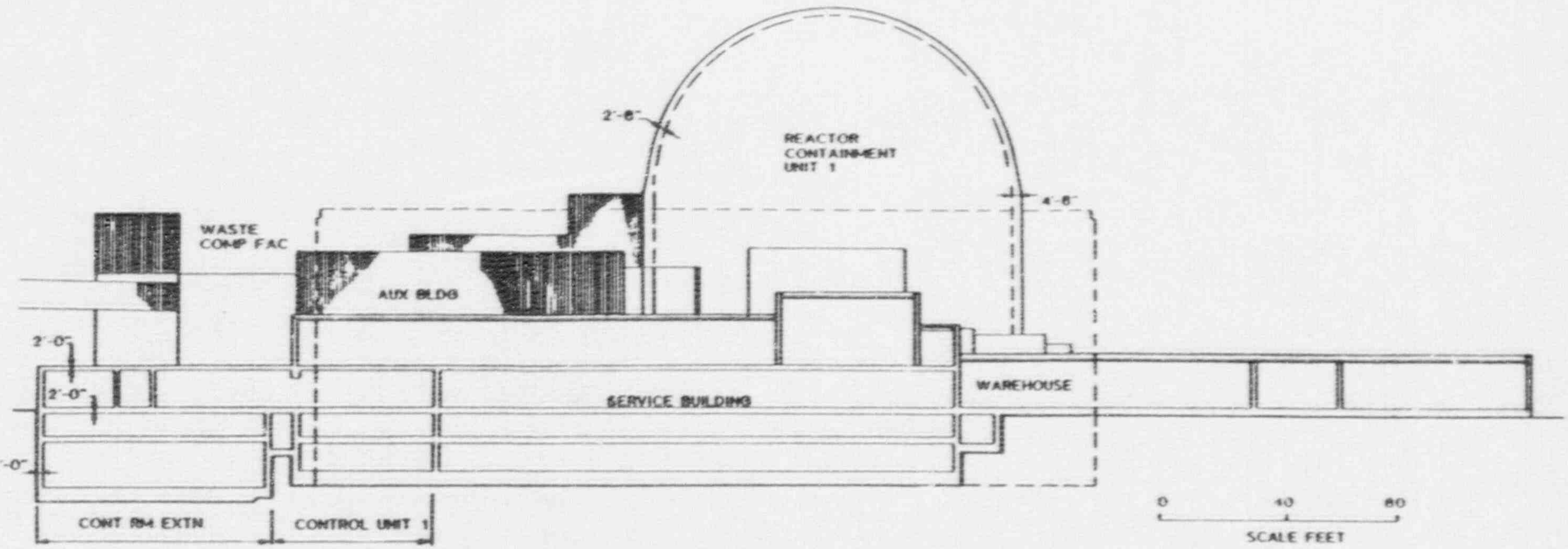

Figure 4-5. Section View of Beaver Valley 1 Looking South

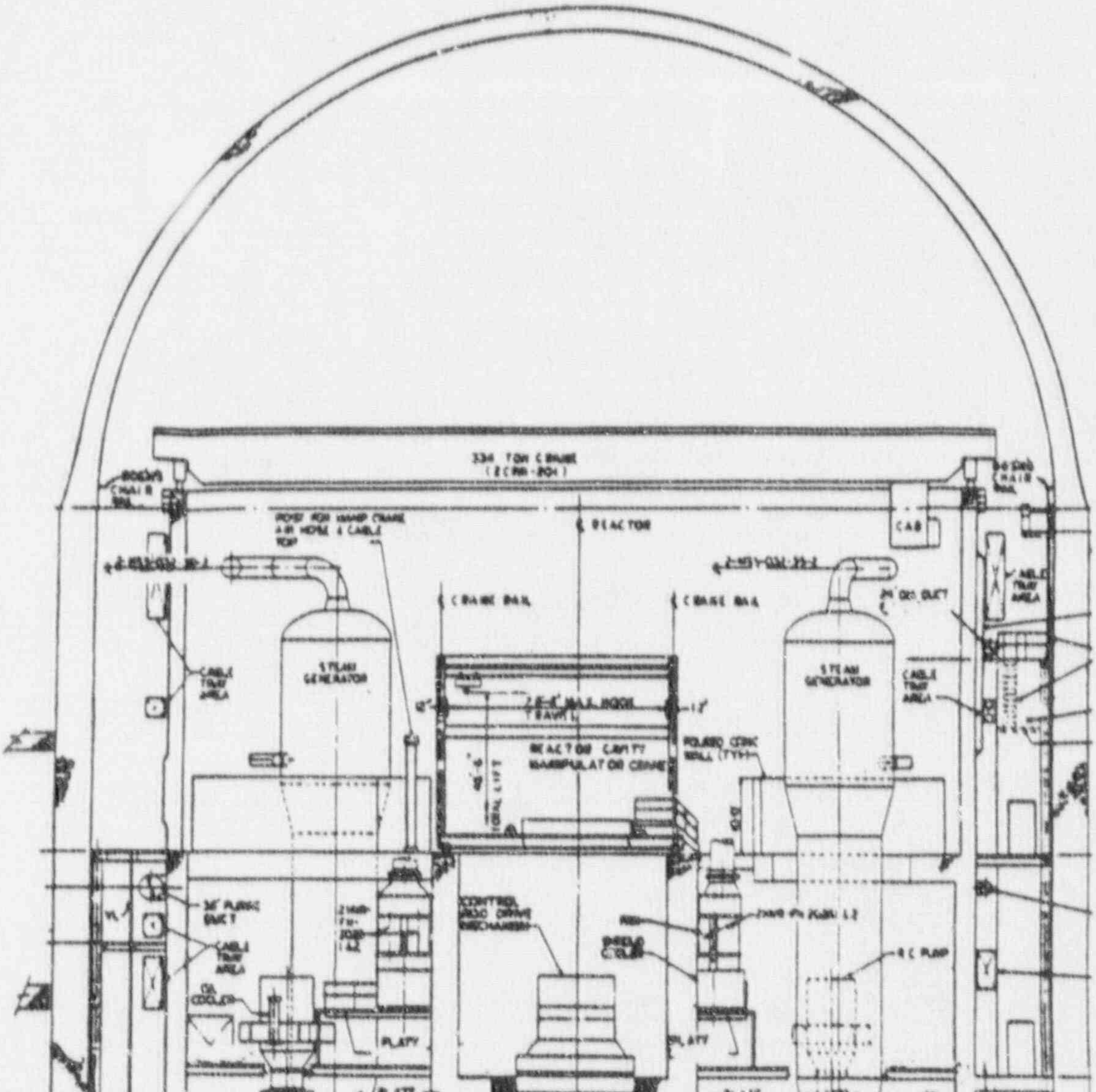

Figure 4-6. General Arrangement of the Beaver Valley 1 Containment Building

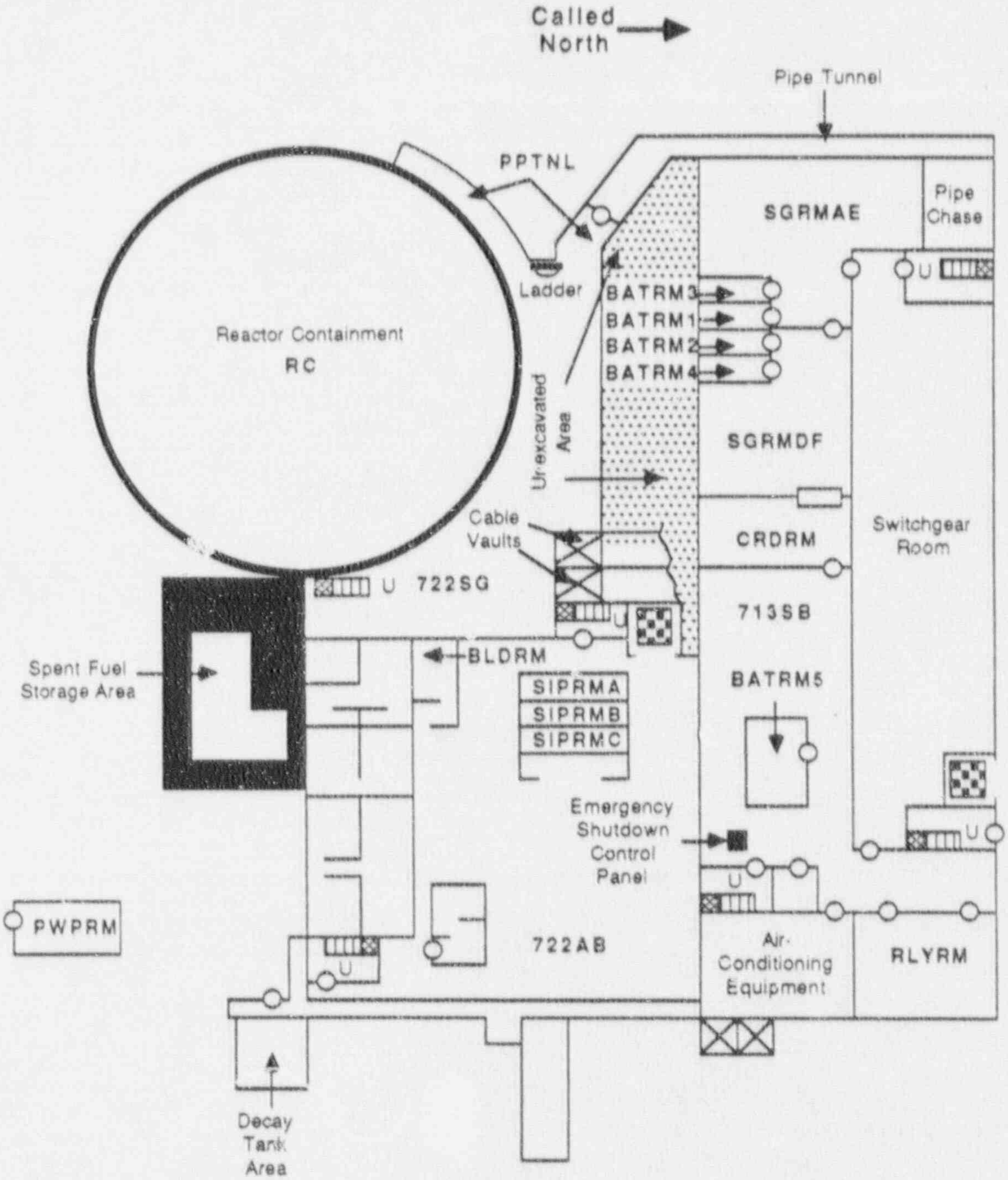

Figure 4-7. Beaver Valley Unit 1 Station Arrangement, Elevation 713"-6"

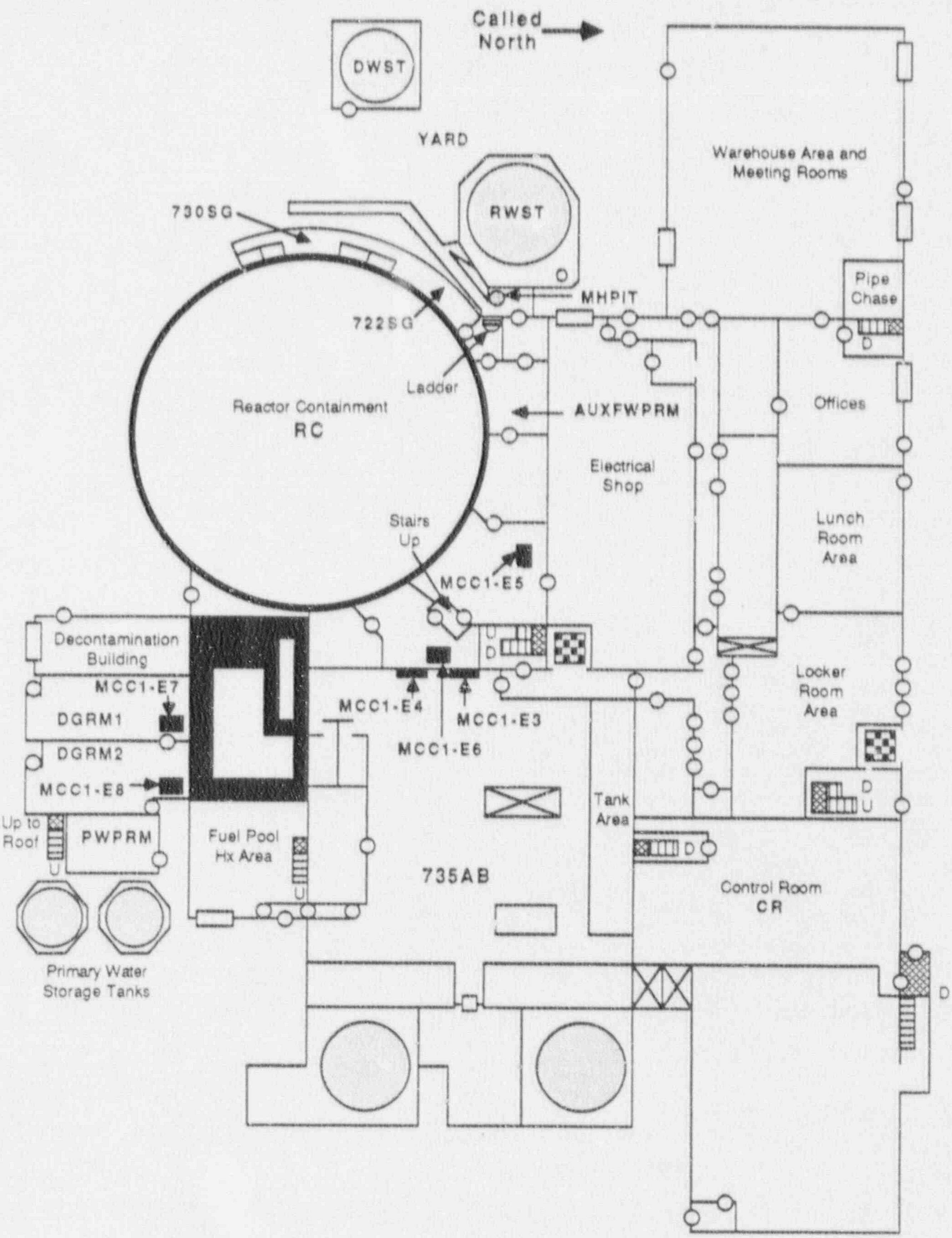

Figure 4-8. Beaver Valley Unit 1 Station Arrangement, Elevation 735'-6"

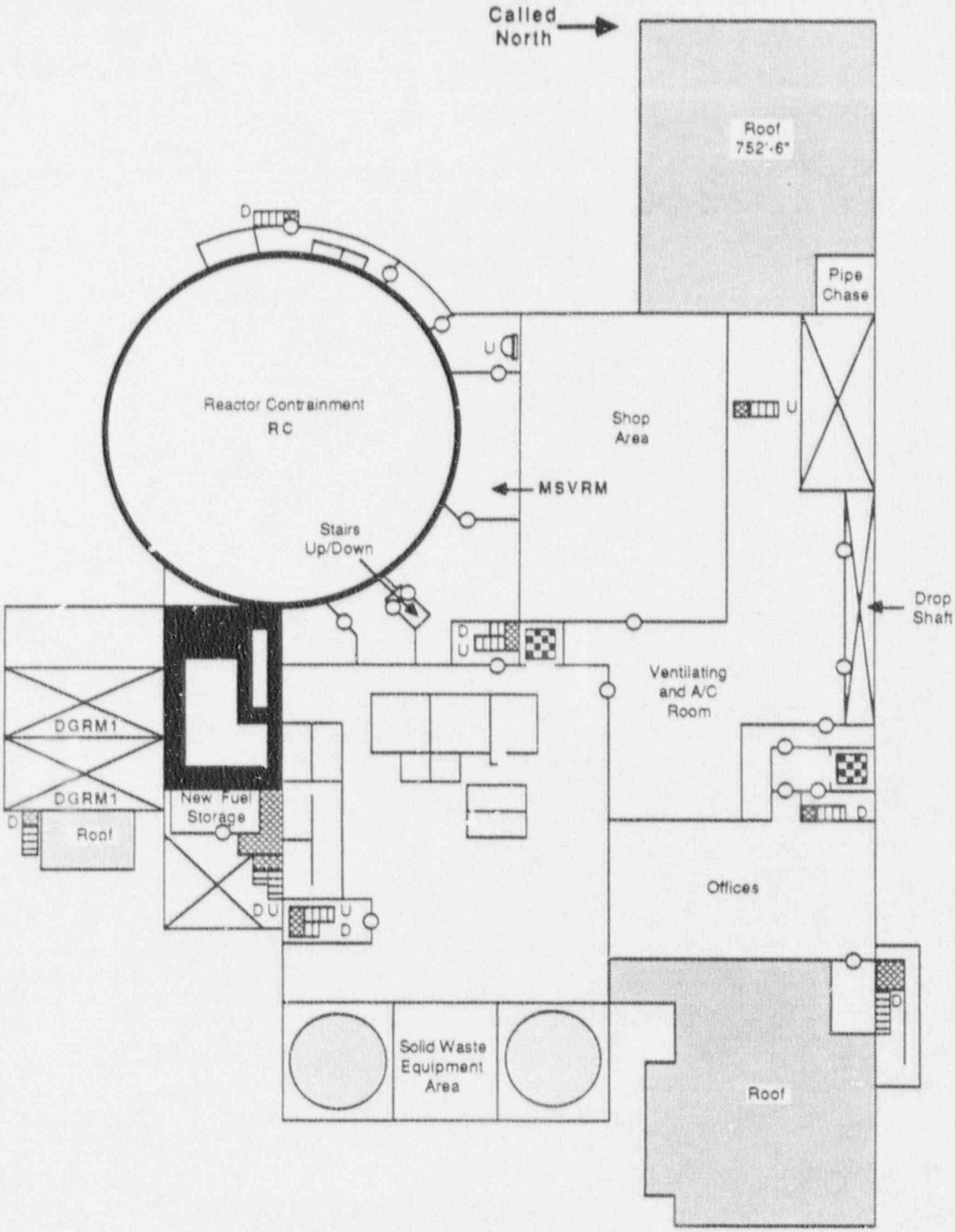

Figure 4-9. Beaver Valley Unit 1 Station Arrangement, Elevation 752'-6"

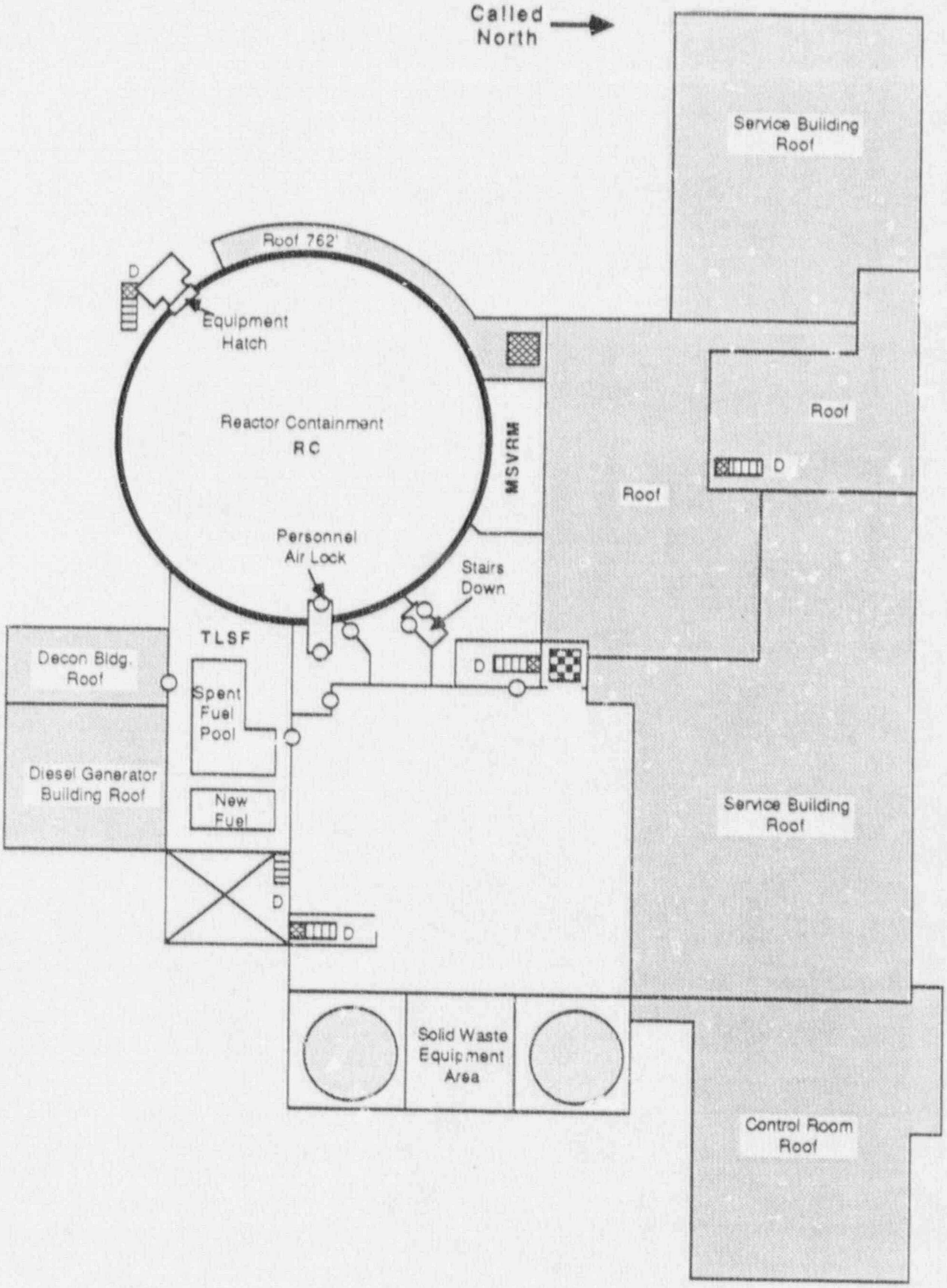

Figure 4-10. Beaver Valley Unit 1 Station Arrangement, Elevation 767'-10"

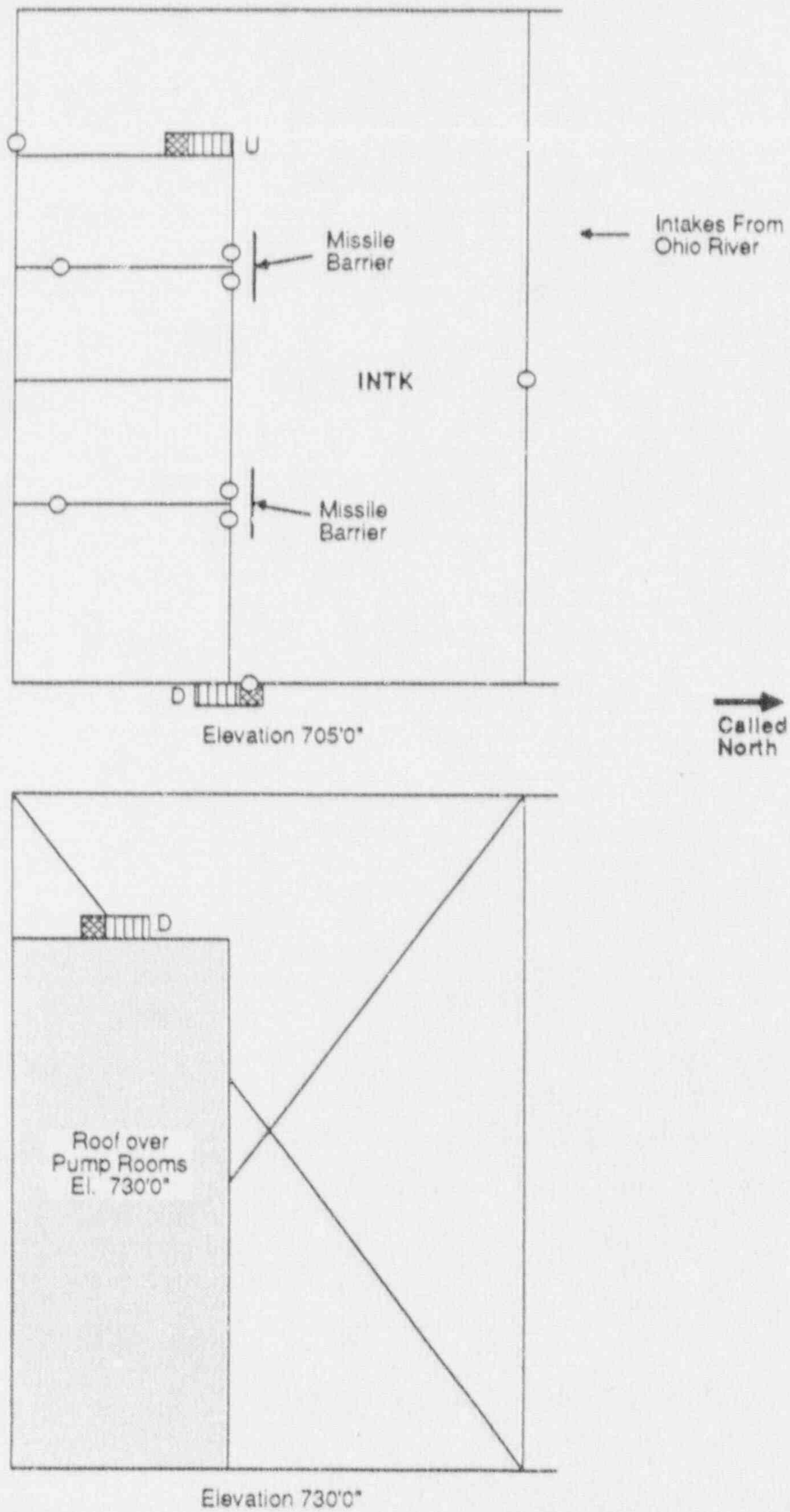

Figure 4-11. Beaver Valley 1 Intake Structure, Elevations 705'0" and 730'0"

Table 4-1. Definition of Beaver Valley 1 Building and Location Codes

	Codes	Descriptions
1.	713SB	713' elevation of the Service Building
2.	722AB	722'-6 " elevation of the Auxiliary Building
3.	722SG	722'-6 " elevation of the Safeguards Room
4.	730SG	732'-6 " elevation of the Safeguards Room
5.	735AB	735' elevation of the Auxiliary Building
6.	AINTK	Auxiliary Intake Structure, located on the Ohio River
7.	AUXFWPRM	Auxiliary Feedwater Pump Room
8.	BATRM1	Battery Room 1, on 713' elevation of the service building
9.	BATRM2	Battery Room 2 on 713' elevation of the service building
10.	BATRM3	Battery Room 3 on 713' elevation of the service building
11.	BARTM4	Battery Room 4 on 713' elevation of the service building
12.	BARTM5	Battery Room 5 on 713' elevation of the service building
13.	BLDRM	Blender Room
14.	CR	Control Room
15.	CRDRM	Control Rod Drive Room
16.	DGRM1	Diesel Generator Room 1
17.	DGRM2	Diesel Generator Room 2
18.	DWST	Demineralized Water Storage Tank
19.	INTK	Intake Structure, located on the Ohio River
20.	MCC1-E1	Motor Control Center 1-E1
21.	MCC1-E2	Motor Control Center 1-E2
22.	MCC1-E3	Motor Control Center 1-E3, on the 735' 6" elevation of the auxiliary building (in area 735 AB)
23.	MCC1-E4	Motor Control Center 1-E4, on the 735' 6" elevation of the auxiliary building (in area 735 AB)

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

Codes		Descriptions
24.	MCC1-E5	Motor Control Center 1-E5, on the 735' 6" elevation of the service building
25.	MCC1-E6	Motor Control Center 1-E6, on the 735' 6" elevation of the service building
26.	MCC1-E7	Motor Control Center 1-E7, in diesel generator room 1 (area DGRM1)
27.	MCC1-E8	Motor Control Center 1-E8, in diesel generator room 2 (area DGRM2)
28.	MHPIT	Man Hole Pit, adjacent to RWST
29.	MSVRM	Main Steam Vault Area
30.	PPTNL	Pipe Tunnel
31.	PWPRM	Primary Water Pumping Room
32.	RC	Reactor Containment
33.	RLYRM	Relay Room
34.	RWST	Refueling Water Storage Tank
35.	SGRMAE	Switchgear Room - AE
36.	SGRMDF	Switchgear Room - DF
37.	SIPRMA	Safety Injection Pump Room - A
38.	SIPRMB	Safety Injection Pump Room - B
39.	SIPRMC	Safety Injection Pump Room - C
40.	TLSF	Spent Fuel Area Operating Floor
41.	YARD	Outside Area

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
722AB	RW	RWS-103B	MOV
722AB	RW	RWS-103A	MOV
722AB	RW	RWS-114A	MOV
722AB	RW	RWS-106A	MOV
722AB	RW	RWS-103C	MOV
722AB	RW	RWS-103D	MOV
722AB	RW	RWS-114B	MOV
722AB	RW	RWS-106B	MOV
722AB	RW	RWS-103A	MOV
722AB	RW	RWS-103B	MOV
722AB	RW	RWS-103D	MOV
722AB	RW	RWS-103C	MOV
722AB	RW	RWS-114A	MOV
722AB	RW	RWS-106A	MOV
722AB	RW	RWS-103B	MOV
722AB	RW	RWS-106B	MOV
722AB	RW	RWS-114B	MOV
722AB	RW	RWS-103C	MOV
722AB	RW	RWS-103D	MOV
722AB	RW	RWS-103A	MOV
722SG	ECCS	HPI-867D	MOV
722SG	ECCS	HPI-867C	MOV
722SG	RW	RSA-105B	MOV
722SG	RW	RSA-105A	MOV
722SG	RW	RWS-104A	MOV
722SG	RW	RWS-104B	MOV
722SG	RW	RWS-104D	MOV
722SG	RW	RWS-104B	MOV
722SG	RW	RWS-104D	MOV
722SG	RW	RWS-104B	MOV
722SG	RW	RWS-104A	MOV
722SG	RW	RWS-104C	MOV

Table 4-2. Partial Listing of Components by Location at Beaver Valley 1 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
722SG	RW	RWS-104D	MOV
722SG	RW	RWS-104C	MOV
722SG	RW	RWS-104A	MOV
722SG	RW	RWS-104C	MOV
722SG	RW	RSB-105D	MOV
722SG	RW	RSB-105C	MOV
730SG	CS	RSB-C	MDP
730SG	CS	RSB-D	MDP
730SG	CS	RSB-156A	MOV
730SG	CS	RSB-156B	MOV
730SG	CS	RSB-155A	MOV
730SG	CS	RSB-155B	MOV
730SG	ECCS	LPI-A	MDP
730SG	ECCS	LPI-B	MDP
730SG	ECCS	LPR-890A	MOV
730SG	ECCS	LPI-A	MDP
730SG	ECCS	LPR-890B	MOV
730SG	ECCS	LPI-B	MDP
730SG	ECCS	RSB-155A	MOV
730SG	ECCS	RSB-155B	MOV
730SG	ECCS	RSB-C	MDP
730SG	ECCS	RSB-D	MDP
730SG	ECCS	LPI-860A	MOV
730SG	ECCS	LPI-862A	MOV
730SG	ECCS	LPI-864A	MOV
730SG	ECCS	LPI-890C	MOV
730SG	ECCS	LPI-860B	MOV
730SG	ECCS	LPI-862B	MOV
730SG	ECCS	LPI-864B	MOV
730SG	ECCS	LPR-890A	MOV
730SG	ECCS	LPR-890B	MOV
730SG	ECCS	LPI-890C	MOV

Table 4-2. Partial Listing of Components by Location at Beaver Valley 1 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
730SG	ECCS	LPI-860A	MOV
730SG	ECCS	LPI-864A	MOV
730SG	ECCS	LPI-890C	MOV
730SG	ECCS	LPI-860B	MOV
730SG	ECCS	LPI-864B	MOV
730SG	ECCS	LPI-890C	MOV
730SG	ECCS	LPI-864A	MOV
730SG	ECCS	LPI-864B	MOV
730SG	ECCS	LPI-890C	MOV
735AB	EP	MCC1-E3	MCC
735AB	EP	MCC1-E4	MCC
AINTK	RW	RWS-9A	MDP
AINTK	RW	RWS-9B	MDP
AINTK	RW	RWS-9A	MDP
AINTK	RW	RWS-9B	MDP
AUXFWPRM	AFW	AFW-151A	MOV
AUXFWPRM	AFW	AFW-151B	MOV
AUXFWPRM	AFW	AFW-3A	MDP
AUXFWPRM	AFW	AFW-225	XV
AUXFWPRM	AFW	AFW-151C	MOV
AUXFWPRM	AFW	AFW-151D	MOV
AUXFWPRM	AFW	AFW-151E	MOV
AUXFWPRM	AFW	AFW-151F	MOV
AUXFWPRM	AFW	AFW-2	TDP
AUXFWPRM	AFW	AFW-105	MOV
AUXFWPRM	AFW	AFW-105A	NV
AUXFWPRM	AFW	AFW-105B	NV
AUXFWPRM	AFW	AFW-3B	MDP
AUXFWPRM	AFW	AFW-226	XV
AUXFWPRM	AFW	AFW-227	XV
BATRM1	EP	BAT1-1	BATT
BATRM2	EP	BAT1-2	BATT

Table 4-2. Partial Listing of Components by Location at Beaver Valley 1 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
BATRM3	EP	BAT1-3	BATT
BATRM4	EP	BAT1-4	BATT
BLDRM	ECCS	HPI-867A	MOV
BLDRM	ECCS	HPI-867B	MOV
BLDRM	ECCS	HPI-115B	MOV
BLDRM	ECCS	HPI-115D	MOV
DGRM1	EP	DG-1	DG
DGRM1	EP	MCC1-E7	MCC
DGRM2	EP	DG-2	DG
DGRM2	EP	MCC1-E8	MCC
DWST	AFW	AFW-DWST	TANK
DWST	AFW	AFW-221	XV
DWST	AFW	AFW-222	XV
DWST	AFW	AFW-223	XV
INTK	EP	MCC1-E1	MCC
INTK	EP	MCC1-E2	MCC
INTK	RW	RWS-102A1	MOV
INTK	RW	RWS-102C1	MOV
INTK	RW	RWS-102B1	MOV
INTK	RW	RWS-1A	MDP
INTK	RW	RWS-1B	MDP
INTK	RW	RWS-1C	MDP
INTK	RW	RWS-102A2	MOV
INTK	RW	RWS-102C2	MOV
INTK	RW	RWS-102B2	MOV
INTK	RW	RWS-1A	MDP
INTK	RW	RWS-102C2	MOV
INTK	RW	RWS-102C1	MOV
INTK	RW	RWS-102B2	MOV
INTK	RW	RWS-102B1	MOV
INTK	RW	RWS-102A2	MOV
INTK	RW	RWS-102A1	MOV

Table 4-2. Partial Listing of Components by Location at Beaver Valley 1 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
INTK	RW	RWS-1B	MDP
INTK	RW	RWS-1C	MDP
MANY	EP	E-LIGHTS-B	LITE
MANY	EP	E-LIGHTS-A	LITE
MCC1-E5	EP	MCC1-E5	MCC
MCC1-E6	EP	MCC1-E6	MCC
PPTNL	ECCS	LPR-863A	MOV
PPTNL	ECCS	LPR-863B	MOV
PWPRM	RW	DG-113A	MOV
PWPRM	RW	DG-113D	MOV
PWPRM	RW	DG-113B	MOV
PWPRM	RW	DG-113C	MOV
RC	AFW	AFW-SGA	SG
RC	AFW	AFW-SGB	SG
RC	AFW	AFW-SGC	SG
RC	CS	RSA-HX1A	HX
RC	CS	RSA-A	MDP
RC	CS	RSA-B	MDP
RC	CS	RSB-HX1C	HX
RC	CS	RSA-HX1B	HX
RC	CS	RSB-HX1D	HX
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-865A	MOV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-865B	MOV
RC	ECCS	RCS-865C	MOV
RC	RCS	RCS-VESSEL	RV
RC	RCS	RCS-PORV1	NV

Table 4-2. Partial Listing of Components by Location at Beaver Valley 1 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RC	RCS	RCS-700	MOV
RC	RCS	RCS-701	MOV
RC	RCS	RCS-PORV2	NV
RC	RCS	RCS-PORV3	NV
RC	RCS	RCS-SV1	NV
RC	RCS	RCS-SV2	NV
RC	RCS	RCS-SV3	NV
RC	RW	RSB-HX1C	HX
RC	RW	RSA-HX1A	HX
RC	RW	RSA-HX1B	HX
RC	RW	RSB-HX1D	HX
RWST	ECCS	LPI-RWST	TANK
RWST	ECCS	LPI-RWST	TANK
RWST	ECCS	LPI-RWST	TANK
SGRMAE	EP	BUS-1AE	BUS
SGRMAE	EP	BUS-1N	BUS
SGRMAE	EP	XFMR-1-8N	TRAN
SGRMAE	EP	BUS1-1	BUS
SGRMAE	EP	BUS1-3	BUS
SGRMAE	EP	INV-VB-3	INV
SGRMAE	EP	VITAL-BUS-3	BUS
SGRMAE	EP	INV-VB-1	INV
SGRMAE	EP	VITAL-BUS-1	BUS
SGRMDF	EP	BUS-1DF	BUS
SGRMDF	EP	BUS-1P	BUS
SGRMDF	EP	XFMR-1-9P	TRAN
SGRMDF	EP	BUS1-2	BUS
SGRMDF	EP	BUS1-4	BUS
SGRMDF	EP	INV-VB-4	INV
SGRMDF	EP	VITAL-BUS-2	BUS
SGRMDF	EP	VITAL-BUS-4	BUS
SGRMDF	EP	INV-VB-2	INV

Table 4-2. Partial Listing of Components by Location at Beaver Valley 1 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
SIPRMA	ECCS	HPI-1A	MDP
SIPRMB	ECCS	HPI-1B	MDP
SIPRMC	ECCS	HPI-1C	MDP
VALVEPIT	RW	RWS-116B	MOV
VALVEPIT	RW	RWS-116A	MOV
VALVEPIT	RW	RWS-116B	MOV
VALVEPIT	RW	RWS-116A	MOV

5. BIBLIOGRAPHY FOR BEAVER VALLEY 1

1. NUREG-0611, "Generic Evaluation of Feedwater Transients and Small Break Loss of Coolant Accidents in Westinghouse-designed Operating Plants", Appendix X.3, "Beaver Valley 1 Auxiliary Feedwater System", USNRC, January 1980.

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

A1. SYSTEM DRAWINGS

A1.1 Fluid System Drawings

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

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

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

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

A1.2 Electrical System Drawings

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

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

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

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

A2. SITE AND LAYOUT DRAWINGS

A2.1 Site Drawings

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

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

A2.2 Layout Drawings

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

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

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

A3. APPENDIX A REFERENCES

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

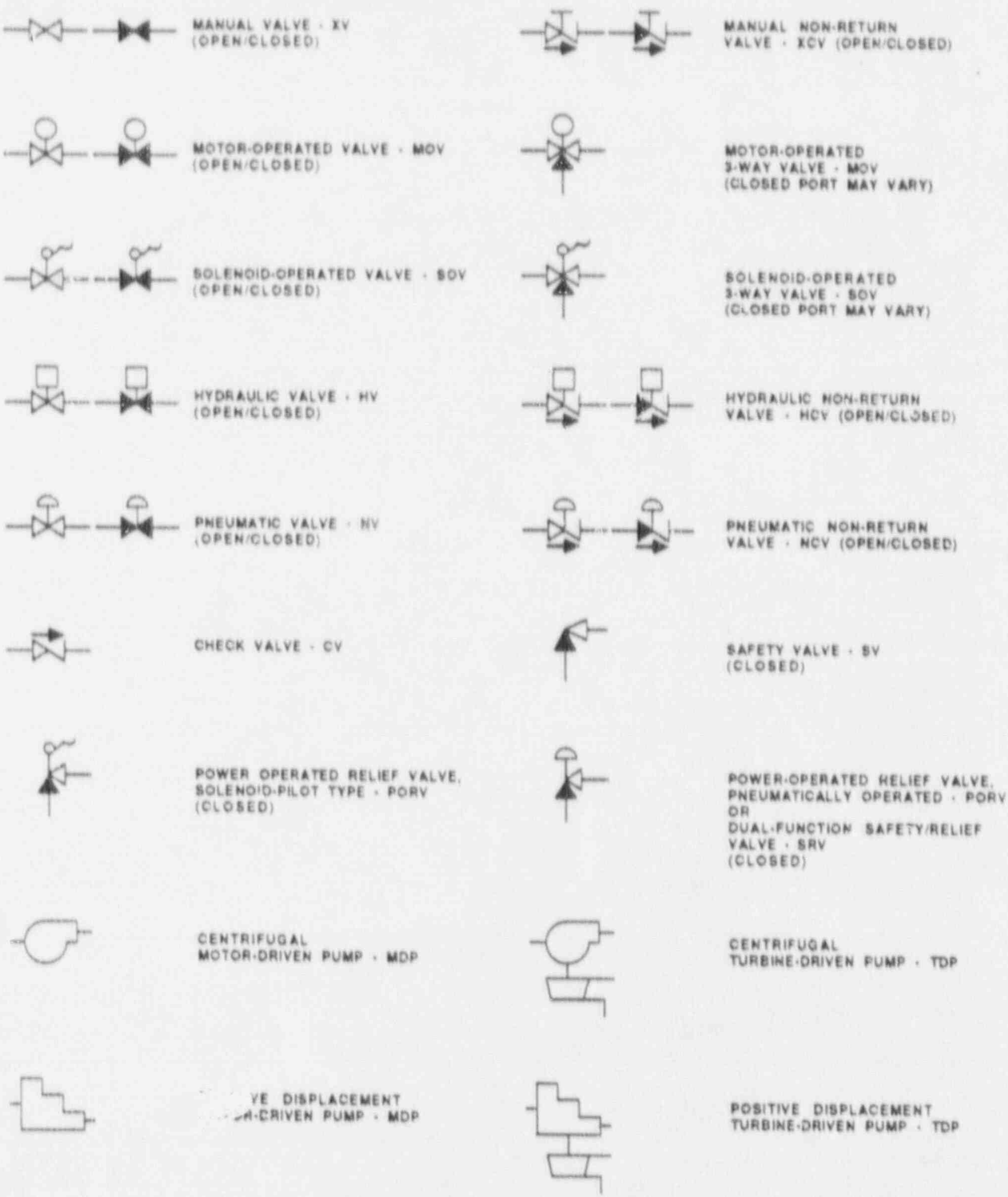

Figure A-1. Key To Symbols In Fluid System Drawings

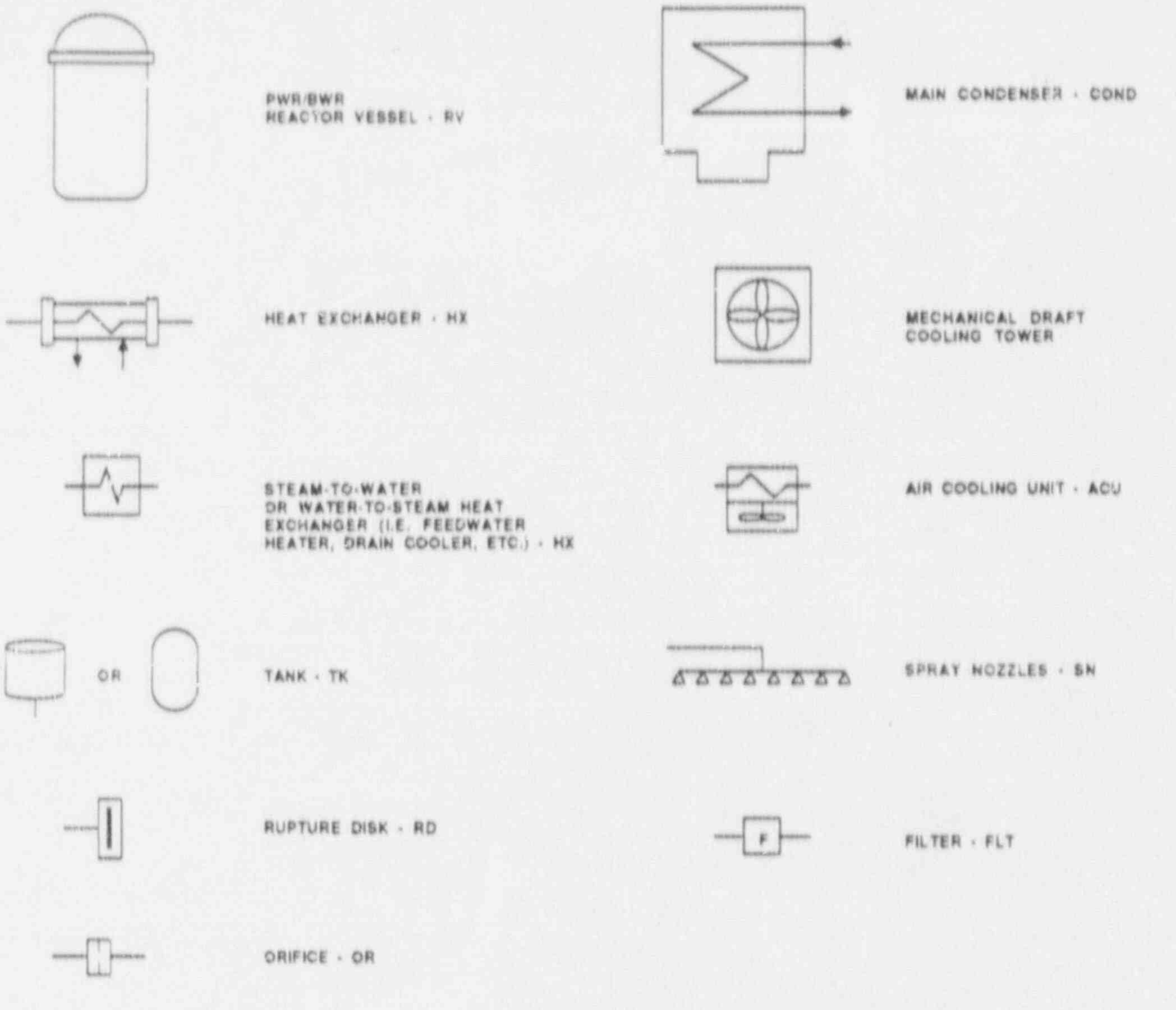

Figure A-1. Key To Symbols In Fluid System Drawings
(Continued)

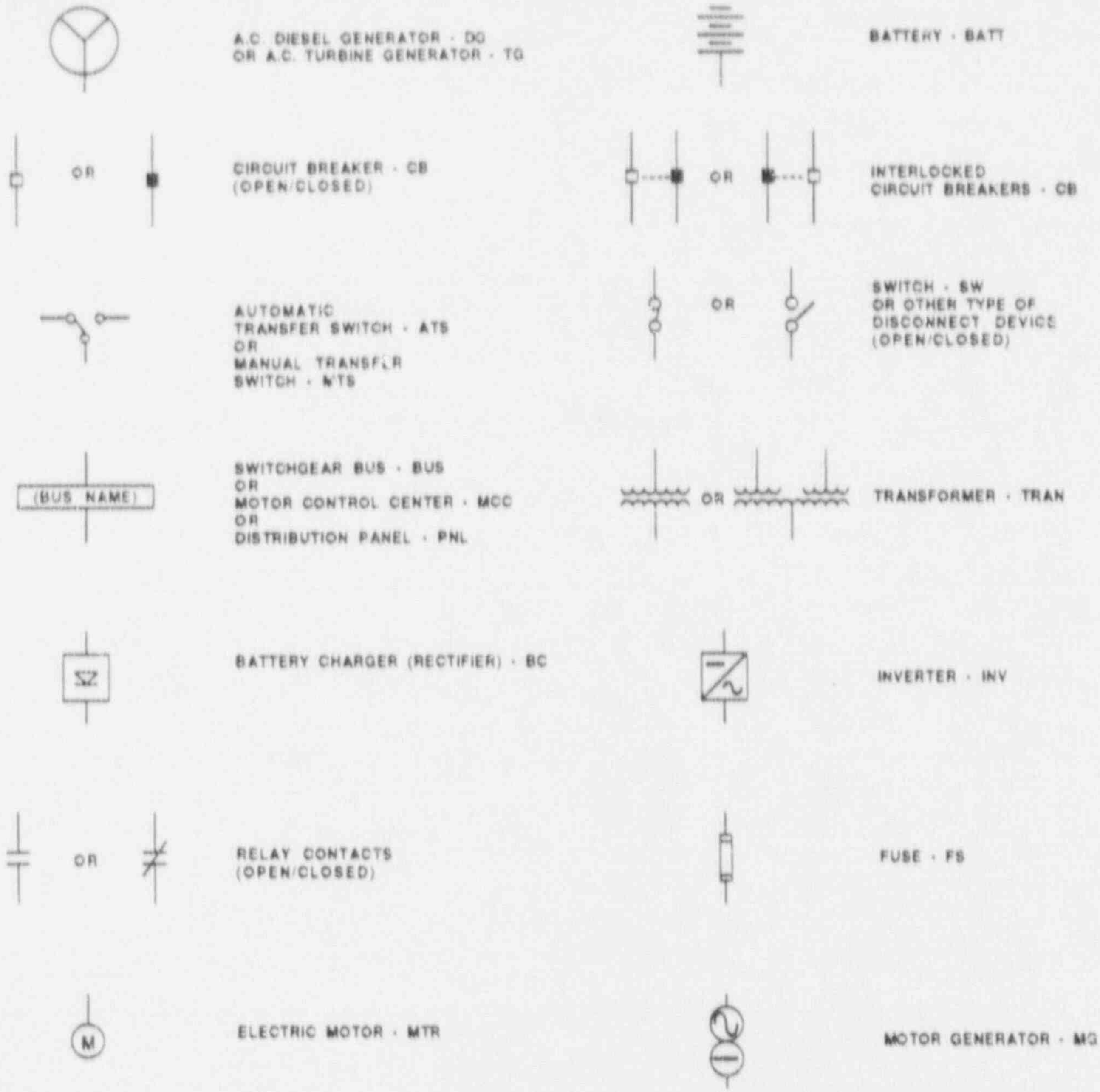

Figure A-2. Key To Symbols In Electrical System Drawings

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

APPENDIX B
DEFINITION OF TERMS USED IN THE DATA TABLES

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

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

Code	Definition
RCS	Reactor Coolant System
AFW	Auxiliary Feedwater System
ECCS	Emergency Core Cooling System (including HPSI and LPSI)
CS	Containment Spray System
EP	Electric Power System
RW	River Water System

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

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

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

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

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

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

)NENT TYPE CODES

	COMP TYPE
	MOV
ve	NV or AOV
	HV
	SOV
	XV
	CV
	NCV
	HCV
	SV
alve	SRV
	PORV
ated)	
ugal or PD)	MDP
ifugal of PD)	TDP
ugal of PD)	DDP
PONENTS:	
	RV
once-through)	SG
vater HX,	HX
	CT
	TANK or TK
	SUMP
	RD
	ORIF
	FLT
	SN
aters)	HTR
IPONENTS:	
e)	FAN
ter HX, usually	ACU or FCU
ng) unit	COND
CES:	
	DG
	GT
	BATT

1. COMPONENT TYPE CODES (Continued)

NT	COMP TYPE
OWER DISTRIBUTION EQUIPMENT:	
witchgear	BUS
ontrol center	MCC
ion panel or cabinet	PNL or CAB
mer	TRAN or XFMR
harger (rectifier)	BC or RECT
	INV
iptible power supply (a unit that may attery, battery charger, and inverter)	UPS
nerator	MG
eaker	CB
	SW
transfer switch	ATS
nsfer switch	MTS

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