NUCLEAR POWER PLANT
SYSTEM SOURCEBOOK

McGUIRE 1 AND 2

50-369, 50-370

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NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

McGUIRE 1 AND 2

50-369, 50-370

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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:

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

McGUIRE 1 & 2
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	10/89	Original report

McGUIRE 1 & 2 SYSTEM SOURCEBOOK

This sourcebook contains summary information on the McGuire 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.

1. SUMMARY DATA ON PLANT

Basic information on the McGuire 1 & 2 nuclear power plant is listed below:

- Docket number	50-369, 50-370
- Operator	Duke Power Company
- Location	Mecklenburg County, North Carolina
- Commercial operation date	12/81 (Unit 1), 3/84 (Unit 2)
- Reactor type	PWR
- NSSS vendor	Westinghouse
- Number of loops	4
- Power (MWt/MWe)	3411/1180
- Architect-engineer	Duke Power Company
- Containment type	Freestanding cylindrical steel enclosed by separate reinforced concrete reactor building

2. IDENTIFICATION OF SIMILAR NUCLEAR POWER PLANTS

The McGuire 1 and 2 plants have a Westinghouse PWR four-loop nuclear steam supply system (NSSS) and an ice-condenser containment. Other operating four-loop Westinghouse plants in the United States include:

- Braidwood 1 and 2
- Byron 1 and 2
- Callaway
- Catawba 1 and 2
- Donald C. Cook 1 and 2 (ice condenser containment)
- Diablo Canyon 1 and 2
- Haddam Neck
- Indian Point 2 and 3
- Millstone 3
- Salem 1 and 2
- Seabrook 1
- Sequoyah 1 and 2 (ice condenser containment)
- Shearon Harris 1 and 2
- South Texas 1 and 2
- Trojan
- Vogtle 1 and 2
- Watts Bar 1 and 2
- Wolf Creek
- Yankee Rowe
- Zion 1 and 2

McGuire is similar to the majority of Westinghouse plants in the number and type of auxiliary feedwater, charging, and high pressure injection pumps. However, McGuire is one of the few Westinghouse plants with an ice condenser containment.

3. SYSTEM INFORMATION

This section contains descriptions of selected systems at McGuire in terms of general function, operation, system success criteria, major components, and support system requirements. A summary of major systems at the McGuire 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 McGuire 1 & 2 Systems Covered in this Report

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Reactor Heat Removal Systems			
- Reactor Coolant System (RCS)	Same	3.1	5
- Auxiliary Feedwater (AFW) and Secondary Steam Relief (SSR) Systems	Same	3.2	7.4.1.1, 10.4.7.2.2
- Emergency Core Cooling Systems (ECCS)			
- High-Pressure Injection & Recirculation	Safety Injection System, Cold Leg and Upper Head Injection Accumulators	3.3	6.1.2, 6.3, 7.4.1.6
- Low-pressure Injection & Recirculation	Residual Heat Removal System	3.3	6.1.2, 6.3, 7.4.1.6
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Residual Heat Removal (RHR) System	3.3	5.5.7, 6.3, 7.4.1.5
- Main Steam and Power Conversion Systems	Main Steam Supply System,	X	10.3, 10.4.4
	Condenser Circulating Water System,	X	10.4.5
	Condensate and Feedwater System	X	10.4.6, 10.4.7 10.4.9
- Other Heat Removal Systems	None identified	-	-
Reactor Coolant Inventory Control Systems			
- Chemical and Volume Control System (CVCS) (Charging System)	Same	3.9	7.4.1.4, 9.3.4 9.3.5, 9.3.6
- ECCS	See ECCS, above	- -	-

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

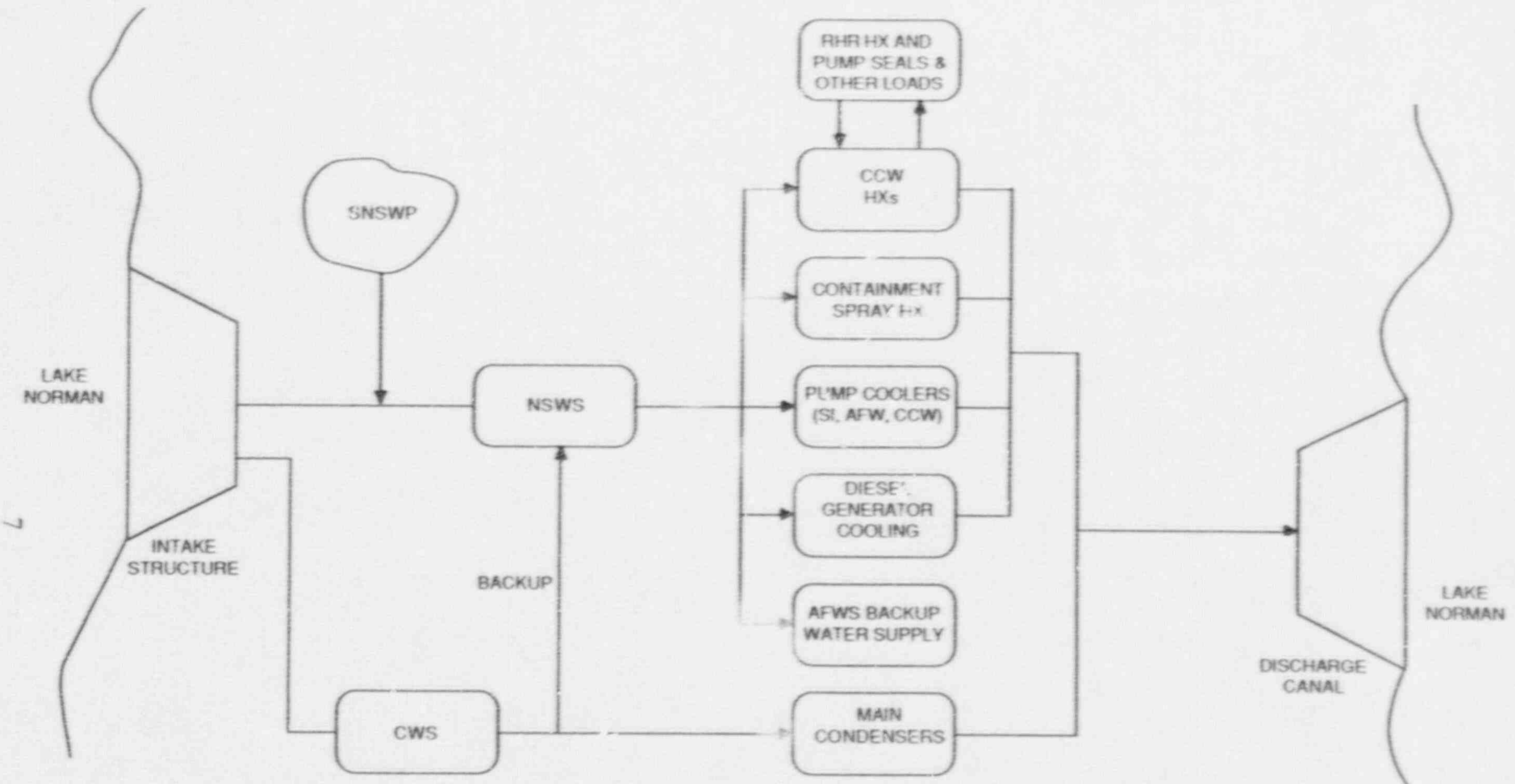
Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Containment Systems			
- Containment	Same	X	6.1.1, 6.2.1
- Containment Heat Removal Systems			
- Containment Spray System	Same	3.4	6.1.3, 6.5
- Ice Condenser System	Same	X	6.1.5, 6.2.2, 6.2.4
- Containment Fan Cooler System	Containment Air Return and Hydrogen Skimmer System	3.4	6.1.4
- Containment Normal Ventilation Systems	Containment Purge and Ventilation System,	X	9.4.5
	Annulus Ventilation System	X	6.1.8
- Combustible Gas Control Systems	Hydrogen Control System,	X	6.1.7, 6.2.5
	Supplemental Hydrogen Control System/Hydrogen Mitigation System	X	6.2.7
- Other Containment Systems	Containment Isolation System,	X	6.1.6, 6.2.4,
	Containment Air Release and Addition System	X	9.5.12
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	4
- Control Rod System	Reactivity Control System	X	4.2.3
- Boration Systems	See CVCS, above	-	-

Table 3-1. Summary of McGuire 1 & 2 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)	Same	3.5	7.2
- Engineered Safety Feature Actuation System (ESFAS)	Same	3.5	7.3
- Remote Shutdown System	Auxiliary Shutdown Control	3.5	7.4.1.7
- Other I&C Systems	Various systems	X	7.4 to 7.7
Support Systems			
- Class 1E Electric Power System	Same	3.6	8.3
- Non-Class 1E Electric Power System	Same	3.6	8.2, 8.3
- Diesel Generator Auxiliary Systems	Same	3.6	7.6.12 to 7.6.15, 9.4.6, 9.5.4 to 9.5.7, 9.5.9 to 9.5.11
- Component Cooling Water (CCW) System	Component Cooling System	3.7	9.2.4
- Service Water System (SWS)	Nuclear Service Water System	3.8	9.2.2
- Other Cooling Water Systems	Spent Fuel Cooling and Purification System,	X	9.1.3
	Recirculated Cooling Water System,	X	9.2.1
	Conventional Low Pressure Service Water System,	X	9.2.3
	Refueling Water System	X	9.2.5

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

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Support Systems (continued)			
- Fire Protection Systems	Same	X	9.5.1
- Other Water Systems	Treated Water System,	X	9.2.6
	Condensate Storage Facilities,	X	9.2.7
	Conventional Waste Water Treatment System,	X	9.2.8
	Equipment and Floor Drainage System	X	9.3.3
- Room Heating, Ventilating, and Air-Conditioning (HVAC) Systems	Same	X	9.4
- Instrument and Service Air Systems	Compressed Air Systems	X	9.3.1
- Refueling and Spent Fuel Systems	Fuel Handling and Storage	X	9.1
- Radioactive Waste Systems	Radioactive Waste Management	X	11
- Radiation Protection Systems	Same	X	12



AFWS = Auxiliary Feedwater System
CCW = Component Cooling Water System
CWS = Condenser Circulating Water System
NSWS = Nuclear Service Water System
RHR = Residual Heat Removal System
SI = Safety Injection System
SNSWP = Standby Nuclear Service Water Pond

Figure 3-1. Cooling Water Systems Functional Diagram for McGuire (Typical, Each Unit)

3.1 REACTOR COOLANT SYSTEM (RCS)

3.1.1 System Function

The RCS transfers heat from the reactor core to the secondary coolant system via the steam generators. The RCS pressure boundary also establishes a boundary against the uncontrolled release of radioactive material from the reactor core and primary coolant.

3.1.2 System Definition

The RCS includes: (a) the reactor vessel, (b) main coolant loops, (c) main coolant pumps, (d) the primary side of the steam generators, (e) pressurizer, and (f) connected piping out to a suitable isolation valve boundary. An isometric drawing of a 4-loop Westinghouse RCS is shown in Figure 3.1-1. A simplified diagram of the RCS and important system interfaces is shown in Figure 3.1-2. A summary of data on selected RCS components is presented in Table 3.1-1.

3.1.3 System Operation

During power operation, circulation in the RCS is maintained by one main coolant pump in each of the four 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 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 unmitigatible LOCA is not initiated.
- If a mitigatible LOCA is initiated, then LOCA mitigating systems are successful.
- If a transient is inititated, 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: 12040 ft^3, including pressurizer
   2. Normal operating pressure: 2235 psig

B. Pressurizer
   1. Volume: 1800 ft^3

C. Safety Valves (3)
   1. Set pressure: 2485 psig
   2. Relief capacity: 420,000 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: Vertical shell and U-Tube
   2. Model: Westinghouse 51 Series
   3. Primary-side volume: 1080 ft^3

F. Pressurizer Heaters
   1. Capacity: 1800 kW

3.1.6 Support Systems and Interfaces

A. Motive Power
   1. The 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.

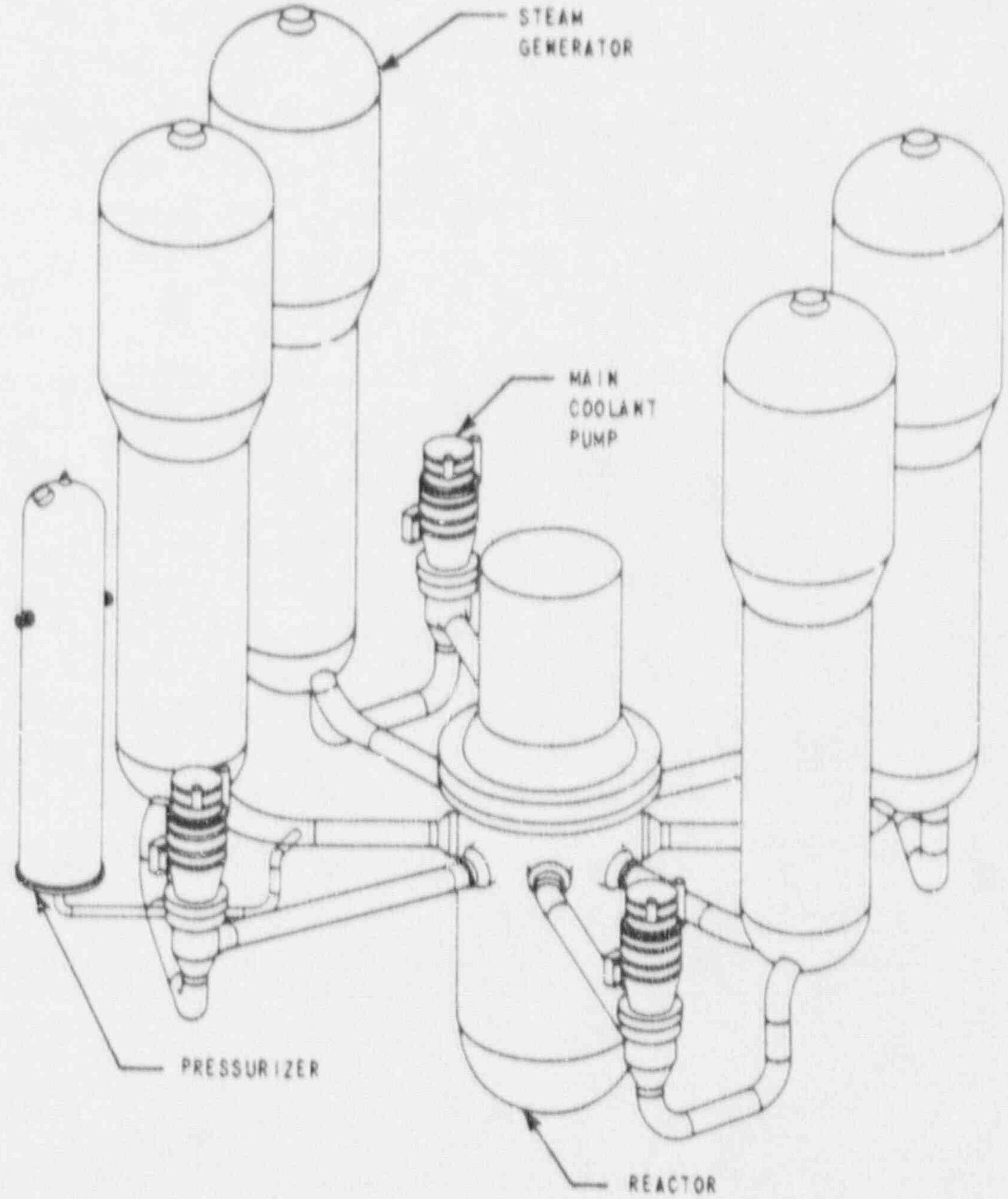


Figure 3.1-1. Isometric View of a 4-Loop Westinghouse RCS.

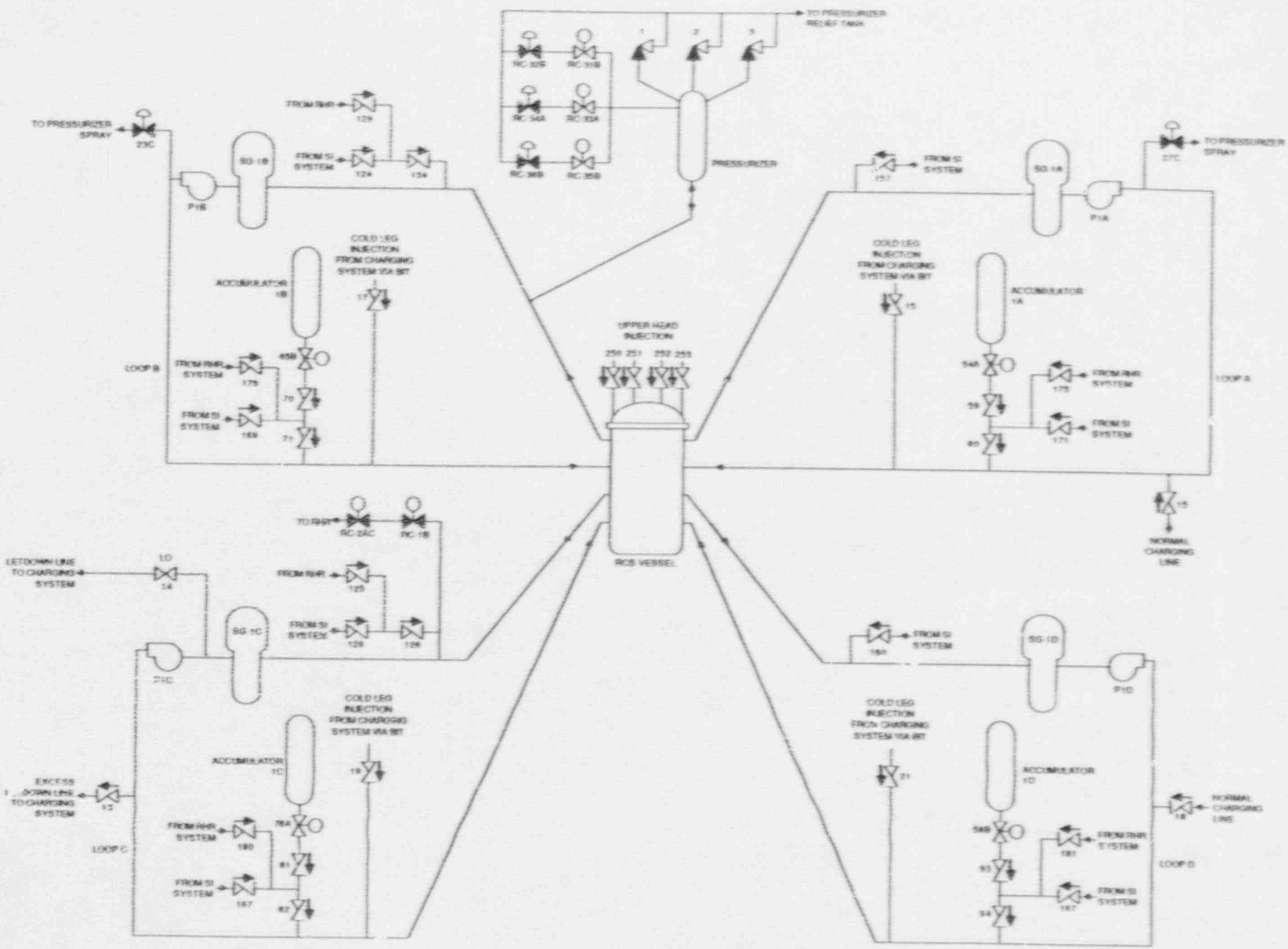


Figure 3.1-2. McGuire Unit 1 Reactor Coolant System

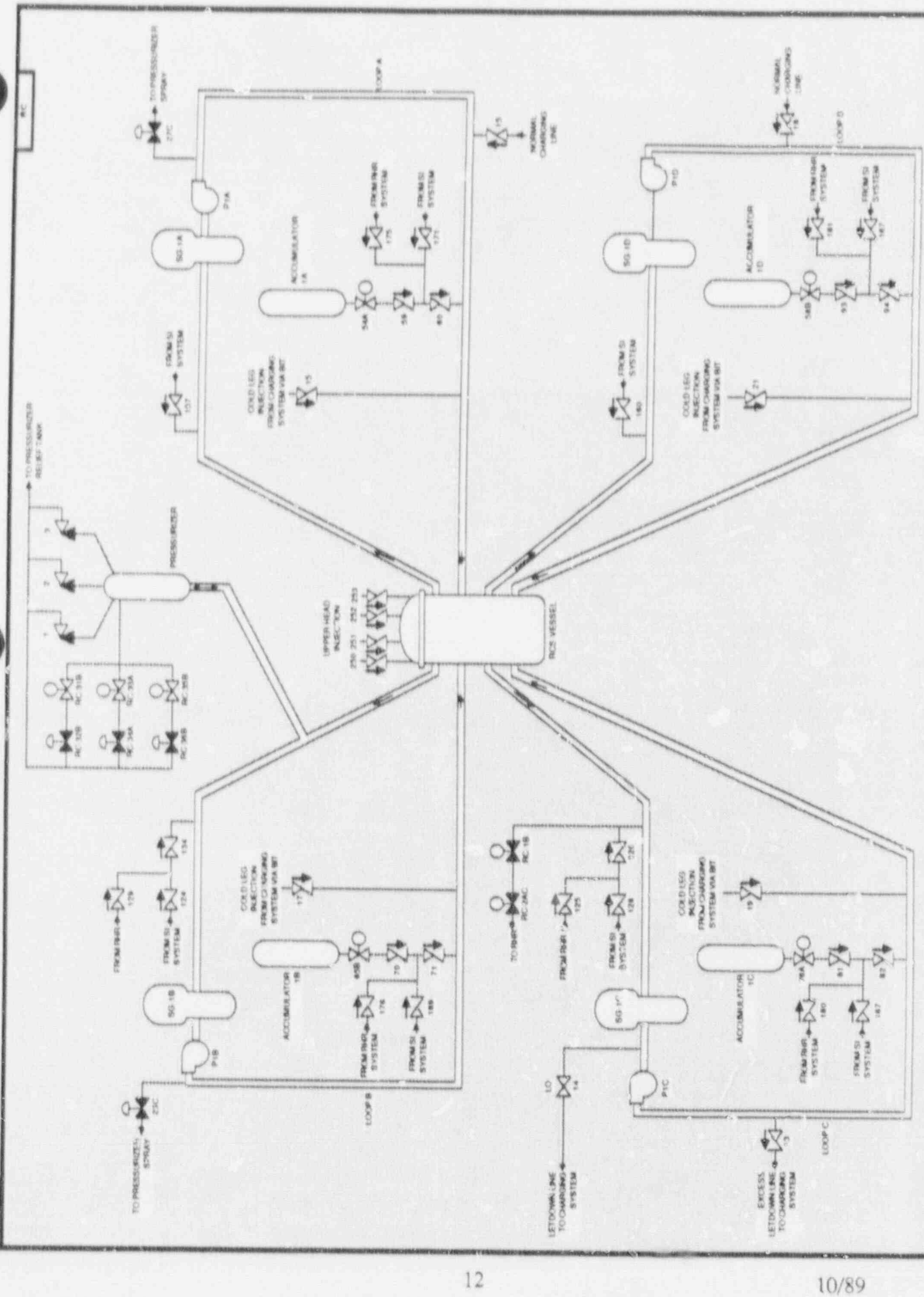


Figure 3.1-3. McGuire Unit 1 Reactor Coolant System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
HTR-PNL-1A	PNL	750EPENRM	BUS-1ELXA	600	ASWGRM	AC/A
HTR-PNL-1B	PNL	733EPENRM	BUS-1ELXB	600	BSWGRM	AC/B
RCS-1B	MOV	RC	MCC-1EMXD	600	BSWGRM	AC/B
RCS-2AC	MOV	RC	MCC-1EMXA-4	600	ASWGRM	AC/A
RCS-31B	MOV	RC	MCC-1EMXD	600	BSWGRM	AC/B
RCS-32B	NV	RC	BUS-EVDD	125	BATDISAREA	DC/D
RCS-33A	MOV	RC	MCC-1EMXC	600	ASWGRM	AC/A
RCS-34A	NV	RC	BUS-EVDA	125	BATDISAREA	DC/A
RCS-35B	MOV	RC	MCC-1EMXD	600	BSWGRM	AC/B
RCS-36B	NV	RC	BUS-EVDD	125	BATDISAREA	DC/D
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. The normal water sources for the pumps are the upper surge tank, the auxiliary feedwater condensate storage tank, and the condenser hotwell. Water will be drawn from the source producing the highest pump suction pressure. An alternate source of water is the Nuclear Service Water system. Each motor driven pump is normally aligned to supply two of four steam generators, but can be aligned to supply the other two steam generators through a crosstie containing two locked closed manual valves. The turbine-driven pump supplies all four steam generators. The turbine-driven pump receives its steam supply from two steam generators and exhausts to the atmosphere.

The SSR system includes five safety valves and one power-operated pressure control valve on each of the four main steam lines.

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

3.2.3 System Operation

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

Motor-driven pump 1A has discharge flow paths to steam generators SG 1A and SG 1D. Motor-driven pump 1B has discharge flow paths to steam generators SG 1B and SG 1C. Turbine-driven pump 1 has discharge flow paths to all four SGs. After actuation of the AFW pumps, level in the SGs is maintained manually from the control room by positioning eight flow control valves, one on each of the pump discharge flow paths. Water must be supplied to a minimum of two steam generators to maintain safe shutdown conditions. Steam is supplied to the turbine driven driven pump from either SG 1B or SG 1C.

All three AFW pumps are normally supplied from a common header which can be aligned to the 85,000 gallon upper surge tank, the 42,500 gallon auxiliary feedwater condensate storage tank, or the 170,000 condenser hotwell. Water will be drawn from the source producing the highest pump pressure. The assured source of water is from the Nuclear Service Water system. Use of this backup source is not preferred since this increases the probability that poor quality water could be inadvertently introduced into the steam generators.

When the main condenser is not available as a heat sink, reactor core decay heat is rejected to an ultimate heat sink by venting to atmosphere via five safety valves or a power-operated pressure control valve on each main steam line.

3.2.4 System Success Criteria

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

- Any one AFW pump can provide adequate flow.
- Water must be provided from at least one of the available water sources (i.e. upper surge tank, AFW condensate storage tank, condenser hotwell, or the NSW system) to the AFW pump suctions
- Makeup to any two steam generator provides adequate decay heat removal from the reactor coolant system.

The SSR system must operate to complete the heat transfer path to the environment.

3.2.5 Component Information

A. Steam turbine-driven AFW pump 1
   1. Rated flow: 900 gpm @ 3200 ft. head (1387 psid)
   2. Rated capacity: 200% (Ref. 1)
   3. Type: Horizontal centrifugal

B. Motor-driven AFW pumps 1A and 1B
   1. Rated flow: 450 gpm @ 3200 ft. head (1337 psid)
   2. Rated capacity: 100% (Ref. 1)
   3. Type: Horizontal centrifugal

C. Auxiliary feedwater condensate storage tank
   1. Capacity: 42,500 gallons

D. Secondary steam relief valves
   1. Five safety valves per main steam line
   2. One power-operated pressure control valve per main steam line

3.2.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The AFW pumps are automatically actuated based on the following signals:
      a) Turbine driven pump 1
         - 2/4 low-low water level in any 2 of 4 steam generators
         - loss of offsite power and station normal auxiliary power (blackout)
      b) Motor-driven pumps 1A and 1B
         - 2/4 low-low water level in any one steam generator
         - loss of all main feedwater pumps
         - safety injection signal
         - loss of offsite power and station normal auxiliary power (blackout).

      The water source for the AFW pumps is automatically switched to the Nuclear Service Water system on low pump suction pressure.

   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 actuated and controlled locally.

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 AFW-48ABC and AFW-49AB for the turbine-driven pump are 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 with steam from two main steam lines via supply headers upstream of the main steam isolation valves.

C. Other
1. The motor-driven AFW pumps are cooled by the Nuclear Service Water (NSW) system (see Section 3.8).
2. The NSW system provides a backup source of water for the AFW pumps (see Section 3.8).
3. Lubrication is assumed to be provided locally for pumps, pump motors, and the turbine drive.
4. Source of AFW pump room cooling has not been determined.

3.2.7 Section 3.2 References

1. McGuire Final Safety Analysis Report, Section 10.4.7.2.2.

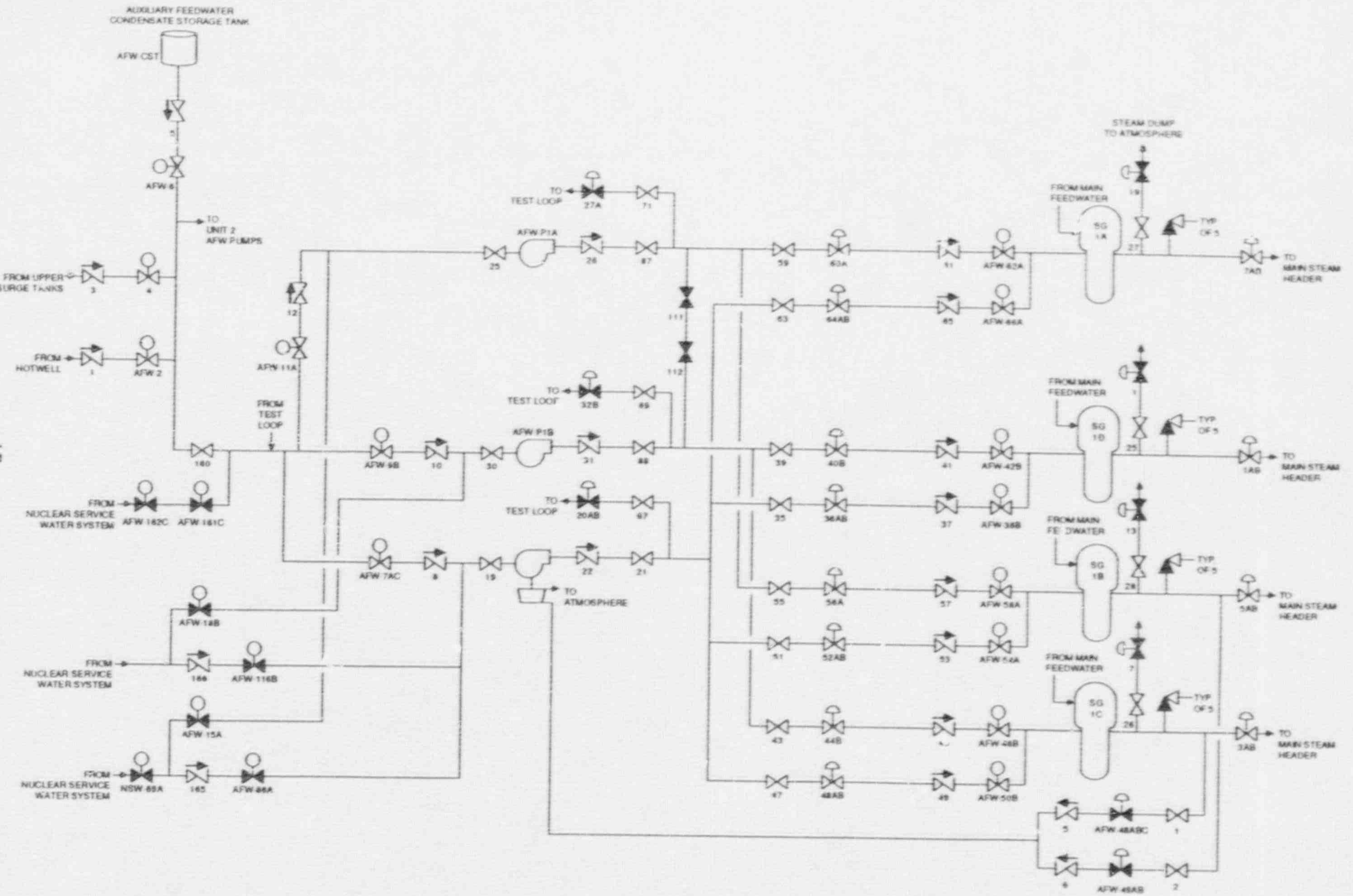


Figure 3.2-1. McGuire Unit 1 Auxiliary Feedwater System

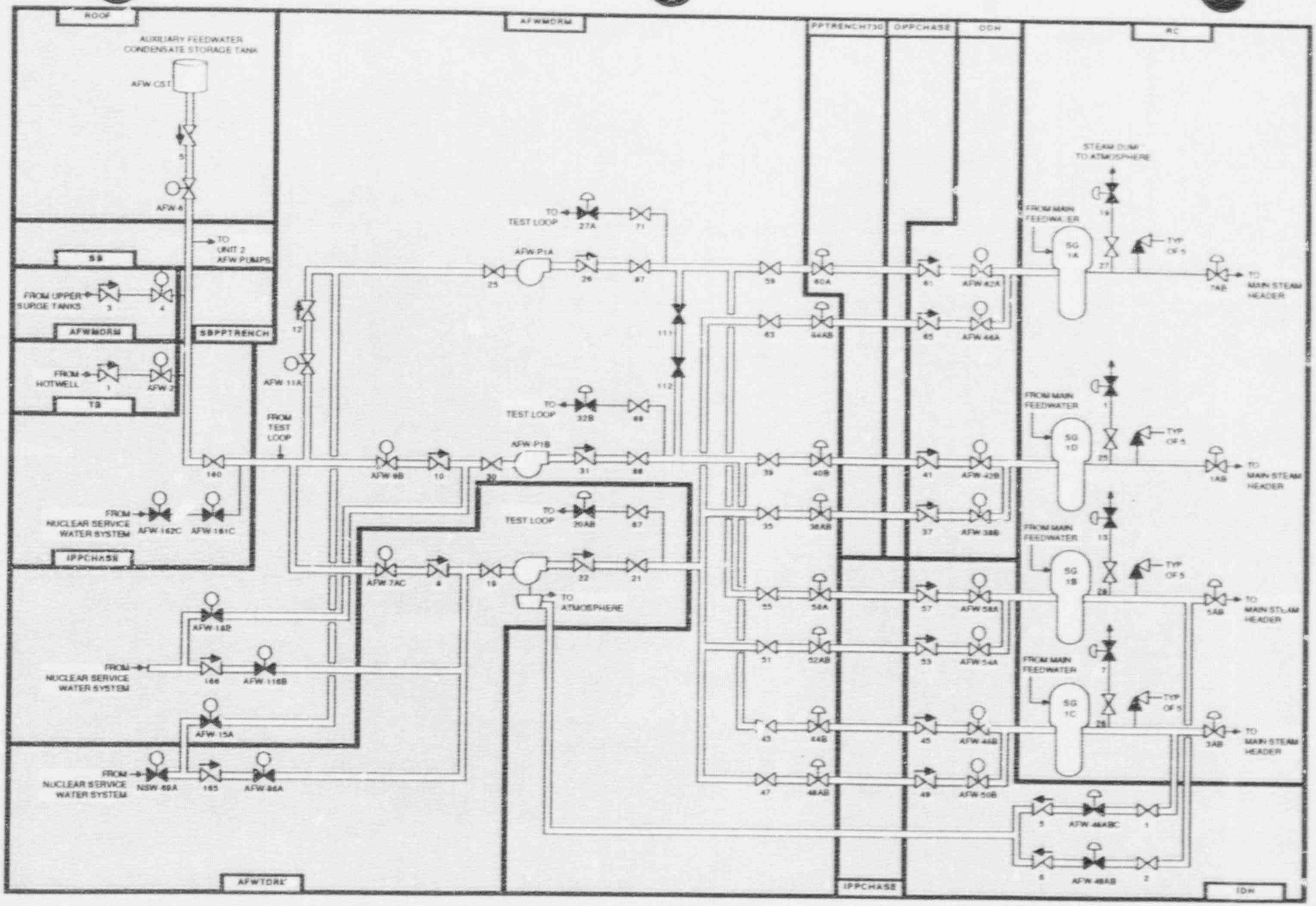


Figure 3.2-2. McGuire Unit 1 Auxiliary Feedwater System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
AFW-116B	MOV	AFWMDRM	MCC-1EMXB	600	ELEQRM722	AC/B
AFW-11A	MOV	AFWMDRM	MCC-1EMXA	600	MCCRM	AC/A
AFW-15A	MOV	AFWMDRM	MCC-1EMXA	600	MCCRM	AC/A
AFW-161C	MOV	IPPCHASE				
AFW-162C	MOV	IPPCHASE				
AFW-18B	MOV	AFWMDRM	MCC-1EMXB	600	ELEQRM722	AC/B
AFW-2	MOV	TB				
AFW-38B	MOV	ODH	MCC-1EMXB	600	ELEQRM722	AC/B
AFW-42B	MOV	ODH	MCC-1EMXB	600	ELEQRM722	AC/B
AFW-46B	MOV	IDH	MCC-1EMXB-2	600	ELEQRM722	AC/B
AFW-48ABC	NV	IDH				
AFW-49AB	NV	IDH				
AFW-50B	MOV	IDH	MCC-1EMXB-2	600	ELEQRM722	AC/B
AFW-54A	MOV	IDH	MCC-1EMXA	600	MCCRM	AC/A
AFW-58A	MOV	IDH	MCC-1EMXA	600	MCCRM	AC/A
AFW-6	MOV	ROOF	MCC-1MXC	600	MCC1MXC	
AFW-62A	MOV	ODH	MCC-1EMXA	600	MCCRM	AC/A
AFW-66A	MOV	ODH	MCC-1EMXA	600	MCCRM	AC/A
AFW-7A	MOV	AFWTDRM	MCC-1EMXA	600	MCCRM	AC/A
AFW-86A	MOV	AFWTDRM	MCC-1EMXA	600	MCCRM	AC/A
AFW-9B	MOV	AFWMDRM	MCC-1EMXB	600	ELEQRM722	AC/B
AFW-CST	TANK	CST				
AFW-P1	TDP	AFWTDRM				
AFW-P1A	MDP	AFWMDRM	BUS-1ETA	4160	ASWGRM	AC/A
AFW-P1B	MDP	AFWMDRM	BUS-1ETB	4160	BSWGRM	AC/B
NSW-147AC	MOV	AFWMDRM	MCC-1EMXH-1	600	750EPENRM	AC/A
NSW-148A	MOV	AFWMDRM	MCC-1EMXH	600	MCC1EMXH	AC/A

Table 3.2-1. McGuire 1 Auxiliary Feedwater System Data Summary for Selected Components (continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
NSW-69A	MOV	AFWTDRM	MCC-1EMXA	600	MCCRM	AC/A
SG-1A	SG	RC				
SG-1B	SG	RC				
SG-1C	SG	RC				
SG-1D	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:

- Passive cold leg and upper head injection accumulators
- Charging system (CVCS)
- Safety injection (SI) system
- Residual heat removal (RHR) system

The charging function of the CVCS is described in Section 3.9.

The SI system provides high pressure coolant injection capability. The RHR pumps perform the low pressure injection function. The Refueling Water Storage Tank (RWST) is the water source for both the high and low pressure injection systems. Both systems inject coolant into all four RCS cold legs. The SI system can also inject into all four hot legs, while the RHR system can inject into two hot legs

After the injection phase is completed, recirculation (ECR) is performed by the RHR pumps drawing suction from the containment sump and discharging into the RCS cold legs. Heat is transferred to the component cooling water system by the RHR heat exchangers.

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

3.3.3 System Operation

During normal operation, the ECCS is in standby. Following a LOCA, the four cold leg injection accumulators (one for each loop) and the upper head injection accumulator will supply borated water to the RCS as soon as RCS pressure drops below accumulator pressure (about 427 psig and 1220 psig, respectively). A safety injection signal (SIS) automatically starts the two charging pumps, the two safety injection pumps, and the two RHR pumps, and aligns the charging pumps for injection. The charging pumps inject through the boron injection tank (BIT) into four RCS cold legs. (In Unit 2 the BIT has been eliminated, so charging flow goes directly into the cold legs.) The SI and RHR pumps can inject into either the cold legs or the hot legs. All pumps are aligned to take suction on the RWST.

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 cold legs. If depressurization of the RCS proceeds slowly, high pressure recirculation can be accomplished by aligning the discharge of the RHR pumps to the suction of the charging and SI pumps. In accordance with emergency operating procedures, approximately 15 hours after the switchover to recirculation, hot leg recirculation is initiated to ensure termination of boiling and preclude excessive boron concentration in the reactor vessel.

During recirculation a portion of the RHR flow can be directed to auxiliary containment spray headers to supplement the Containment Spray system.

3.3.4 System Success Criteria

LOCA mitigation both the emergency coolant injection and emergency coolant recirculation functions to be accomplished. ECI and ECR system success criteria are not clearly stated in the McGuire FSAR, however, the following is noted:

- Only the centrifugal charging pumps are capable of providing ECCS makeup at normal RCS pressure (2235 psig). Shutoff head for the SI pumps is 1520 psig.
- A 0.375 inch diameter break is the maximum break size for which the normal makeup system can maintain the pressurizer level and the normal RCS pressure of 2235 psig. For a break of this size, one centrifugal charging pump is adequate to sustain an RCS pressure of 2235 psig.
- Small LOCAs include breaks with equivalent diameters less than or equal to 6 inches. This break size will not depressurize the RCS to below the cold leg accumulator pressure.
- For a small break LOCA one train of the ECCS high-head pumps (centrifugal charging and SI pumps) and the UHI accumulators provide sufficient core flooding.
- For a large break LOCA in which the break is in one injection path, adequate core flooding is provided by 3 of 4 cold leg accumulators, the UHI accumulators, and one train of ECCS pumps (SI, RHR, and centrifugal charging pumps).
- Emergency coolant recirculation can only be established by the RHR pumps which can be aligned to the containment sump. Low pressure recirculation (i.e. following a large LOCA) can be accomplished by one RHR pump. High pressure recirculation (i.e. following a small LOCA) requires that an RHR pump be aligned to deliver water from the sump to a high-head pump suction (i.e. a centrifugal charging pump and/or the SI pump, as appropriate based on leak size).

3.3.5 Component Information

A. Safety injection (high pressure) pumps 1A and 1B
   1. Rated flow: 400 gpm @ 2600 ft head (1127 psid)
   2. Rated capacity: 100%
   3. Discharge pressure at shutoff head: 1520 psig
   4. Type: horizontal centrifugal

B. Centrifugal charging pumps (see Section 3.9)

C. Residual heat removal (low pressure) pumps 1A and 1B
   1. Rated flow: 3000 gpm @ 375 ft. head (162 psid)
   2. Rated capacity: 100%
   3. Type: vertical centrifugal

D. Cold leg injection accumulators (4)
   1. Accumulator volume: 1350 ft^3
   2. Minimum water volume: 950 ft^3
   3. Normal operating pressure: 427 psig
   4. Nominal boric acid concentration: 2000 ppm

E. Upper head injection accumulator
   1. Accumulator volume: 1850 ft^3
   2. Normal operation pressure: 1220 to 1280 psig
   3. Nominal boric acid concentration: 200 ppm

F. Refueling water storage tank
   1. Capacity: 372,100 gallons
   2. Design Pressure: Atmospheric
   3. Minimum Boron Concentration: 1900 ppm

G. RHR heat exchangers 1A and 1B
   1. Design duty: 35.14 x 10^6 Btu/hr
   2. Type: Vertical, shell and U-tube

3.3.6 Support Systems and Interfaces

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

      a. Low pressurizer pressure
      b. High containment pressure
      c. Low steam line pressure
      d. Manual actuation

      The SIS automatically initiates the following actions:

      - starts the diesel generators
      - starts the charging, SI, and RHR pumps
      - aligns the charging pumps for injection

      Switchover to the recirculation mode occurs automatically on low level in the RWST.

   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 can be initiated by remote manual means.

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 SI, RHR, and charging pump is cooled from redundant supplies from Nuclear Service Water System headers "A" and "B" (see Section 3.8).
   2. Lubrication is assumed to be provided locally for the SI, RHR, and charging pumps and motors.
   3. Systems for ECCS pump room cooling have not been identified.

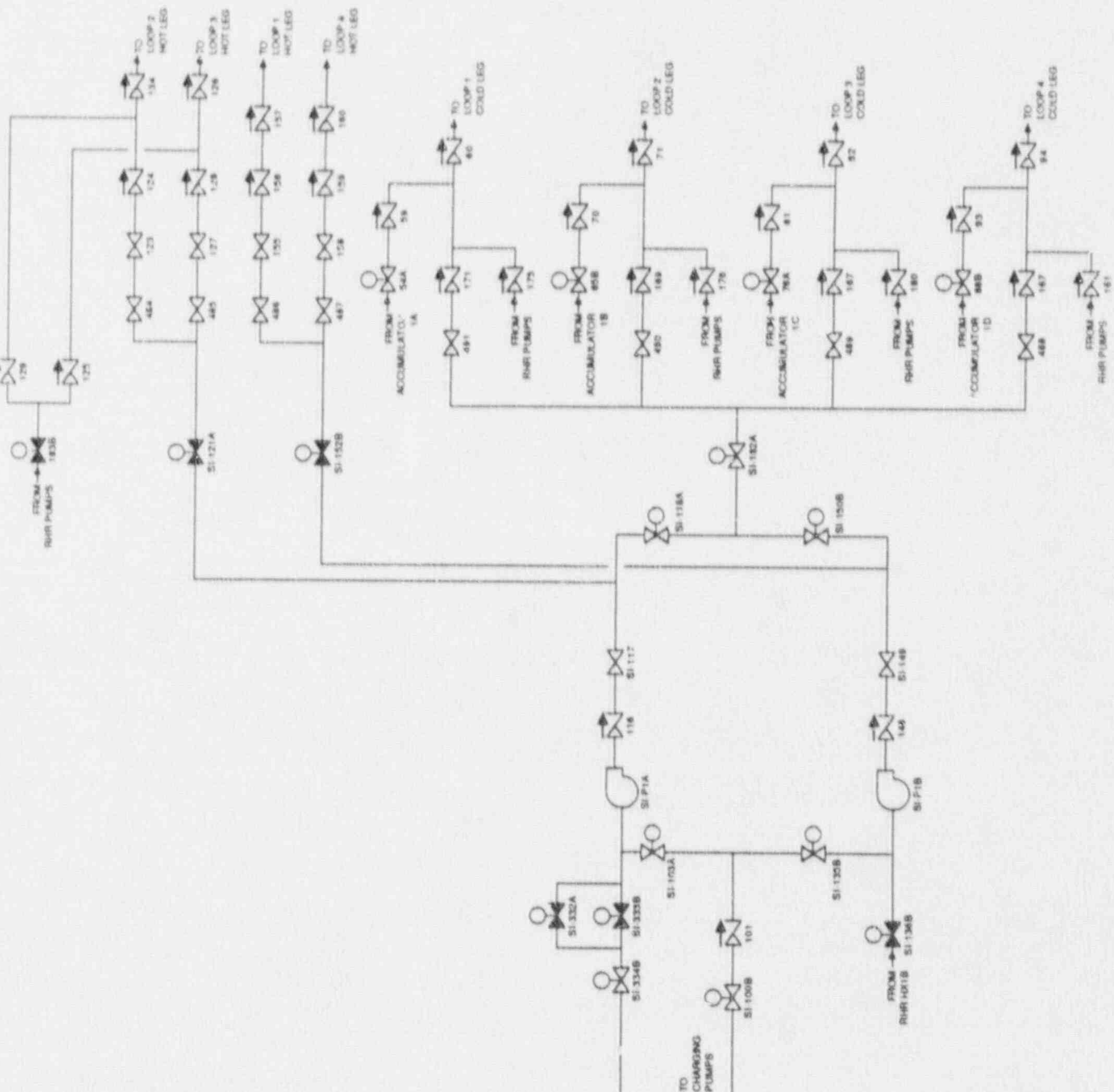


Figure 3.3-1. McGuire Unit 1 High Pressure Injection System

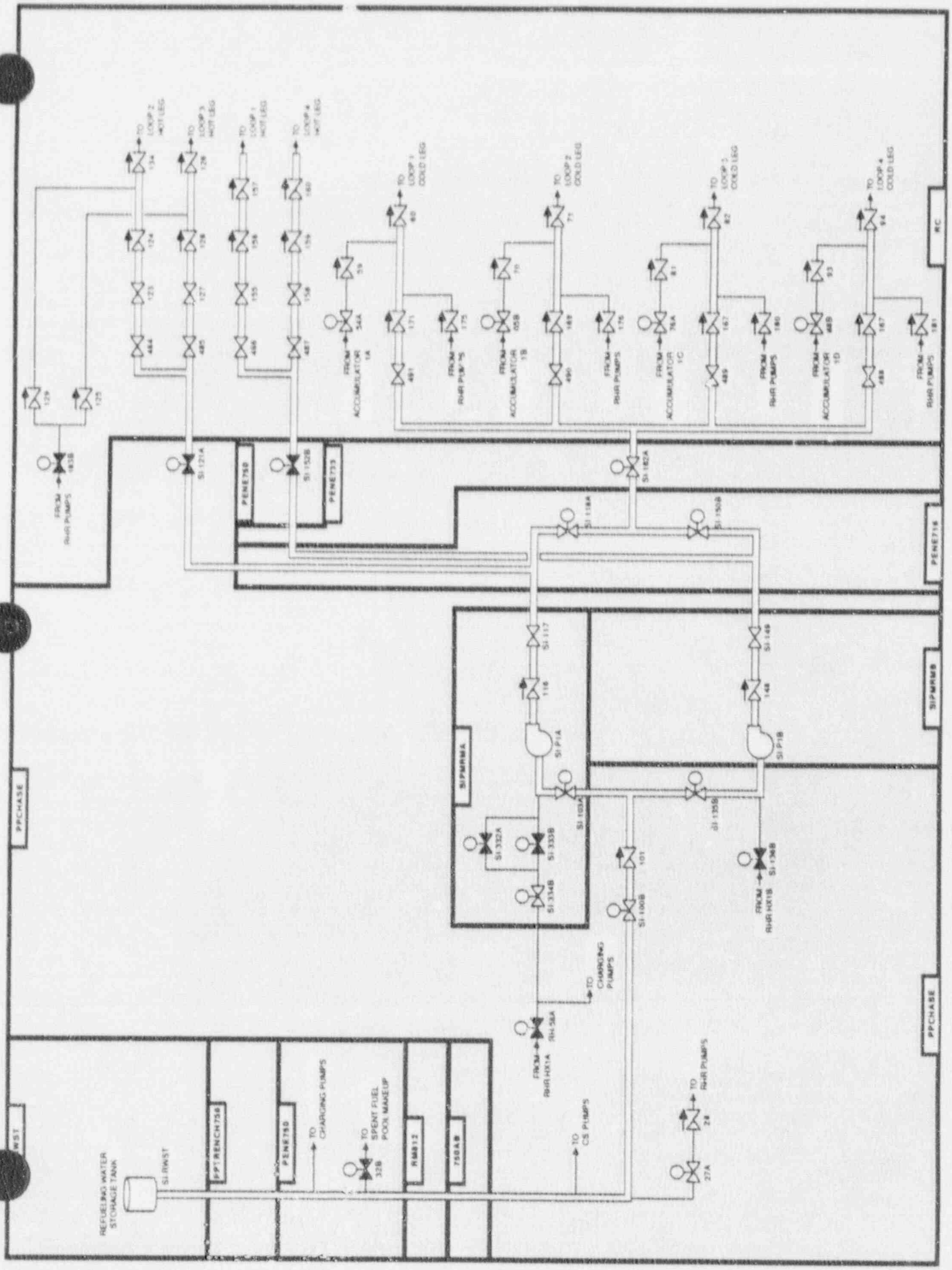


Figure 3.3-2. McGuire Unit 1 High Pressure Injection System Showing Component Locations

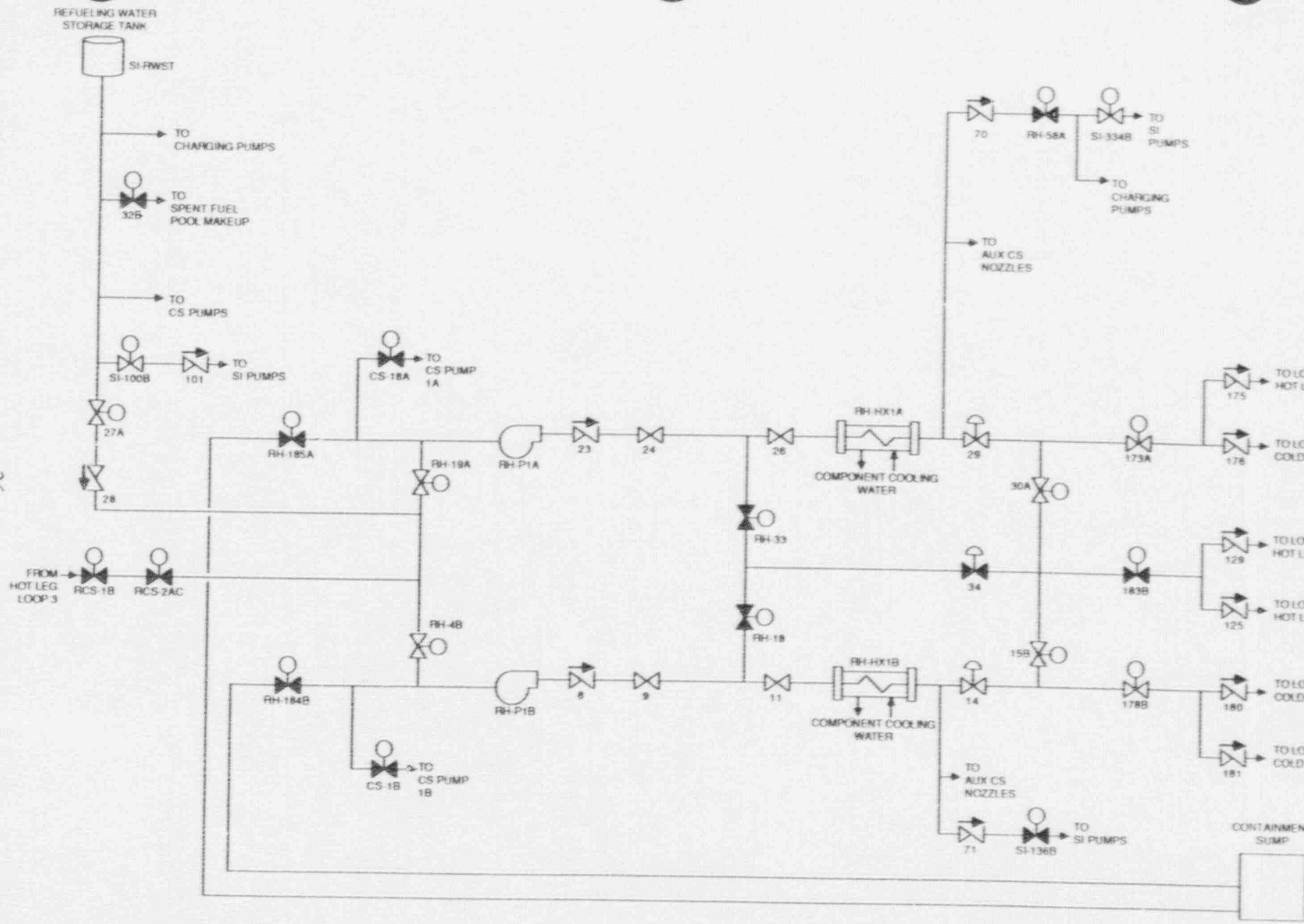


Figure 3.3-3. McGuire Unit 1 Low Pressure Injection/Recirculation System

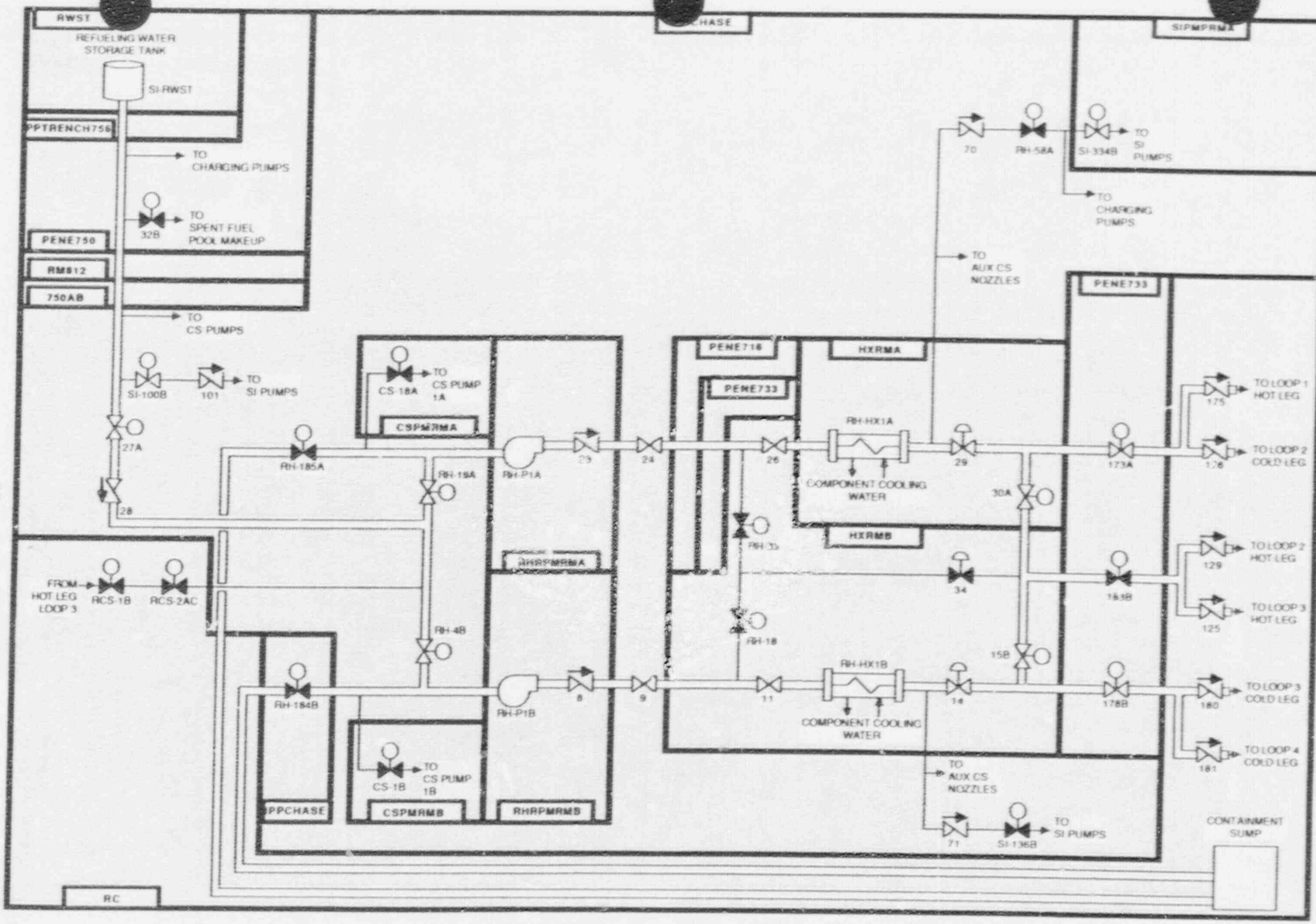


Figure 3.3-4. McGuire Unit 1 Low Pressure Injection/Recirculation System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RH-18	MOV	HXRMB	MCC-SMXB	600	MCCSMXB	
RH-18	MOV	HXRMB	MCC-SMXB	600	MCCSMXB	
RH-184B	MOV	IPPCHASE	MCC-1EMXB-1	600	ELEQRM722	AC/B
RH-185A	MOV	PPCHASE	MCC-1EMXA	600	MCCRM	AC/A
RH-19A	MOV	PPCHASE	MCC-1EMXA	600	MCCRM	AC/A
RH-33	MOV	HXMRB	MCC-SMXB	600	MCCSMXB	
RH-33	MOV	HXRMB	MCC-SMXB	600	MCCSMXB	
RH-4B	MOV	PPCHASE	MCC-1EMXB-1	600	ELEQRM722	AC/B
RH-58A	MOV	PPCHASE	MCC-1EMXA	600	MCCRM	AC/A
RH-HX1A	HX	HXRMA				
RH-HX1B	HX	HXRMB				
RH-P1A	MDP	RHRPMRMA	BUS-1ETA	4160	ASWGRM	AC/A
RH-P1B	MDP	RHRPMRMB	BUS-1ETB	4160	BSWGRM	AC/B
SI-100B	MOV	PPCHASE	MCC-1EMXB-1	600	ELEQRM722	AC/B
SI-103A	MOV	SIPMRMA	MCC-1EMXA-1	600	MCC1EMXA-1	AC/A
SI-117	XV	SIPMRMA				
SI-118A	MOV	PENE716	MCC-1EMXA-1	600	MCC1EMXA-1	AC/A
SI-121A	MOV	PPCHASE	MCC-1EMXA	600	MCCRM	AC/A
SI-135B	MOV	PPCHASE	MCC-1EMXB-1	600	ELEQRM722	AC/B
SI-136B	MOV	PPCHASE	MCC-1EMXB-1	600	ELEQRM722	AC/B
SI-149	XV	SIPMRMB				
SI-150B	MOV	PENE716	MCC-1EMXB-1	600	ELEQRM722	AC/B
SI-152B	MOV	PENE750	MCC-1EMXB-1	600	ELEQRM722	AC/B
SI-162A	MOV	PENE733	MCC-1EMXA	600	MCCRM	AC/A
SI-332A	MOV	SIPMRMA	MCC-1EMXA-1	600	MCC1EMXA-1	AC/A
SI-333B	MOV	SIPMRMA	MCC-1EMXB-1	600	ELEQRM722	AC/B
SI-334B	MOV	SIPMRMA	MCC-1EMXB-1	600	ELEQRM722	AC/B

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
SI-P1A	MDP	SIPMRMA	BUS-1ETA	4160	ASWGRM	AC/A
SI-P1B	MDP	SIPMRMB	BUS-1ETB	4160	BSWGRM	AC/B
SI-RWST	TANK	RWST				
SUMP	TANK	SUMP				

3.4 POST-ACCIDENT HEAT REMOVAL SYSTEM (PAHRS)

3.4.1 System Function

The PAHRS is an integrated set of subsystems that provide the functions of containment heat removal and containment pressure control following a loss of coolant accident. In conjunction with the ECCS, the PAHRS completes the post-LOCA heat transfer path from the reactor core to the ultimate heat sink. The Containment Spray System, a subsystem of the PAHRS, also serves to remove elemental iodine from the containment atmosphere.

3.4.2 System Definition

The PAHRS consists of two seperate subsystems:

- Ice Condenser System
- Containment Spray (CS) system

The ice condenser is a passive system designed to limit the containment pressure below the design pressure for all reactor coolant pipe break sizes up to and including a double-ended coolant pipe break. The Containment Spray system sprays cool water into the containment atmosphere in the event of a LOCA. The CS system is designed based on the conservative assumption that core residual heat is continuously released to the containment as steam, eventually melting all of the ice in the ice condenser (Ref. 1).

The Containment Spray system consists of two parallel trains, each consisting of a motor driven pump and a heat exchanger. During the injection phase of LOCA mitigation the CS pumps draw suction from the RWST. During recirculation the CS pumps draw from the containment sump. Heat is transferred to the Nuclear Service Water system by the CS heat exchangers.

The CS system can be supplemented by diverting a portion of the recirculation flow from the RHR system to additional spray headers.

Simplified drawings of the Containment Spray system are shown in Figures 3.4-1 and 3.4-2.

3.4.3 System Operation

The Containment Spray system consists of two pumps, each supplying two spray headers located in the containment dome area. The spray system will be actuated by high-high containment pressure. During the injection phase a portion of the contents of the RWST are sprayed into the containment atmosphere by the CS pumps. Following the injection phase the spray pumps are realigned to draw suction from the containment sump during recirculation.

3.4.4 Component Information

A. Containment Spray Pumps 1A and 1B
   1. Rated flow: 3400 gpm @ 380 ft head
   2. Rated capacity: 100%
   3. Shutoff head: 480 ft., or 208 psig at 60°F
   4. Type: vertical centrifugal

B. Containment Spray Heat Exchangers 1A and 1B
   1. Type: Shell and U-tube

3.4.5 Support Systems and Interfaces

A. Control Signals
  1. Automatic
     The containment spray system is automatically actuated on 2 of 4 high-high containment pressure signals.
  2. Remote manual
     The containment spray system can be actuated by remote manual means from the 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 CS heat exchangers are cooled by the Nuclear Service Water system (see Section 3.8).

D. Other
  1. Lubrication and pump cooling are assumed to be provided locally for the CS pumps.
  2. Systems for pump room cooling have not been identified.

3.4.6 Section 3.4 References

1. McGuire Final Safety Analysis Report, Section 6.1

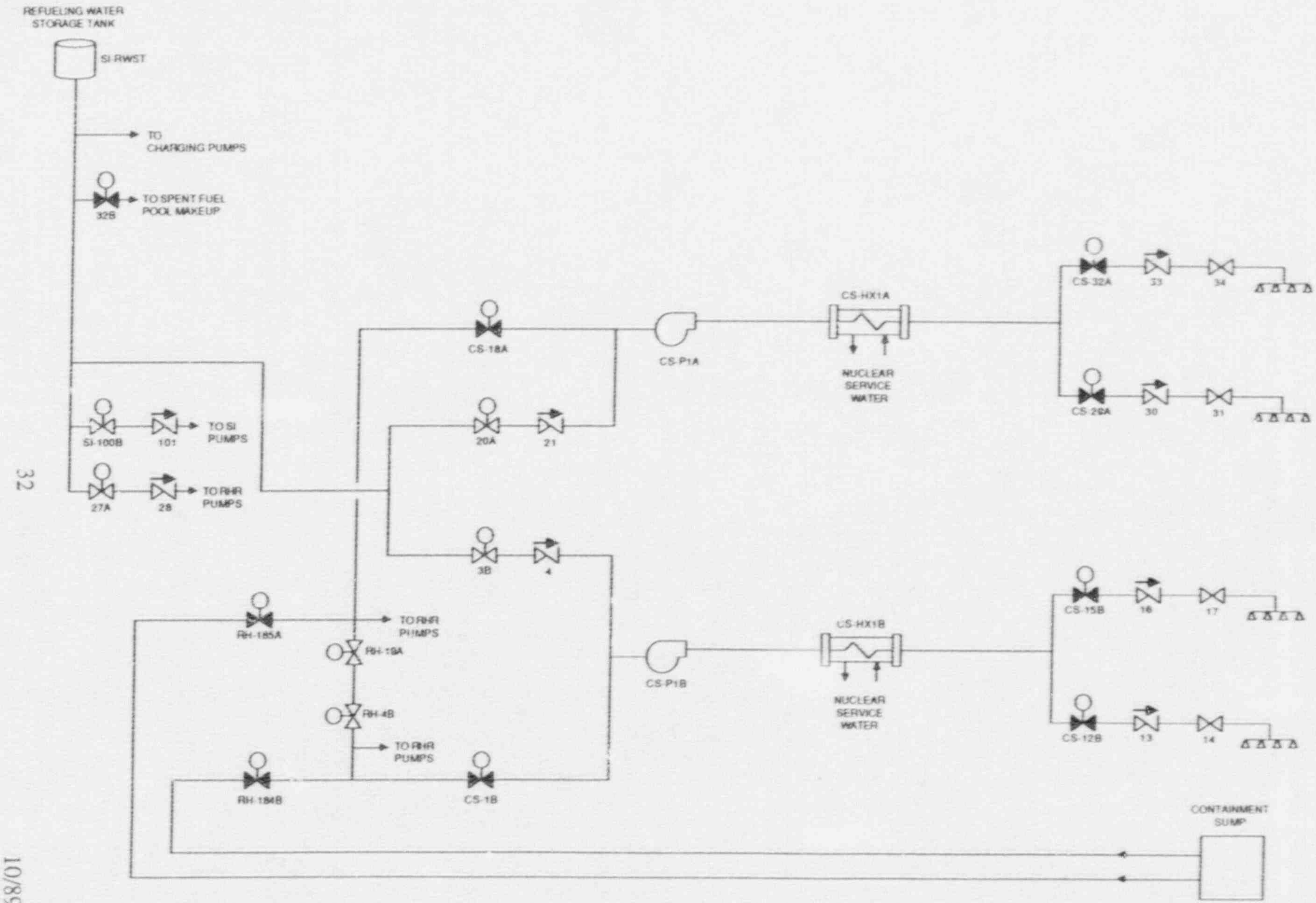


Figure 3.4-1. McGuire Unit 1 Containment Spray System

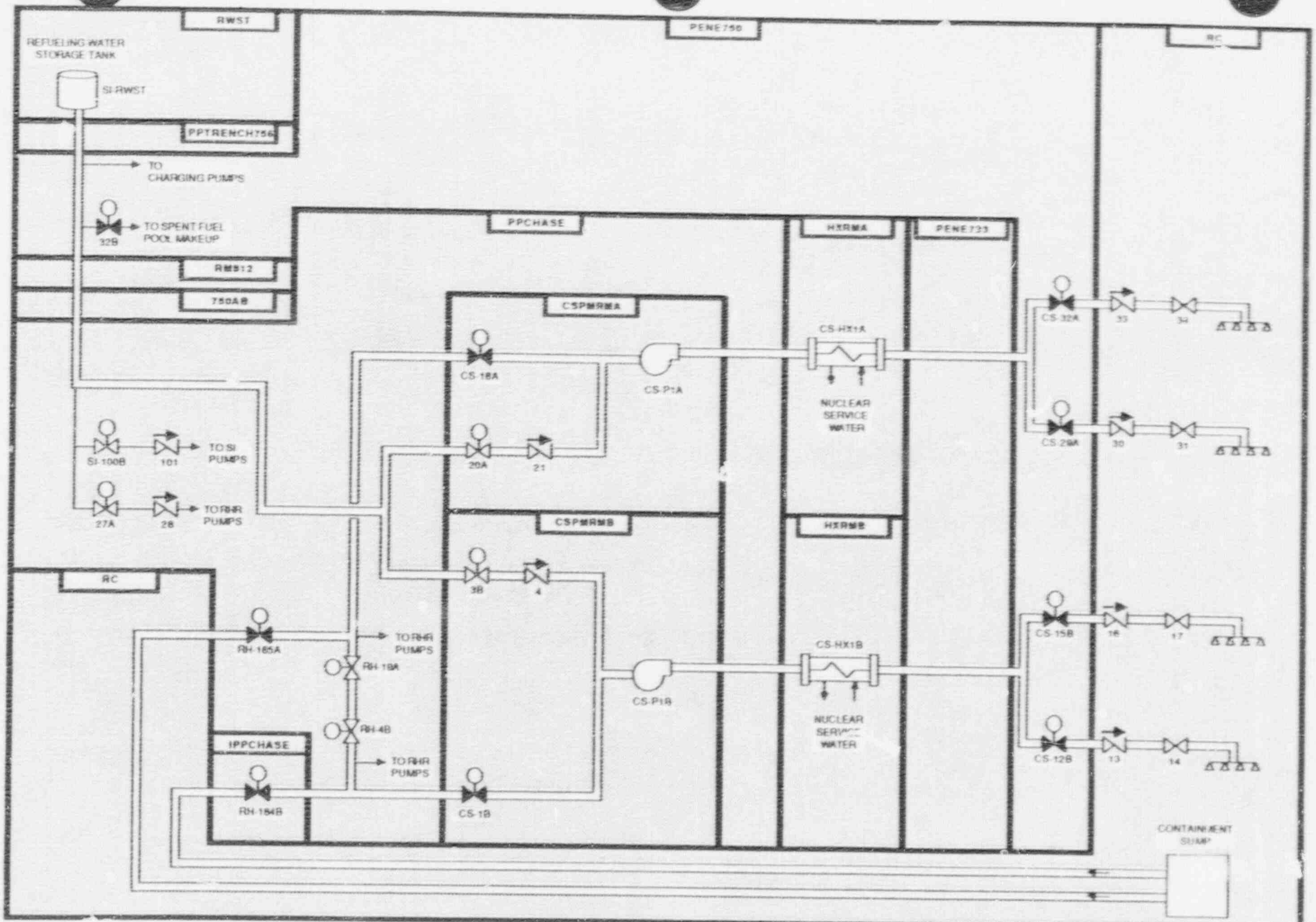


Figure 3.4-2. McGuire Unit 1 Containment Spray System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CS-12B	MOV	PENE750	MCC-1EMXB-2	600	ELEQRM722	AC/B
CS-15B	MOV	PENE750	MCC-1EMXB-2	600	ELEQRM722	AC/B
CS-18A	MOV	CSPMRMA	MCC-1EMXA	600	MCCRM	AC/A
CS-1B	MOV	CSPMRMB	MCC-1EMXB-1	600	ELEQRM722	AC/B
CS-29A	MOV	PENE750	MCC-1EMXA	600	MCCRM	AC/A
CS-32A	MOV	PENE750	MCC-1EMXA	600	MCCRM	AC/A
CS-HX1A	HX	HXRMA				
CS-HX1B	HX	HXRMB				
CS-P1A	MDP	CSPMRMA	BUS-1ETA	4160	ASWGRM	AC/A
CS-P1B	MDP	CSPMRMB	BUS-1ETB	4160	BSWGRM	AC/B

3.5 INSTRUMENTATION AND CONTROL SYSTEM (I & C)

3.5.1 System Function

The instrumentation and control systems consist of the Reactor Protection System (RPS), the Engineered Safety Features Actuation System (ESFAS), and systems for the display of plant information to the operators. The RPS 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 condition in the event that the main control room must be evacuated.

3.5.2 System Definition

The RPS includes sensor and transmitter units, logic units, and output trip relays that operate reactor trip circuit breakers to cause a reactor scram. The 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. Operator instrumentation display systems consist of display panels in the control room that are powered by the 120 VAC electric power system (see Section 3.6). The remote shutdown capability is provided by the auxiliary shutdown control panel and the auxiliary feedwater control panels in conjunction with normal automatic systems and local controls.

3.5.3 System Operation

A. RPS

The Westinghouse RPS (or Reactor Trip System, RTS) has four input instrument channels, and two output actuation trains (A and B). 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 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 or four input instrument channels for each sensed parameter, and two output actuation trains (A and B). In general, each train controls equipment powered from different Class 1E AC electrical buses. An individual component usually receives an actuation signal from only one ESFAS train. The ESFAS generates the following signals: (1) reactor trip, provided one has not already been generated by the RPS, (2) safety injection signal (SIS), (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

For equipment having motor controls outside the Control Room (which duplicate the functions inside the Control Room) the controls are provided with a selector switch which transfers control of the switchgear from the Control Room to an auxiliary control panel. Placing the local selector switch in the local operating position gives an annunciating alarm in the Control Room. The auxiliary shutdown control panel and auxiliary feedwater control panels have doors which are alarmed in the Control Room when opened. A tabulation of the controls on the auxiliary shutdown control panel and auxiliary feedwater control panels necessary for a hot shutdown is presented in Table 3.5-1.

3.5.4 System Success Criteria

A. RPS

The RPS uses hindrance logic (normal = 1, trip = 0) in both the input and output logic. Therefore, a channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). A reactor scram will occur upon loss of control power to the RPS. A reactor scram usually is implemented by the scram circuit breakers which must open in response to a scram signal. Typically, there are two series scram circuit breakers in the power path to the scram rods. In this case, one of two circuit breakers must open. Details of the scram system for McGuire have not been determined.

B. ESFAS

A single component usually receives a signal from only one ESFAS output train although all swing components and both AFW pumps receive signals from both trains. ESFAS Trains A and B must be available in order to automatically actuate their respective components. ESFAS typically 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 RPS. Details of the ESFAS system for McGuire have not been determined.

C. Manually-Initiated Protective Actions

When reasonable time is available, certain protective actions may be performed manually by plant personnel. The control room operators are capable of operating individual components using normal control circuitry, or operating groups of components by manually tripping the RPS or 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 judgements, data on key plant parameters must be available to the operators.

3.5.5 Support System and Interfaces

A. Control Power

1. RPS

   The RPS input instrument channels are powered from 120 VAC vital buses 1EKVA, 1EKVB, 1EKVC, and 1EKVD (see Section 3.6). The RPS A and B output logic trains are powered from separate 125 VDC distribution panels.

2. ESFAS

   The ESFAS input instrument channels are powered from 120 VAC vital buses 1EKVA, 1EKVB, 1EKVC, and 1EKVD. The ESFAS A and B output logic trains are powered from separate 125 VDC distribution panels.

3. Operator Instrumentation

   Operator instrumentation displays are powered from 120 VAC vital buses 1EKVA, 1EKVB, 1EKVC, and 1EKVD.

3.5.6 Section 3.5 References

1. McGuire Final Safety Analysis Report, Section 7.4.1.7

Table 3.5-1. McGuire 1 Controls Available for Hot Shutdown Outside the Control Room

Auxiliary Shutdown Control Panel	AFW Pump Motor 1A Control Panel	AFW Pump Motor 1B Control Panel	AFW Pump Turbine Control Panel
Reciprocating Charging Pump Nuclear Service Water Pumps 1A and 1B Component Cooling Water Pumps 1A1, 1A2, 1B1 and 1B2 Pressurizer Heater Backup Groups '1A' AND '1B' Boric Acid Transfer Pumps 1A and 1B Letdown Orifice Isolation Valves 457A, 458A and 459A Centrifugal Charging Pumps 1A and 1B Boric Acid Charging Pump Valve 265B Auxiliary Spray Suppy to Pressurizer Isolation Valve 21A NV Supply to NC Loop 4 Isolation Valve 16A NV Supply go NC Loop 1 Isolation Valve 13B Pressurizer Power Operated Safety Relief Valves 34A, 32B and 26B NC Loop 3 Supply to Excess Letdown Hx. #1 Isolation Valves 24B and 25B NC Letdown Isolation to Regenerative Hx. #1 Valves 1A and 1B BA to BA Blender Control Valve -V267A Excess Letdown Hx. #1 Tube Outlet Control Valve V26 Regenerative Hx. #1 Tube Inlet Control Valve - V241	AFW Pump 1A Control Pump 1A Control Selector Hotwell Supply Valves 265 and 2 Pump 1A AFW to SG 1A Valve Position Selector Station Pump 1A AFW to SG 1A Valve Position Selector Station	AFW Pump 1B Control Pump 1B Control Selector Pump 1B AFW to SG 1C Valve Position Selector Station Pump 1B AFW to SG 1D Valve Position Selector Station	Hotwell Supply Valves 265 and 2 AFW Turbine-Driven Pump Control AFWPT Control Selector AFW Steam Supply Valves 48 and 49

Note: While not used for hot shutdown, RHR controls have been provided on this panel.

3.6 ELECTRIC POWER SYSTEM

3.6.1 System Function

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

3.6.2 System Definition

The onsite Class 1E electric power system consists of two 4160 buses, designated 1ETA and ETB. There are two standby diesel generators connected to the buses. Diesel generator 1A is connected to bus 1ETA, and diesel generator 1B is connected to bus 1ETB. There are also four 600 VAC load center buses, designated 1ELXA, 1ELXB, 1ELXC, and 1ELXD. Buses 1ELXA and 1ELXC are connected to 4160 bus 1ETA through transformers, and buses 1ELXB and 1ELXD are connected to 4160 bus 1ETB through transformers. Various motor control centers receive their power from the 600 VAC buses

Emergency power for vital instruments, control, and emergency lighting is supplied by four 125 VDC station batteries. The batteries energize four DC distribution centers, designated 1EVAD, 1EVDB, 1EVDC, and 1EVDD. Four 120 VAC instrument buses are connected to the distribution centers through inverters. There are three other non-safety DC power systems: (a) the 250 VDC Auxiliary Power System for larger DC loads and backup lighting, (b) the Switchyard 125 VDC System, and (c) the 125 VDC Auxiliary Control Power System.

A simplified one-line diagram of the McGuire 1 4160 and 480 VAC electric power system is shown in Figure 3.6-1. The 125 VDC vital instrumentation and control power system and the 120 VAC power system are shown in Figure 3.6-2. A summary of data on selected electric power system components is presented in Table 3.6-1. A partial listing of electrical sources and loads is presented in Table 3.6-2.

3.6.3 System Operation

During normal operation, the Class 1E electric power system is supplied from the 6900 VAC Normal Auxiliary Power System. The normal source for 4160 VAC buses 1ETA and 1ETB is the 230 kV system, via two station auxiliary transformers and four 6900 VAC switchgear assemblies. The transfer from the preferred power source to the diesel generators is accomplished automatically by opening the normal source circuit breakers and then reenergizing the Class 1E portion of the electric power system from the diesel generators. Following a start command, each diesel generator is designed to reach rated speed and be capable of accepting loads within 11 seconds. The onsite AC power system for Unit 2 is identical to the Unit 1 system shown in Figure 3.6-1 with the exception that the preferred power supply is the 525 kV switching station.

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 125 VDC vital instrumentation and control power batteries are sized to carry the continuous emergency load of its own vital buses and also assume the loads of another battery, in a backup capacity if required, for a period of one hour.

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

Redundant safety equipment such as motor driven pumps and motor operated valves are supplied by different VAC buses. For the purpose of discussion, this equipment has been grouped into "load groups". Load group "AC/A" contains components receiving electric power either directly or indirectly from 4160 bus 1ETA. Load group "AC/B" contains components powered either directly or indirectly from 4160 bus 1ETB. Components receiving DC power are assigned to load groups "DC/A to DC/D", based on the battery power source.

3.6.4 System Success Criteria

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

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

3.6.5 Component Information

A. Standby diesel generators (2 per unit)
   1. Maximum continuous rating: 4000 kW
   2. 2 hour rating: 4400 kW
   3. Rated voltage: 4160 VAC
   4. Manufacturer: unknown

B. Vital instrumentation and control (station) batteries (4)
   1. Voltage: 125 VDC
   2. Capacity: 1 to 2 hours with rated loads

3.6.6 Support Systems and Interfaces

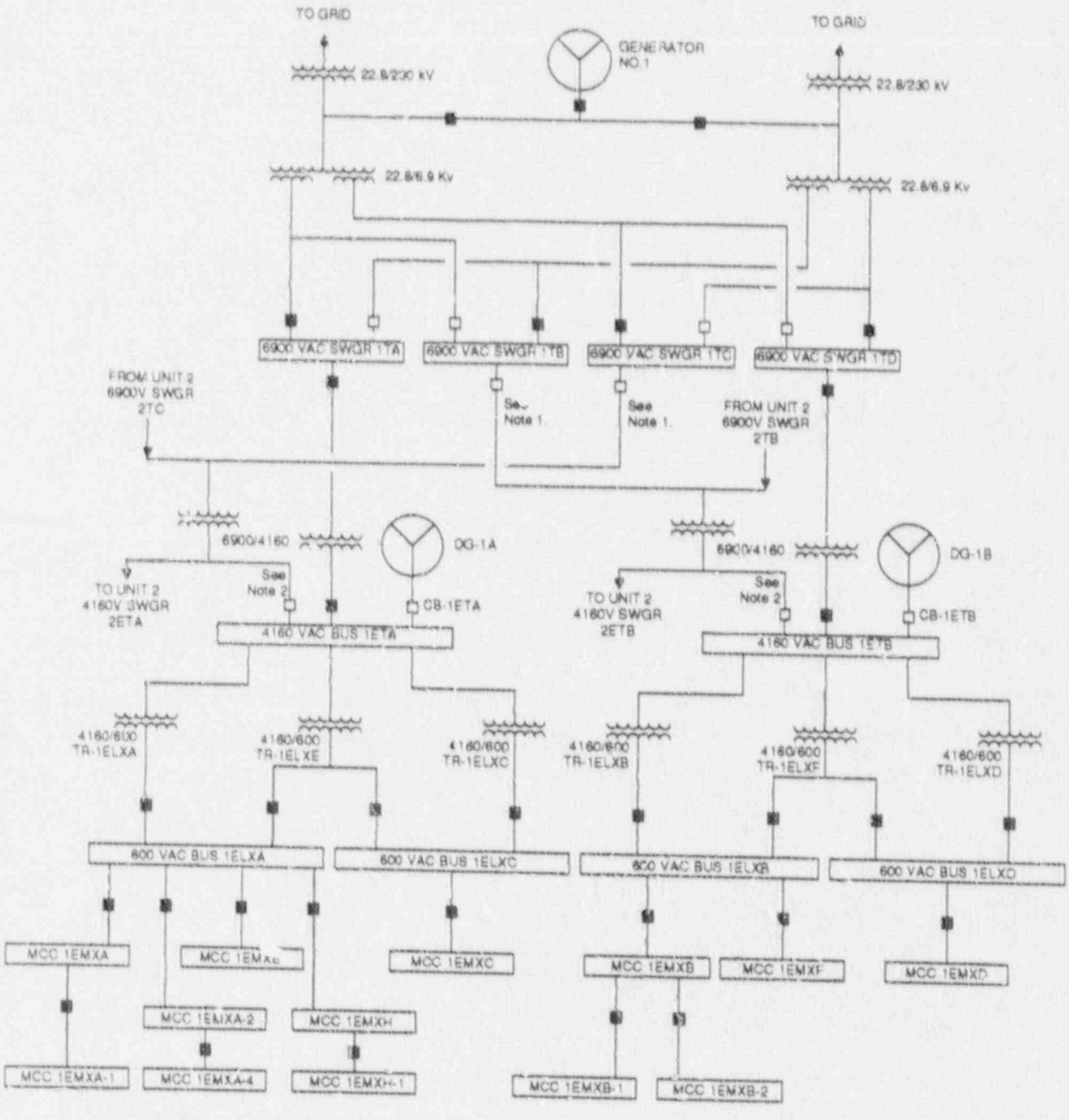
A. Control Signals
   1. Automatic
      The standby diesel generators are automatically started based on:
      - Undervoltage on the normal bus
      - Safety injection signal (SIS, see Section 3.3)

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

B. Diesel Generator Auxiliary Systems
   1. Diesel Cooling Water System
      Heat is transferred from a jacket water system to the Nuclear Service Water system. Each diesel receives redundant cooling water supplies from the NSW "A" and "B" headers.
   2. Diesel Starting System
      The air starting system for each diesel is capable of 4 start attempts without requiring AC power to recharge the starting air accumulators.
   3. Diesel Fuel Oil Transfer and Storage System
      A 275 gallon "day tank" supplies the relatively short-term (approximately 75 minutes) fuel needs of each diesel. The day tanks are automatically replenished from separate underground storage tanks during engine operation. A fuel oil transfer pump is activated by a level switch on the day tank.
   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. Control System
   The diesel control system is powered from the 125 VDC vital instrumentation and control power system.
7. 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
   Details on these systems have not been determined.



NOTE 1: Breaker is not furnished. A key interlock scheme is provided to allow a breaker to be instered into this breaker compartment only if there is no breaker in the corresponding 6900V switchgear compartment of the other unit.

NOTE 2: Breaker is not furnished. A key interlock scheme is provided to allow a breaker to be instered into this breaker compartment only if there is no breaker in the corresponding 4160V switchgear compartment of the other unit.

Figure 3.6-1. McGuire Unit 1 4160 and 480 VAC Electric Power Distribution System

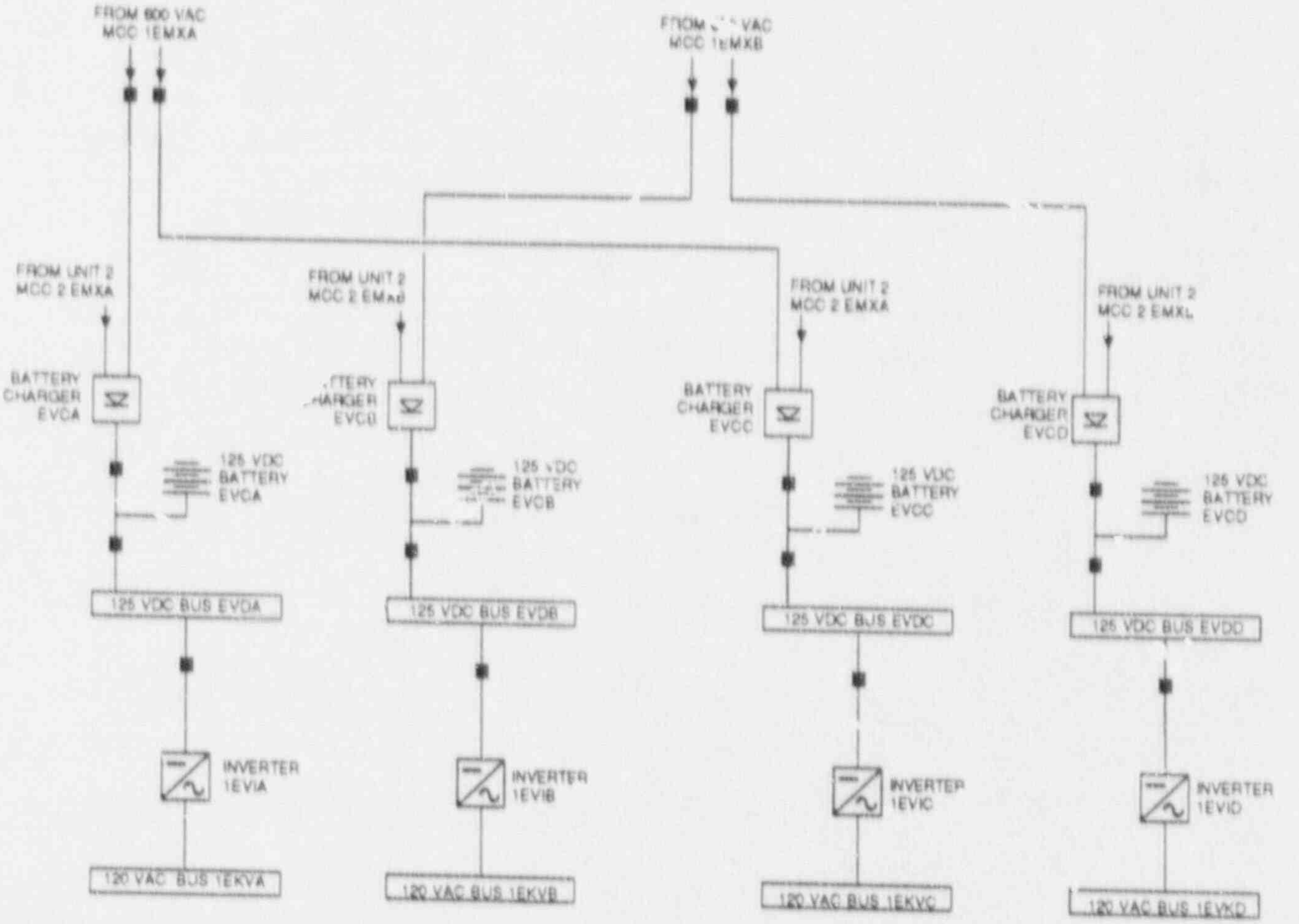


Figure 3.6-2. McGuire Unit 1 125 VDC and 120 VAC Electric Power Distribution System

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BC-EVCA	BC	BATDISAREA	MCC-1EMXA	125	MCCRM	AC/A
BC-EVCB	BC	BATDISAREA	MCC-1EMXB	125	ELEQRM722	AC/B
BC-EVCC	BC	BATDISAREA	MCC-1EMXA	125	MCCRM	AC/A
BC-EVCD	BC	BATDISAREA	MCC-1EMXB	125	ELEQRM722	AC/B
BT-EVCA	BATT	EVCA		125		DC/A
BT-EVCB	BATT	EVCB		125		DC/B
BT-EVCC	BATT	EVCC		125		DC/C
BT-EVCD	BATT	EVCD		125		DC/D
BUS-1EKVA	BUS	BATDISAREA	INV-EVIA	120	BATDISAREA	DC/A
BUS-1EKVB	BUS	BATDISAREA	INV-EVIB	120	BATDISAREA	DC/B
BUS-1EKVC	BUS	BATDISAREA	INV-EVIC	120	BATDISAREA	DC/C
BUS-1EKVD	BUS	BATDISAREA	INV-EVID	120	BATDISAREA	DC/D
BUS-1ELXA	BUS	ASWGRM	TR-1ELXA	600	ASWGRM	AC/A
BUS-1ELXA	BUS	ASWGRM	TR-1ELXE	600	ASWGRM	AC/A
BUS-1ELXB	BUS	BSWGRM	TR-1ELXB	600	BSWGRM	AC/B
BUS-1ELXB	BUS	BSWGRM	TR-1ELXF	600	BSWGRM	AC/B
BUS-1ELXC	BUS	ASWGRM	TR-1ELXC	600	ASWGRM	AC/A
BUS-1ELXC	BUS	ASWGRM	TR-1ELXE	600	ASWGRM	AC/A
BUS-1ELXD	BUS	BSWGRM	TR-1ELXD	600	BSWGRM	AC/B
BUS-1ELXD	BUS	BSWGRM	TR-1ELXF	600	BSWGRM	AC/B
BUS-1ETA	BUS	ASWGRM	DG-1A	4160	DGRM703	AC/A
BUS-1ETB	BUS	BSWGRM	DG-1B	4160	DGRM714	AC/B
BUS-EVDA	BUS	BATDISAREA	BT-EVCA	125	EVCA	DC/A
BUS-EVDA	BUS	BATDISAREA	BC-EVCA	125	BATDISAERA	DC/A
BUS-EVDB	BUS	BATDISAREA	BT-EVCB	125	EVCB	DC/A
BUS-EVDB	BUS	BATDISAREA	BC-EVCB	125	BATDISAREA	DC/B
BUS-EVDC	BUS	BATDISAREA	BT-EVCC	125	EVCC	DC/C

Table 3.6-1. McGuire 1 Electric Power System Data Summary for Selected Components (continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
BUS-EVDC	BUS	BATDISAREA	BC-EVCC	125	BATDISAREA	DC/C
BUS-EVDD	BUS	BATDISAREA	BT-EVCD	125	EVCD	DC/D
BUS-EVDD	BUS	BATDISAREA	BC-EVCD	125	BATDISAREA	DC/D
CB-1ETA	CB	ASWGRM				
CB-1ETB	CB	BSWGRM				
DG-1A	DG	DGRM703		4160		AC/A
DG-1B	DG	DGRM714		4160		AC/B
DG-HX1A	HX	DGRM703				
DG-HX1B	HX	DGRM714				
DG-P1A	MDP	DGRM703	MCC-1EMXE	600	DGRM703	AC/A
DG-P1B	MDP	DGRM714	MCC-1EMXF	600	DGRM714	AC/B
DG1-13	XV	DGRM703				
DG2-33	XV	DGRM714				
INV-EVIA	INV	BATDISAREA	BUS-EVDA	120	BATDISAREA	DC/A
INV-EVIB	INV	BATDISAREA	BUS-EVDB	120	BATDISAREA	DC/B
INV-EVIC	INV	BATDISAREA	BUS-EVDC	120	BATDISAREA	DC/C
INV-EVID	INV	BATDISAREA	BUS-EVDD	120	BATDISAREA	DC/D
MCC-1EMXA	MCC	MCCRM	BUS-1ELXA	600	ASWGRM	AC/A
MCC-1EMXA-1	MCC	MCC1EMXA-1	MCC-1EMXA	600	MCCRM	AC/A
MCC-1EMXA-2	MCC	ASWGRM	BUS-1ELXA	600	ASWGRM	AC/A
MCC-1EMXA-4	MCC	ASWGRM	MCC-1EMXA-2	600	ASWGRM	AC/A
MCC-1EMXB	MCC	ELEQRM722	BUS-1ELXB	600	BSWGRM	AC/B
MCC-1EMXB-1	MCC	ELEQRM722	MCC-1EMXB	600	ELEQRM722	AC/B
MCC-1EMXB-2	MCC	ELEQRM722	MCC-1EMXB	600	ELEQRM722	AC/B
MCC-1EMXC	MCC	ASWGRM	BUS-1ELXC	600	ASWGRM	AC/A
MCC-1EMXD	MCC	BSWGRM	BUS-1ELXD	600	BSWGRM	AC/B
MCC-1EMXE	MCC	DGRM703	BUS-1ELXA	600	ASWGRM	AC/A

Table 3.6-1. McGuire 1 Electric Power System Data Summary for Selected Components (continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
MCC-1EMXE	MCC	DGRM703	BUS-1ELXA	600	ASWGRM	AC/A
MCC-1EMXF	MCC	DGRM714	BUS-1ELXB	600	BSWGRM	AC/B
MCC-1EMXF	MCC	DGRM714	BUS-1ELXB	600	BSWGRM	AC/B
MCC-1EMXH	MCC	MCC1EMXH	BUS-1ELXA	600	ASWGRM	AC/A
MCC-1EMXH-1	MCC	ASWGRM	MCC-1EMXH	600	MCC1EMXH	AC/A
MCC-1MXC	MCC	MCC1MXC		600		
MCC-1SMXA	MCC	MCC1SMXA		600		
MCC-SMXB	MCC	MCCSMXB		600		
NSW-171B	MOV	DGRM714	MCC-1EMXF	600	DGRM714	AC/B
NSW-174B	MOV	DGRM714	MCC-1EMXF	600	DGRM714	AC/B
NSW-70A	MOV	DGRM703	MCC-1EMXE	600	DGRM703	AC/A
NSW-73A	MOV	DGRM703	MCC-1EMXE	600	DGRM703	AC/A
TR-1ELXA	XFMR	ASWGRM	BUS-1ETA	600	ASWGRM	AC/A
TR-1ELXB	XFMR	BSWGRM	BUS-1ETB	600	BSWGRM	AC/B
TR-1ELXC	XFMR	ASWGRM	BUS-1ETA	600	ASWGRM	AC/A
TR-1ELXD	XFMR	BSWGRM	BUS-1ETB	600	BSWGRM	AC/B
TR-1ELXE	XFMR	ASWGRM	BUS-1ETA	600	ASWGRM	AC/A
TR-1ELXE	XFMR	ASWGRM	BUS-1ETA	600	ASWGRM	AC/A
TR-1ELXF	XFMR	BSWGRM	BUS-1ETB	600	BSWGRM	AC/B
TR-1ELXF	XFMR	BSWGRM	BUS-1ETB	600	BSWGRM	AC/B

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BC-EVCA	125	DC/A	BATDISAERA	EP	BUS-EVDA	BUS	BATDISAREA
BC-EVCB	125	DC/B	BATDISAREA	EP	BUS-EVDB	BUS	BATDISAREA
BC-EVCC	125	DC/C	BATDISAREA	EP	BUS-EVDC	BUS	BATDISAREA
BC-EVCD	125	DC/D	BATDISAREA	EP	BUS-EVDD	BUS	BATDISAREA
BT-EVCA	125	DC/A	EVCA	EP	BUS-EVDA	BUS	BATDISAREA
BT-EVCB	125	DC/A	EVCB	EP	BUS-EVDB	BUS	BATDISAREA
BT-EVCC	125	DC/C	EVCC	EP	BUS-EVDC	BUS	BATDISAREA
BT-EVCD	125	DC/D	EVCD	EP	BUS-EVDD	BUS	BATDISAREA
BUS-1ELXA	600	AC/A	ASWGRM	EP	MCC-1EMXA	MCC	MCCRM
BUS-1ELXA	600	AC/A	ASWGRM	EP	MCC-1EMXA-2	MCC	ASWGRM
BUS-1ELXA	600	AC/A	ASWGRM	EP	MCC-1EMXE	MCC	DGRM703
BUS-1ELXA	600	AC/A	ASWGRM	EP	MCC-1EMXE	MCC	DGRM703
BUS-1ELXA	600	AC/A	ASWGRM	EP	MCC-1EMXH	MCC	MCC1EMXH
BUS-1ELXA	600	AC/A	ASWGRM	RCS	HTR-PNL-1A	PNL	750EPENRM
BUS-1ELXB	600	AC/B	BSWGRM	EP	MCC-1EMXB	MCC	ELEQRM722
BUS-1ELXB	600	AC/B	BSWGRM	EP	MCC-1EMXB	MCC	ELEQRM722
BUS-1ELXB	600	AC/B	BSWGRM	EP	MCC-1EMXF	MCC	DGRM714
BUS-1ELXB	600	AC/B	BSWGRM	EP	MCC-1EMXF	MCC	DGRM714
BUS-1ELXB	600	AC/B	BSWGRM	RCS	HTR-PNL-1B	PNL	733EPENRM
BUS-1ELXC	600	AC/A	ASWGRM	EP	MCC-1EMXC	MCC	ASWGRM
BUS-1ELXD	600	AC/B	BSWGRM	EP	MCC-1EMXD	MCC	BSWGRM
BUS-1ETA	4160	AC/A	ASWGRM	AFW	AFW-P1A	MDP	AFWMDRM
BUS-1ETA	4160	AC/A	ASWGRM	CCW	CC-P1A1	MDP	733AB
BUS-1ETA	4160	AC/A	ASWGRM	CCW	CC-P1A2	MDP	733AB
BUS-1ETA	4160	AC/A	ASWGRM	CS	CS-P1A	MDP	CSPMRMA
BUS-1ETA	4160	AC/A	ASWGRM	CVCS	CH-P1A	MDP	716AB
BUS-1ETA	4160	AC/A	ASWGRM	ECCS	RH-P1A	MDP	RHRPMRMA
BUS-1ETA	4160	AC/A	ASWGRM	ECCS	SI-P1A	MDP	SIPMRMA
BUS-1ETA	4160	AC/A	ASWGRM	ECCS	SI-P1A	MDP	SIPMRMA
BUS-1ETA	600	AC/A	ASWGRM	EP	TR-1ELXA	XFMR	ASWGRM
BUS-1ETA	600	AC/A	ASWGRM	EP	TR-1ELXC	XFMR	ASWGRM

Table 3.6-2. Partial Listing of Electrical Sources and Loads at McGuire 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BUS-1ETA	600	AC/A	ASWGRM	EP	TR-1ELXE	XFMR	ASWGRM
BUS-1ETA	600	AC/A	ASWGRM	EP	TR-1ELXE	XFMR	ASWGRM
BUS-1ETA	4160	AC/A	ASWGRM	NSW	NSW-P1A	MDP	713AB
BUS-1ETB	4160	AC/B	BSWGRM	AFW	AFW-P1B	MDP	AFWMDRM
BUS-1ETB	4160	AC/B	BSWGRM	CCW	CC-P1B1	MDP	733AB
BUS-1ETB	4160	AC/B	BSWGRM	CCW	CC-P1B2	MDP	733AB
BUS-1ETB	4160	AC/B	BSWGRM	CS	CS-P1B	MDP	CSPMRMB
BUS-1ETB	4160	AC/B	BSWGRM	CVCS	CH-P1B	MDP	716AB
BUS-1ETB	4160	AC/B	BSWGRM	ECCS	RH-P1B	MDP	RHRPMRMB
BUS-1ETB	4160	AC/B	BSWGRM	ECCS	SI-P1B	MDP	SIPMRMB
BUS-1ETB	4160	AC/B	BSWGRM	ECCS	SI-P1B	MDP	SIPMRMB
BUS-1ETB	600	AC/B	BSWGRM	EP	TR-1ELXB	XFMR	BSWGRM
BUS-1ETB	600	AC/B	BSWGRM	EP	TR-1ELXD	XFMR	BSWGRM
BUS-1ETB	600	AC/B	BSWGRM	EP	TR-1ELXF	XFMR	BSWGRM
BUS-1ETB	600	AC/B	BSWGRM	EP	TR-1ELXF	XFMR	BSWGRM
BUS-1ETB	4160	AC/B	BSWGRM	NSW	NSW-P1B	MDP	716AB
BUS-EVDA	120	DC/A	BATDISAREA	EP	INV-EVIA	INV	BATDISAREA
BUS-EVDA	125	DC/A	BATDISAREA	RCS	RCS-34A	NV	RC
BUS-EVDB	120	DC/B	BATDISAREA	EP	INV-EVIB	INV	BATDISAREA
BUS-EVDC	120	DC/C	BATDISAREA	EP	INV-EVIC	INV	BATDISAREA
BUS-EVDD	120	DC/D	BATDISAREA	EP	INV-EVID	INV	BATDISAREA
BUS-EVDD	125	DC/D	BATDISAREA	RCS	RCS-32B	NV	RC
BUS-EVDD	125	DC/D	BATDISAREA	RCS	RCS-36B	NV	RC
DG-1A	4160	AC/A	DGRM703	EP	BUS-1ETA	BUS	ASWGRM
DG-1B	4160	AC/B	DGRM714	EP	BUS-1ETB	BUS	BSWGRM
INV-EVIA	120	DC/A	BATDISAREA	EP	BUS-1EKVA	BUS	BATDISAREA
INV-EVIB	120	DC/B	BATDISAREA	EP	BUS-1EKVB	BUS	BATDISAREA
INV-EVIC	120	DC/C	BATDISAREA	EP	BUS-1EKVC	BUS	BATDISAREA
INV-EVID	120	DC/D	BATDISAREA	EP	BUS-1EKVD	BUS	BATDISAREA
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-11A	MOV	AFWMDRM
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-15A	MOV	AFWMDRM

Table 3.6-2. Partial Listing of Electrical Sources and Loads at McGuire 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-54A	MOV	IDH
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-58A	MOV	IDH
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-62A	MOV	ODH
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-66A	MOV	ODH
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-7A	MOV	AFWTDRM
MCC-1EMXA	600	AC/A	MCCRM	AFW	AFW-86A	MOV	AFWTDRM
MCC-1EMXA	600	AC/A	MCCRM	AFW	NSW-69A	MOV	AFWTDRM
MCC-1EMXA	600	AC/A	MCCRM	CCW	CC-230A	MOV	750AB
MCC-1EMXA	600	AC/A	MCCRM	CCW	CC-50A	MOV	750AB
MCC-1EMXA	600	AC/A	MCCRM	CCW	CC-56A	MOV	750AB
MCC-1EMXA	600	AC/A	MCCRM	CS	CS-18A	MOV	CSPMRMA
MCC-1EMXA	600	AC/A	MCCRM	CS	CS-29A	MOV	PENE750
MCC-1EMXA	600	AC/A	MCCRM	CS	CS-32A	MOV	PENE750
MCC-1EMXA	600	AC/A	MCCRM	CS	RH-185A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	CS	RH-185A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	CS	RH-19A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	CVCS	CH-221A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	CVCS	CH-4A	MOV	RM812
MCC-1EMXA	600	AC/A	MCCRM	CVCS	CH-9A	MOV	RM812
MCC-1EMXA	600	AC/A	MCCRM	ECCS	RH-185A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	ECCS	RH-19A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	ECCS	RH-58A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	ECCS	SI-121A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	ECCS	SI-121A	MOV	PPCHASE
MCC-1EMXA	600	AC/A	MCCRM	ECCS	SI-162A	MOV	PENE733
MCC-1EMXA	600	AC/A	MCCRM	ECCS	SI-162A	MOV	PENE733
MCC-1EMXA	125	AC/A	MCCRM	EP	BC-EVCA	BC	BATDISAREA
MCC-1EMXA	125	AC/A	MCCRM	EP	BC-EVCC	BC	BATDISAREA
MCC-1EMXA	600	AC/A	MCCRM	EP	MCC-1EMXA-1	MCC	MCC1EMXA-1
MCC-1EMXA	600	AC/A	MCCRM	NSW	NSW-16A	MOV	AFWMDRM
MCC-1EMXA-1	600	AC/A	MCC1EMXA-1	ECCS	SI-103A	MOV	SIPMRMA

Table 3.6-2. Partial Listing of Electrical Sources and Loads at McGuire 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-1EMXA-1	600	AC/A	MCC1EMXA-1	ECCS	SI-103A	MOV	SIPMRMA
MCC-1EMXA-1	600	AC/A	MCC1EMXA-1	ECCS	SI-118A	MOV	PENE716
MCC-1EMXA-1	600	AC/A	MCC1EMXA-1	ECCS	SI-118A	MOV	PENE716
MCC-1EMXA-1	600	AC/A	MCC1EMXA-1	ECCS	SI-332A	MOV	SIPMRMA
MCC-1EMXA-2	600	AC/A	ASWGRM	EP	MCC-1EMXA-4	MCC	ASWGRM
MCC-1EMXA-4	600	AC/A	ASWGRM	RCS	RCS-2AC	MOV	RC
MCC-1EMXB	600	AC/B	ELEQRM722	AFW	AFW-116B	MOV	AFWMDRM
MCC-1EMXB	600	AC/B	ELEQRM722	AFW	AFW-18B	MOV	AFWMDRM
MCC-1EMXB	600	AC/B	ELEQRM722	AFW	AFW-38B	MOV	ODH
MCC-1EMXB	600	AC/B	ELEQRM722	AFW	AFW-42B	MOV	ODH
MCC-1EMXB	600	AC/B	ELEQRM722	AFW	AFW-9B	MOV	AFWMDRM
MCC-1EMXB	600	AC/B	ELEQRM722	CCW	CC-228B	MOV	750AB
MCC-1EMXB	600	AC/B	ELEQRM722	CCW	CC-53B	MOV	750AB
MCC-1EMXB	600	AC/B	ELEQRM722	CCW	CC-81B	MOV	750AB
MCC-1EMXB	125	AC/B	ELEQRM722	EP	BC-EVCB	BC	BATDISAREA
MCC-1EMXB	125	AC/B	ELEQRM722	EP	BC-EVCD	BC	BATDISAREA
MCC-1EMXB	600	AC/B	ELEQRM722	EP	MCC-1EMXB-1	MCC	ELEQRM722
MCC-1EMXB	600	AC/B	ELEQRM722	EP	MCC-1EMXB-2	MCC	ELEQRM722
MCC-1EMXB-1	600	AC/B	ELEQRM722	CS	CS-1B	MOV	CSPMRMB
MCC-1EMXB-1	600	AC/B	ELEQRM722	CS	RH-184B	MOV	IPPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	CS	RH-4B	MOV	PPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	CVCS	CH-10B	MOV	RM812
MCC-1EMXB-1	600	AC/B	ELEQRM722	CVCS	CH-5B	MOV	RM812
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	RH-184B	MOV	IPPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	RH-4B	MOV	PPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-100B	MOV	PPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-135B	MOV	PPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-135B	MOV	PPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-136B	MOV	PPCHASE
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-150B	MOV	PENE716
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-150B	MOV	PENE716

Table 3.6-2. Partial Listing of Electrical Sources and Loads at McGuire 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-152B	MOV	PENE750
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-152B	MOV	PENE750
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-333B	MOV	SIPMRMA
MCC-1EMXB-1	600	AC/B	ELEQRM722	ECCS	SI-334B	MOV	SIPMRMA
MCC-1EMXB-2	600	AC/B	ELEQRM722	AFW	AFW-46B	MOV	IDH
MCC-1EMXB-2	600	AC/B	ELEQRM722	AFW	AFW-50B	MOV	IDH
MCC-1EMXB-2	600	AC/B	ELEQRM722	CS	CS-12B	MOV	PENE750
MCC-1EMXB-2	600	AC/B	ELEQRM722	CS	CS-15B	MOV	PENE750
MCC-1EMXB-2	600	AC/B	ELEQRM722	CVCS	CH-222B	MOV	PPCHASE
MCC-1EMXB-2	600	AC/B	ELEQRM722	NSW	NSW-18B	MOV	AFWMDRM2
MCC-1EMXC	600	AC/A	ASWGRM	RCS	RCS-33A	MOV	RC
MCC-1EMXD	600	AC/B	BSWGRM	RCS	RCS-1B	MOV	RC
MCC-1EMXD	600	AC/B	BSWGRM	RCS	RCS-31B	MOV	RC
MCC-1EMXD	600	AC/B	BSWGRM	RCS	RCS-35B	MOV	RC
MCC-1EMXE	600	AC/A	DGRM703	EP	DG-P1A	MDP	DGRM703
MCC-1EMXE	600	AC/A	DGRM703	EP	NSW-70A	MOV	DGRM703
MCC-1EMXE	600	AC/A	DGRM703	EP	NSW-73A	MOV	DGRM703
MCC-1EMXF	600	AC/B	DGRM714	EP	DG-P1B	MDP	DGRM714
MCC-1EMXF	600	AC/B	DGRM714	EP	NSW-171B	MOV	DGRM714
MCC-1EMXF	600	AC/B	DGRM714	EP	NSW-174B	MOV	DGRM714
MCC-1EMXH	600	AC/A	MCC1EMXH	AFW	NSW-148A	MOV	AFWMDRM
MCC-1EMXH	600	AC/A	MCC1EMXH	AFW	NSW-148A	MOV	AFWMDRM
MCC-1EMXH	600	AC/A	MCC1EMXH	AFW	NSW-148A	MOV	AFWMDRM
MCC-1EMXH	600	AC/A	MCC1EMXH	EP	MCC-1EMXH-1	MCC	ASWGRM
MCC-1EMXH	600	AC/A	MCC1EMXH	NSW	NSW-13A	MOV	AFWMDRM
MCC-1EMXH	600	AC/A	MCC1EMXH	NSW	NSW-7A	MOV	AFWMDRM2
MCC-1EMXH-1	600	AC/A	750EPENRM	AFW	NSW-147AC	MOV	AFWMDRM
MCC-1EMXH-1	600	AC/A	750EPENRM	AFW	NSW-147AC	MOV	AFWMDRM
MCC-1EMXH-1	600	AC/A	750EPENRM	AFW	NSW-147AC	MOV	AFWMDRM
MCC-1EMXH-1	600	AC/A	ASWGRM	NSW	NSW-10AC	MOV	AFWMDRM2
MCC-1EMXH-1	600	AC/A	ASWGRM	NSW	NSW-12AC	MOV	AFWMDRM

Table 3.6-2. Partial Listing of Electrical Sources and Loads at McGuire 1 (continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC-1MXC	600		MCC1MXC	AFW	AFW-6	MOV	ROOF
MCC-1SMXA	600		MCC1SMXA	NSW	NSW-1	MOV	YARD
MCC-SMXB	600		MCCSMXB	ECCS	RH-18	MOV	HXRMB
MCC-SMXB	600		MCCSMXB	ECCS	RH-18	MOV	HXRMB
MCC-SMXB	600		MCCSMXB	ECCS	RH-33	MOV	HXMRB
MCC-SMXB	600		MCCSMXB	ECCS	RH-33	MOV	HXRMB
TR-1ELXA	600	AC/A	ASWGRM	EP	BUS-1ELXA	BUS	ASWGRM
TR-1ELXB	600	AC/B	BSWGRM	EP	BUS-1ELXB	BUS	BSWGRM
TR-1ELXC	600	AC/A	ASWGRM	EP	BUS-1ELXC	BUS	ASWGRM
TR-1ELXD	600	AC/B	BSWGRM	EP	BUS-1ELXD	BUS	BSWGRM
TR-1ELXE	600	AC/A	ASWGRM	EP	BUS-1ELXA	BUS	ASWGRM
TR-1ELXE	600	AC/A	ASWGRM	EP	BUS-1ELXC	BUS	ASWGRM
TR-1ELXF	600	AC/B	BSWGRM	EP	BUS-1ELXB	BUS	BSWGRM
TR-1ELXF	600	AC/B	BSWGRM	EP	BUS-1ELXD	BUS	BSWGRM

3.7 COMPONENT COOLING WATER SYSTEM (CCW)

3.7.1 System Function

The CCW system is designed to remove residual and sensible heat from the RCS during plant shutdown by cooling the RHR heat exchangers, to cool the letdown flow to the Chemical and Volume Control System during power operation, cool the spent fuel pool water, and to provide cooling to dissipate heat from various primary plant components.

3.7.2 System Definition

The CCW system is a closed loop cooling system consisting of two parallel loops. Each loop consists of two pumps and one heat excha[illegible]oling loads are divided between the two headers in such a manner to ensure that eac[illegible] a redundant set of components needed to establish and maintain a safe shutdown [illegible]ion following a design basis accident. The heat exchangers transfer heat to the Nuclear Service Water system. A surge tank accommodates expansion, contraction, and inleakage of water.

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

3.7.3 System Operation

Two component cooling pumps and one component cooling heat exchanger provide the necessary cooling requirements during normal operation. The remaining two pumps and one heat exchanger serve as a backup system. Heat loads supported by the CCW system include the following:

- RHR heat exchangers
- RHR pumps
- Fuel pool cooling heat exchangers
- Letdown heat exchanger
- Excess letdown heat exchanger

Component cooling is also provided for additional components, such as the reactor cooling pumps and other components of the Chemical and Volume Control System. At the reactor coolant pump, component cooling water removes heat from the bearing oil and the thermal barrier.

3.7.4 System Success Criteria

Two CCW pumps per unit and one heat exchanger provide adequate cooling under the following conditions (Ref. 1):

- Normal station operation
- Cooldown and refueling
- LOCA

3.7.5 Component Information

A. Component Cooling Water Pumps 1A1, 1A2, 1B1, and 1B2
   1. Rated flow: 3500 gpm @ 180 ft head (78 psid)
   2. Rated capacity: 50%
   3. Type: horizontal centrifugal

B. Component Cooling Heat Exchangers 1A and 1B
   1. Design duty: 4.06 x 106 Btu/hr
   2. Type: shell and straight tube

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. The CCW pumps are not automatically actuated.
      b. The CCW nonessential header is automatically isolated from NSW Loop B when a safety injection signal is present.
   2. Remote Manual
      The CCW pumps can be actuated by remote manual means from the control room.

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

C. Other
   1. The CCW heat exchangers are cooled by the Nuclear Service Water system.
   2. Normal makeup to the CCW split volume surge tank is provided by the demineralized water system. A backup source of makeup water is the Nuclear Service Water System (see Section 3.8).
   3. Lubrication is assumed to be provided locally for the CCW pumps.
   4. Systems for pump room cooling have not been identified.

3.7.7 Section 3.7 References

1. McGuire Final Safety Analysis Report, Section 9.2.4.2

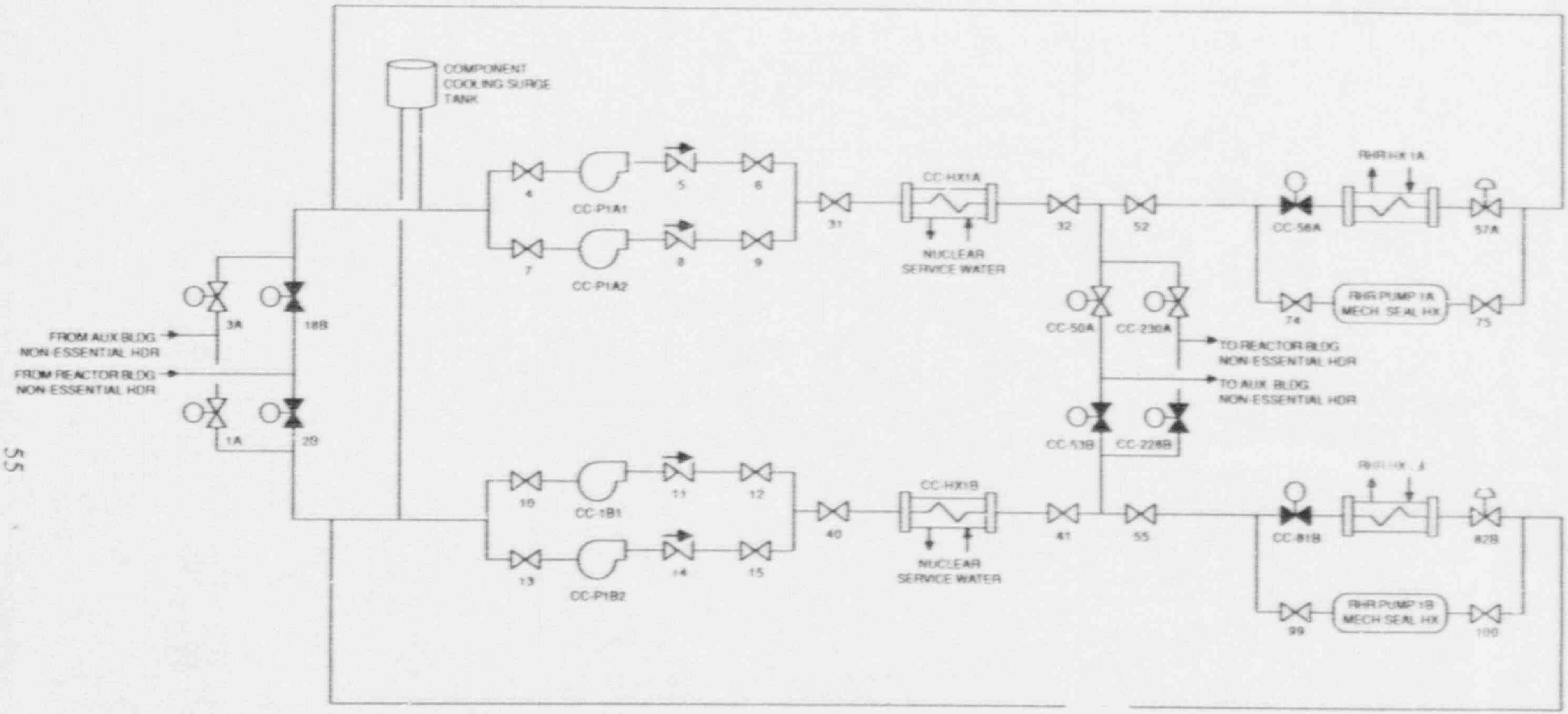


Figure 3.7-1. McGuire Unit 1 Component Cooling System

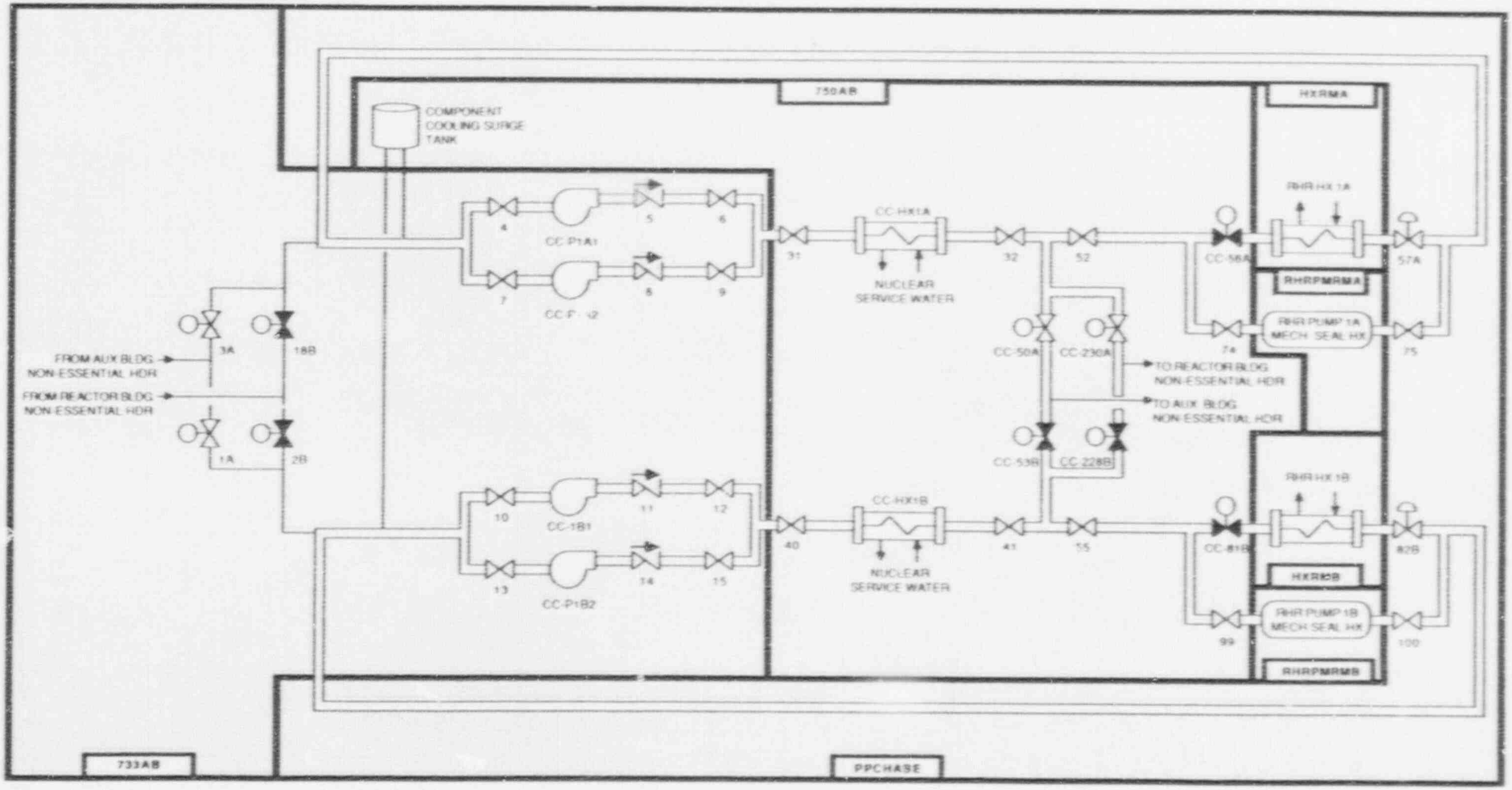


Figure 3.7-2. McGuire Unit 1 Component Cooling System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CC-228B	MOV	750AB	MCC-1EMXB	600	ELEQRM722	AC/B
CC-230A	MOV	750AB	MCC-1EMXA	600	MCCRM	AC/A
CC-50A	MOV	750AB	MCC-1EMXA	600	MCCRM	AC/A
CC-53B	MOV	750AB	MCC-1EMXB	600	ELEQRM722	AC/B
CC-56A	MOV	750AB	MCC-1EMXA	600	MCCRM	AC/A
CC-81B	MOV	750AB	MCC-1EMXB	600	ELEQRM722	AC/B
CC-HX1A	HX	750AB				
CC-HX1B	HX	750AB				
CC-P1A1	MDP	733AB	BUS-1ETA	4160	ASWGRM	AC/A
CC-P1A2	MDP	733AB	BUS-1ETA	4160	ASWGRM	AC/A
CC-P1B1	MDP	733AB	BUS-1ETB	4160	BSWGRM	AC/B
CC-P1B2	MDP	733AB	BUS-1ETB	4160	BSWGRM	AC/B

3.8 NUCLEAR SERVICE WATER (NSW) SYSTEM

3.8.1 System Function

The Nuclear Service Water System supplies cooling water from the ultimate heat sink, Lake Norman, to various heat loads in both the primary and secondary portions of the plant. The system is designed to provide a continuous flow of cooling water to these systems and components necessary for plant safety either during normal operation or under abnormal and accident conditions.

3.8.2 System Definition

The Nuclear Service Water System contains two headers, each supplied by a single motor-driven pump. The sources of water for the system are the Low Level Intake Cooling Water System, the Standby Nuclear Service Water Pond (SNSWP) and the Condenser Circulating Water System. Strainers are provided to remove impurities from the raw water before it enters the NSW pumps.

Simplified drawings of NSW header 1A are shown in Figures 3.8-1 and 3.8-2. Simplified drawings of NSW header 1B are shown in Figures 3.8-3 and 3.8-4. A summary of the data on selected SW system components is presented in Table 3.8-1.

3.8.3 System Operation

During normal operation, channel A of the NSW system is in operation providing cooling water to essential and non-essential loads. The normal source of water is Lake Norman through the Low Level Intake Cooling Water System. Essential loads are those required for safe shutdown, and are therefore redundant and served by the corresponding channels of the NSW system. Heat loads supported by the NSW system include the following:

- AFW, CCW, Charging, SI, RHR, and CS pump motors
- Diesel generator, CCW, and CS heat exchangers

The NSW also provides an assured supply of water to the Auxiliary Feedwater System. NSW header 1A can supply AFW pumps 1A and 1 (turbine driven pump) while NSW header 1B can supply AFW pumps 1B and 1. A third connection to the AFW system from NSW header 1A can supply all three AFW pumps.

During normal operation with supply from the Low Level Intake Cooling Water System, water is returned to Lake Norman via the Condenser Circulating Water system. There are four cross-ties between the NSW loops:

- Main supply cross-over (suction-side of NSW pumps)
- Pump discharge header cross-over
- Non-essential loop supply header
- Main discharge cross-over

These cross-ties are intended to give the NSW system added flexibility to operate should more than one failure occur.

3.8.4 System Success Criteria

An NSW train can provide adequate cooling for the associated heat loads if the single NSW pump in the loop operates and an intact and open flow path exists to the heat loads of interest.

3.8.5 Component Information

A. Service Water Pumps 1A and 1B
   1. Rated flow: 17,500 gpm @ 130 ft head (56 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

B. Ultimate Heat Sink - Lake Norman

3.8.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. The NSW pumps are not automatically actuated.
      b. The NSW main supply and discharge cross-over lines are automatically isolated when a safety injection signal is present.
      c. The NSW non-essential header is automatically isolated from NSW Loop B when a safety injection signal is present. The non-essential header continues to be supplied from NSW Loop A until it too is isolated by a Containment Spray signal.
   2. Remote Manual
      The NSW pumps can be actuated by remote manual means from the control room.

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

C. Other
   1. Lubrication is assumed to be provided locally for the NSW pumps.
   2. Systems for pump room cooling have not been identified.

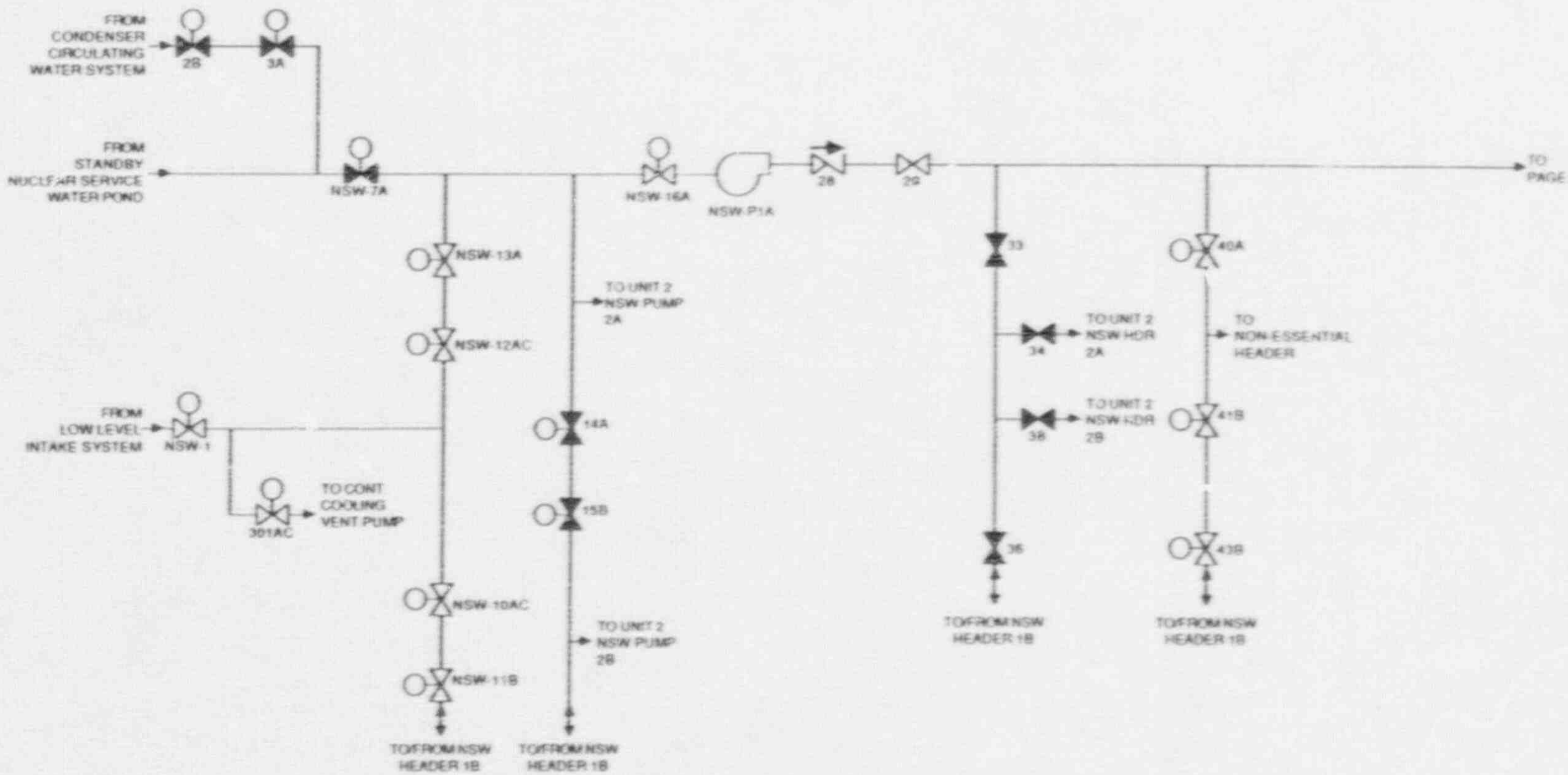


Figure 3.8-1. McGuire Unit 1 Nuclear Service Water System Header 1A (page 1 of 2)

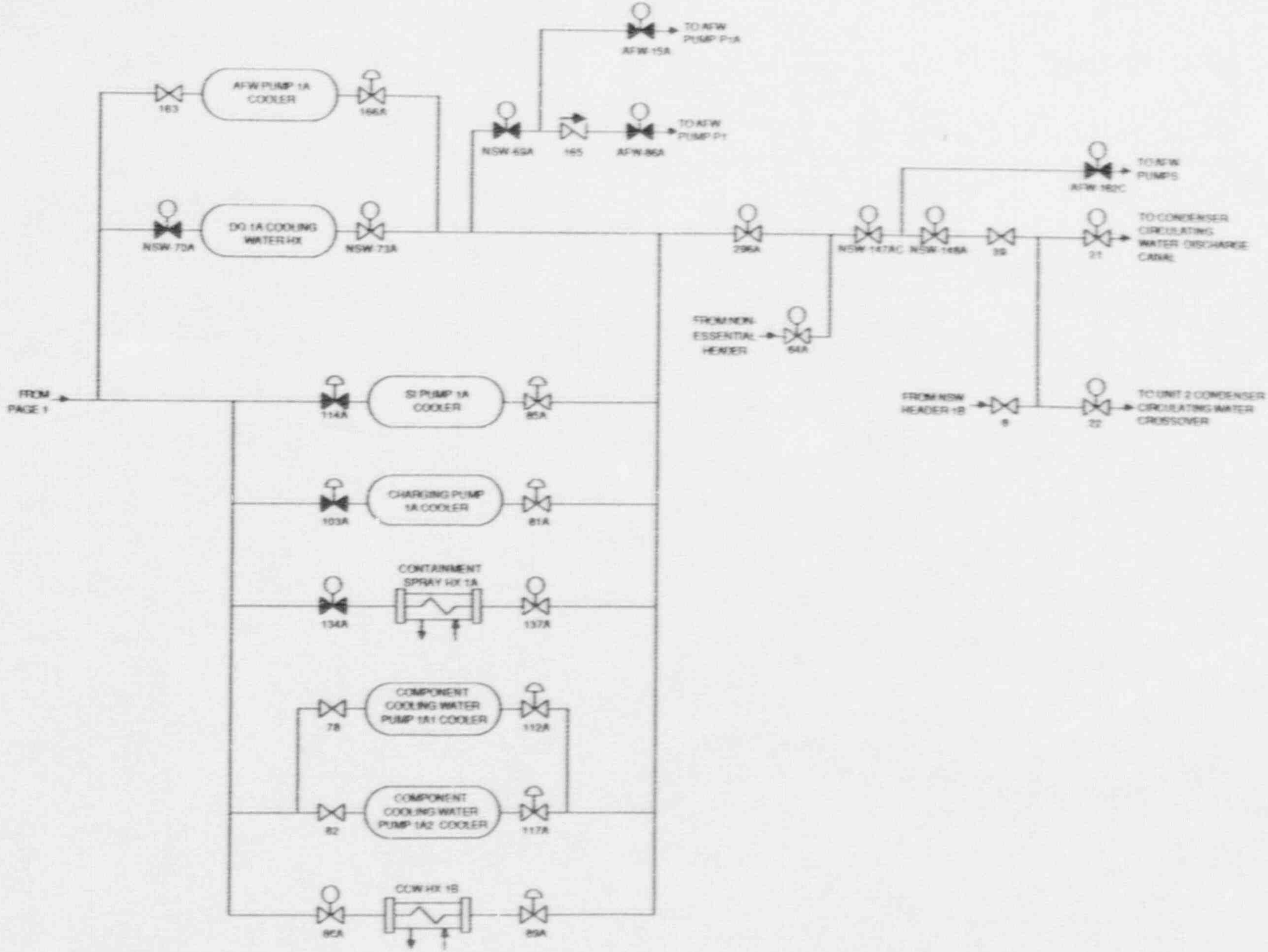


Figure 3.8-1. McGuire Unit 1 Nuclear Service Water System Header 1A (page 2 of 2)

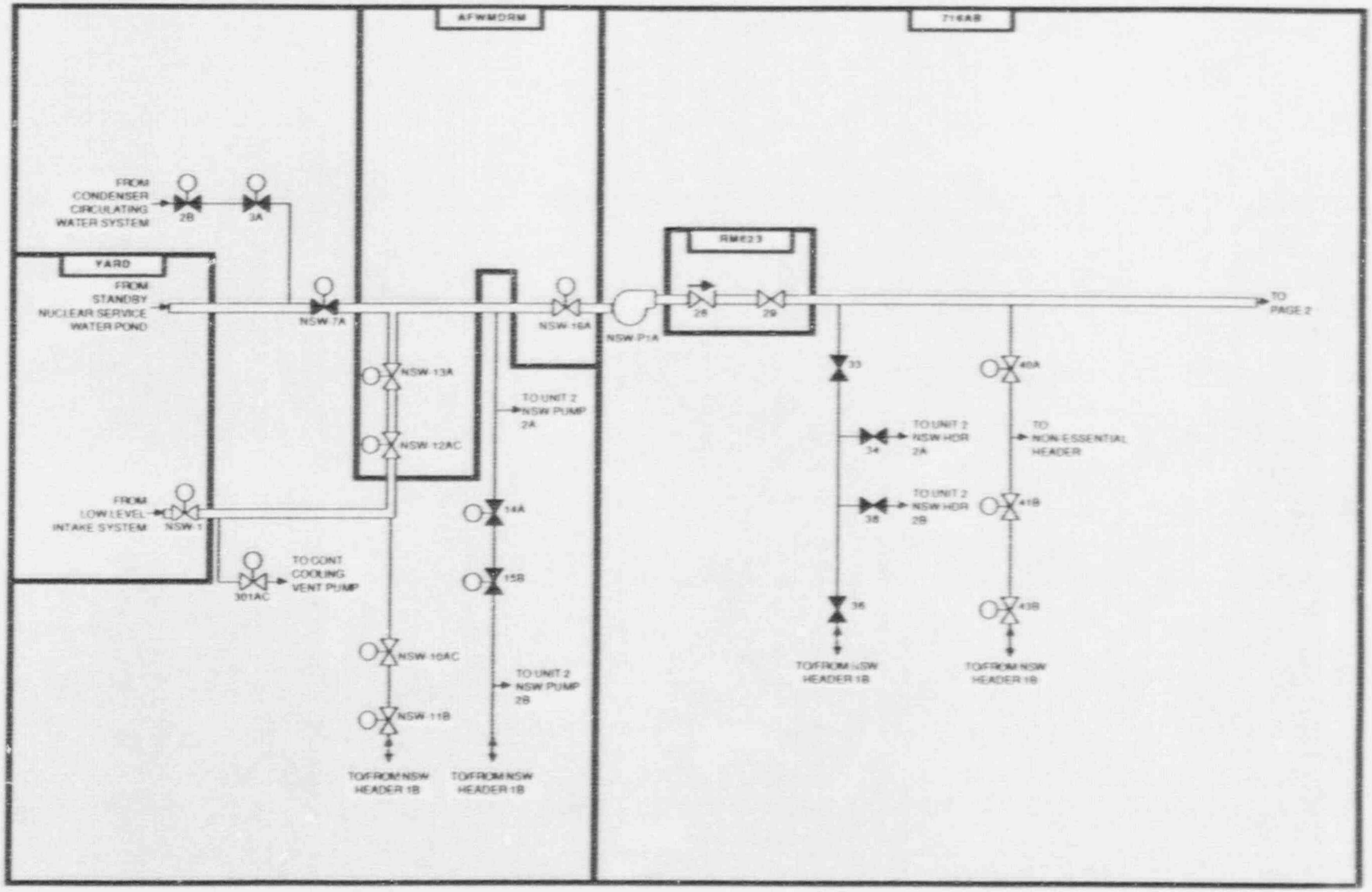


Figure 3.8-2. McGuire Unit 1 Nuclear Service Water System Header 1A Showing Component Locations (page 1 of 2)

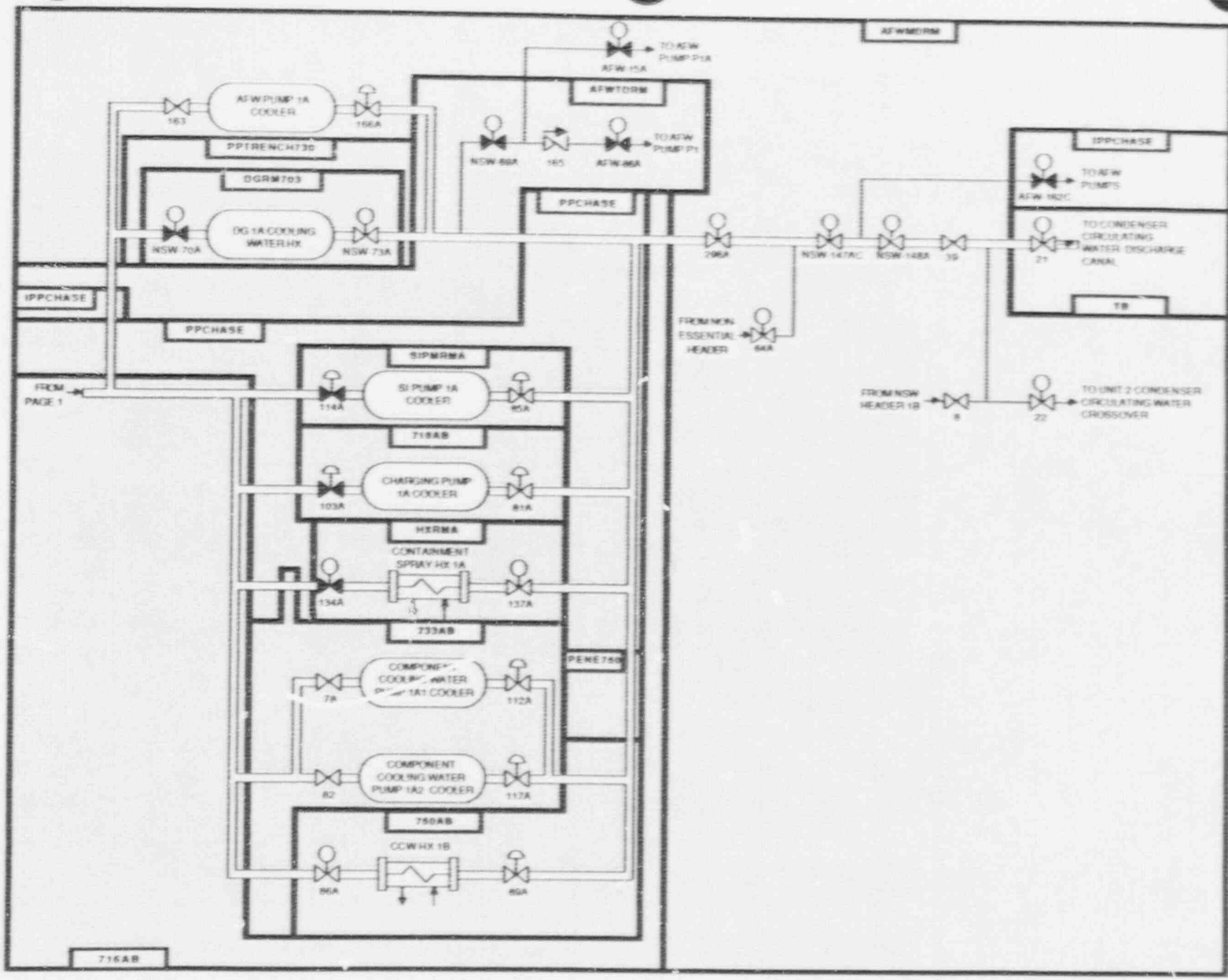


Figure 3.8-2. McGuire Unit 1 Nuclear Service Water System Header 1A Showing Component Locations (page 2 of 2)

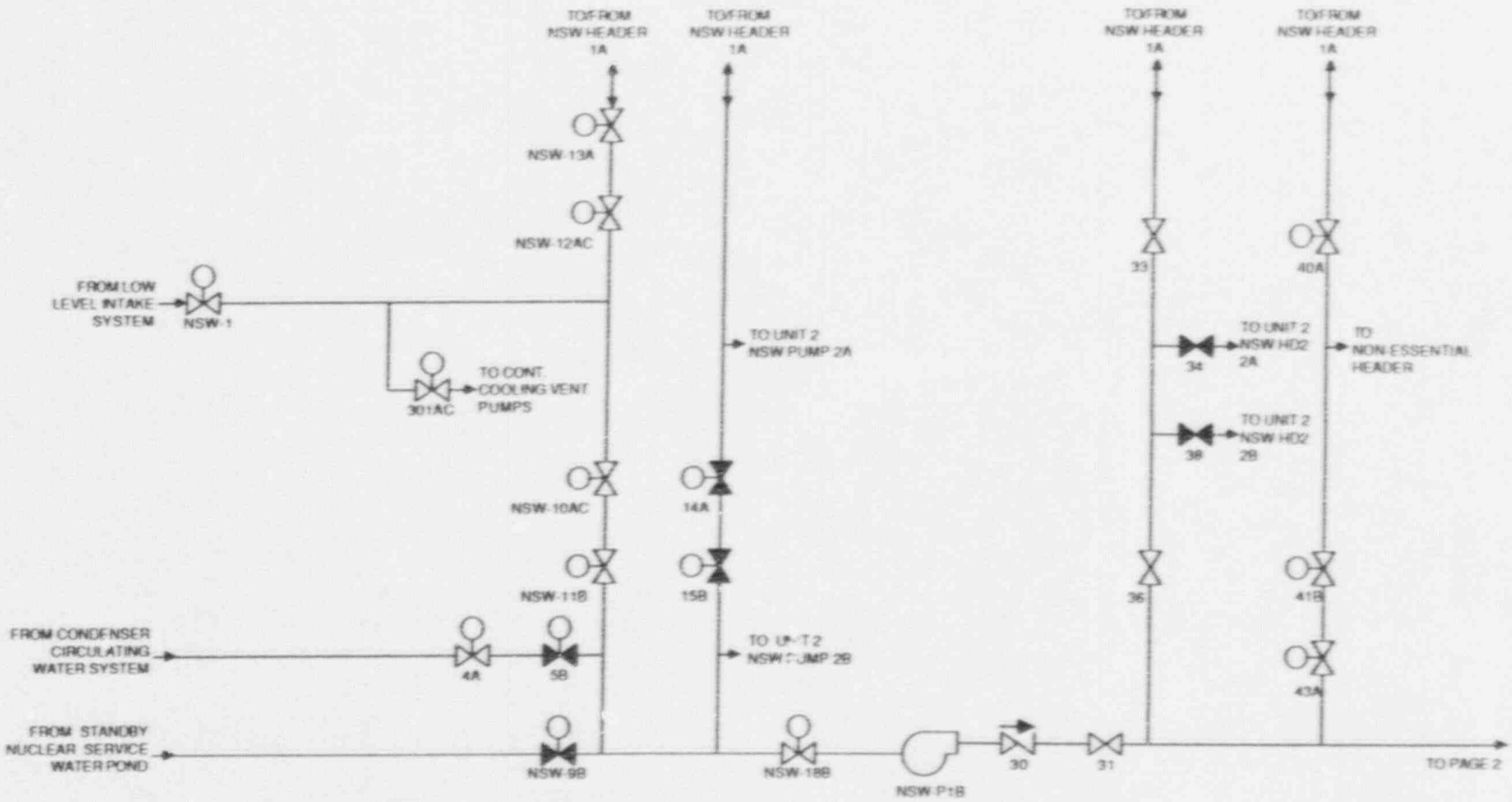


Figure 3.8-3. McGuire Unit 1 Nuclear Service Water System Header 1B Showing Component Locations (Page 1 of 2)

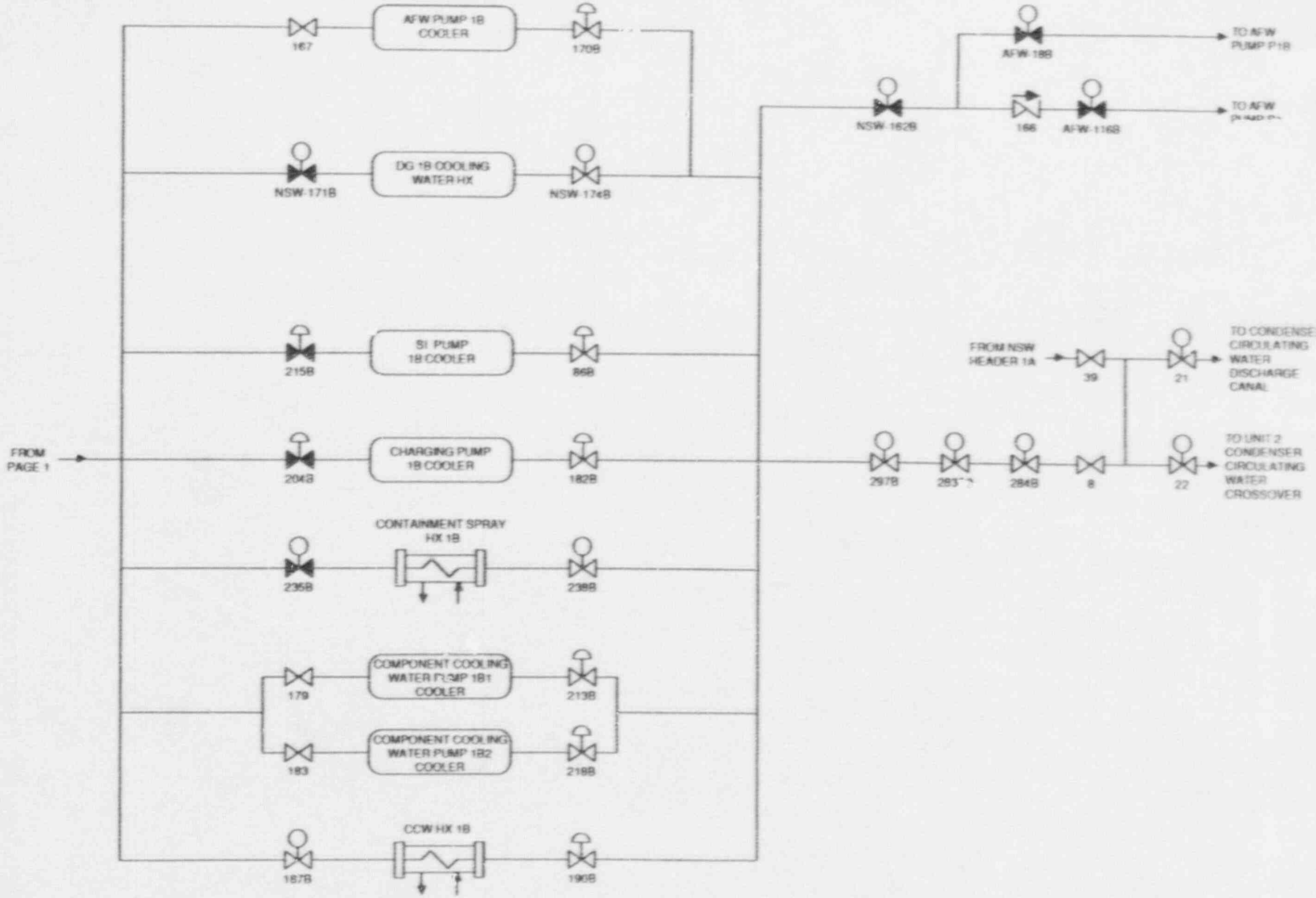


Figure 3.8-3. McGuire Unit 1 Nuclear Service Water System Header 1B Showing Component Locations (Page 2 of 2)

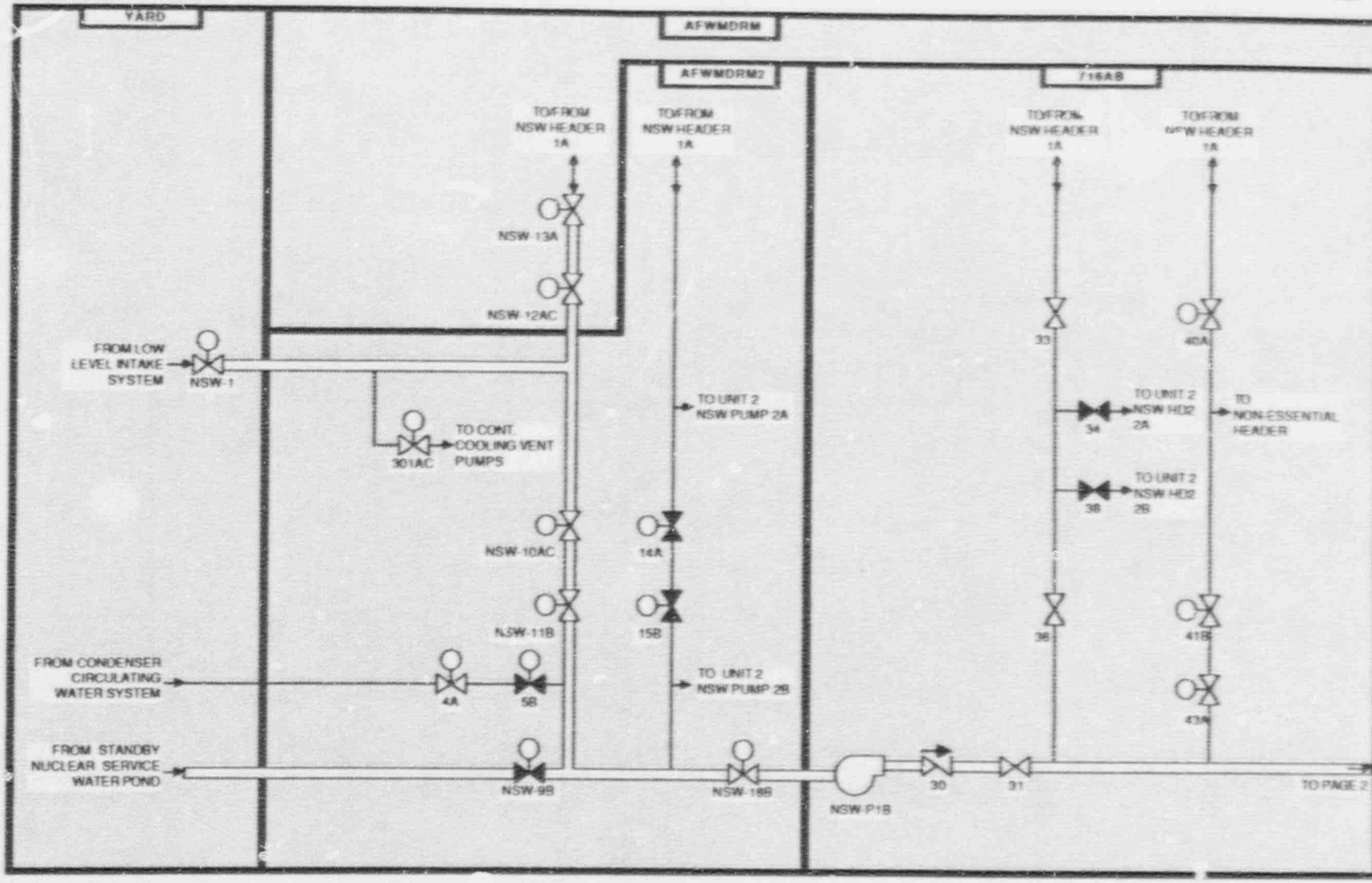


Figure 3.8-4. McGuire Unit 1 Nuclear Service Water System Header 1B Showing Component Locations (Page 1 of 2)

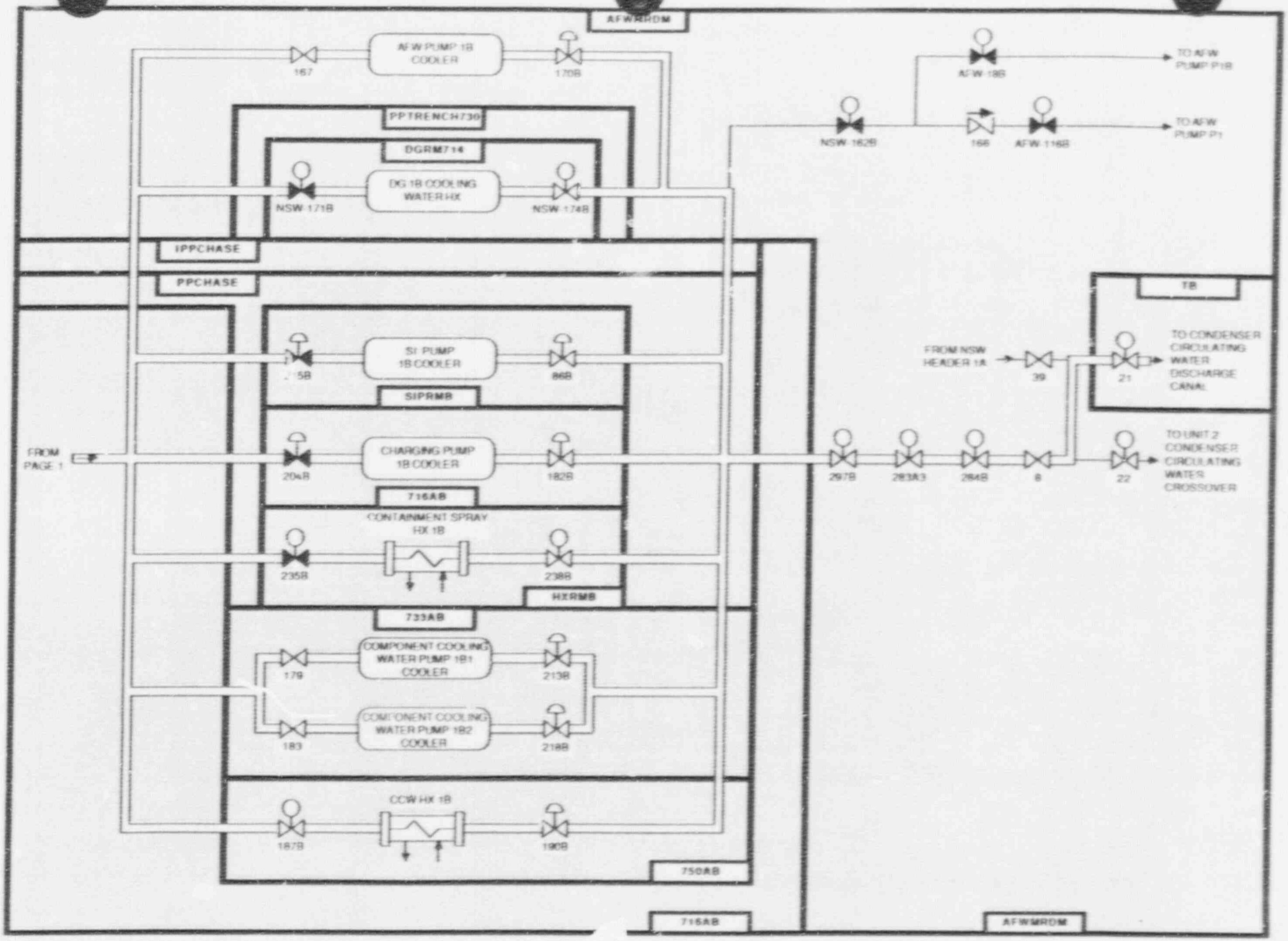


Figure 3.8-4. McGuire Unit 1 Nu ear Service Water System Header 1B Showing Componen Locations (Page 2 of 2)

Table 3.8-1. McGuire 1 Nuclear Service Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
NSW-1	MOV	YARD	MCC-1SMXA	600	MCC1SMXA	
NSW-10AC	MOV	AFWMDRM2	MCC-1EMXH-1	600	ASWGRM	AC/A
NSW-11B	MOV	AFWMDRM2				
NSW-12AC	MOV	AFWMDRM	MCC-1EMXH-1	600	ASWGRM	AC/A
NSW-13A	MOV	AFWMDRM	MCC-1EMXH	600	MCC1EMXH	AC/A
NSW-16A	MOV	AFWMDRM	MCC-1EMXA	600	MCCRM	AC/A
NSW-18B	MOV	AFWMDRM2	MCC-1EMXB-2	600	ELEQRM722	AC/B
NSW-7A	MOV	AFWMDRM2	MCC-1EMXH	600	MCC1EMXH	AC/A
NSW-9B	MOV	AFWMDRM2				
NSW-P1A	MDP	716AB	BUS-1ETA	4160	ASWGRM	AC/A
NSW-P1B	MDP	716AB	BUS-1ETB	4160	BSWGRM	AC/B

3.9 CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS)

3.9.1 System Function

The CVCS is responsible for maintaining the proper water inventory in the Reactor Coolant System and maintaining water purity and the proper concentration of neutron absorbing and corrosion inhibiting chemicals in the reactor coolant. The makeup function of the CVCS is assumed to be required to maintain the plant in a long-term (8 hours) hot shutdown condition.

3.9.2 System Definition

The CVCS provides a means for injection of control poison in the form of boric acid solution, chemical additions for corrosion control, and reactor coolant cleanup and degasification. This system also adds makeup water to the RCS, reprocesses water letdown from the RCS, provides seal water injection to the reactor coolant pump seals, and performs emergency core cooling. The centrifugal charging pumps in the CVCS also serve as the high-head safety injection pumps of the ECCS.

The CVCS consists of two subsystems: the charging, letdown, and seal water system, and the chemical control, purification, and makeup system. The functions of the CVCS are performed by the following components: the charging pumps, (two centrifugal, one positive displacement), boric acid makeup pumps, reactor water makeup pumps, volume control tank, boric acid tanks, and various heat exchangers and demineralizers.

Simplified drawings of the CVCS, focusing on the charging portion of the system, are shown in Figures 3.9-1 and 3.9-2.

3.9.3 System Operation

During normal plant operation, one charging pump is running with its suction aligned to the Volume Control Tank (VCT). The letdown flow from RCS loop 3 cold leg is cooled in the shell side of the regenerative heat exchanger, then directed to the VCT. The reactor makeup control system maintains the desired inventory in the VCT. The bulk of the charging flow is pumped back to the RCS through the tube side of the regenerative heat exchanger. Two charging lines, into cold legs 1 and 4 are provided. A portion of the charging flow is directed to the reactor coolant pumps through a seal water injection filter.

The centrifugal charging pumps also serve as the high-head safety injection pumps of the ECCS (see Section 3.3). During a LOCA the CVCS is isolated except for the centrifugal charging pumps and the piping in the safety injection path. The pumps take suction on the Refueling Water Storage Tank (RWST) and inject into all four cold legs. In Unit 1 water is injected through the Boron Injection Tank (BIT). In Unit 2 the BIT has been deleted and water is injected directly into the cold legs.

The reciprocating (positive displacement) charging pumps is used to perform hydrostatic tests which verify the integrity of the RCS. The pump can pressurize the RCS to the maximum design test pressure.

3.9.4 System Success Criteria

Any one charging pump can provide adequate flow for normal makeup to the RCS. Success criteria related to the ECCS function of the centrifugal charging pumps is discussed in Section 3.3.

3.9.5 Component Information

A. Centrifugal charging pumps 1A and 1B
   1. Rated flow: 150 @ 5800 ft head (2514 psid)
   2. Rated capacity: 100%
   3. Type: centrifugal

B. Reciprocating charging pump 1
   1. Rated flow: 98 gpm
   2. Rated capacity: 100%
   3. Type: positive displacement

3.9.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The centrifugal charging pumps are automatically actuated by a safety injection signal (SIS).
   2. Remote Manual
      The charging pumps can be actuated by remote manual means from the control room.

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

C. Other
   1. The charging pumps are cooled by the Nuclear Service Water system (see Section 3.8).
   2. Lubrication is assumed to be provided locally for the charging pumps.
   3. Systems for charging pump room cooling have not been identified.

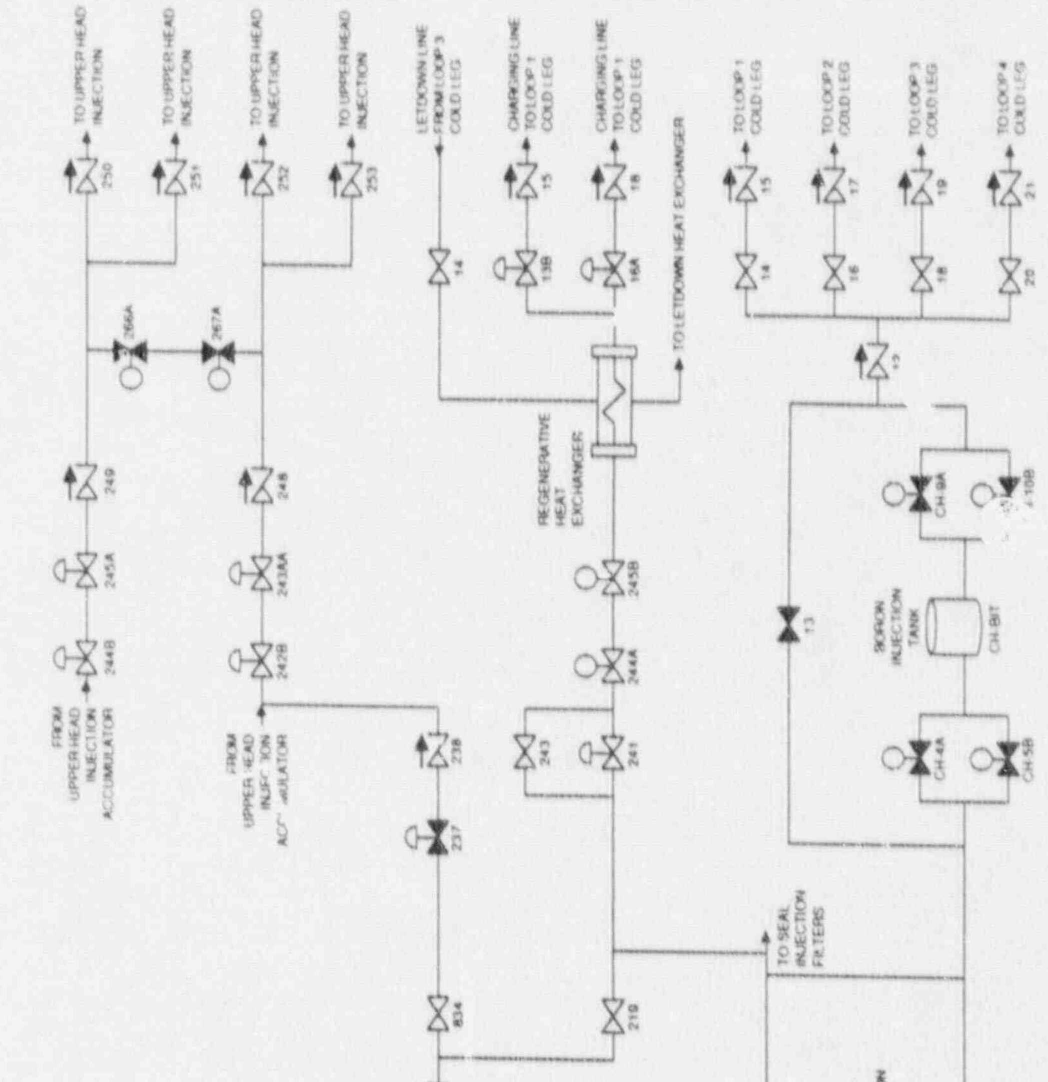


Figure 3.9-1. McGuire Unit 1 Charging System

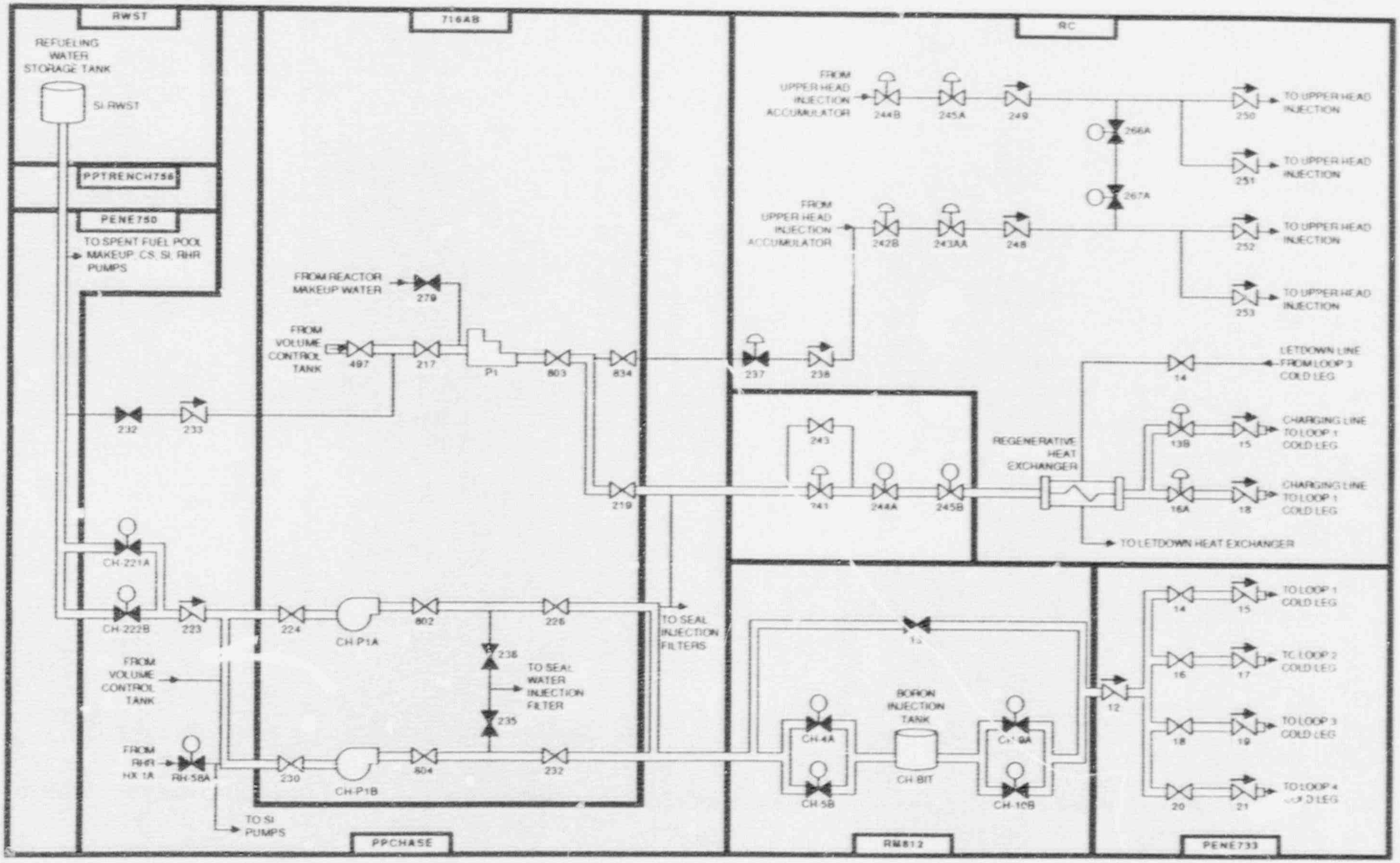


Figure 3.9-2. McGuire Unit 1 Charging System Showing Component Locations

Table 3.9-1. McGuire 1 Chemical and Volume Control System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CH-10B	MOV	RM812	MCC-1EMXB-1	600	ELEQRM722	AC/B
CH-221A	MOV	PPCHASE	MCC-1EMXA	600	MCCRM	AC/A
CH-222B	MOV	PPCHASE	MCC-1EMXB-2	600	ELEQRM722	AC/B
CH-4A	MOV	RM812	MCC-1EMXA	600	MCCRM	AC/A
CH-5B	MOV	RM812	MCC-1EMXB-1	600	ELEQRM722	AC/B
CH-9A	MOV	RM812	MCC-1EMXA	600	MCCRM	AC/A
CH-BIT	TANK	RM812				
CH-P1A	MDP	716AB	BUS-1ETA	4160	ASWGRM	AC/A
CH-P1B	MDP	716AB	BUS-1ETB	4160	BSWGRM	AC/B

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The McGuire Nuclear Station is located on a site of approximately 30,000 acres of land in northwestern Mecklenburg County, North Carolina. The site is approximately 17 miles northwest of Charlotte. The site is bounded on the west by the Catawba River and on the north by Lake Norman. The power station contains two operating units, McGuire 1 and 2. Figure 4-1 is a general view of the plant and vicinity (from Ref. 1).

The major structures at this unit include the two containment buildings, two turbine buildings, a shared auxiliary building, a shared service building, and the intake structure. A site plot plan is shown in Figure 4-2.

Each containment structure is reinforced concrete cylinder with a steel liner and an ice condenser. An elevation view of a Westinghouse ice condenser containment similar to McGuire is shown in Figure 4-3. The containment contains the reactor vessel, reactor coolant pumps, steam generators, and pressurizer. Pumps, piping, and valving for the reactor coolant system is completely contained within the containment structure. Access to the building is via an equipment hatch or a personnel hatch. Piping and electrical penetration areas are on various levels of the auxiliary building, on the northeast and southwest side of the containment, respectively.

The turbine buildings, located south of their respective containments, house the turbine generator and the associated power generating auxiliaries.

The auxiliary building is located mainly to the north of the containments. It contains much of the plant's safety related equipment, specifically the auxiliary feedwater pumps, high pressure injection pumps, RHR pumps and heat exchangers, containment spray pumps, charging pumps, component cooling water pumps and heat exchangers, and motor control centers supplying power to safety system components.

The intake structure is located north of the auxiliary building, on Lake Norman. The remainder of this section pertains only to Unit 1.

4.2 FACILITY LAYOUT DRAWINGS

Figures 4-4 through 4-9 are simplified building layout drawings for the McGuire 1 containment and auxiliary building. Similar drawings for McGuire 2 are shown in Figures 4-10 to 4-14. The Standby Shutdown Facility (SSF) is shown in Figure 4-15. The turbine and service building and the intake structure are not shown on these drawings. Major rooms, stairways, elevators, and doorways are shown in the simplified layout drawings however, many interior walls have been omitted for clarity. Labels printed in uppercase correspond to the location codes listed in Table 4-1 and used in the component data listings and system drawings in Section 3. Some additional labels are included for information and are printed in lowercase type.

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

4.3 SECTION 4 REFERENCES

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

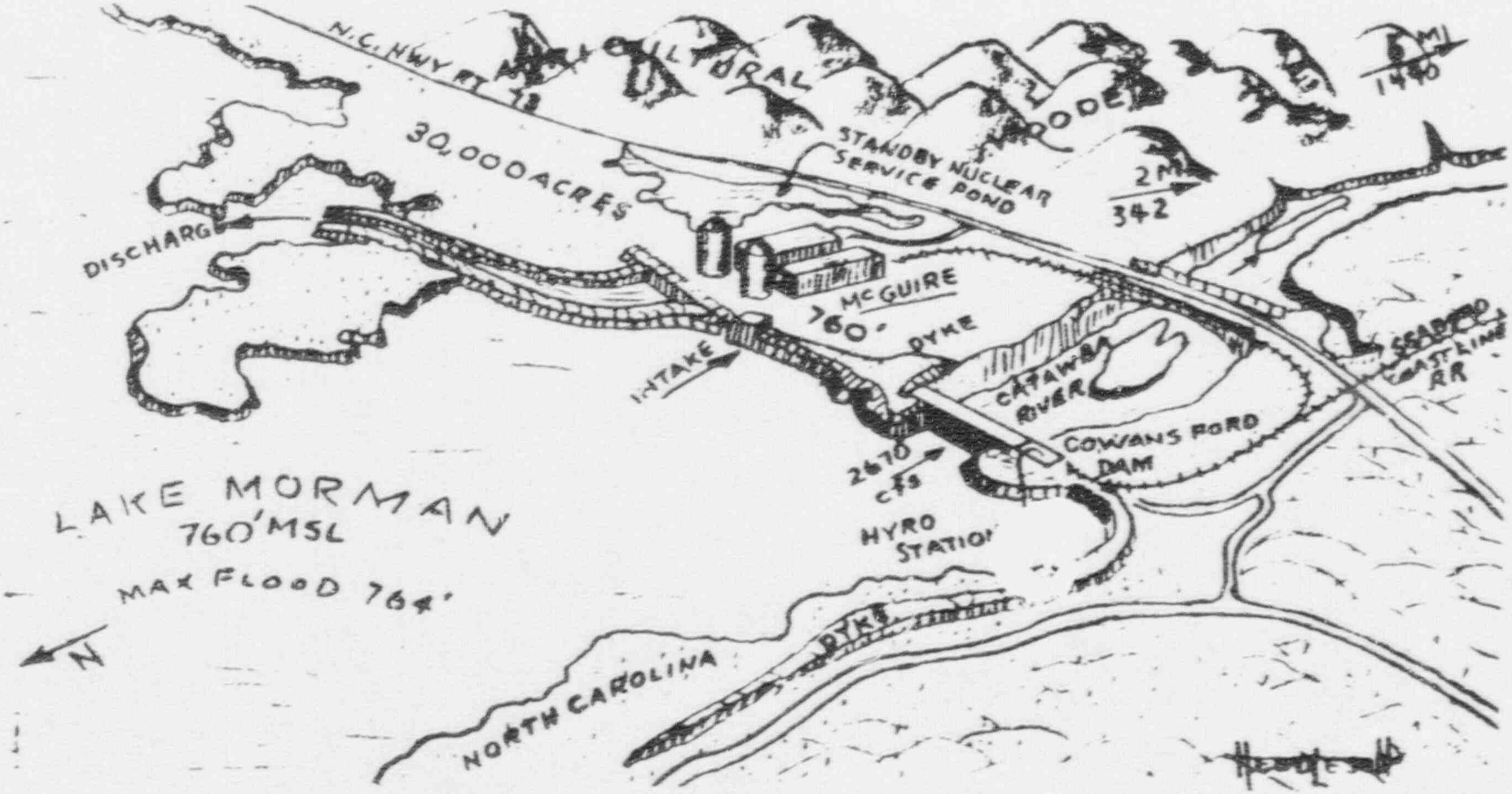


Figure 4-1. General View of McGuire Nuclear Station and Vicinity

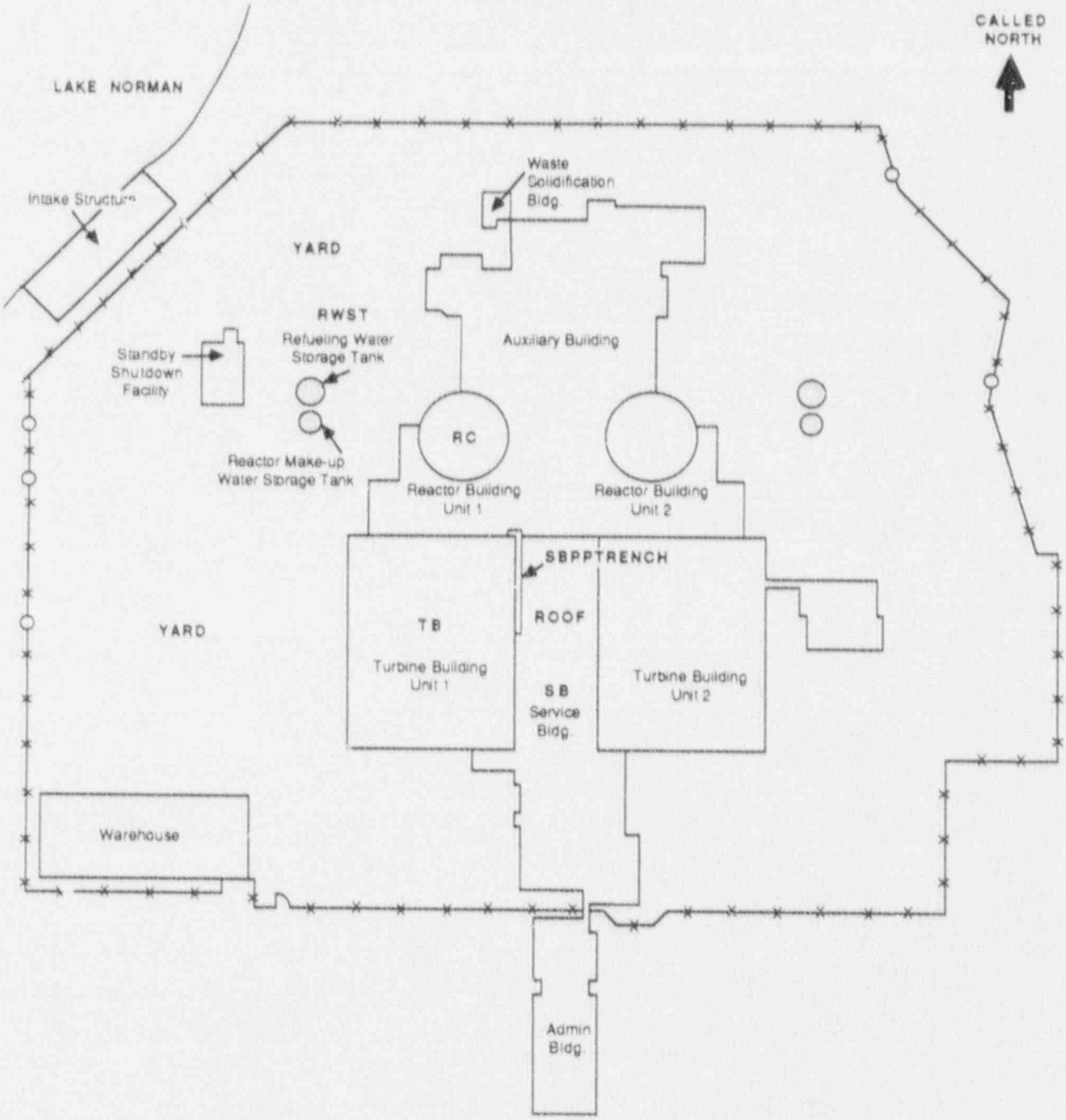


Figure 4-2. McGuire Nuclear Station Plot Plan

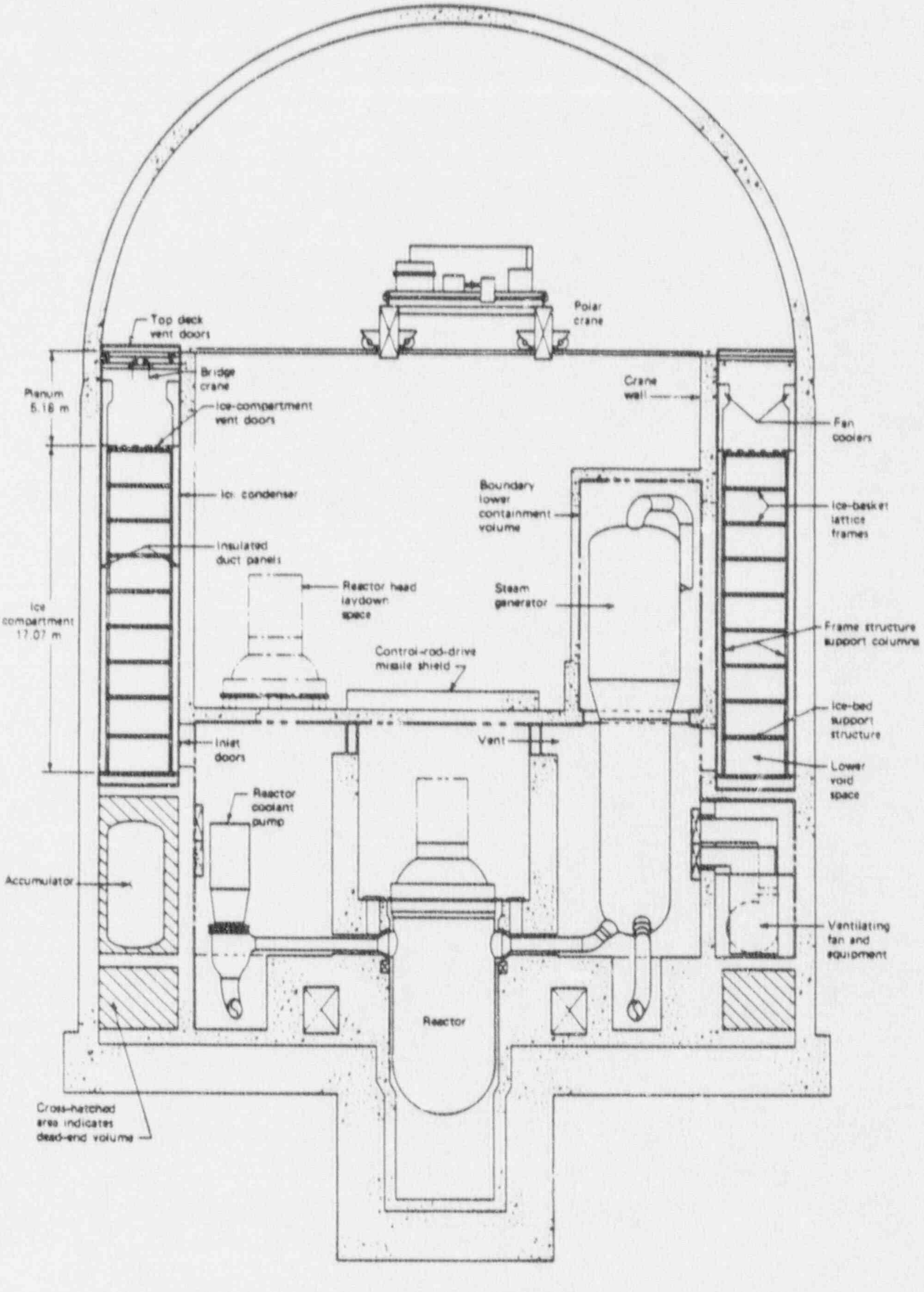
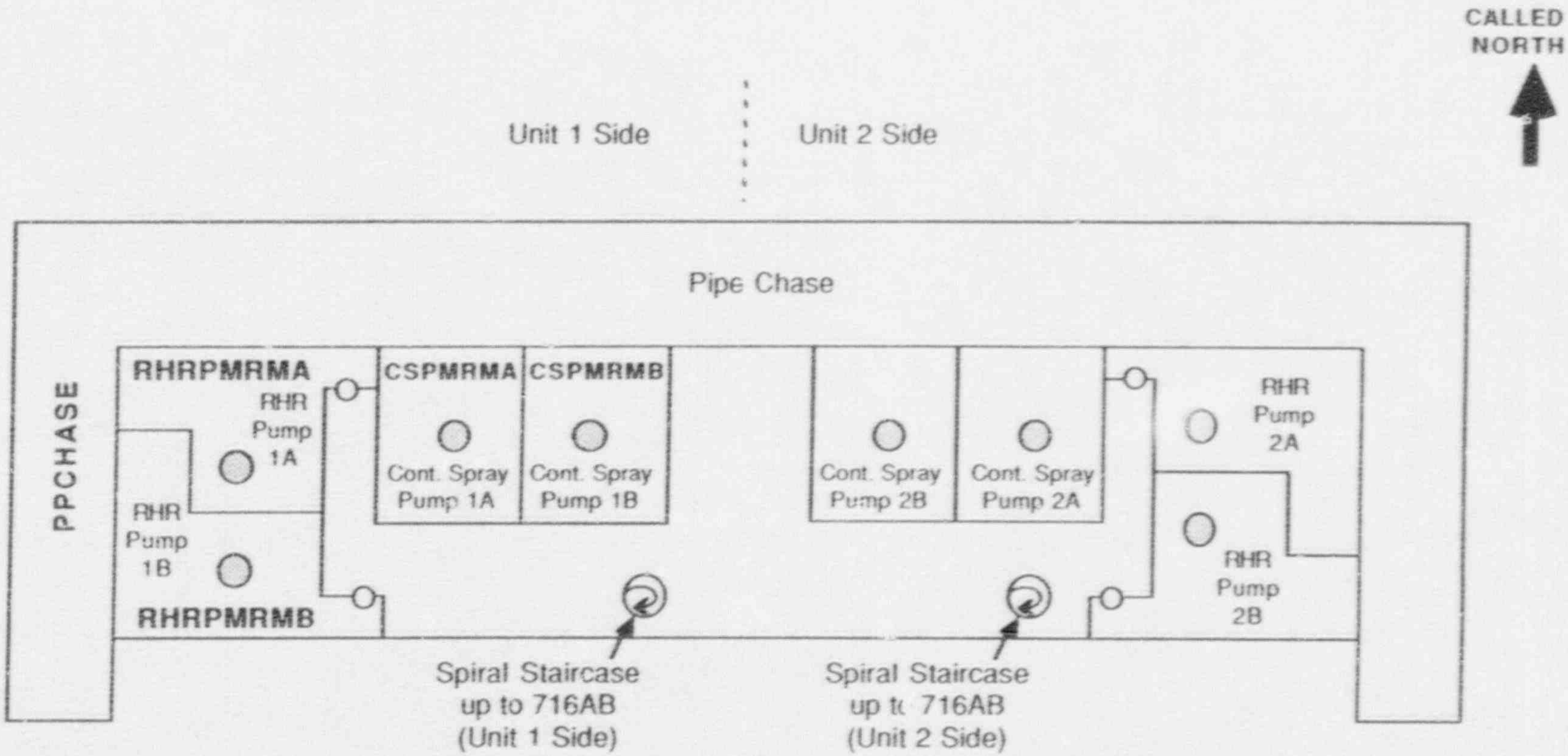


Figure 4-3. Westinghouse NSSS in an Ice Condenser Containment, Elevation View



NOTE: Not drawn to same scale as Figures 4-5 to 4-9.

Figure 4-4. McGuire Units 1 and 2 Auxiliary Building, Elevation 695'

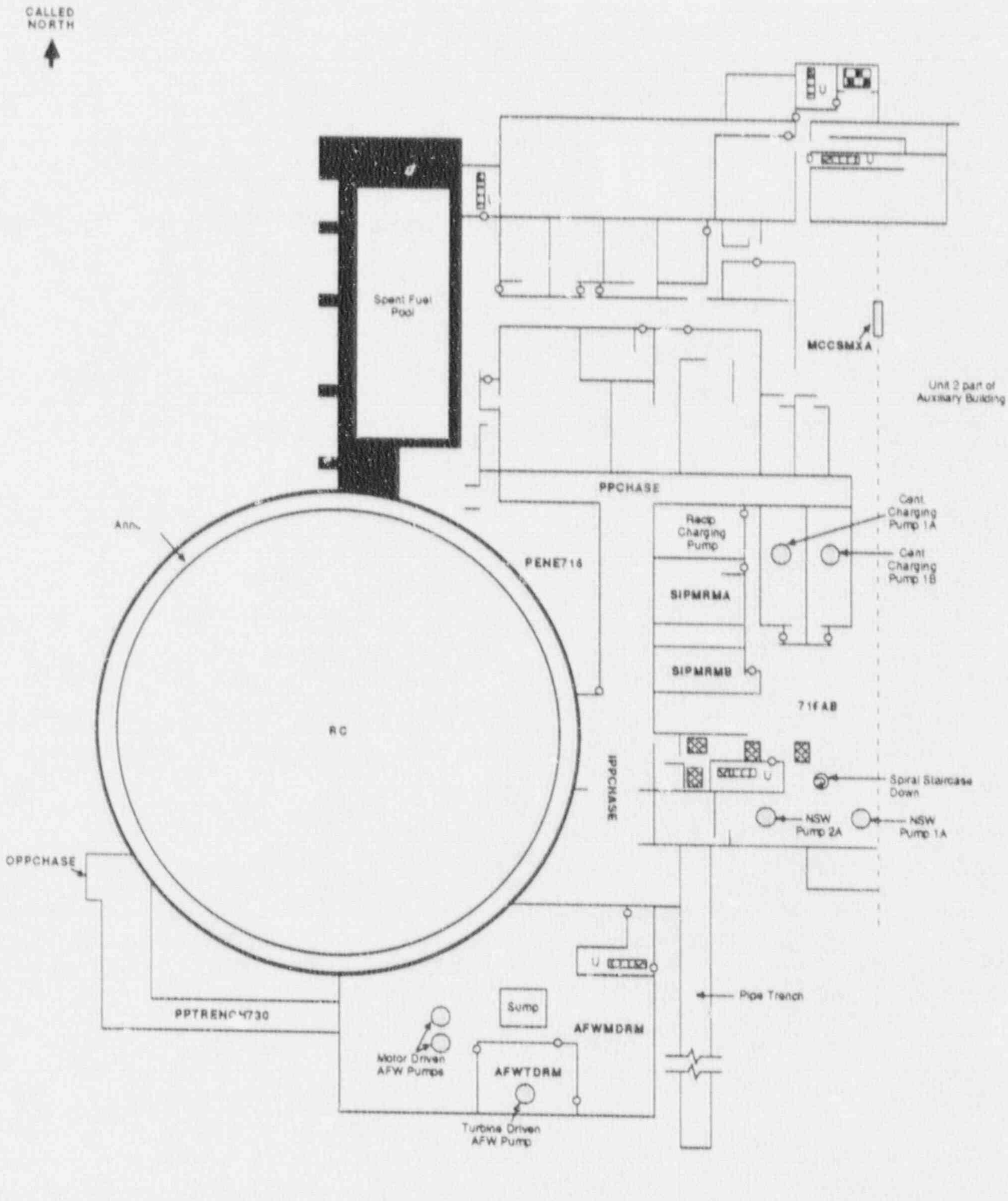


Figure 4-5. McGuire Unit 1 Reactor and Auxiliary Buildings, Elevation 716'

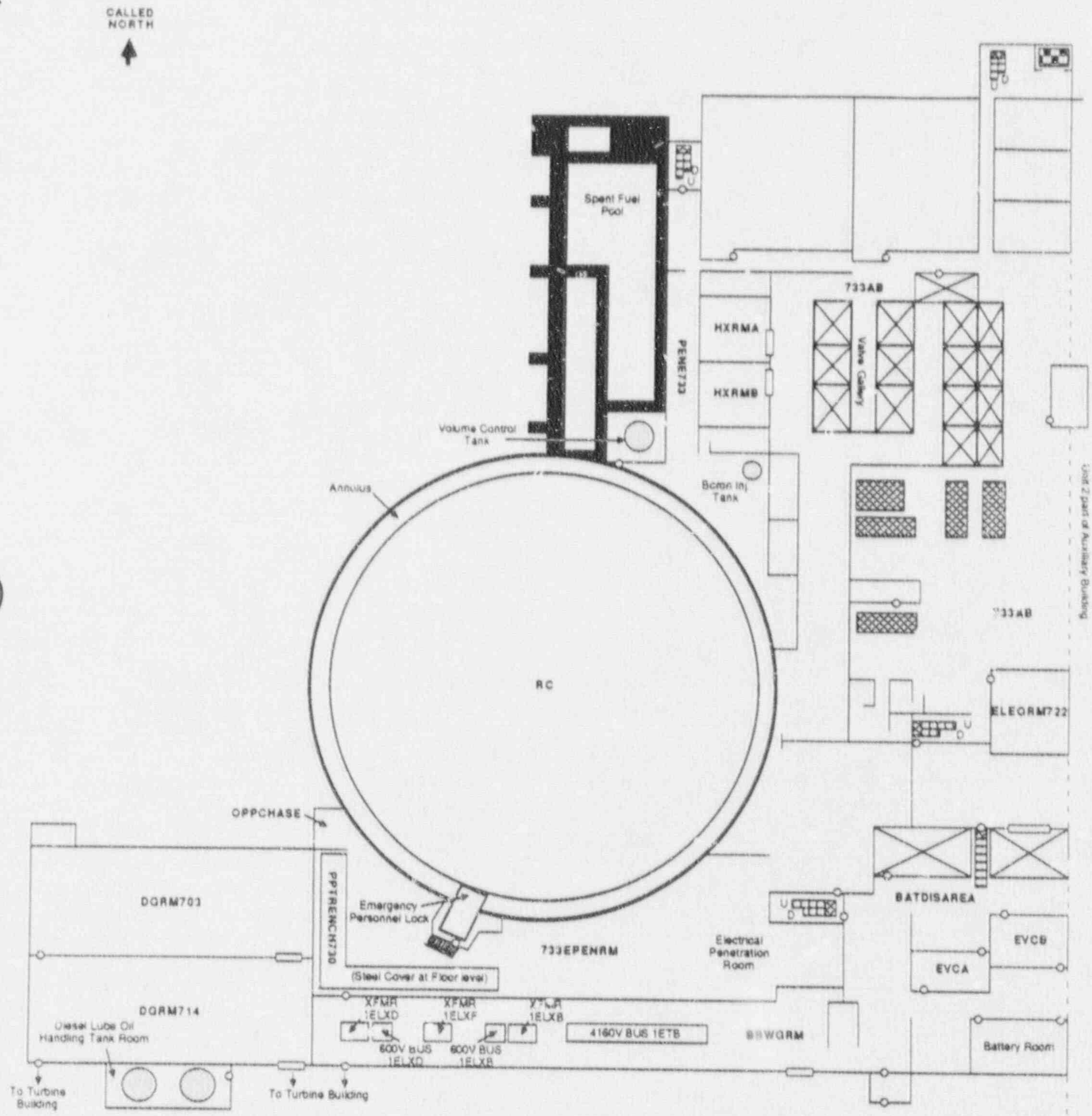


Figure 4-6. McGuire Unit 1 Reactor and Auxiliary Buildings, Elevation 733' and 739'

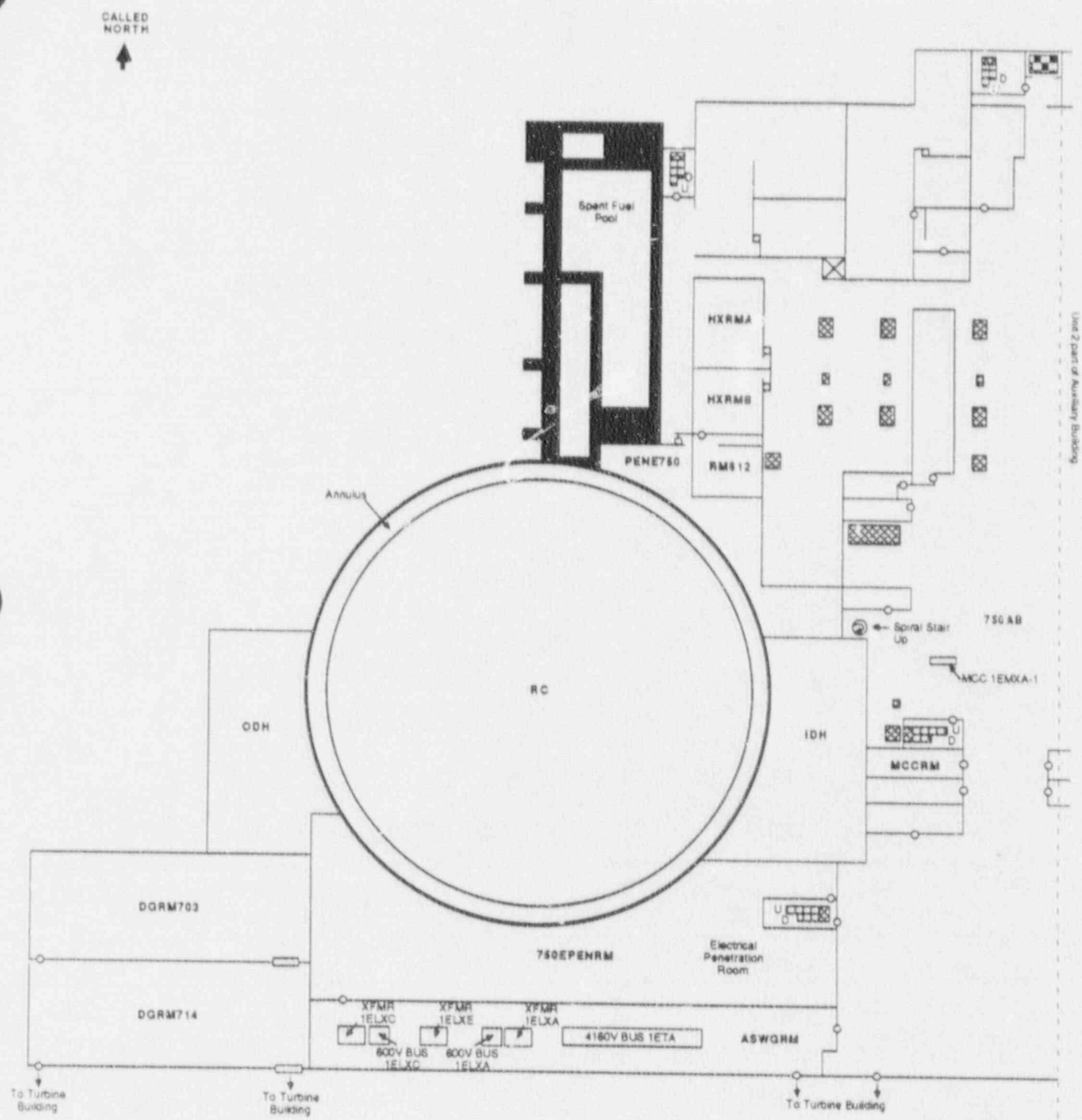


Figure 4-7. McGuire Unit 1 Reactor and Auxiliary Buildings, Elevation 750'

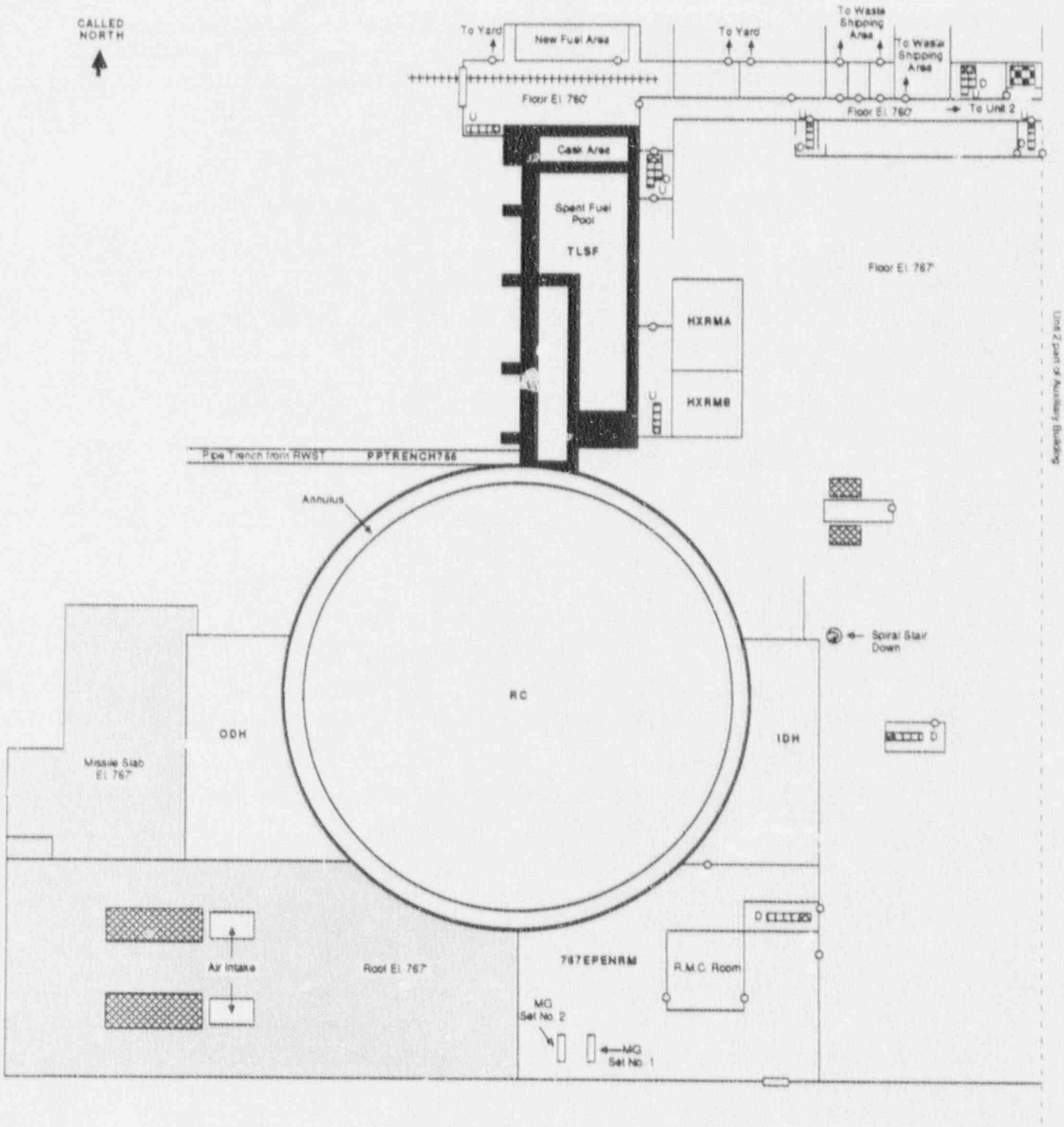


Figure 4-8. McGuire Unit 1 Reactor and Auxiliary Buildings, Elevation 760' and 767'

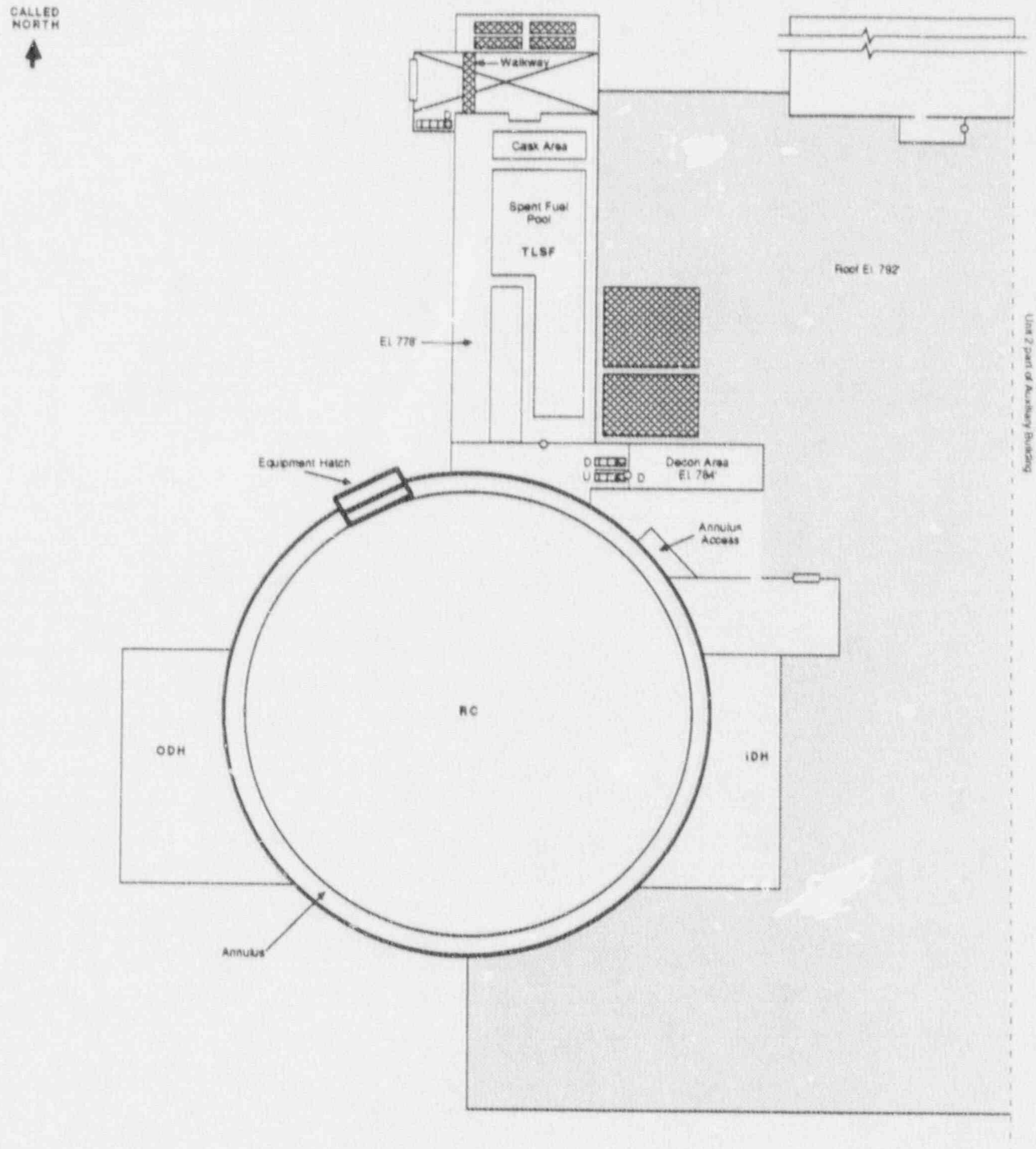


Figure 4-9. McGuire Unit 1 Reactor and Auxiliary Buildings, Elevation 778' and 792'

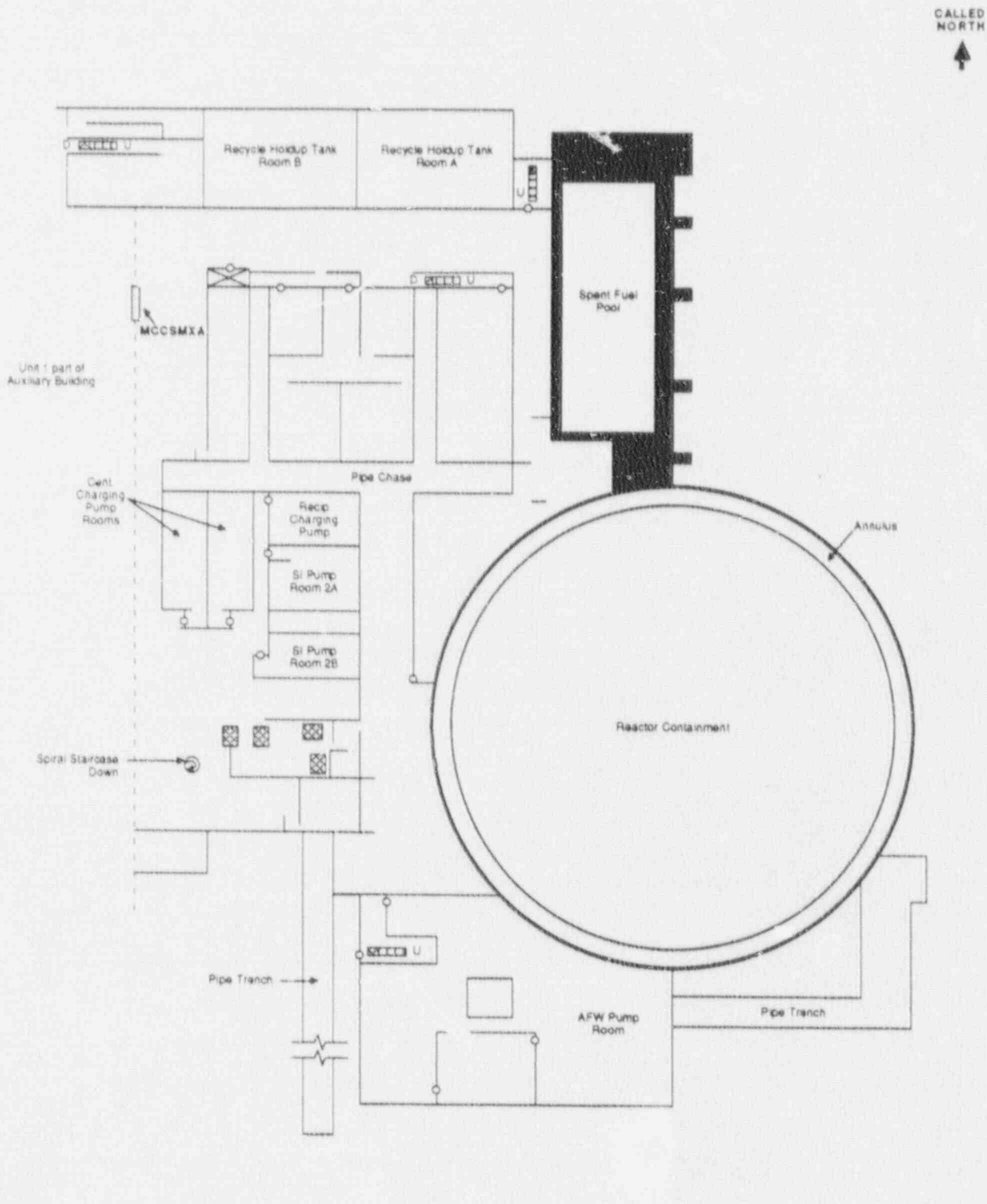


Figure 4-10. McGuire Unit 2 Reactor and Auxiliary Buildings, Elevation 716'

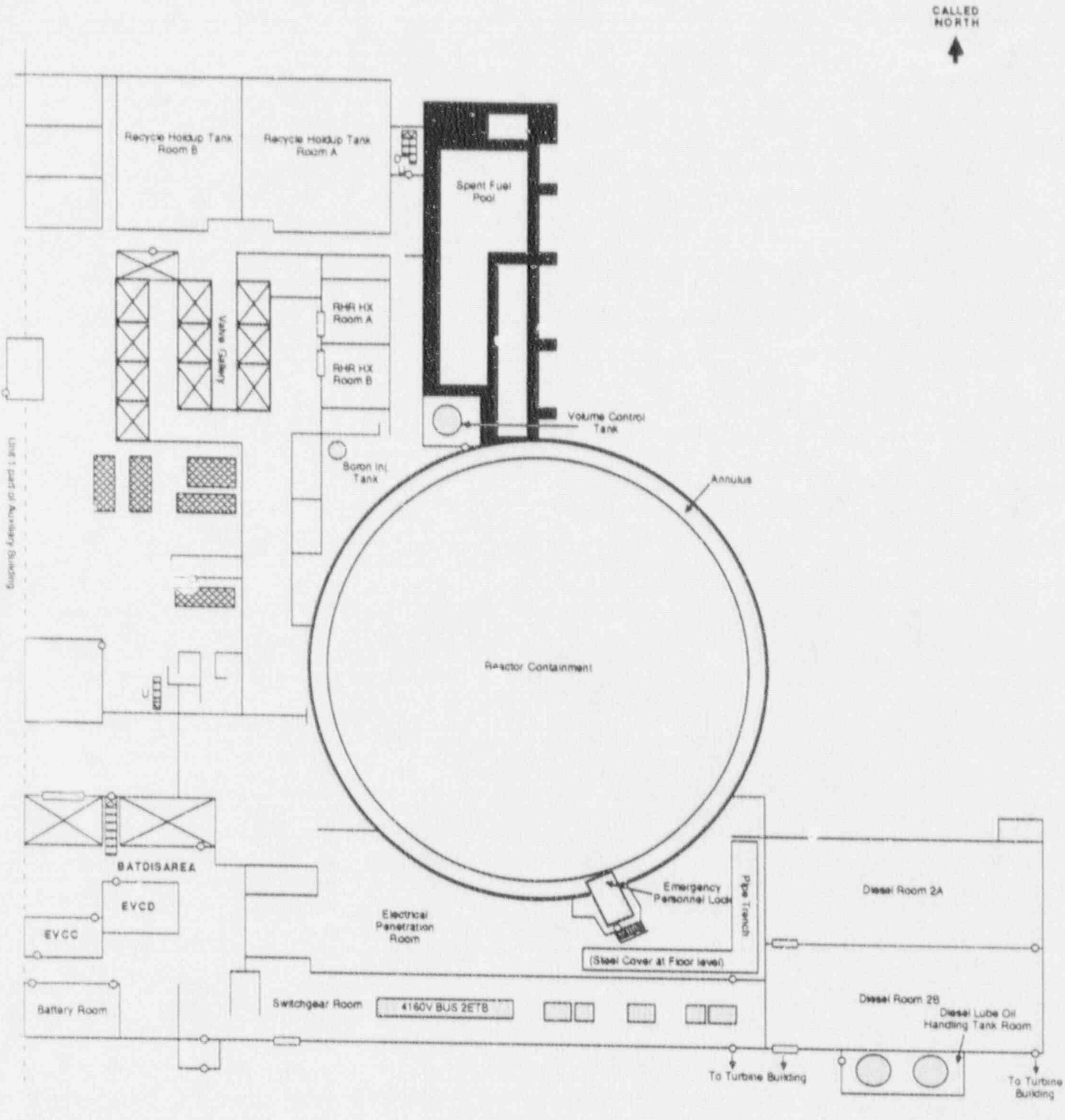


Figure 4-11. McGuire Unit 2 Reactor and Auxiliary Buildings, Elevation 733' and 739'

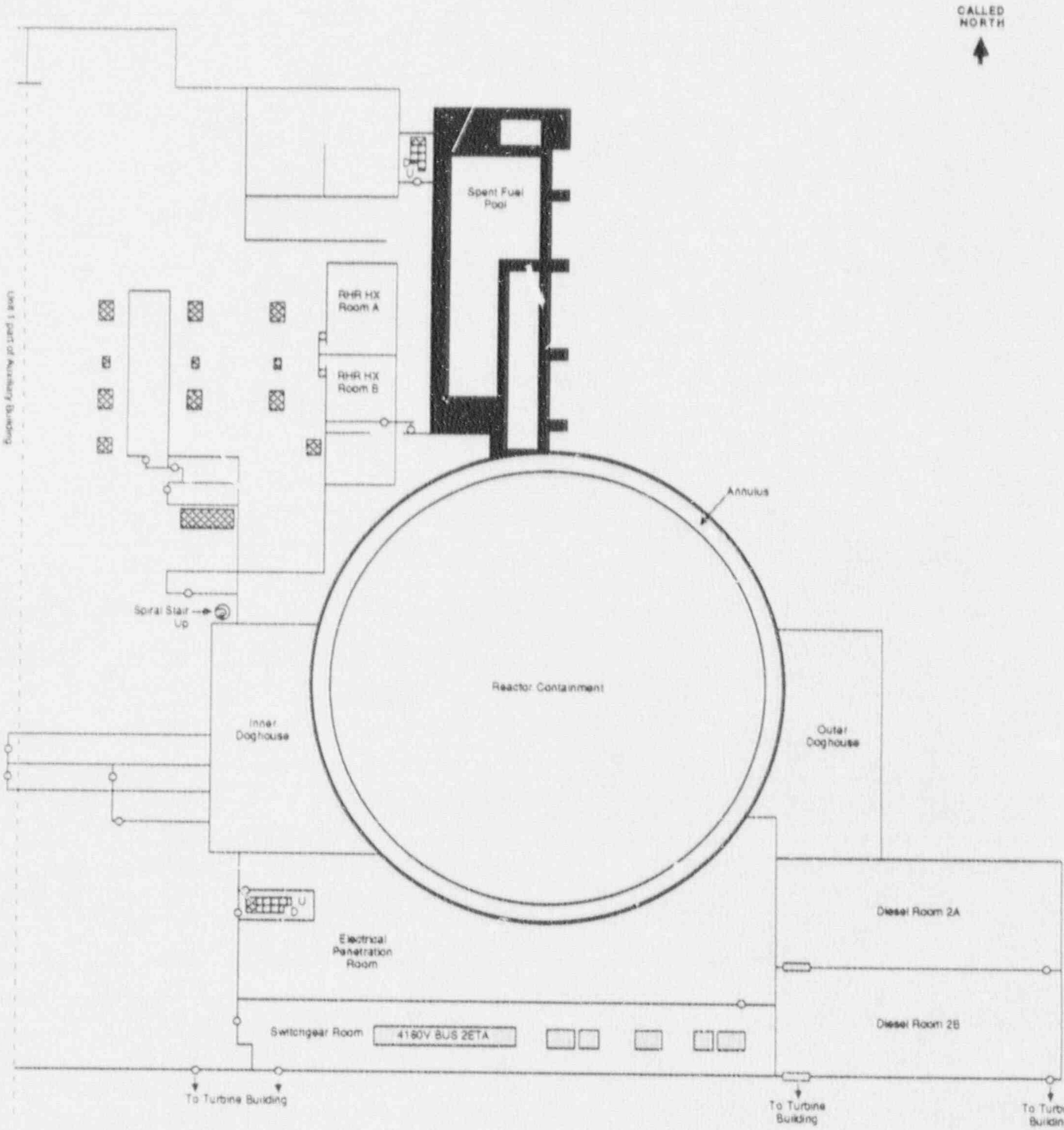


Figure 4-12. McGuire Unit 2 Reactor and Auxiliary Buildings, Elevation 750'

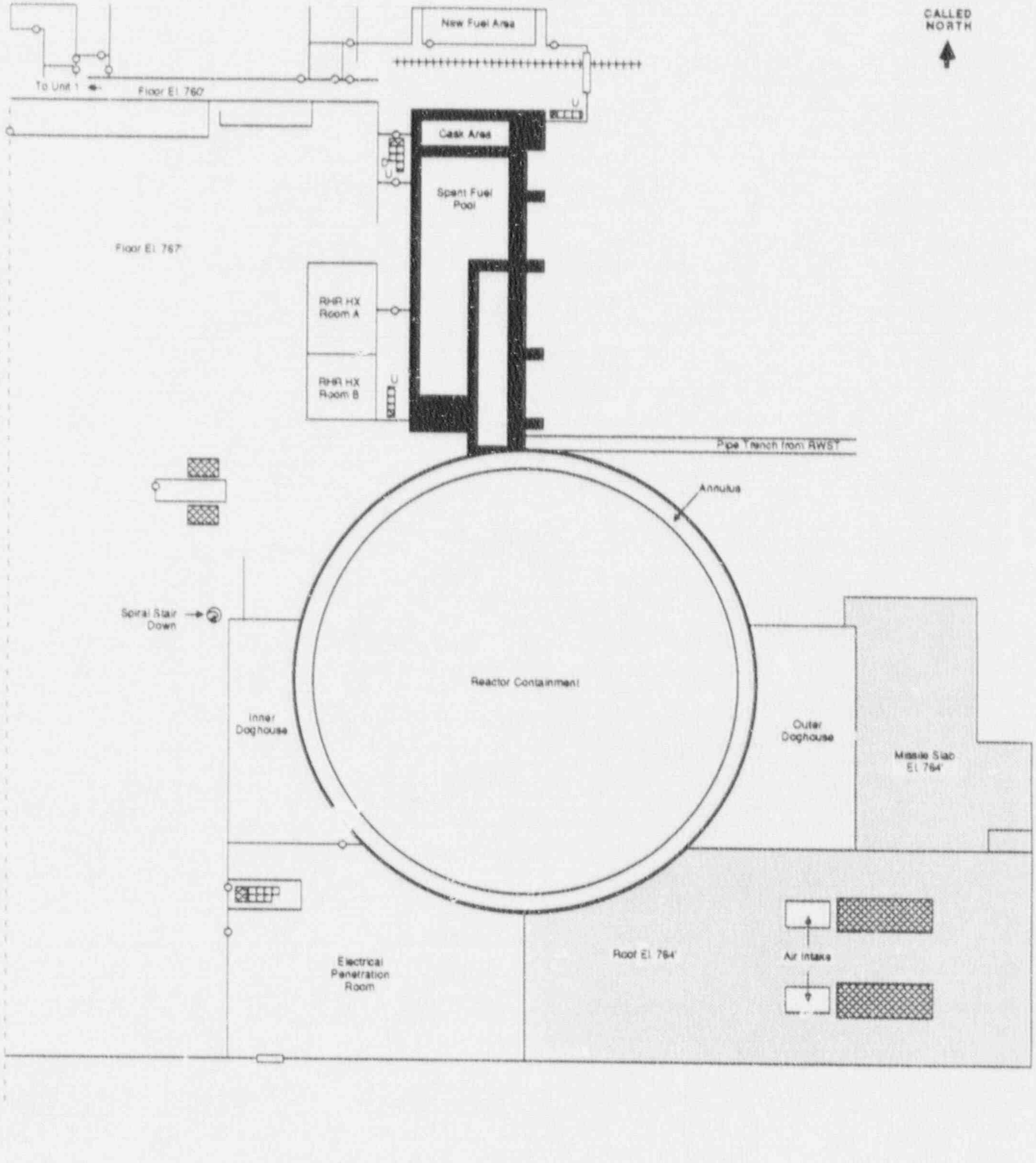


Figure 4-13. McGuire Unit 2 Reactor and Auxiliary Buildings, Elevation 760' and 767'

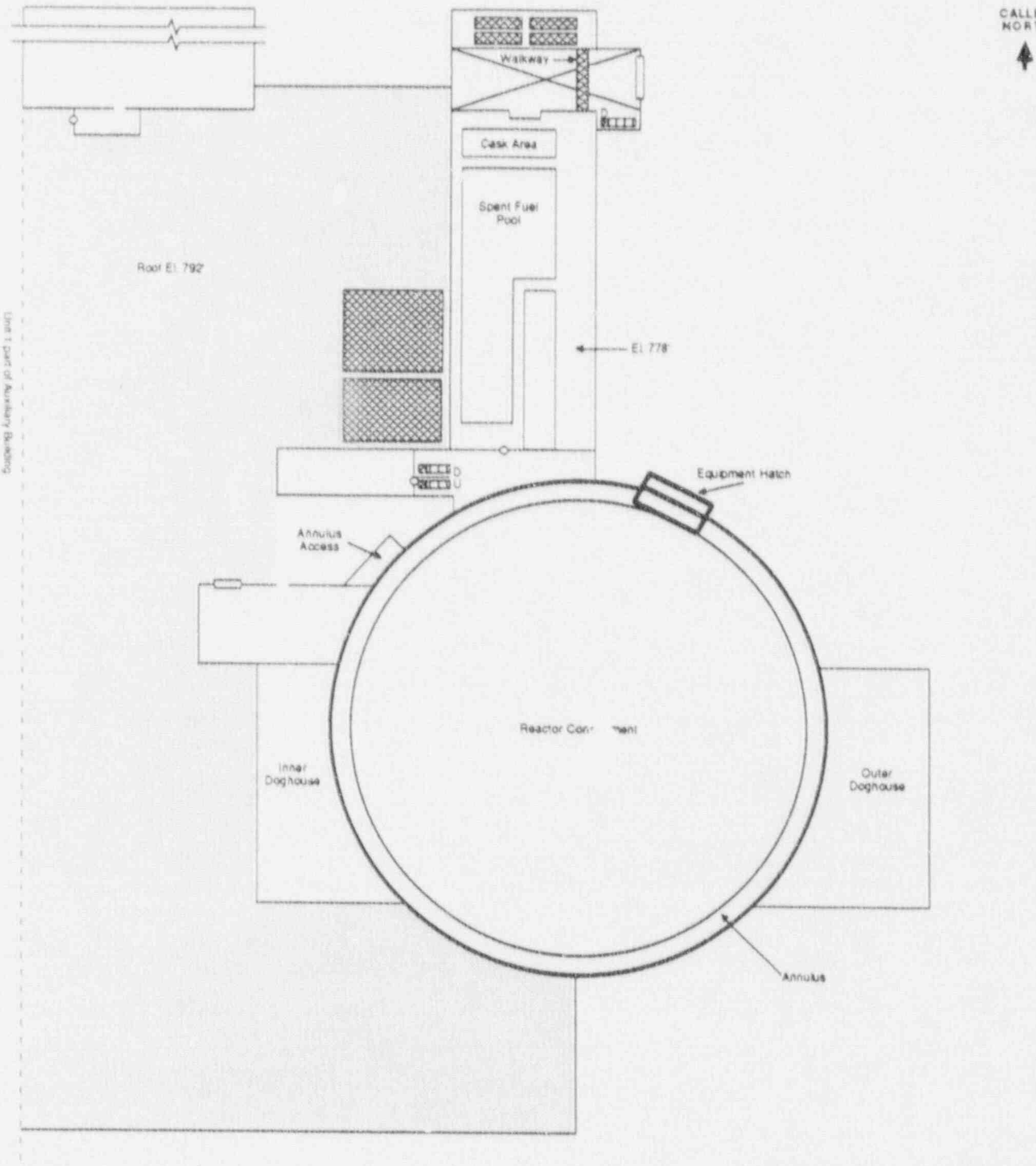


Figure 4-14. McGuire Unit 2 Reactor and Auxiliary Buildings, Elevation 778' and 792'

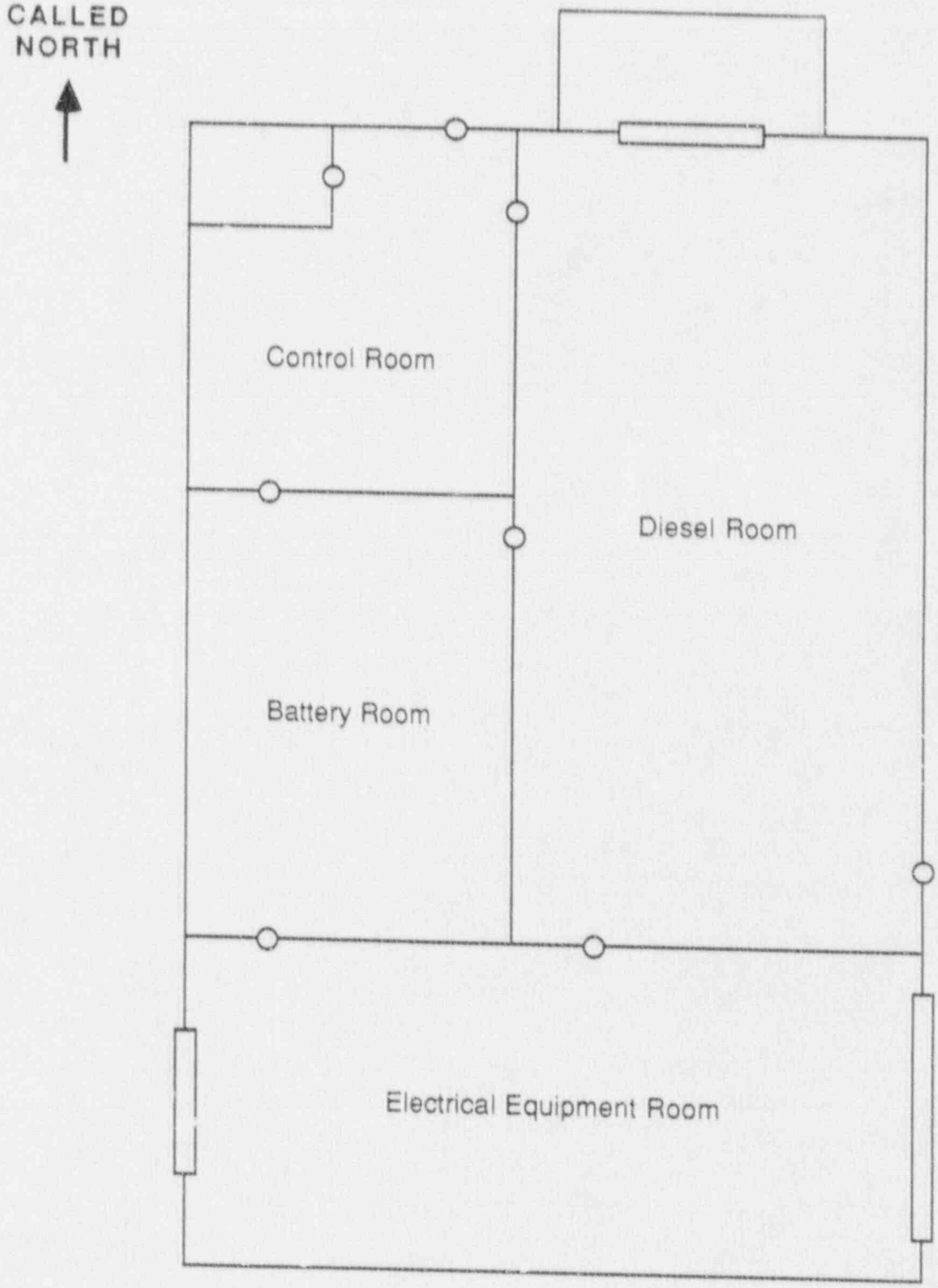


Figure 4-15. McGuire Standby Shutdown Facility

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

	Codes	Descriptions
1.	600AB	600' elevation of the Auxiliary Building
2.	716AB	716' elevation of the Auxiliary Building
3.	733AB	733' elevation of the Auxiliary Building
4.	750AB	750' elevation of the Auxiliary Building
5.	733EPENRM	Electrical Penetration Room, located on the 733' elevation of the Auxiliary Building
6.	750EPENRM	Electrical Penetration Room, located on the 750' elevation of the Auxiliary Building
7.	767EPENRM	Electrical Penetration Room, located on the 767' elevation of the Auxiliary Building
8.	AFWMDRM	Auxiliary Feedwater Motor Driven Pump Room, located on the 716' elevation of the Auxiliary Building
9.	AFWMDRM2	Auxiliary Feedwater Motor Driven Pump Room for Unit 2, located on the 716' elevation of the Auxiliary Building
10.	AFWTDRM	Auxiliary Feedwater Turbine Driven Pump Room, located on the 716' elevation of the Auxiliary Building
11.	ASWGRM	Switchgear Room A, located on the 716' elevation of the Auxiliary Building
12.	BATDISAREA	Battery Area, located on the 733' elevation of the Auxiliary Building
13.	BSWGRM	Switchgear Room B, located on the 733' elevation of the Auxiliary Building
14.	CR	Control Room
15.	CSPMRMA	Core Spray Pump Room A, located on the 685' elevation of the Auxiliary Building
16.	CSPMRMB	Core Spray Pump Room B, located on the 685' elevation of the Auxiliary Building
17.	CST	Condensate Storage Tank, located on the Roof of the Service Building

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

Codes	Descriptions
18. DGRM703	Diesel Generator Room 703, located on the 733' elevation of the Auxiliary Building
19. DGRM714	Diesel Generator Room 714, located on the 733' elevation of the Auxiliary Building
20. ELEQRM722	Electrical Equipment Room 722, located on the 733' elevation of the Auxiliary Building
21. EVCA	Vital Battery EVCA, located on the 733' elevation of the Auxiliary Building
22. EVCB	Vital Battery EVCB, located on the 733' elevation of the Auxiliary Building
23. EVCC	Vital Battery EVCC, located on the 733' elevation of the Auxiliary Building
24. EVCD	Vital Battery EVCD, located on the 733' elevation of the Auxiliary Building
25. HXRMA	Heat Exchanger Room A, located on the 750' elevation of the Auxiliary Building
26. HXRMB	Heat Exchanger Room B, located on the 750' elevation of the Auxiliary Building
27. IDH	Inside Doghouse
28. IPPCHASE	Inside Pipe Chase - runs vertically through the Auxiliary Building just east of Containment
29. MCC1EMXA-1	Motor Control Center 1EMXA-1, located on the 750' elevation of the Auxiliary Building
30. MCC1EMXH	Motor Control Center 1EMXH, located on the 750' elevation of the Auxiliary Building
31. MCC1MXC	Motor Control Center 1MXC, located in the Turbine Building
32. MCC1SMXA	Motor Control Center 1SMXA, located on the 733' elevation of the Auxiliary Building
33. MCCRM	Motor Control Center Room, located just east of Containment on the 750' elevation of the Auxiliary Building

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

	Codes	Descriptions
34.	MCCSMXB	Motor Control Center SMXB, located on the 733' elevation of the Auxiliary Building
35.	ODH	Outside Doghouse
36.	OPPCHASE	Outside Pipe Chase - runs from elevation 716' TO 750' elevations just west of the Containment
37.	PENE716	Penetration Area, located on the 716' elevation of the Auxiliary Building
38.	PENE733	Penetration Area, located on the 733' elevation of the Auxiliary Building
39.	PENE750	Penetration Area, located on the 750' elevation of the Auxiliary Building
40.	PPCHASE	Pipe Chase - runs through all elevations of the Auxiliary Building
40.	PPTRENCH730	Pipe Trench - running from AFWMDRM to the Diesel Generator Area
42.	PPTRENCH756	Pipe Trench - running from RWST to Auxiliary Building
43.	RC	Reactor Containment
44.	RHRPMRMA	Residual Heat Removal Pump Room A, located on the 685' elevation of the Auxiliary Building39.
45.	RHRPMRMB	Residual Heat Removal Pump Room B, located on the 685' elevation of the Auxiliary Building
46.	RM623	Room 623, located on the 716' elevation of the Auxiliary Building
47.	RM812	Room 812, located on the 750' elevation of the Auxiliary Building - contains piping from the RWST to the Safety Injection System
48.	ROOF	Roof of the Service Building
49.	RWST	Refueling Water Storage Tank
50.	SB	Service Building
51.	SBPPTRENCH	Service Building Pipe Trench
52.	SIPMRMA	Safety Injection Pump Room A, located on the 716' elevation of the Auxiliary Building

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

Codes	Descriptions
53. SIPMRMB	Safety Injection Pump Room B, located on the 716' elevation of the Auxiliary Building
54. SUMP	Sump Area, located beneath the reactor vessel
55. TB	Turbine Building
56. TLSF	Spent fuel pool operating floor
57. YARD	Yard Area - outside the Reactor Building

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
716AB	CVCS	CH-P1A	MDP
716AB	CVCS	CH-P1B	MDP
716AB	NSW	NSW-P1A	MDP
716AB	NSW	NSW-P1B	MDP
733AB	CCW	CC-P1A1	MDP
733AB	CCW	CC-P1A2	MDP
733AB	CCW	CC-P1B1	MDP
733AB	CCW	CC-P1B2	MDP
733EPENRM	RCS	HTR-PNL-1B	PNL
750AB	CCW	CC-228B	MOV
750AB	CCW	CC-230A	MOV
750AB	CCW	CC-50A	MOV
750AB	CCW	CC-53B	MOV
750AB	CCW	CC-56A	MOV
750AB	CCW	CC-81B	MOV
750AB	CCW	CC-HX1A	HX
750AB	CCW	CC-HX1B	HX
750EPENRM	RCS	HTR-PNL-1A	PNL
AFWMDRM	AFW	AFW-P1A	MDP
AFWMDRM	AFW	AFW-11A	MOV
AFWMDRM	AFW	NSW-147AC	MOV
AFWMDRM	AFW	NSW-148A	MOV
AFWMDRM	AFW	AFW-P1B	MDP
AFWMDRM	AFW	NSW-147AC	MOV
AFWMDRM	AFW	NSW-148A	MOV
AFWMDRM	AFW	AFW-9B	MOV
AFWMDRM	AFW	AFW-116B	MOV
AFWMDRM	AFW	NSW-147AC	MOV
AFWMDRM	AFW	NSW-148A	MOV
AFWMDRM	AFW	AFW-15A	MOV

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
AFWMDRM	AFW	AFW-18B	MOV
AFWMDRM	NSW	NSW-12AC	MOV
AFWMDRM	NSW	NSW-13A	MOV
AFWMDRM	NSW	NSW-16A	MOV
AFWMDRM2	NSW	NSW-10AC	MOV
AFWMDRM2	NSW	NSW-11B	MOV
AFWMDRM2	NSW	NSW-18B	MOV
AFWMDRM2	NSW	NSW-7A	MOV
AFWMDRM2	NSW	NSW-9B	MOV
AFWTDRM	AFW	AFW-P1	TDP
AFWTDRM	AFW	AFW-7A	MOV
AFWTDRM	AFW	AFW-86A	MOV
AFWTDRM	AFW	NSW-69A	MOV
ASWGRM	EP	CB-1ETA	CB
ASWGRM	EP	BUS-1ETA	BUS
ASWGRM	EP	BUS-1ELXA	BUS
ASWGRM	EP	BUS-1ELXC	BUS
ASWGRM	EP	TR-1ELXA	XFMR
ASWGRM	EP	TR-1ELXC	XFMR
ASWGRM	EP	BUS-1ELXA	BUS
ASWGRM	EP	BUS-1ELXC	BUS
ASWGRM	EP	TR-1ELXE	XFMR
ASWGRM	EP	TR-1ELXE	XFMR
ASWGRM	EP	MCC-1EMXA-2	MCC
ASWGRM	EP	MCC-1EMXA-4	MCC
ASWGRM	EP	MCC-1EMXH-1	MCC
ASWGRM	EP	MCC-1EMXC	MCC
BATDISAREA	EP	BUS-EVDA	BUS
BATDISAREA	EP	BUS-EVDB	BUS
BATDISAREA	EP	BUS-EVDA	BUS

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
BATDISAREA	EP	BUS-EVDB	BUS
BATDISAREA	EP	BC-EVCA	BC
BATDISAREA	EP	BC-EVCB	BC
BATDISAREA	EP	BC-EVCC	BC
BATDISAREA	EP	BC-EVCD	BC
BATDISAREA	EP	BUS-1EKVA	BUS
BATDISAREA	EP	BUS-1EKVB	BUS
BATDISAREA	EP	BUS-1EKVC	BUS
BATDISAREA	EP	BUS-1EKVD	BUS
BATDISAREA	EP	INV-EVIA	INV
BATDISAREA	EP	INV-EVIB	INV
BATDISAREA	EP	INV-EVIC	INV
BATDISAREA	EP	INV-EVID	INV
BATDISAREA	EP	BUS-EVDC	BUS
BATDISAREA	EP	BUS-EVDC	BUS
BATDISAREA	EP	BUS-EVDD	BUS
BATDISAREA	EP	BUS-EVDD	BUS
BSWGRM	EP	CB-1ETB	CB
BSWGRM	EP	BUS-1ETB	BUS
BSWGRM	EP	BUS-1ELXB	BUS
BSWGRM	EP	BUS-1ELXD	BUS
BSWGRM	EP	TR-1ELXB	XFMR
BSWGRM	EP	TR-1ELXD	XFMR
BSWGRM	EP	BUS-1ELXB	BUS
BSWGRM	EP	BUS-1ELXD	BUS
BSWGRM	EP	TR-1ELXF	XFMR
BSWGRM	EP	TR-1ELXF	XFMR
BSWGRM	EP	MCC-1EMXD	MCC
CSPMRMA	CS	CS-18A	MOV
CSPMRMA	CS	CS-P1A	MDP

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
CSPMRMB	CS	CS-1B	MOV
CSPMRMB	CS	CS-P1B	MDP
CST	AFW	AFW-CST	TANK
CST	AFW	AFW-CST	TANK
CST	AFW	AFW-CST	TANK
DGRM703	EP	MCC-1EMXE	MCC
DGRM703	EP	DG-1A	DG
DGRM703	EP	DG-P1A	MDP
DGRM703	EP	DG-1A	DG
DGRM703	EP	DG-HX1A	HX
DGRM703	EP	DG1-13	XV
DGRM703	EP	NSW-70A	MOV
DGRM703	EP	NSW-73A	MOV
DGRM703	EP	MCC-1EMXE	MCC
DGRM714	EP	MCC-1EMXF	MCC
DGRM714	EP	DG-1B	DG
DGRM714	EP	DG-P1B	MDP
DGRM714	EP	DG-1B	DG
DGRM714	EP	DG-HX1B	HX
DGRM714	EP	DG2-33	XV
DGRM714	EP	NSW-171B	MOV
DGRM714	EP	NSW-174B	MOV
DGRM714	EP	MCC-1EMXF	MCC
ELEQRM722	EP	MCC-1EMXB	MCC
ELEQRM722	EP	MCC-1EMXB	MCC
ELEQRM722	EP	MCC-1EMXB-1	MCC
ELEQRM722	EP	MCC-1EMXB-2	MCC
EVCA	EP	BT-EVCA	BATT
EVCB	EP	BT-EVCB	BATT
EVCC	EP	BT-EVCC	BATT

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
EVCD	EP	BT- [illegible]CD	BATT
HXMRB	ECCS	RH-3[illegible]	MOV
HXRMA	CCW	RH-HX1A	HX
HXRMA	CS	CS-HX1A	HX
HXRMA	ECCS	RH-HX1A	HX
HXRMB	CCW	RH-HX1B	HX
HXRMB	CS	CS-HX1B	HX
HXRMB	ECCS	RH-33	MOV
HXRMB	ECCS	RH-HX1B	HX
HXRMB	ECCS	RH-18	MOV
HXRMB	ECCS	RH-18	MOV
IDH	AFW	AFW-46B	MOV
IDH	AFW	AFW-50B	MOV
IDH	AFW	AFW-54A	MOV
IDH	AFW	AFW-58A	MOV
IDH	AFW	AFW-48ABC	NV
IDH	AFW	AFW-49AB	NV
IPPCHASE	AFW	AFW-161C	MOV
IPPCHASE	AFW	AFW-162C	MOV
IPPCHASE	AFW	AFW-161C	MOV
IPPCHASE	AFW	AFW-162C	MOV
IPPCHASE	AFW	AFW-161C	MOV
IPPCHASE	AFW	AFW-162C	MOV
IPPCHASE	CS	RH-184B	MOV
IPPCHASE	ECCS	RH-184B	MOV
MCC1EMXA-1	EP	MCC-1EMXA-1	MCC
MCC1EMXH	EP	MCC-1EMXH	MCC
MCC1MXC	EP	MCC-1MXC	MCC
MCC1SMXA	EP	MCC-1S[illegible]A	MCC
MCCRM	EP	MCC-1EMXA	MCC

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
MCCSMXB	EP	MCC-SMXB	MCC
ODH	AFW	AFW-38B	MOV
ODH	AFW	AFW-42B	MOV
ODH	AFW	AFW-62A	MOV
ODH	AFW	AFW-66A	MOV
PENE716	ECCS	SI-118A	MOV
PENE716	ECCS	SI-150B	MOV
PENE716	ECCS	SI-118A	MOV
PENE716	ECCS	SI-150B	MOV
PENE733	ECCS	SI-162A	MOV
PENE733	ECCS	SI-162A	MOV
PENE750	CS	CS-29A	MOV
PENE750	CS	CS-32A	MOV
PENE750	CS	CS-12B	MOV
PENE750	CS	CS-15B	MOV
PENE750	ECCS	SI-152B	MOV
PENE750	ECCS	SI-152B	MOV
PPCHASE	CS	RH-185A	MOV
PPCHASE	CS	RH-19A	MOV
PPCHASE	CS	RH-4B	MOV
PPCHASE	CS	RH-185A	MOV
PPCHASE	CVCS	CH-221A	MOV
PPCHASE	CVCS	CH-222B	MOV
PPCHASE	ECCS	SI-121A	MOV
PPCHASE	ECCS	RH-185A	MOV
PPCHASE	ECCS	RH-19A	MOV
PPCHASE	ECCS	RH-4B	MOV
PPCHASE	ECCS	RH-58A	MOV
PPCHASE	ECCS	SI-135B	MOV
PPCHASE	ECCS	SI-136B	MOV

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
PPCHASE	ECCS	SI-100B	MOV
PPCHASE	ECCS	SI-121A	MOV
PPCHASE	ECCS	SI-135B	MOV
RC	AFW	SG-1B	SG
RC	AFW	SG-1C	SG
RC	AFW	SG-1D	SG
RC	AFW	SG-1B	SG
RC	AFW	SG-1C	SG
RC	AFW	SG-1D	SG
RC	AFW	SG-1B	SG
RC	AFW	SG-1C	SG
RC	AFW	SG-1D	SG
RC	AFW	SG-1A	SG
RC	AFW	SG-1A	SG
RC	AFW	SG-1A	SG
RC	CS	RCS-VESSEL	RV
RC	CS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	ECCS	RCS-VESSEL	RV
RC	RCS	RCS-1B	MOV
RC	RCS	RCS-2AC	MOV
RC	RCS	RCS-VESSEL	RV
RC	RCS	RCS-31B	MOV
RC	RCS	RCS-32B	NV
RC	RCS	RCS-33A	MOV
RC	RCS	RCS-34A	NV
RC	RCS	RCS-35B	MOV
RC	RCS	RCS-36B	NV
RHRPMRMA	ECCS	RH-P1A	MDP

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RHRPMRMB	ECCS	RH-P1B	MDP
RM812	CVCS	CH-BIT	TANK
RM812	CVCS	CH-4A	MOV
RM812	CVCS	CH-9A	MOV
RM812	CVCS	CH-5B	MOV
RM812	CVCS	CH-10B	MOV
ROOF	AFW	AFW-6	MOV
RWST	CVCS	SI-RWST	TANK
RWST	ECCS	SI-RWST	TANK
RWST	ECCS	SI-RWST	TANK
SIPMRMA	ECCS	SI-P1A	MDP
SIPMRMA	ECCS	SI-334B	MOV
SIPMRMA	ECCS	SI-103A	MOV
SIPMRMA	ECCS	SI-332A	MOV
SIPMRMA	ECCS	SI-333B	MOV
SIPMRMA	ECCS	SI-103A	MOV
SIPMRMA	ECCS	SI-117	XV
SIPMRMA	ECCS	SI-P1A	MDP
SIPMRMB	ECCS	SI-P1B	MDP
SIPMRMB	ECCS	SI-149	XV
SIPMRMB	ECCS	SI-P1B	MDP
SUMP	CS	SUMP	TANK
SUMP	CS	SUMP	TANK
SUMP	ECCS	SUMP	TANK
TB	AFW	AFW-2	MOV
TB	AFW	AFW-2	MOV
TB	AFW	AFW-2	MOV
YARD	NSW	NSW-1	MOV

5. BIBLIOGRAPHY FOR McGUIRE 1 AND 2

1. NUREG-75/104, "Environmental Statement for the McGuire Nuclear Station, Units 1 and 2," USNRC.
2. NUREG-0422, "Safety Evaluation Report for McGuire Nuclear Station, Units 1 and 2," USNRC.

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

A1. SYSTEM DRAWINGS

A1.1 Fluid System Drawings

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

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

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

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

A1.2 Electrical System Drawings

The electric power system drawings focus on the Class 1E portions of the plant's electric power system. Separate drawings are provided for the AC and DC portions of the Class

1E system. There often are two versions of each electrical system drawing; a simplified system drawing, and a comparable drawing showing component locations. The drawing conventions used in the electrical system drawings are the following:

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

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

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

A2. SITE AND LAYOUT DRAWINGS

A2.1 Site Drawings

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

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

A2.2 Layout Drawings

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

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

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

A3. APPENDIX A REFERENCES

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

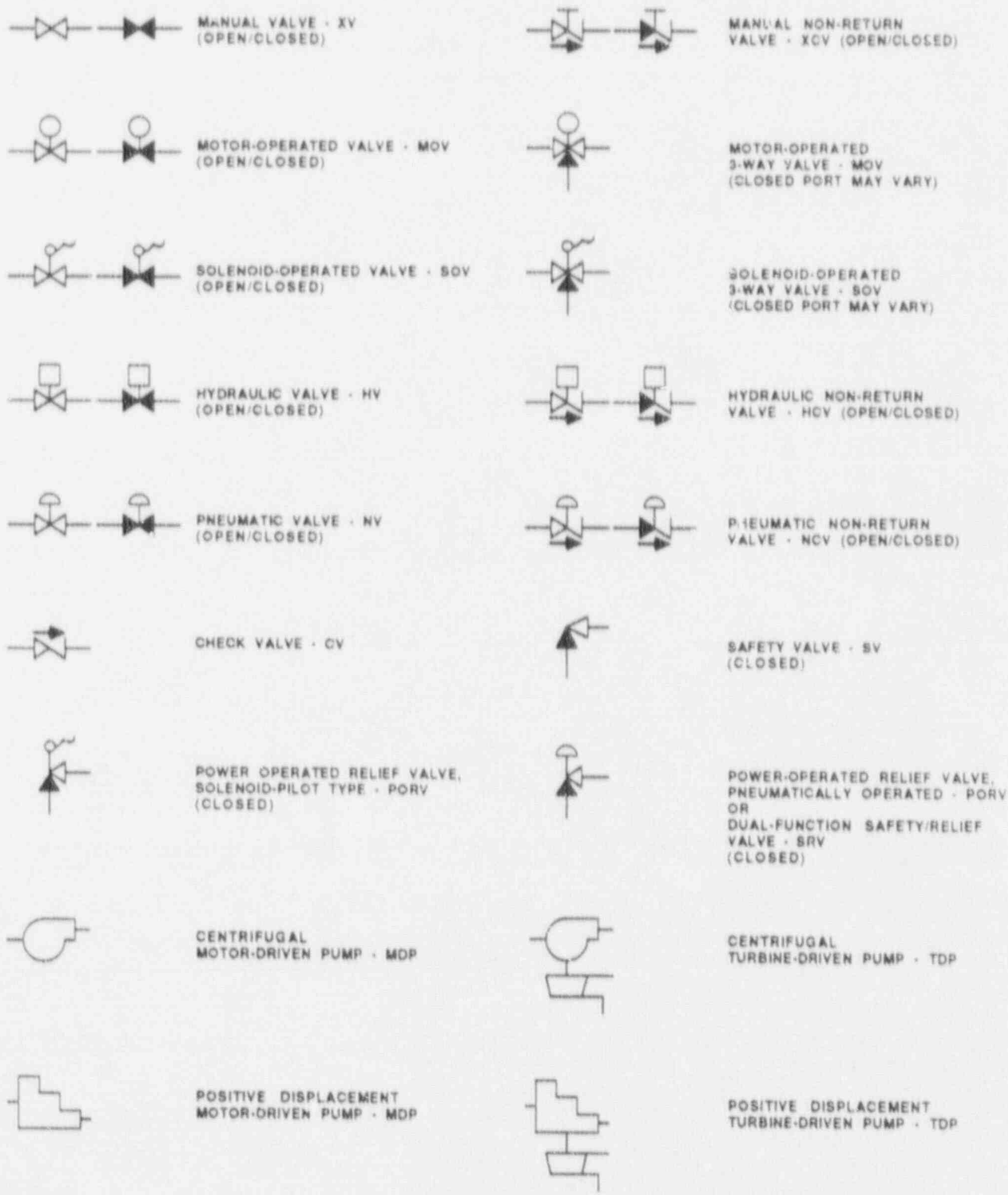


Figure A-1. Key To Symbols In Fluid System Drawings

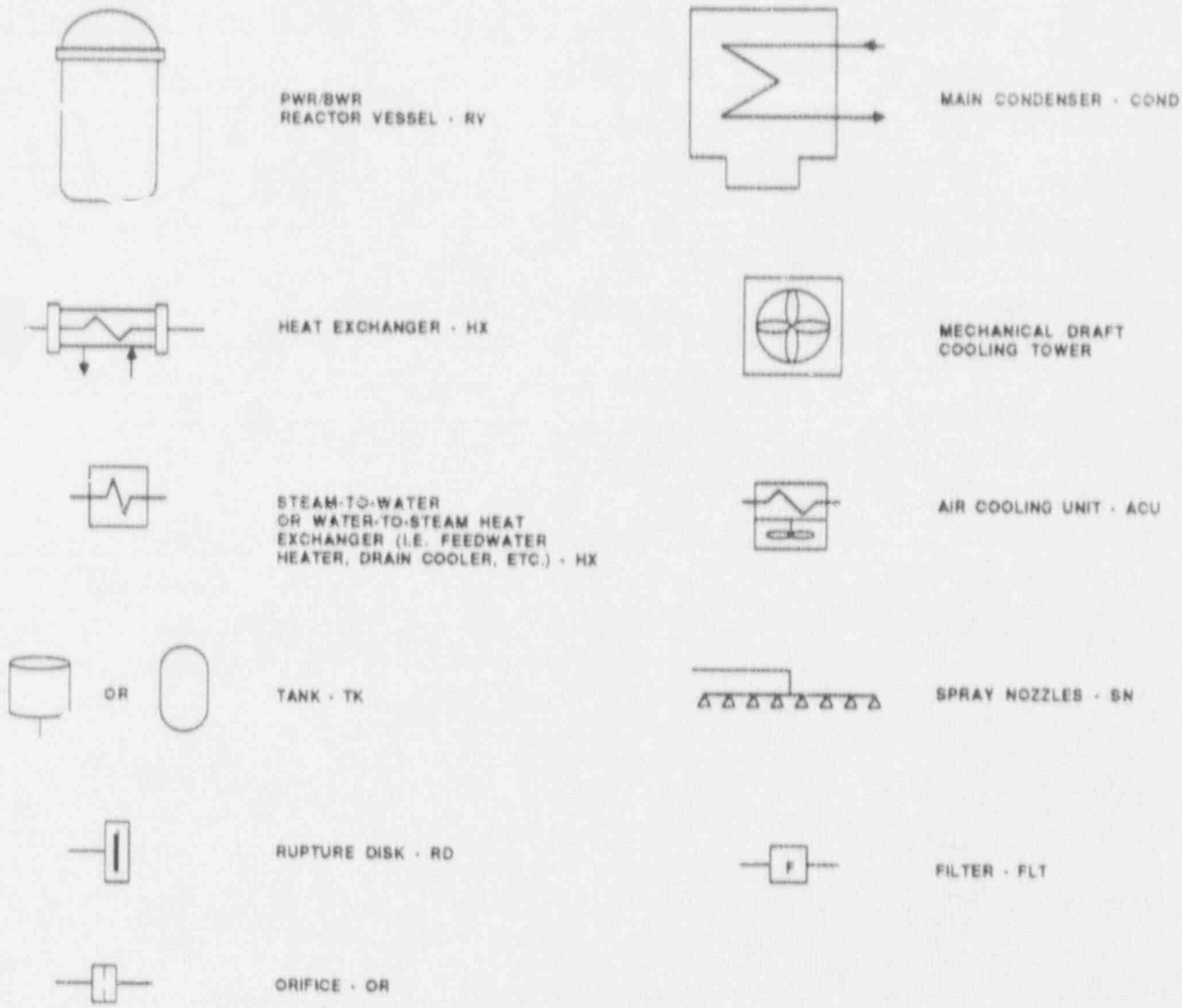


Figure A-1. Key To Symbols In Fluid System Drawings (Continued)

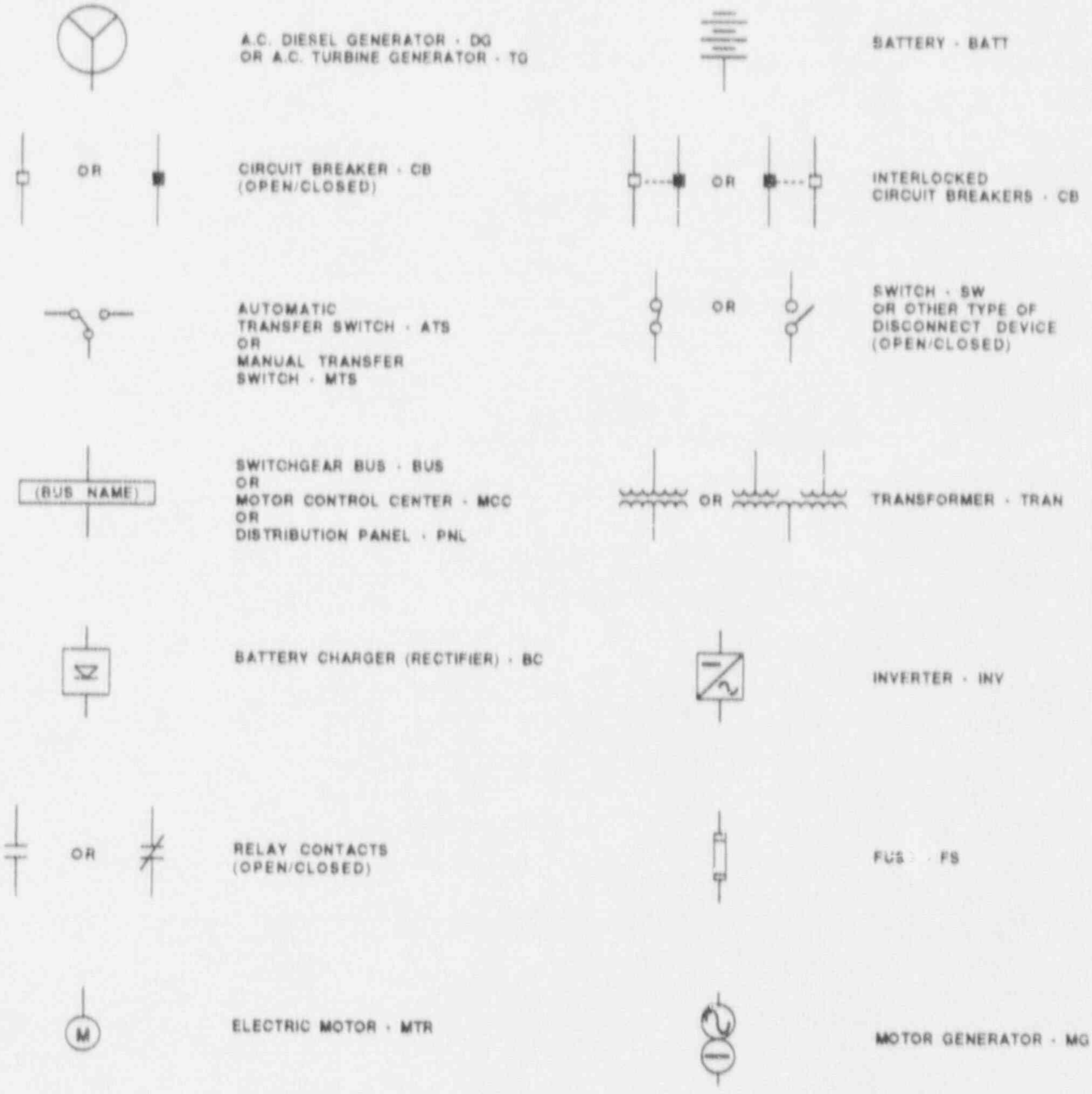


Figure A-2. Key To Symbols In Electrical System Drawings

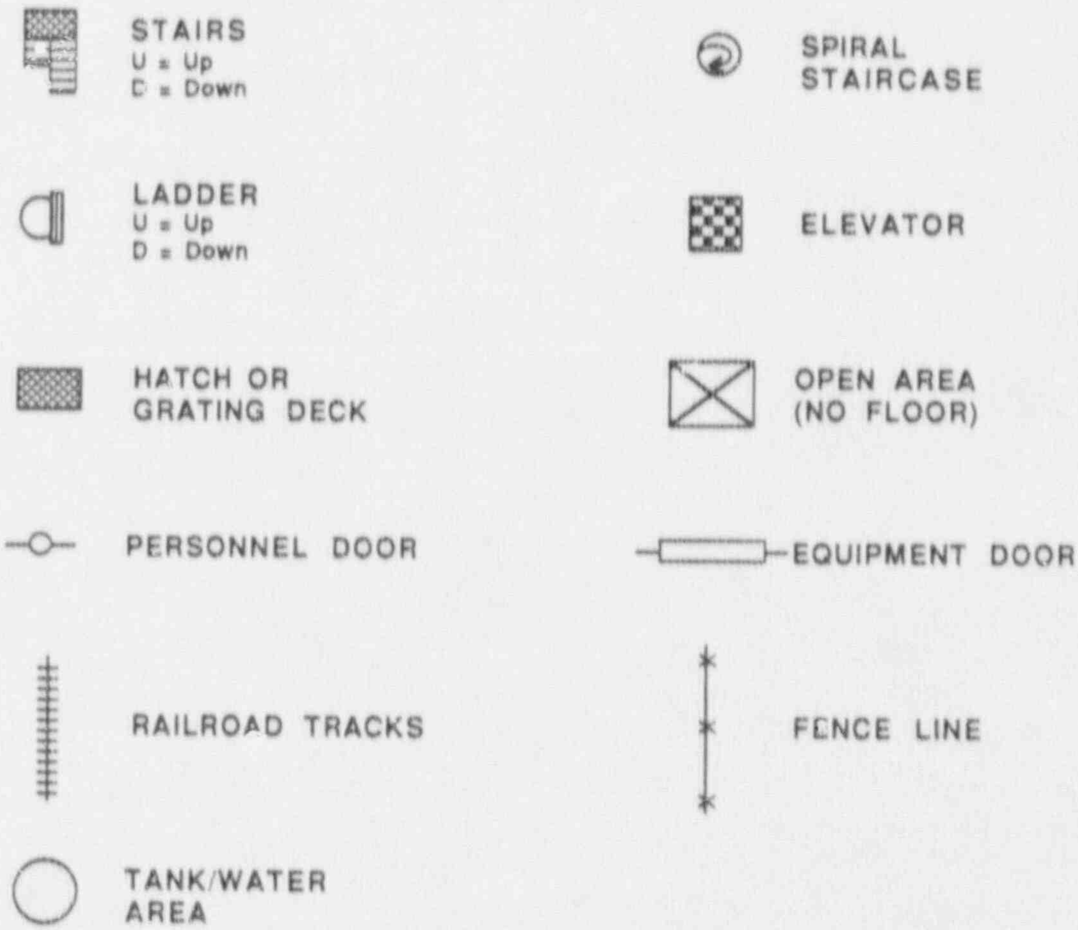


Figure A-3. Key To Symbols In Facility Layout Drawings

APPENDIX B
DEFINITION OF TERMS USED IN THE DATA TABLES

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

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

Code	Definition
RCS	Reactor Coolant System
AFW	Auxiliary Feedwater System
ECCS	Emergency Core Cooling System (including HPSI and LPSI)
CS	Containment Spray
EP	Electric Power System
CCW	Component Cooling Water System
NSW	Nuclear Service Water System
CVCS	Chemical and Volume Control System

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

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

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

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

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

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

TABLE B-1. COMPONENT TYPE CODES

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

TABLE B-1. COMPONENT TYPE CODES (Continued)

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