NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

NINE MILE POINT 2

50-410

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50-410

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CAUTION

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

NOTICE

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

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

NINE MILE POINT 2
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	12/89	Original report

NINE MILE POINT 2 SYSTEM SOURCEBOOK

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

1. SUMMARY DATA ON PLANT

Basic information on the Nine Mile Point 2 nuclear plant is listed below:

- Docket number	50-410
- Operator	Niagra Mohawk Power Corporation
- Location	Scriba, New York
- Commercial operation date	3/88
- Reactor type	BWR/5
- NSSS vendor	General Electric
- Power (MWt/MWe)	3323/1080
- Architect-engineer	Stone & Webster Engineering Corporation
- Containment type	Mark II

2. IDENTIFICATION OF SIMILAR NUCLEAR POWER PLANTS

The Nine Mile Point 2 plant contains a General Electric BWR/5 nuclear steam supply system with a Mark II containment incorporating the drywell/pressure suppression concept. The plant also has a secondary containment structure of reinforced concrete. Other BWR/5 plants in the United States are as follows:

- LaSalle 1 & 2
- WNP-2

3. SYSTEM INFORMATION

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

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

Table 3-1. Summary of Nine Mile Point 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
- Reactor Core Isolation Cooling (RCIC) Systems	Same	3.2	5.4.6, 7.4.1.1
- Emergency Core Cooling Systems (ECCS)	Same	-	-
- High-Pressure Injection & Recirculation	High-Pressure Core Spray (HPCS) System	3.3	6.3.1.2.1, 6.3.2.2.1
- Low-Pressure Injection & Recirculation	Low Pressure Core Spray (LPCS) System	3.3	6.3.1.2.2, 6.3.2.2.3
	Low-Pressure Coolant Injection (LPCI) System (an operating mode of the RHR system)	3.3	6.3.1.2.3, 6.3.2.2.4
- Automatic Depressurization System (ADS)	Same	3.3	6.3.1.2.4, 6.3.2.2.2
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Residual Heat Removal (RHR) System (a multi-mode system)	X	5.4.7
- Main Steam and Power Conversion Systems	Main Steam Supply System,	X	10.3
	Condensate and Feedwater Systems,	X	10.4.7
	Circulating Water System	X	10.4.5
- Other Heat Removal Systems	Steam-condensing RHR/RCIC operation	3.2	5.4.6.2.5.3, 5.4.7.1.1

Table 3-1. Summary of Nine Mile Point 2 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Reactor Coolant Inventory Control Systems			
- Reactor Water Cleanup (RWCU) System	Same	X	5.4.8
- ECCS	See above	-	-
- Control Rod Drive Hydraulic System (CRDHS)	Same	3.6	4.6.1
Containment Systems			
- Primary Containment	Containment Structure (drywell and pressure suppression chamber)	X	6.2.1
- Secondary Containment	Same	X	6.2.3
- Standby Gas Treatment System (SGTS)	Same	X	6.5.1.1
- Containment Heat Removal Systems			
- Suppression Pool Cooling System	Suppression Pool Cooling Mode (an operating mode of the RHR system)	3.3	5.4.7.1.1
- Containment Spray System	Containment Spray Cooling Mode (an operating mode of the RHR system)	3.3	5.4.7.1.1, 6.2.2.3.1, 6.5.2
- Containment Fan Cooler System	None	-	-
- Containment Normal Ventilation Systems	Reactor Building Ventilation System	X	6.2.3.2.1, 9.4.2
- Combustible Gas Control Systems	Same	X	6.2.5

Table 3-1. Summary of Nine Mile Point 2 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	4
- Control Rod System	Control Rod Drive System	X	4.6.1
- Chemical Poison System	Standby Liquid Control System (SLCS)	X	9.3.5
Instrumentation & Control (I&C) Systems			
- Reactor Protection System (RPS)	Same	3.4	7.2
- Engineered Safety Feature Actuation System (ESFAS)	Engineered Safety Feature Systems	3.4	7.3
- Remote Shutdown System	Same	3.4	7.4.1.4
- Other I&C Systems	Various other systems	X	7.4.1.2, 7.4.1.3
Support Systems			
- Class 1E Electric Power System	Same	3.5	8.3.1, 8.3.2
- Non-Class 1E Electric Power System	Same	3.5	8
- Diesel Generator Auxiliary Systems	Same	3.5	9.5.4 to 9.5.8
- Component Cooling Water (CCW) System	None	X	-

Table 3-1. Summary of Nine Mile Point 2 Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Support Systems (continued)			
- Emergency Service Water System	None	--	--
- Service Water System (SWS)	Same	3.7	9.2.1
- Residual Heat Removal Service Water (RHRSW) System	See Service Water System, Above	--	--
- Other Cooling Water Systems	Reactor Building Closed Cooling Water System	X	9.2.2
- Fire Protection Systems	Same	X	9.5.1
- 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 Fuel Storage Systems	Fuel Storage and Handling Systems	X	9.1
- Radioactive Waste Systems	Radioactive Waste Management Systems	X	11
- Radiation Protection Systems	Same	X	12

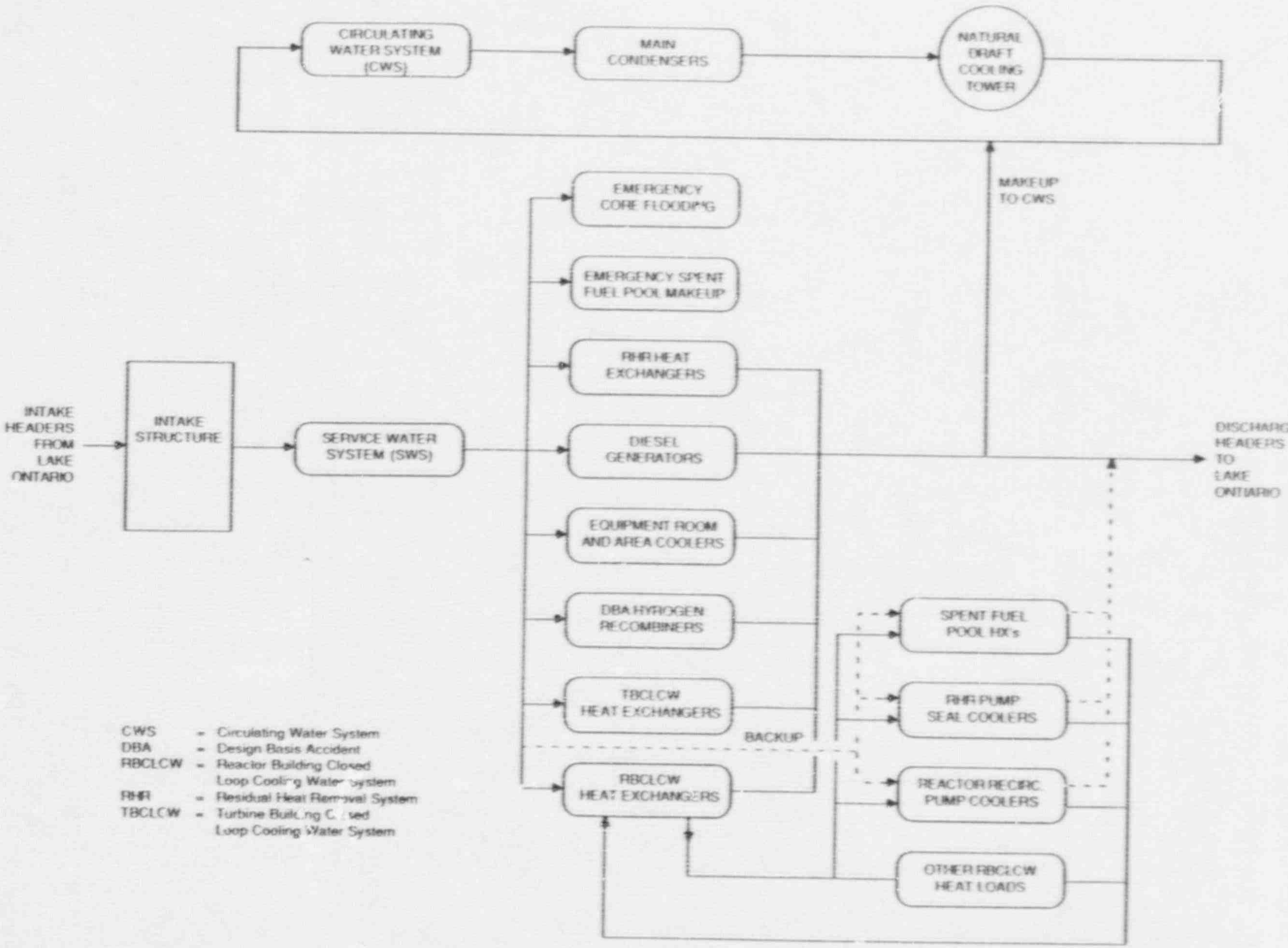


Figure 3-1. Cooling Water Systems Functional Diagram for Nine Mile Point 2

3.1 REACTOR COOLANT SYSTEM (RCS)

3.1.1 System Function

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

3.1.2 System Definition

The RCS includes: (a) the reactor vessel, (b) two recirculation loops, (c) two recirculation pumps, (d) 18 safety/relief valves, and (e) connected piping out to a suitable isolation valve boundary. Simplified diagrams of the RCS and important system interfaces are shown in Figures 3.1-1 and 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 recirculation pump in each of the two recirculation loops and the associated jet pumps internal to the reactor vessel. The steam water mixture flows upward in the core to the steam dryers and separators where the entrained liquid is removed. The steam is piped through the main steam lines to the turbine. The separated liquid returns to the core, mixes with the feedwater and is recycled.

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

The steam that is produced by the reactor is piped to the turbine via the main steam lines. There are two main steam isolation valves (MSIVs) in each main steam line, one located inside and the other located outside the primary containment. Condensate from the turbine is returned to the RCS as feedwater.

Following a transient that involves the loss of the main condenser or loss of feedwater, heat from the RCS is dumped to the suppression chamber via safety/relief valves on the main steam lines. A LOCA inside containment or operation of the Automatic Depressurization System (ADS) also dumps heat to the suppression chamber. Post-accident to the RCS is provided by the Reactor Core Isolation Cooling (RCIC) system (see Section 3.2) or by the Emergency Core Cooling System (ECCS, see Section 3.3). Heat is transferred from the containment by the Residual Heat Removal (RHR) System operating in the containment cooling mode. The Service Water System completes the decay heat transfer path from the containment to the ultimate heat sink (see Section 3.7). Actuation systems provide for automatic closure of the MSIVs and isolation of other lines connected to the RCS.

RCS overpressure protection is provided by eighteen safety/relief valves which discharge to the suppression pool.

3.1.4 System Success Criteria

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

- An unmitigatable LOCA is not initiated.
- If a mitigatable LOCA is initiated, then LOCA mitigating systems are successful.

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

3.1.5 Component Information

A. RCS
  1. Steam flow: 14.3×10^6 lb/hr
  2. Normal operating pressure: 985 psia

B. Safety/relief Valves (18)
  1. Set pressure: 2 @ 1148 psig, 882,000 lb/hr (each)
     4 @ 1175 psig, 902,000 lb/hr (each)
     4 @ 1185 psig, 910,000 lb/hr (each)
     4 @ 1195 psig, 917,000 lb/hr (each)
     4 @ 1205 psig, 925,000 lb/hr (each)

C. Recirculation Pumps (2)
  1. Rated flow: 47,200 gpm
  2. Type: dual speed (25 and 100 percent), vertical, solid shaft, totally enclosed, air-water cooled induction motor.

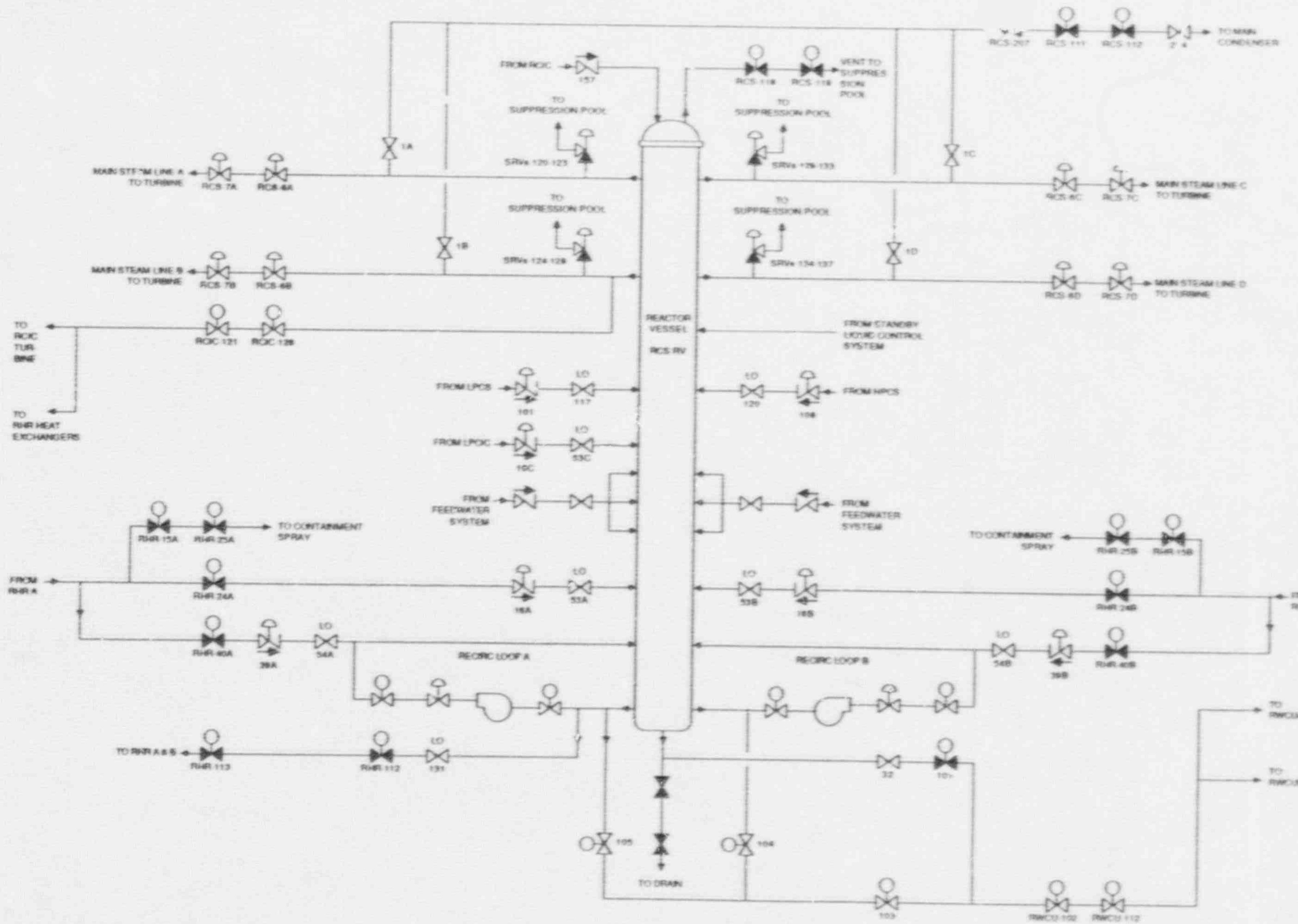
D. Jet Pumps (20)
  1. Rated flow: 108.6×10^6 lb/hr (total)

3.1.6 Support Systems and Interfaces

A. Motive Power for Recirculation Pumps
  1. 25% speed: low frequency motor generator set (15 Hz)
  2. 100% speed: an unidentified 60 Hz source

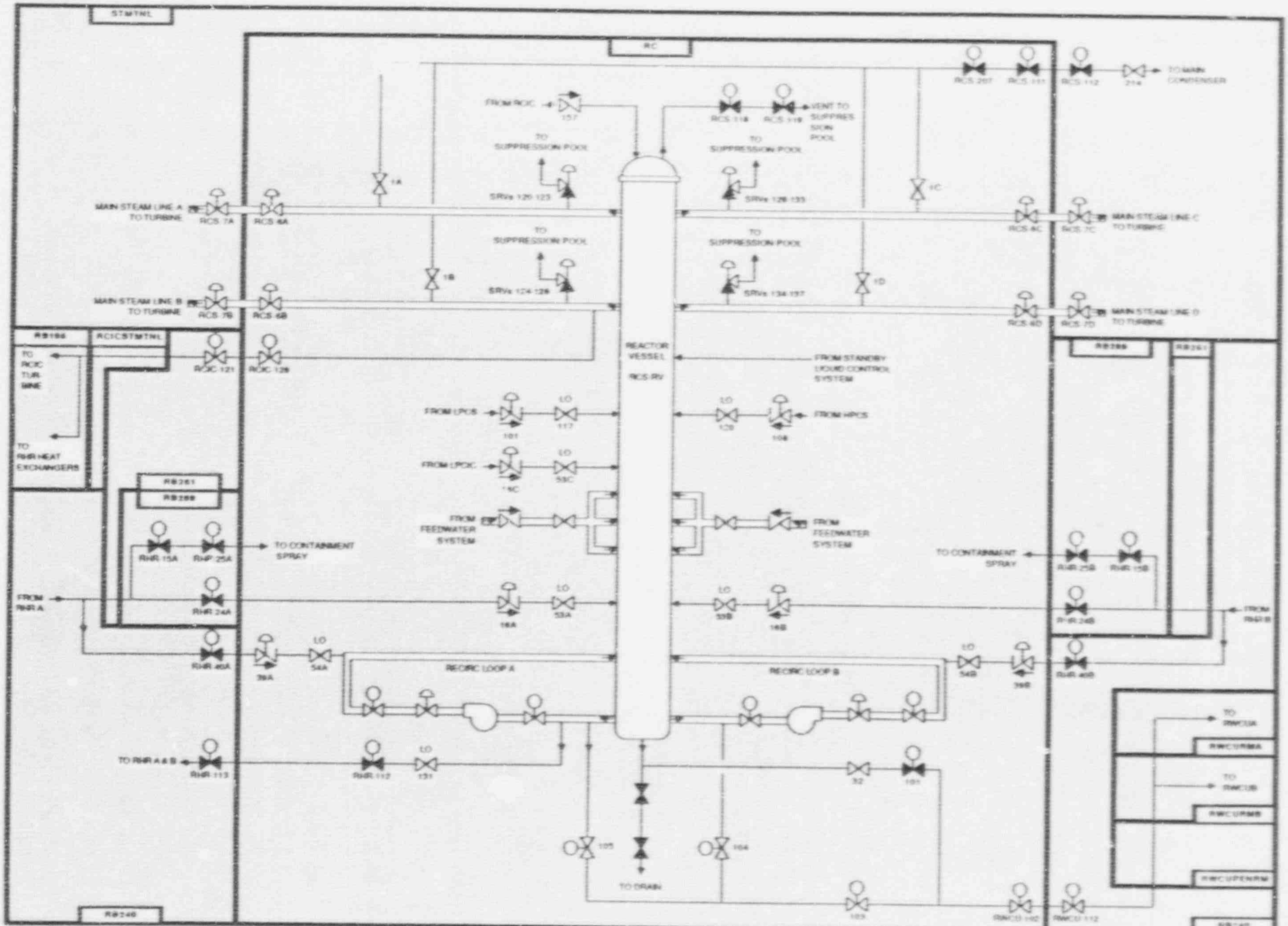
B. Recirculation Pump Cooling
The system providing recirculation pump cooling has not been identified.

C. MSIV Operating Power
The MSIVs are operated by pneumatic pressure and by the action of two redundant and independent sets of compressed springs. The control unit is attached to the air cylinder. This unit contains air pilot valves and solenoid operated valves. The solenoid valves control opening and closing of the air valves and provide exercising capability at slow speed. Remote manual switches in the control room enable the operator to operate the valves. Operating air is supplied to the valves from the plant air system. An air accumulator between the control valve and a check valve provides backup operating air.



NOTE: SRVs 121, 126, 127, 129, 130, 134, 137 are used for ADS

Figure 3.1-1. Nine Mile Point 2 Reactor Coolant System



NOTE: SRVs 121, 126, 127, 129, 130, 134, 137 are used for ADS

Figure 3.1-2. Nine Mile Point 2 Reactor Coolant System Showing Component Locations

Table 3.1-1. Nine Mile Point 2 Reactor Coolant System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RCS-111	MOV	RC	EP-MCC-302B	600	AUXBAYS240	AC/II
RCS-112	MOV	STMTNL	EP-MCC-102A	600	AUXBAYN240	AC/I
RCS-118	MOV	RC	EP-MCC-302B	600	AUXBAYS240	AC/II
RCS-119	MOV	RC	EP-MCC-102A	600	AUXBAYN240	AC/I
RCS-207	MOV	RC	UNKNOWN			
RCS-6	AOV	RC				
RCS-7	AOV	STMTNL				
RCS-RV	RV	RC				
RHR-112	MOV	RC	EP-BS-US3	600	SWGRMB	AC/II
RHR-113	MOV	RB240	EP-BS-US1	600	SWGRMA	AC/I
RWCU-102	MOV	RC	EP-MCC-302B	600	AUXBAYS240	AC/II
RWCU-112	MOV	RB240	EP-MCC-102A	600	AUXBAYN240	AC/I

3.2 REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.2.1 System Function

The reactor core isolation cooling (RCIC) system is designed to assure that sufficient reactor water inventory is maintained in the reactor vessel to permit adequate core cooling to take place. This prevents the reactor fuel from overheating in the event that the vessel is isolated and feedwater flow is lost. This system provides makeup at reactor operating pressure and does not require RCS depressurization. The RCIC system is not considered to be part of the Emergency Core Cooling System (ECCS, see Section 3.3) and does not have a LOCA mitigating function.

3.2.2 System Definition

The reactor core isolation cooling (RCIC) system consists of a steam turbine-driven pump, associated valves, and piping for delivering demineralized makeup water from the condensate storage tank to the reactor pressure vessel. An alternate source of water is available from the suppression pool. The turbine is driven with a portion of the decay heat steam from the reactor vessel and exhausts to the suppression pool. The RCIC can also operate in conjunction with the RHR system in the steam condensing mode, in which condensed steam is delivered from the RHR heat exchanger outlets to the RCIC pump suction for return to the RCS.

Simplified drawings of the reactor core isolation cooling system are shown in Figures 3.2-1 and 3.2-2. Interfaces between the RCIC and the RCS are shown in Section 3.1. A summary of data on selected RCIC system components is presented in Table 3.2-1.

3.2.3 System Operation

During normal operation, the RCIC is in standby with the steam line isolation valves to the RCIC turbine-driven pump open and the pump suction aligned to the condensate storage tank. Upon receipt of a reactor pressure vessel (RPV) low water level signal, the turbine-pump steam supply valves are opened and makeup water is supplied to the RPV. Reactor core heat is dumped to the suppression pool via the safety/relief valves which cycle as needed to limit RCS pressure. The primary water supply for the RCIC is the condensate storage tank (CST), and the suppression pool is used as a backup water supply. The RCIC pump suction is automatically shifted to the suppression pool when a low level in the CST is reached.

The RCIC can also operate in conjunction with the RHR system in the steam condensing mode, in which condensed steam is delivered from the RHR heat exchanger outlets to the RCIC pump suction, for return to the RCS. In this mode of operation, reactor core heat is transferred to the RHR system rather than to the suppression pool.

3.2.4 System Success Criteria

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

3.2.5 Component Information

A. Steam turbine-driven RCIC pump:
   1. Rated Flow: 625 gpm @ 165 to 1,173 psia
   2. Rated Capacity: 100%
   3. Type: centrifugal

B. Condensate Storage Tank
   1. Capacity: 135,000 gal (reserved for RCIC and HPCS use)

3.2.6 Support System and Interfaces

A. Control Signals

1. Automatic

   a. The RCIC system is automatically actuated on a reactor vessel low water level (Level 2) signal. The system automatically shuts down when the reactor vessel water level reaches high reactor water level (Level 8), at which time the RCIC steam supply valve is closed.

   b. The RCIC pump is automatically isolated upon receipt of any of the following signals:
      - RCIC isolation signal
      - Turbine over-speed
      - Pump low suction pressure
      - Turbine high exhaust pressure

      When the signal is cleared, the trip throttle valve must be reset from the control room.

2. Remote Manual

   The RCIC pump can be actuated by remote manual means from the control room. Manual action is required to place the RCIC in the RHR steam condensing mode.

B. Motive Power

1. The RCIC turbine driven pump is supplied with steam from main steam line B, upstream of the main steam isolation valves.
2. The RCIC motor-operated valves are either Class 1E AC or Class 1E DC loads that can be supplied from the standby diesel generators or the station batteries, respectively, as described in Section 3.5.

C. Other

1. The RCIC lube oil cooler is cooled by water from the RCIC pump discharge.
2. Lubrication for the turbine-driven pump is supplied locally.
3. The Service Water System provides cooling water for RCIC room coolers (see Section 3.7).

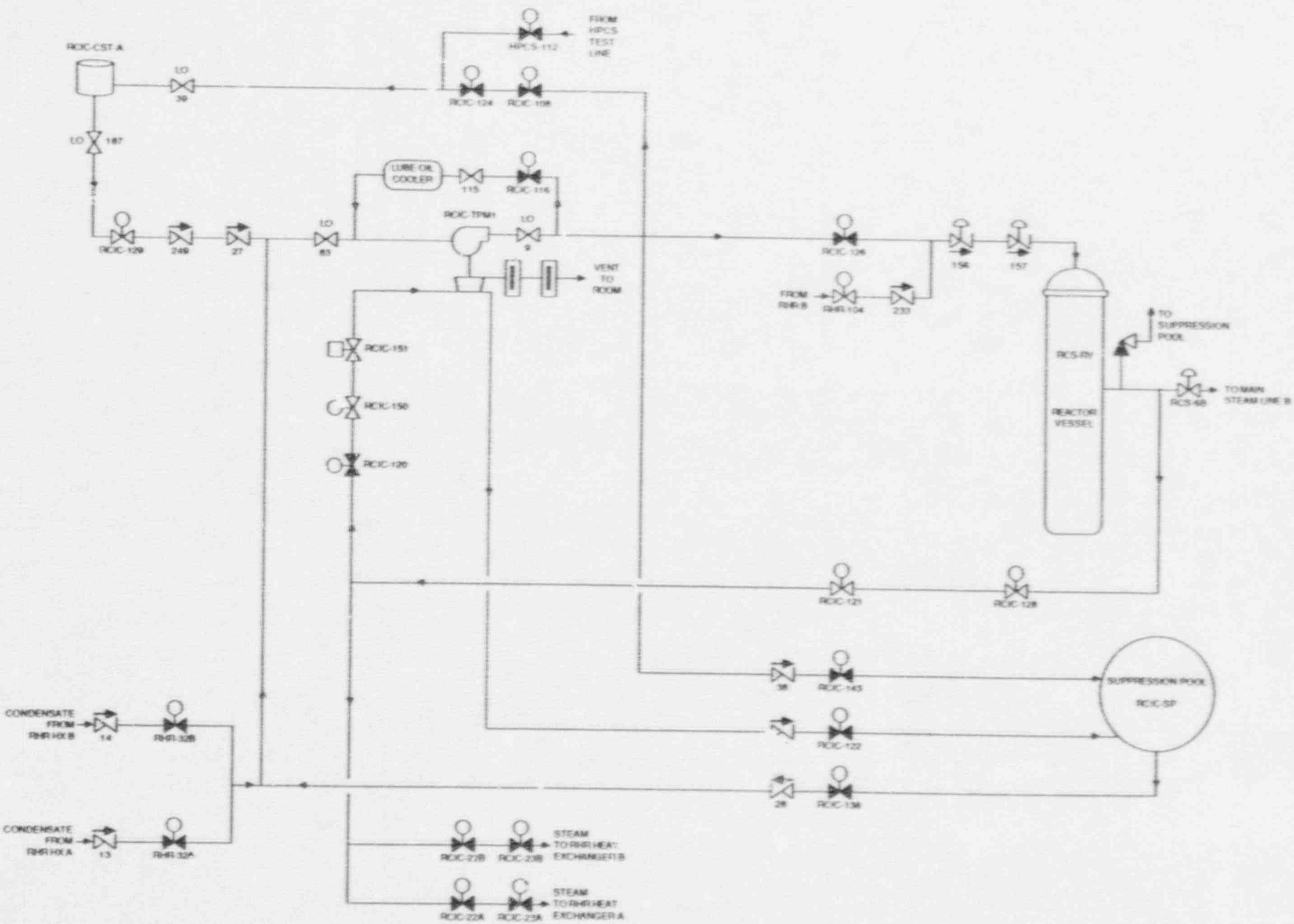


Figure 3.2-1. Nine Mile Point 2 Reactor Core Isolation System

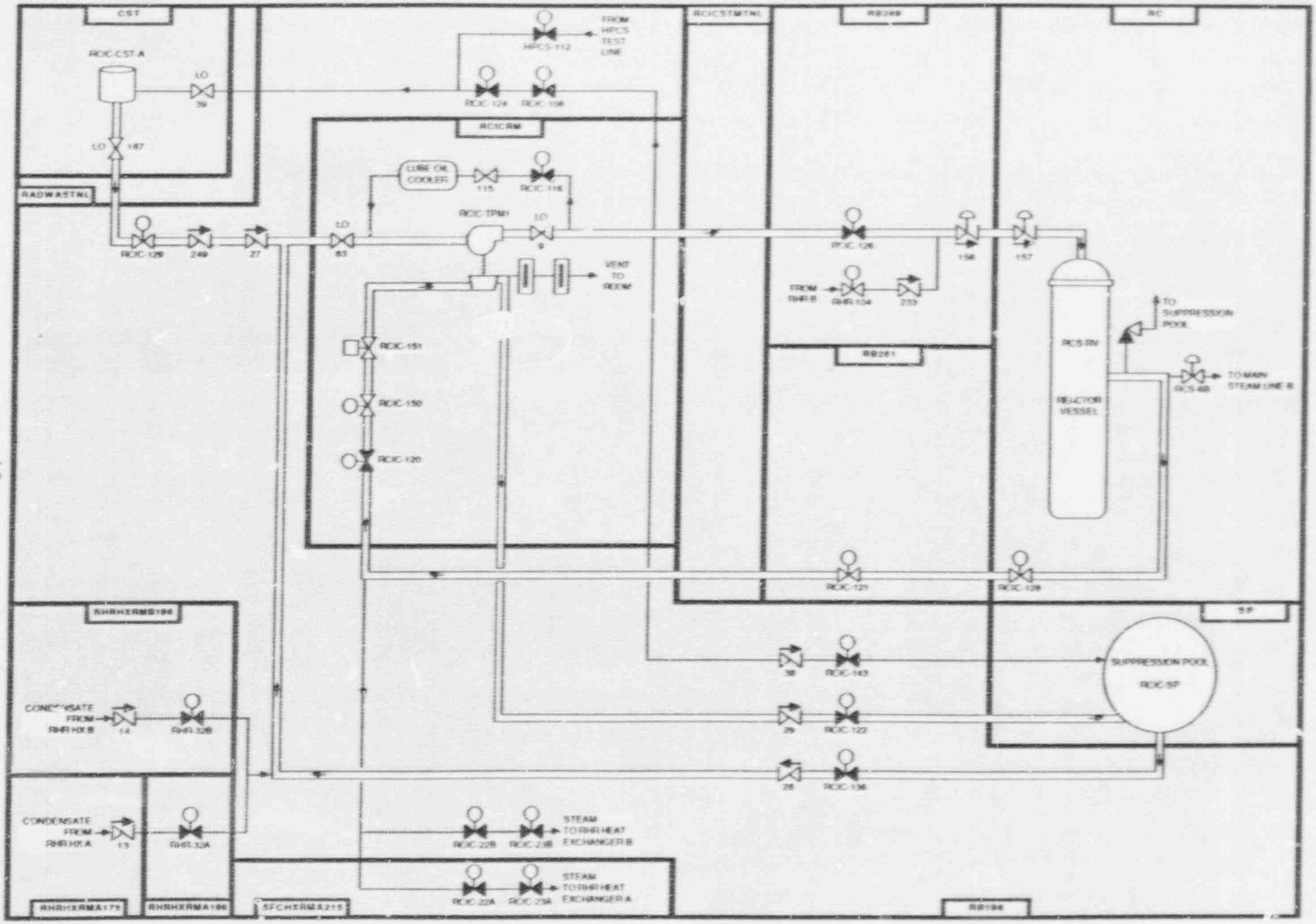


Figure 3.2-2. Nine Mile Point 2 Reactor Core Isolation System Showing Component Locations

Table 3.2-1. Nine Mile Point _ Reactor Core Isolation System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RCIC-108	MOV	RB196	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-116	MOV	RCICRM	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-120	MOV	RCICRM	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-121	MOV	RB261	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-121	MOV	RB261	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-124	MOV	RB196	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-126	MOV	RB289	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-128	MOV	RC	EP-MCC-302B	600	AUXBAYS240	AC/II
RCIC-128	MOV	RC	EP-MCC-302B	600	AUXBAYS240	AC/II
RCIC-129	MOV	RB196	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-136	MOV	RB196	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-143	MOV	RB196	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-150	MOV	RCICRM	EP-MCC-A1	125	AUXBAYN240	DC/A
RCIC-151	HV	RCICRM	UNKNOWN			
RCIC-22A	MOV	SFCHXRMA215	EP-BS-US1	600	SWGRMA	AC/I
RCIC-22B	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RCIC-23A	MOV	SFCHXRMA215	EP-BS-US1	600	SWGRMA	AC/I
RCIC-23B	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RCIC-32A	MOV	RHRHXRMA196	EP-BS-US1	600	SWGRMA	AC/I
RCIC-CST-A	TK	CST				
RCIC-TPM1	TDP	RCICRM				

3.3 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.3.1 System Functi...

The ECCS is an i... ...ed 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 ECCS also performs suppression pool cooling and containment spray functions and has a capability for mitigating transients.

3.3.2 System Definition

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

- High Pressure Core Spray (HPCS) System
- Low Pressure Core Spray (LPCS) System
- Low Pressure Coolant Injection (LPCI) System
- Automatic Depressurization System (ADS)

The primary purpose of the HPCS system is to supply make-up water to the reactor pressure vessel (RPV) in the event of a small break LOCA which does not result in a rapid depressurization of the reactor vessel. The HPCS system can supply makeup over the entire range of system operating pressures, thus, it is capable of providing makeup to the RCS following a large LOCA. The HPCS system consists of a motor-driven pump, system piping, valves and controls. A dedicated diesel generator supplies electric power to HPCS components.

The LPCS system is an independent loop similar to the HPCS system. The primary difference is that the LPCS delivers water over the core at relatively low reactor pressure. The primary purpose of the LPCS is to provide coolant inventory makeup during large breaks. The system consists of a motor-driven pump to supply water from the suppression pool to a spray sparger in the reactor vessel above the core.

The LPCI system is an operating mode of the RHR system. It delivers water from the suppression pool to the reactor vessel to provide inventory makeup following large pipe breaks, when the vessel is at low pressure. The LPCI system consists of three loops designated LPCIA, LPCIB, and LPCIC, each of which consists of a motor driven pump, system piping, valves and controls. Loops A and B of the RHR system can be manually realigned as needed to perform suppression pool cooling or containment spray as part of the basic emergency core cooling function. The RHR heat exchangers also can be aligned for normal shutdown cooling and for steam condensing operation in conjunction with the RCIC system (see Section 3.2). These are not ECCS functions.

The ADS provides automatic RPV depressurization follow... ... small break LOCA or transient so that the low pressure systems (LPCI and LPCS) ca... ...vide makeup to the RCS. The ADS utilizes 7 of the 18 safety/relief valves that discharge the high pressure steam to the suppression pool.

Simplified drawings of the HPCS system are shown in Figures 3.3-1 and 3.3-2. The LPCS system is shown in Figures 3.3-3 and 3.3-4. A flow diagram of LPCIA is shown in Figures 3.3-5 and 3.3-6, LPCIB is shown in Figures 3.3-7 and 3.3-8, and LPCIC is shown in Figures 3.3-9 and 3.3-10. Interfaces between these systems and the RCS are shown in Section 3.1. A summary of data on selected ECCS components is presented in Table 3.3-1.

3.3.3 System Operation

All ECCS systems are normally on standby. The manner in which the ECCS operates to protect the reactor core is a function of the rate at which coolant is being lost from the RCS. The ECCS is automatically actuated and requires no operator action during the first 10 minutes following the accident.

If a LOCA should occur, a low water level signal or high drywell pressure signal initiates the HPCS and its support equipment. Suction is normally taken from the Condensate Storage Tank (CST), but in the event that this supply becomes exhausted or unavailable, HPCS suction is automatically transferred to the suppression pool. A dedicated diesel generator supplies electric power to HPCS components.

If the RCIC and HPCS cannot maintain the reactor water level, the ADS reduces the reactor pressure so that flow from LPCI and LPCS enters the reactor vessel in time to cool the core and limit fuel cladding temperature. The ADS employs seven nuclear steam system pressure relief valves that discharge to the suppression pool.

When low water level in the reactor vessel or high pressure in the drywell is sensed, and with reactor pressure low enough, the LPCS and LPCI systems automatically start. The LPCS injects via a spray sparger located above the core; the LPCI system injects into the reactor vessel in the region of the downcomer annulus around the core. Each system takes suction from the suppression pool.

During the long-term cooling period, the operator can take specific action to place the suppression pool cooling system into operation. RHR loops A and B can be aligned to do so, with heat being transferred to the service water system via the RHR heat exchangers.

3.3.4 System Success Criteria

LOCA mitigation requires that both the emergency coolant injection (ECI) and emergency coolant recirculation (ECR) functions be accomplished. The success criteria are not clearly defined in the Nine Mile Point 2 FSAR but can be inferred from pump capacities that are defined based on certain design basis accidents that are considered in the licensing process. On this basis, the ECI system success criteria for a large LOCA are the following:

- The low pressure core spray pump with a suction on the suppression pool, or
- 1 of 3 low pressure coolant injection pumps with a suction on the suppression pool or,
- The high pressure core spray pump with a suction on the suppression pool or the condensate storage tank.

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

- The high-pressure core spray (HPCS) pump with a suction on the suppression pool or the condensate storage tank, or
- The automatic depressurization system (ADS) and 1 of 3 LPCI pumps with a suction on the suppression pool or
- the automatic depressurization system and the low pressure core spray pump with a suction on the suppression pool.

It is possible that the coolant inventory control function for some small LOCAs can be satisfied by low-capacity high-pressure injection systems such as the RCIC system (see Section 3.2) or the control rod drive hydraulic system (see Section 3.6).

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

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

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

For the suppression pool cooling function to be successful, one of two RHR trains (A or B) must be aligned for containment heat removal and the associated service water train must be operating to complete the heat transfer path from the RHR heat exchangers to the ultimate heat sink.

3.3.5 Component Information

A. Motor-driven HPCS pump P1
   1. Rated flow: 516 gpm @ 1,160 psid;
      1,550 gpm @ 1,130 psid;
      6,250 gpm @ 200 psid
   2. Rated capacity: 100%
   3. Type: centrifugal

B. Motor-driven LPCS pump P1
   1. Rated flow: 6,250 gpm @ 122 psid (vessel to drywell)
   2. Rated capacity: 100%
   3. Type: centrifugal

C. Motor-driven LPCI pumps PMA, PMB, PMC
   1. Rated flow: 7,450 gpm @ 20 psid (vessel to drywell) each
   2. Rated capacity: 100%
   3. Type: centrifugal

D. RHR Heat Exchangers A, B
   1. Heat transfer capability: 1.14×10^6 Btu/hr-°F (total)
   2. Rated capacity: 100%
   3. Type: shell and tube

E. Automatic-depressurization valves (7 of the 18 SRVs, specific valves and relief capacity assigned to ADS not determined)
   1. Rated flow: 882,000 lb/hr @ 1,076 psig (2);
      902,000 lb/hr @ 1,086 psig (4);
      910.000 lb/hr @ 1,096 psig (4);
      917,000 lb/hr @ 1,106 psig (4);
      925,000 lb/hr @ 1,116 psig (4)

F. Pressure Suppression Chamber
   1. Design temperature: 212°F
   2. Maximum operating temperature: 90°F
   3. Minimum water volume: 145,495 ft^3

G. Condensate Storage Tank
   1. Capacity: 135,000 gallon available supply (for use by RCIC and HPCS)
   2. Pressure: atmospheric

3.3.6 Support Systems and Interfaces

A. Control signals
   1. Automatic
      a. The HPCS, LPCS, and LPCI pumps, and all their associated valves function upon receipt of low water level in the reactor vessel or high pressure in the drywell.
      b. HPCS pump suction is automatically switched to the suppression pool on high suppression pool water level or low water level in the condensate storage tank.
      c. The HPCS pump automatically stops when a high water level in the reactor vessel signals the injection valve to close.
      d. The ADS system is actuated by sensed variables for reactor vessel low water level and drywell high pressure plus indication that at least one LPCI or LPCS pump is operating.
      e. LPCI initiation automatically causes all RHR components to perform their function under the LPCI mode.
   2. Remote manual
      ECCS pumps and valves and the ADS can be actuated by remote manual means from the main control room.

B. Motive Power
   1. The ECCS motor-driven pumps and motor-operated valves are Class 1E AC loads that can be supplied from the emergency diesel generators as described in Section 3.5.
   2. The three emergency diesel generators deliver power as follows:
      Division I - LPCS and one LPCI loop (A-loop)
      Division II - the two remaining LPCI loops (B, C-loops)
      Division III - HPCS

C. Other
   1. The Service Water System provides cooling water to the RHR heat exchangers (see Section 3.7).
   2. The Reactor Building Closed Loop Cooling Water (RBCLCW) system provides RHR pump seal cooling. The Service Water System can be manually aligned to provide RHR pump seal cooling if the RBCLCW system is unavailable (see Section 3.7).
   3. Cooling for other ECCS pumps is assumed to be provided locally.
   4. Lubrication for the ECCS pumps is assumed to be supplied locally.
   5. The Service Water System provides cooling water for ECCS equipment room coolers (see Section 3.7).

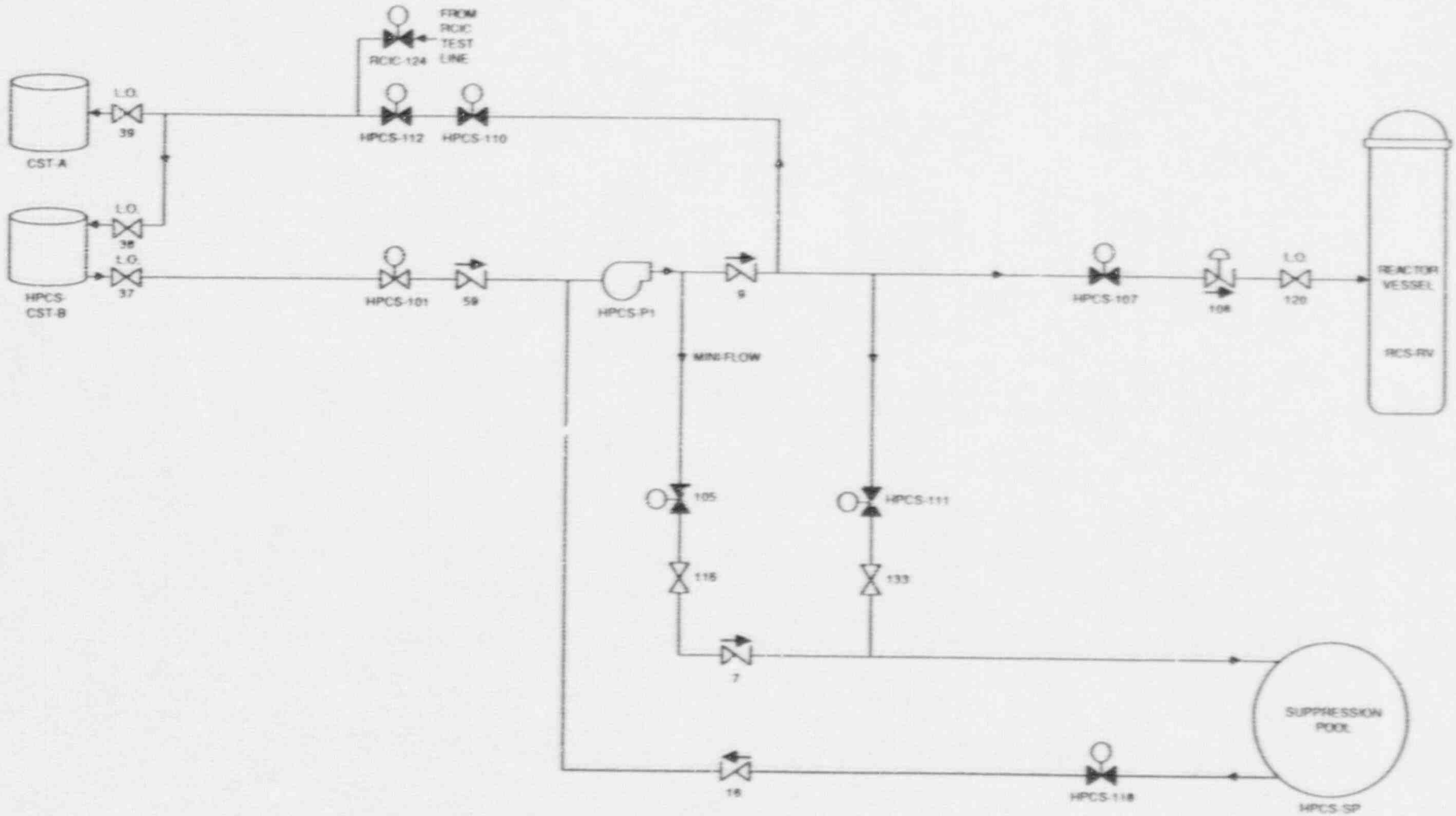


Figure 3.3-1. Nine Mile Point 2 High Pressure Core Spray System

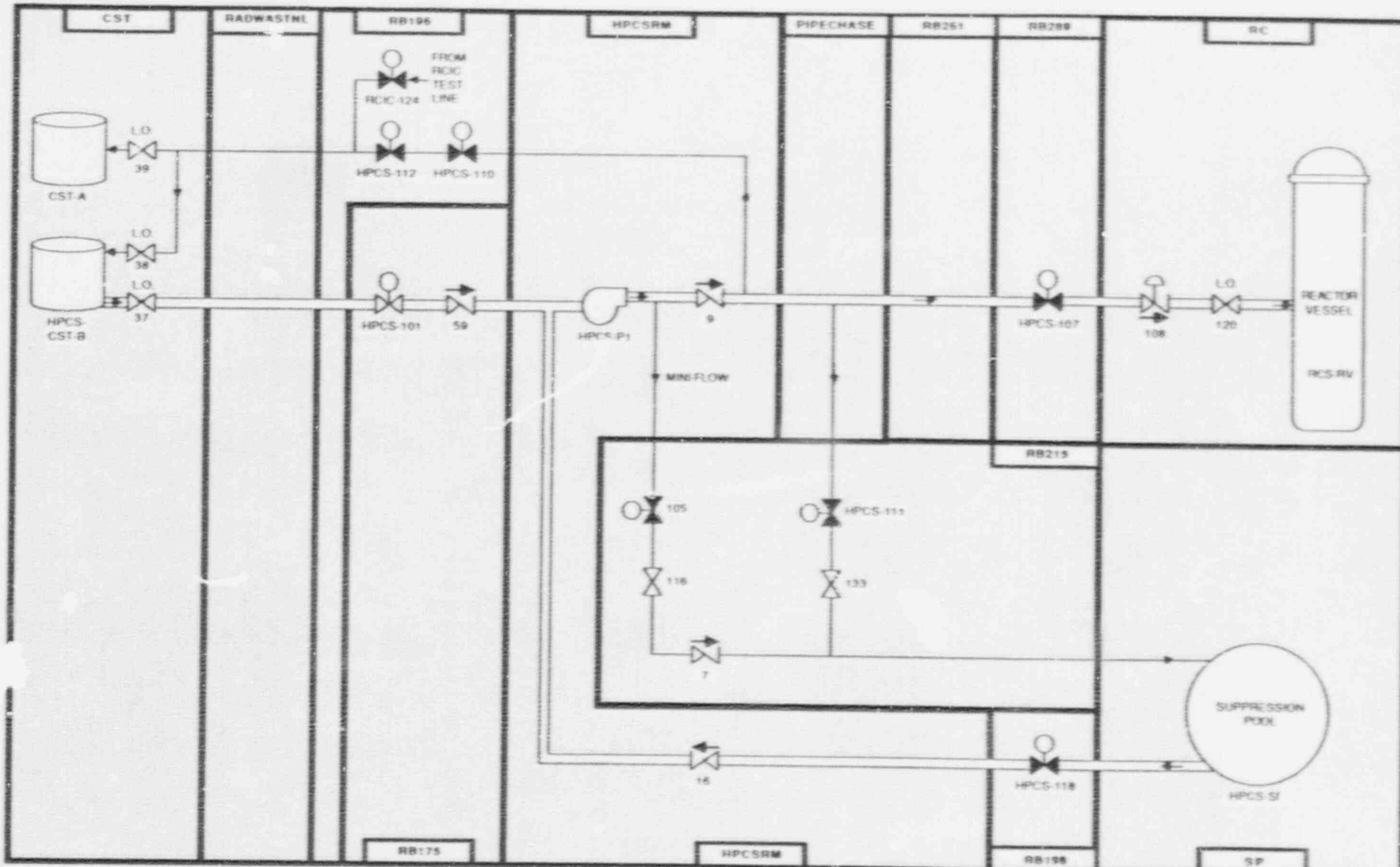


Figure 3.3-2. Nine Mile Point 2 High Pressure Core Spray System Showing Component Locations

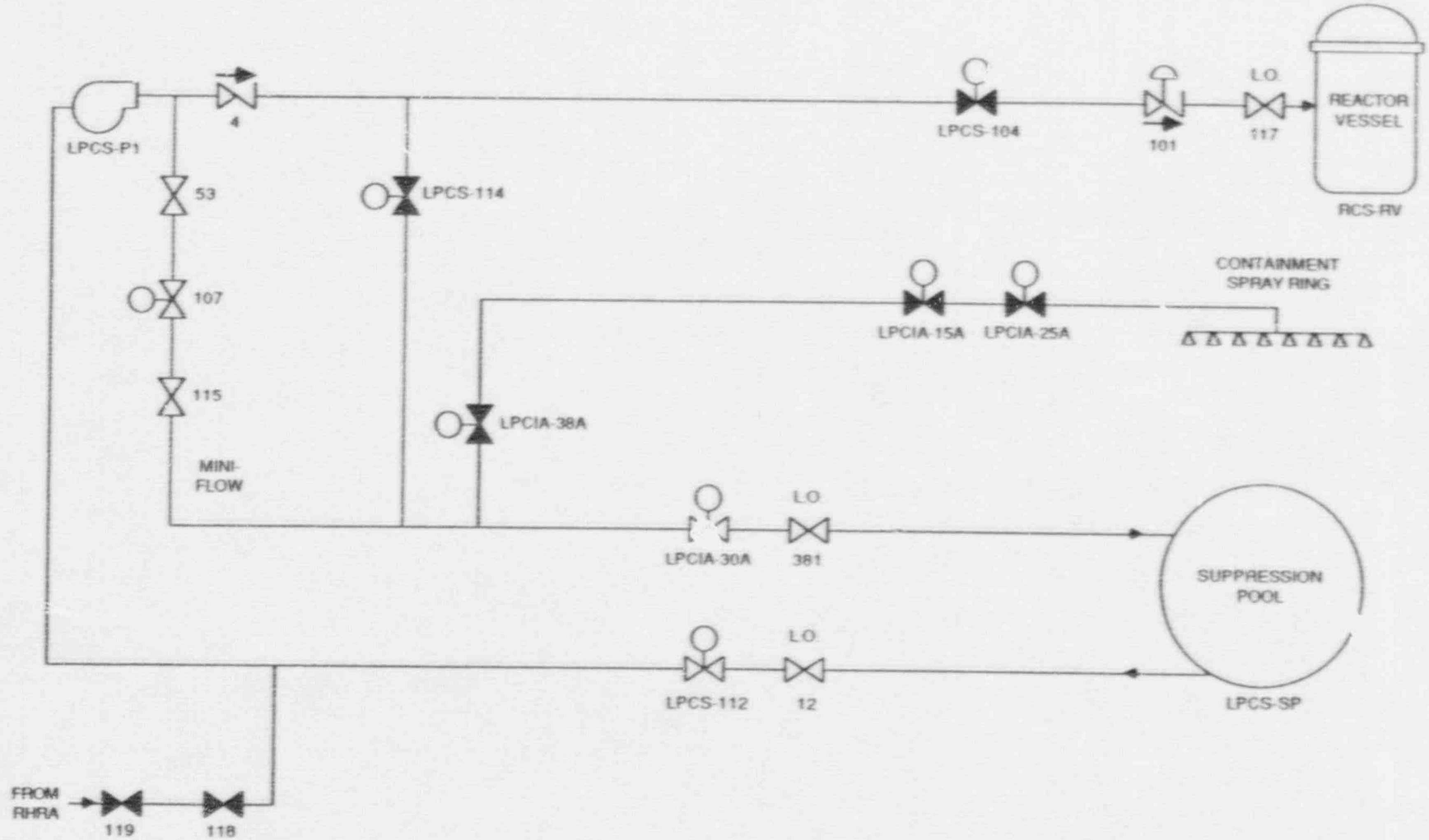


Figure 3.3-3. Nine Mile Point 2 Low Pressure Core Spray System

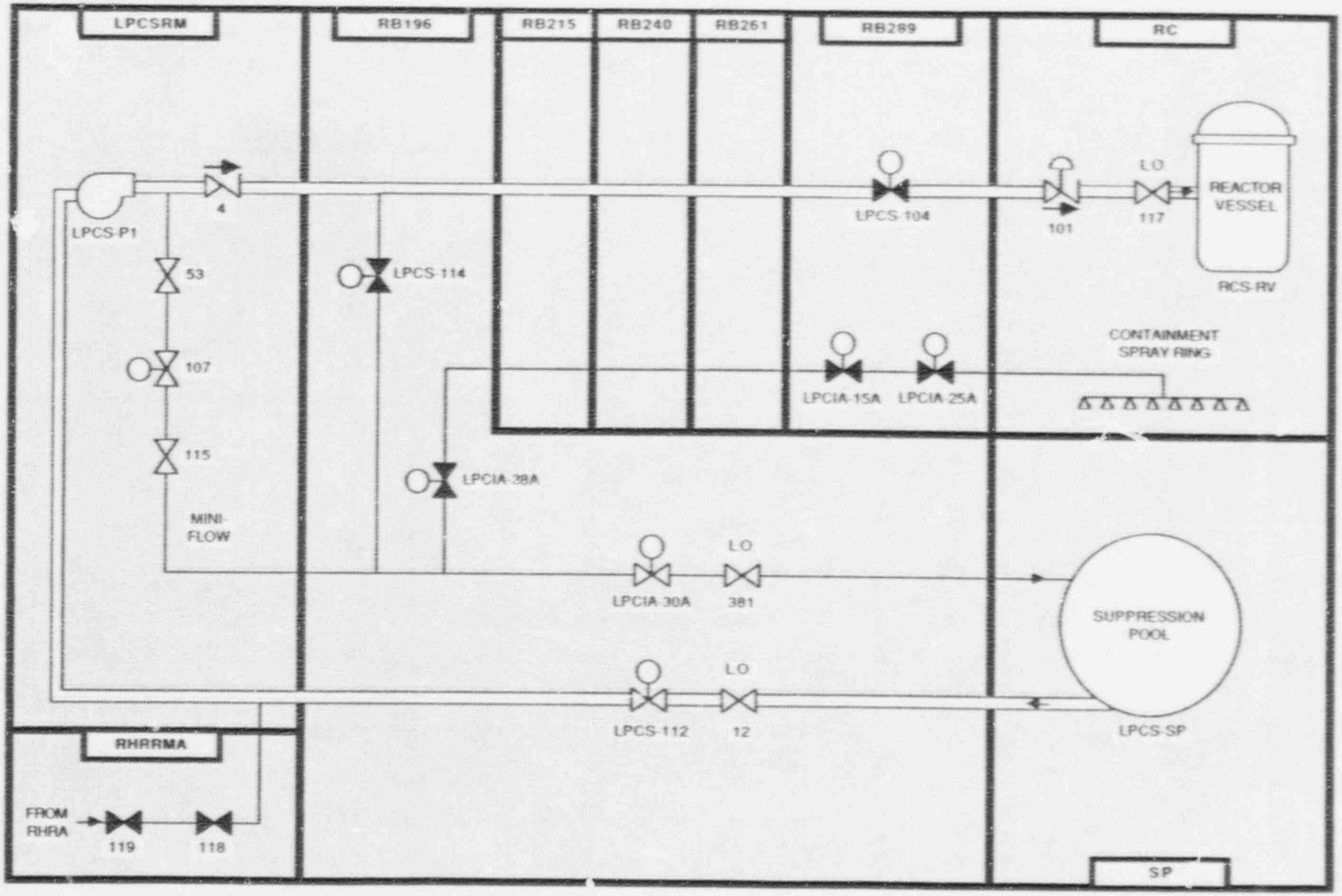


Figure 3.3-4. Nine Mile Point 2 Low Pressure Core Spray System Showing Component Locations

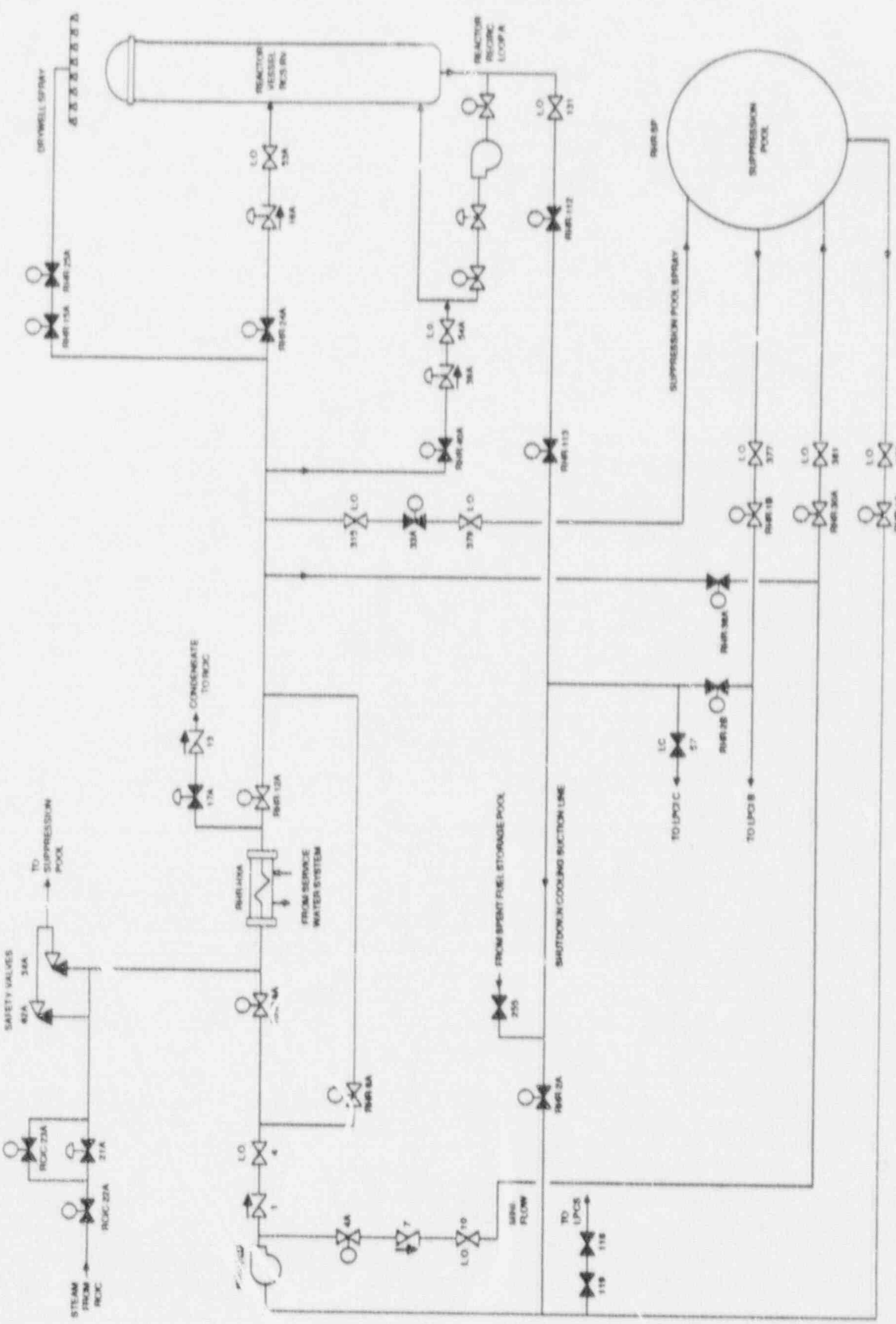


Figure 3.3-5. Nine Mile Point 2 Low Pressure Coolant Injection System Loop A

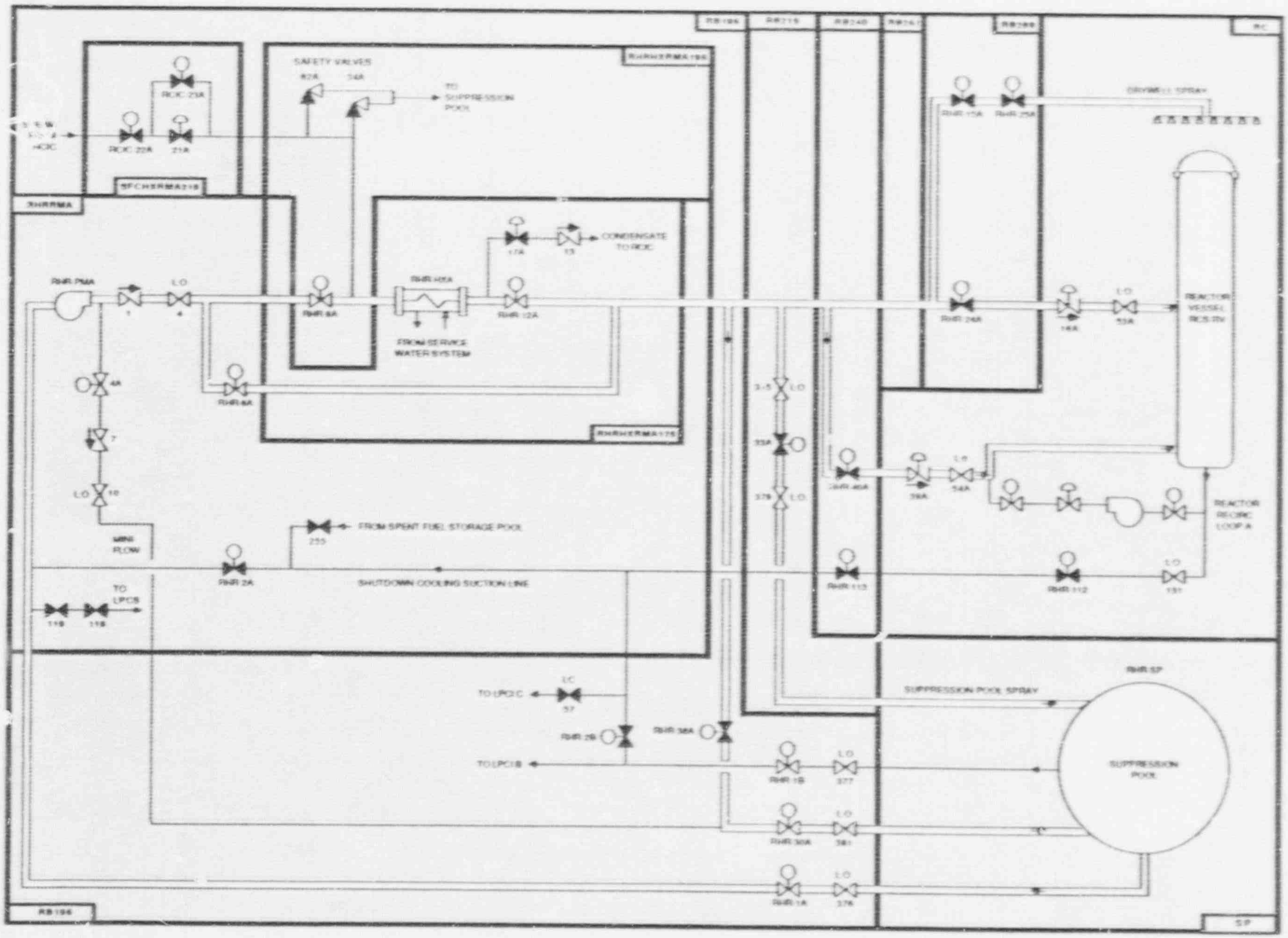


Figure 3.3-6. Nine Mile Point 2 Low Pressure Coola ... ection System Loop A Showing Component Locations

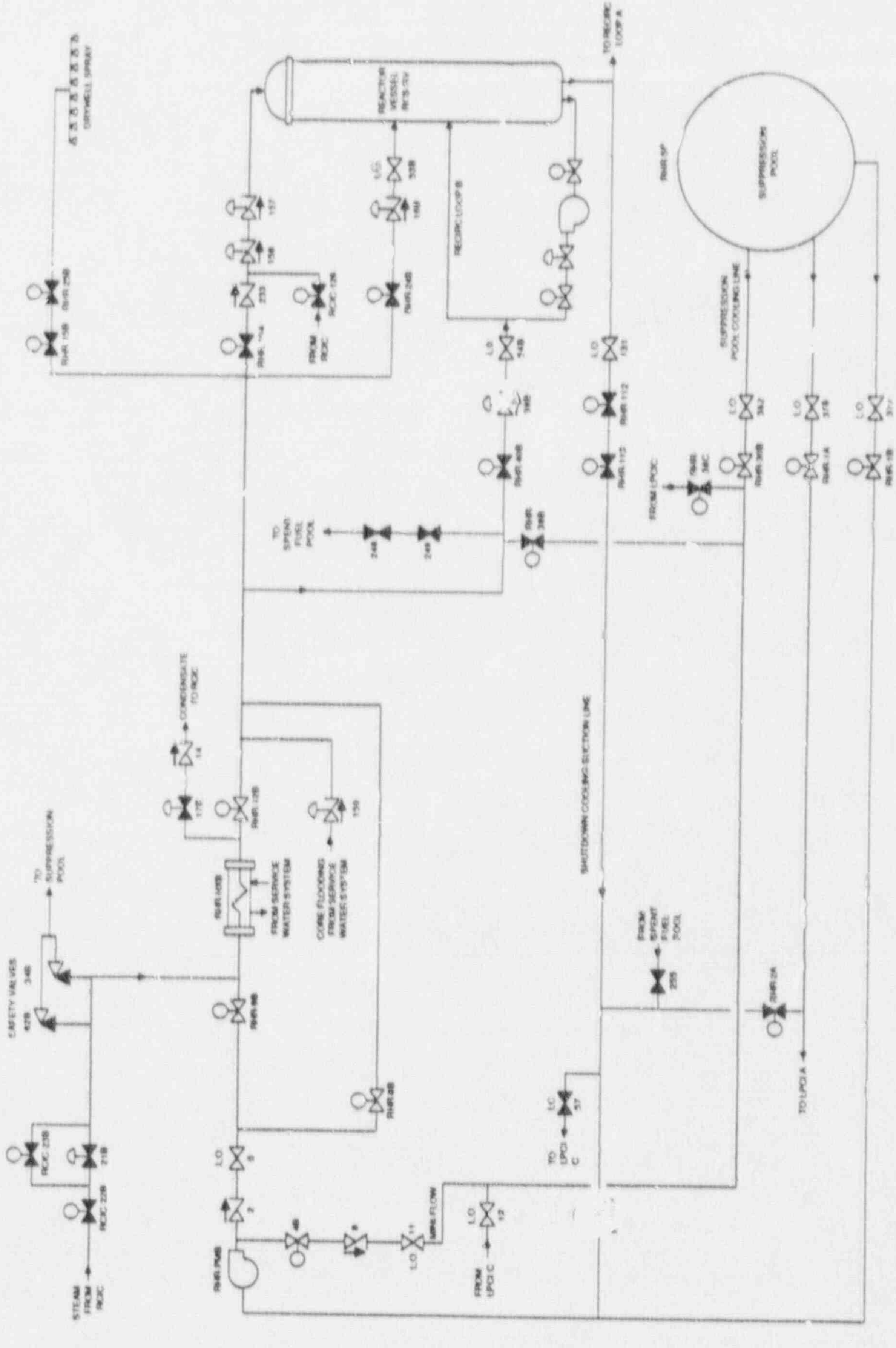


Figure 3.3-7. Nine Mile Point 2 Low Pressure Coolant Injection System Loop B

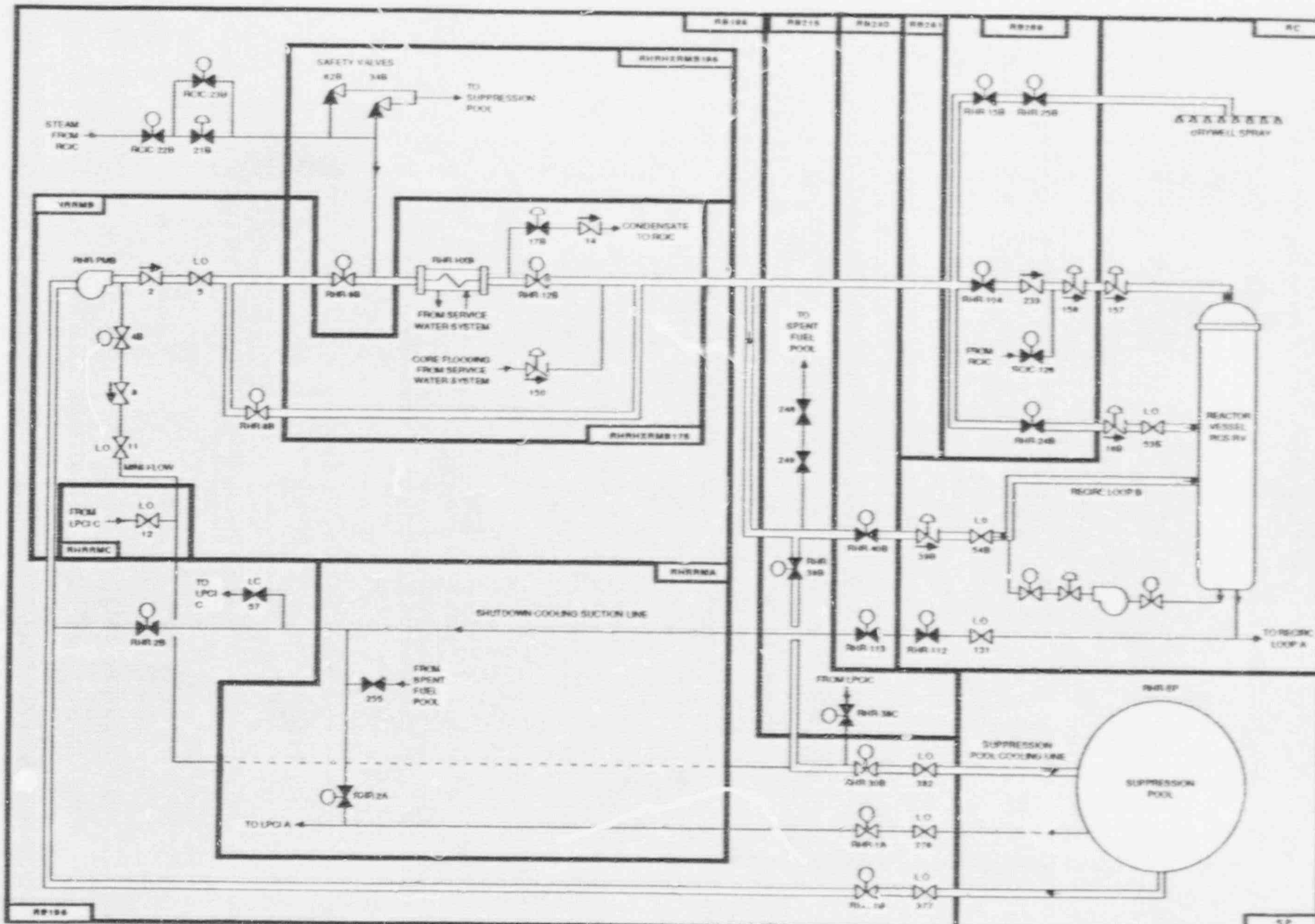


Figure 3.3-8. Nine Mile Point 2 Low Pressure Coolant Injection System Loop B Showing Component Locations

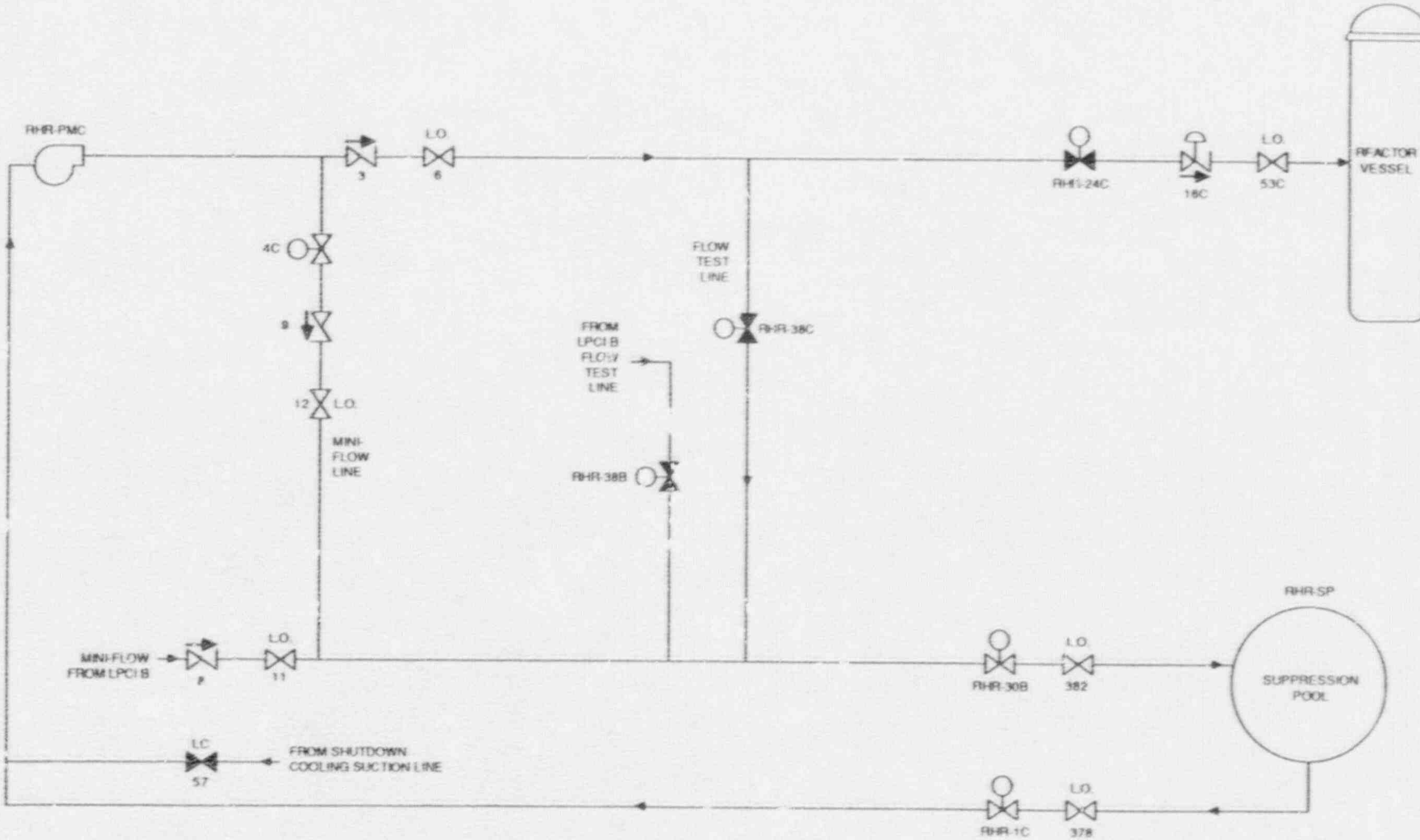


Figure 3.3-9. Nine Mile Point 2 Low Pressure Coolant Injection System Loop C

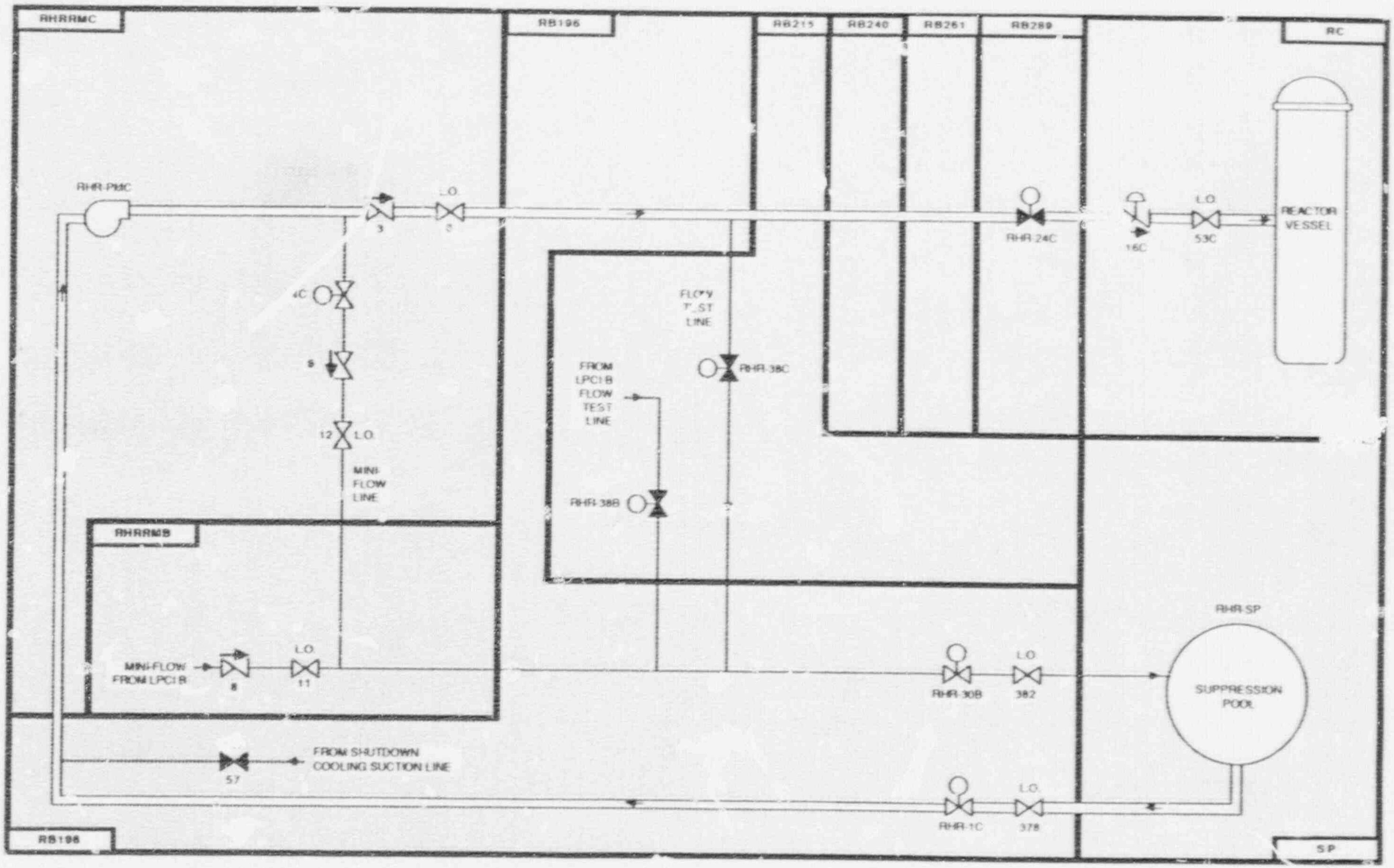


Figure 3.3-10. Nine Mile Point 2 Low Pressure Coolant Injection System Loop C Showing Component Locations

Table 3.3-1. Nine Mile Point 2 Emergency Core Cooling System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
HPCS-101	MOV	RB175	EP-MCC-201	600	HPCSSWGR	AC/III
HPCS-107	MOV	RB289	EP-MCC-201	600	HPCSSWGR	AC/III
HPCS-110	MOV	RB196	EP-MCC-201	600	HPCSSWGR	AC/III
HPCS-111	MOV	RB215	EP-MCC-201	600	HPCSSWGR	AC/III
HPCS-112	MOV	RB196	EP-MCC-201	600	HPCSSWGR	AC/III
HPCS-118	MOV	RB196	EP-MCC-201	600	HPCSSWGR	AC/III
HPCS-CST-B	TK	CST				
LPCS-104	MOV	RB289	EP-MCC-102A	600	AUXBAYN240	AC/I
LPCS-112	MOV	RB196	EP-MCC-102A	600	AUXBAYN240	AC/I
LPCS-114	MOV	RB196	EP-MCC-102A	600	AUXBAYN240	AC/I
LPCS-P1	MDP	LPCSRM	EP-BS-101	4160	SWGRMA	AC/I
RCIC-126	MOV	RB289	EP-MCC-A1	125	AUXBAYN240	DC/A
RHR-104	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-104	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-104	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-12A	MOV	RHRHXRMA175	EP-BS-US1	600	SWGRMA	AC/I
RHR-12B	MOV	RHRHXRMB175	EP-BS-US3	600	SWGRMB	AC/II
RHR-15A	MOV	RB289	EP-BS-US1	600	SWGRMA	AC/I
RHR-15A	MOV	RB289	EP-BS-US1	600	SWGRMA	AC/I
RHR-15B	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-15B	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-1A	MOV	RB196	EP-BS-US1	600	SWGRMA	AC/I
RHR-1B	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RHR-1C	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RHR-24A	MOV	RB289	EP-BS-US1	600	SWGRMA	AC/I
RHR-24B	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-24C	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II

Table 3.3-1. Nine Mile Point 2 Emergency Core Cooling System Data Summary for Selected Components (Continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RHR-25A	MOV	RB289	EP-BS-US1	600	SWGRMA	AC/I
RHR-25A	MOV	RB289	EP-BS-US1	600	SWGRMA	AC/I
RHR-25B	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-25B	MOV	RB289	EP-BS-US3	600	SWGRMB	AC/II
RHR-2A	MOV	RHRRMA	EP-BS-US1	600	SWGRMA	AC/I
RHR-2A	MOV	RHRRMA	EP-BS-US1	600	SWGRMA	AC/I
RHR-2B	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RHR-2B	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RHR-30A	MOV	RB196	EP-BS-US1	600	SWGRMA	AC/I
RHR-30A	MOV	RB196	EP-BS-US1	600	SWGRMA	AC/I
RHR-30B	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RHR-30B	MOV	RB196	EP-BS-US3	600	SWGRMB	AC/II
RHR-38A	MOV	RB196	EP-BS-US1	600	SWGRMA	AC/I
RHR-38A	MOV	RB196	EP-BS-US1	600	SWGRMA	AC/I
RHR-38B	MOV	RB215	EP-BS-US3	600	SWGRMB	AC/II
RHR-38B	MOV	RB215	EP-BS-US3	600	SWGRMB	AC/II
RHR-38C	MOV	RB215	EP-BS-US3	600	SWGRMB	AC/II
RHR-40A	MOV	RB240	EP-BS-US1	600	SWGRMA	AC/I
RHR-40B	MOV	RB240	EP-BS-US3	600	SWGRMB	AC/II
RHR-8A	MOV	RHRRMA	EP-BS-US1	600	SWGRMA	AC/I
RHR-8A	MOV	RHRRMA	EP-BS-US1	600	SWGRMA	AC/I
RHR-8B	MOV	RHRRMB	EP-BS-US3	600	SWGRMB	AC/II
RHR-8B	MOV	RHRRMB	EP-BS-US3	600	SWGRMB	AC/II
RHR-9A	MOV	RHRHXRMA196	EP-BS-US1	600	SWGRMA	AC/I
RHR-9B	MOV	RHRHXRMB196	EP-BS-US3	600	SWGRMB	AC/II
RHR-HXA	HX	RHRHXRMA175				
RHR-HXB	HX	RHRHXRMB175				

Table 3.3-1. Nine Mile Point 2 Emergency Core Cooling System Data Summary for Selected Components (Continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RHR-PMA	MDP	RHRRMA	EP-BS-101	4160	SWGRMA	AC/I
RHR-PMB	MDP	RHRRMB	EP-BS-103	4160	SWGRMB	AC/II
RHR-PMC	MDP	RHRRMC	EP-BS-103	4160	SWGRMB	AC/II

3.4 INSTRUMENTATION AND CONTROL (I & C) SYSTEMS

3.4.1 System Function

The instrumentation and control systems consist of the Reactor Protection System (RPS), the Engineered Safety Features System (ESF), and systems for the display of plant information to the operators. The RPS and the Engineered Safety Features System 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 Engineered Safety Features System will automatically actuate selected safety systems based on the specific limits or combinations of limits that are exceeded. A completely separate and diverse system, the Redundant Reactivity Control System (RRCS), is provided to mitigate the effects of a postulated Anticipated Transient Without Scram (ATWS).

3.4.2 System Definition

The RPS includes sensor and transmitter units, logic units, and output trip relays that generate a reactor trip signal. The Engineered Safety Features System 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 this system. Operator instrumentation display systems consist of display panels in the control room and at the auxiliary control panel that are powered by the 120 VAC electric power system (see Section 3.6) The RRCS consists of control panels, their associated ATWS detection and actuation logic, and the necessary interface logic for those systems required to perform specific functions in response to an ATWS event.

3.4.3 System Operation

A. RPS

The RPS design is based on two separate (A and B) trip systems. Each trip system has at least two independent trip channels (A1, A2 and B1, B2). Each trip channel is associated with trip logics of the same designation.

Trip logics A1 and A2 (Trip System A) outputs are combined in a one-out-of-two logic arrangement to control the "A" pilot scram valve solenoid in each of the four rod groups (a rod group consists of approximately 25 percent of the total of control rods). Trip logics B1 and B2 (Trip System B) outputs control the "B" pilot scram valve solenoids in each of the four rod groups. In order to initiate a scram, the A1 or A2 logic and the B1 or B2 logic must be in a tripped state. Thus, a scram is initiated by a one-out-of-two-twice logic.

When a trip channel contact opens, the trip logic de-energizes the trip actuator logic which de-energizes the pilot scram valves associated with that trip actuator logic. However, the other pilot scram valves for each rod must also be de-energized before the scram valves provide a reactor scram. There is one dual coil pilot scram valve and two scram valves for each control rod. The pilot scram valve is solenoid operated, with the solenoids normally energized. The pilot scram valve controls the air supply to the scram valves for each control rod. With either pilot scram valve coil energized, air pressure holds the scram valves closed. The scram valves control the supply and discharge paths for control rod drive water (see Section 3.6).

When trip logics A1 or A2 and B1 or B2 are tripped, air is vented from the scram valves and allows control rod drive water to act on the control rod drive piston, scramming all control rods. The water displaced by the movement of each rod piston is exhausted into a scram discharge volume. To restore the RPS to normal operation following any single actuator logic trip or a scram, the trip actuators must be reset manually. After a 10-second delay, reset is possible only if the conditions that caused the scram have been cleared. The trip actuators are reset by operating switches in the control room. Four reset switches (one per trip channel) are provided.

There are two 125 VDC solenoid operated backup scram valves that provide a second means of controlling the air supply to the scram valves for all control rods. When the solenoid for either back scram valve is energized, the associated backup scram valve vents the air supply for the scram valves. This action initiates insertion of any withdrawn control rods regardless of the action of the scram pilot valves. The backup scram valves' solenoids are energized (initiate scram) when trip logic A1 or A2 and B1 or B2 are both tripped.

The following conditions result in reactor trip:

- Neutron monitoring system (NMS)
- Intermediate Range Monitor (IRM)
- Average Power Range Monitors (APRM)
- Reactor vessel high pressure
- Reactor vessel low water level
- Turbine stop valve position
- Turbine control valve position
- Main steam line isolation valve position
- Scram discharge volume water level
- Drywell high pressure
- Main steam line high radiation
- Manual
- Reactor mode switch in SHUTDOWN position

B. Redundant Reactivity Control System

The RRCS solid state logic is divided into Divisions 1 and 2, each of which is subdivided into two channels. The logic is energized to trip, and both channels of either division must be tripped in order to initiate the RRCS protective actions. The system can be manually initiated by depressing two pushbuttons (tripping both channels) in the same division. This manual initiation function is designed so that no single operator action can result in an inadvertent initiation. The manual initiation pushbuttons are located in the control room near the RPS manual scram pushbuttons. There are four RRCS manual initiation pushbuttons.

The RRCS sensors monitor reactor dome pressure and reactor water level. High pressure or low water level (Level 2) or RRCS manual initiation will cause the alternate rod insertion (ARI) valves to scram the reactor independently of the reactor protection system. The RRCS sensors and logic are also designed to automatically initiate the recirculation pump trip logic whenever the reactor pressure or the reactor water level reaches the RRCS sensor settings.

C. ESF Actuation Systems

The ESF actuation systems also utilize a two-out-of-four coincidence of like initiating trip signals from four independent measurement channels, with two output actuation trains. The ESF logic is similar to that of the RPS. The ESF systems that can be automatically actuated include the following (not a complete listing):

- Emergency Core Cooling System
  - HPCS
  - LPCS
  - LPCI/RHR
  - ADS
- Standby power system
- Primary containment and reactor vessel isolation control systems (PCRVICS)
- Standby gas treatment system (SGTS)
- Combustible gas control system (CGCS)
- Portion of reactor building HVAC system
- Portion of service water system
- Service water pump bays ventilation system
- Control building HVAC system
- Control building chilled water system
- Diesel generator building HVAC system

Details regarding ESF actuation logic are included in the system description for the actuated system.

D. Remote Shutdown

The Remote Shutdown System (RSS) is designed to achieve a hot then cold reactor shutdown from outside the main control room. It is required only when the main control room is inaccessible when normal plant operating conditions exist.

Functions needed for remote shutdown control are provided with manual keylock transfer switches that override controls from the main control room and transfer controls to the remote shutdown system. All necessary power supplies and control logic are also transferred. Operation of the transfer devices causes an alarm in the main control room. Access to the remote shutdown panels are administratively and procedurally controlled. All systems equipment (i.e. controls for valves and pumps) necessary for proper system lineup and complete system control are located on the remote shutdown panels.

The following equipment have transfer and control switches located on the remote shutdown control panels:

RCIC Valves:	RCIC-121, RCIC-128, RCIC-170, RCIC-150, RCIC-126, RCIC-120, RCIC-122, RCIC-136
RHR Valves:	RHR-112, RHR-113, RHR-2A, RHR-1A, RCS-9A, RCS-90A, RHR-8A, RHR-12A, RHR-33A, RHR-38A, RHR-40A, RHR-67A, RHR-2B, RHR-1B, RHR-9B, RHR-90B, RHR-8B, RHR-12B, RHR-33B, RHR-38B, RHR-40B, RHR-67B, RHR-104, RHR-142, RHR-149, RHR-30A, RHR-30B
RHR Pumps:	RHR-A, RHR-B
SWS Pumps:	SWS-A, SWS-B, SWS-C, SWS-D, SWS-E, SWS-F

3.4.4 System Success Criteria

A. RPS

The RPS uses hindrance logic (normal = 1, trip = 0) in both the input and output logic. Therefore, a channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). A reactor scram will occur upon loss of control power to the RPS. A reactor scram 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 success criteria for Nine Mile Point 2 have not been determined.

B. Redundant Reactivity Control System

The RRCS uses transmission output logic (normal = 0, trip = 1). Details of the RRCS success criteria for Nine Mile Point 2 have not been determined.

C. ESF Actuation Systems

A single component usually receives a signal from only one ESF output train. ESF Trains A and B must be available in order to automatically actuate their respective components. ESF actuation systems 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 ESF output channels to send an actuation signal. Note that there may be some ESF 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 ESF actuation success criteria system for Nine Mile Point 2 have not been determined.

D. 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 ESF subsystem. The control room operators also may send qualified persons into the plant to operate components locally or from some other remote control location (i.e., the remote shutdown panel or a motor control center). To make these judgments, data on key plant parameters must be available to the operators.

3.4.5 Support Systems and Interfaces

A. Control Power

1. RPS

Details of the RPS power supply could not be determined, but typically the normal 120 VAC power to each of the two RPS buses is supplied by its own high inertia motor generator set. Each drive motor is supplied from 600 VAC buses. High inertia is provided by a flywheel.

2. Other Actuation and Control Systems
   The control power interfaces for the various front-line systems are summarized in Table 3.4-1. This table was developed using information concerning the MCCs and busses used to actuate the motor operated valves and pumps of the front line systems because direct information concerning the control of these valves and pumps was not available.
3. Operator Instrumentation
   Power for instrumentation systems is provided by the 120 VAC electric power distribution system (see Section 3.5).

Table 3.4-1. Matrix of Nine Mile Point 2 Control Power Sources

SYSTEM	125 VDC Division		
	A	B	C
RCIC	■		
HPCS			■
ADS	■		
RHR (LPCI) A	■		
RHR (LPCI) B		■	
RHR (LPCI) C		■	
LPCS	■		
DIESEL A & AUXILIARIES	■		
DIESEL B & AUXILIARIES		■	
DIESEL C & AUXILIARIES			■
SWS A	■		
SWS B		■	

3.5 ELECTRIC POWER SYSTEM

3.5.1 System Function

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

3.5.2 System Definition

The onsite Class 1E AC power system is divided into three independent divisions that are electrically isolated and physically separated from each other. Each division has its own dedicated standby diesel generator that is separate from and independent of the standby diesel generator of any other division. Each division feeds a separate load group consisting of 600 VAC load centers, motor control centers (MCC), distribution panels, and uninterruptable power supply (UPS) systems.

The three divisions of the onsite emergency AC power system are designated as Divisions I, II, and III. They supply power from emergency 4.16 kV switchgear buses 101, 102, and 103 in the following manner: bus 101 is dedicated to Division I of the station emergency power distribution system; buses 103 and 102 are dedicated to Divisions II and III, respectively. Buses 101 and 103 feed all station redundant safety-related loads, except the HPCS system loads. The HPCS system loads are fed by bus 102. Details of the station electric power system are shown in Figures 3.5-1 and 3.5-2.

The emergency 600V load centers US1 and US3 are fed from their respective divisional 4.16 kV switchgear buses 101 and 103. They feed emergency motor loads, emergency MCC's, and 600V emergency power distribution panels belonging to their respective divisions. There is no load center associated with Division III. Instead, the Division III 4.16 kV emergency bus 102 supplies emergency MCC 201 through a step-down transformer. Details of the 4160 and 600 VAC systems are shown in Figures 3.5-3 and 3.5-4.

The plant emergency uninterruptible power supply system consists of two 120V UPS units (UPS2A and UPS2B) and their associated distribution panels. It feeds ECCS instrumentation/control loads, but it does not feed any emergency diesel generator control panels. Details of the 120 VAC system are shown in Figures 3.5-5 and 3.5-6.

The Class 1E 125 VDC power system is divided into three independent divisions corresponding to the three divisions of the onsite AC power system. Each division has its own dedicated battery and battery chargers, DC switchgear and distribution panels. The Division I emergency battery and battery chargers are connected to emergency switchgear bus 2A. The Division II emergency battery and battery chargers are connected to emergency switchgear bus 2B. The Division III emergency battery and battery chargers are connected to emergency 125 VDC panel 414. Details of the 125 VDC systems are shown in Figures 3.5-7 and 3.5-8.

Simplified one-line diagrams of the electric power system are shown in Figures 3.5-1 to 3.5-8. A summary of data on selected electric power system components is presented in Table 3.5-1. A partial listing of electrical sources and loads is presented in Table 3.5-2.

3.5.3 System Operation

Each Class 1E 4160 VAC switchgear bus is provided with a preferred and alternate offsite power source and one standby diesel generator. The normal power sources for buses 101, 102, and 103 are the 4.16 kV buses 16 and 17 which are fed from the 115 kV switchyard via transformers XSR1A and XSR1B.

Under normal plant operating conditions the diesel generators are maintained in a standby status. In the event of a loss of offsite power or degraded offsite voltage condition, the diesel generators automatically start and begin picking up loads sequentially. In case of a LOCA or any other design basis accident (DBA) condition, the diesel generators automatically start and run on no-load. Should subsequent loss of offsite power occur, the diesel generator will then energize the bus. Diesel generators A, B, and C are connected to the 4.16 kV switchgear buses 101, 102, and 103, respectively.

The Class 1E 125 VDC system consists of three independent divisions. Each division is comprised of a 125 VDC bank of batteries and two battery charges. The battery bank in all three divisions will supply its respective loads for 2 hours without recharging. Details of the 125 VDC system are shown in Figures 3.5-7 and 3.5-8.

Redundant safeguards equipment such as motor driven pumps and motor operated valves are supplied by different buses or MCCs. For the purpose of discussion, this equipment has been grouped into "load groups." Load group "AC/I" contains components receiving electric power either directly or indirectly from 4.16 kV switchgear bus 101. Load group "AC/II" contains components powered either directly or indirectly from 4.16 kV switchgear bus 103. Load group "AC/III" contains components powered either directly or indirectly from 4.16 kV switchgear bus 102. Components receiving 125 VDC power are assigned to load groups "DC/A," "DC/B," or "DC/C," based on the associated battery.

3.5.4 System Success Criteria

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

- Each Class 1E DC load group is supplied initially from its respective 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

3.5.5 Component Information

A. Standby diesel generators A, B
   1. Continuous power rating: 4,400 kW
   2. Rated voltage: 4160 VAC
   3. Manufacturer: Cooper Energy Service

B. Standby diesel generator C
   1. Continuous rating: approximately 2,657 kW (3,562 bhp)
   2. Rated voltage: 4160 VAC
   3. Manufacturer: General Electric

C. 125 VDC station batteries 2A, 2B, 2C
   1. Type: lead-acid
   2. Rated voltage: 125 VDC
   3. Design capacity: approximately 2 hours minimum with design loads

3.5.6 Support Systems and Interfaces

A. Control Signals

1. Automatic

   The standby diesel generators are automatically started upon receipt of a LOCA signal or a degraded voltage signal from the associated bus. During emergency operation, the standby diesel generator is shut down under the following conditions: generator differential and engine overspeed. The nonessential trip conditions "high jacket water temperature," "high engine bearing temperature," "low turbocharger oil pressure," "low lubricating oil pressure," and "high vibration level" are bypassed upon receipt of a LOCA signal but will shut down the diesel generators when operating in all other modes.

2. Remote manual

   Each standby diesel generator is capable of being started or stopped manually from the main control room.

3. Local manual

   Each standby diesel generator is capable of being started or stopped manually from the diesel generator control room.

B. Diesel Generator Auxiliary Systems

1. Cooling

   Each standby diesel generator has a closed loop cooling system referred to as the jacket water system to remove heat from the engine. The cooling water transfers heat to the Service Water System which carries the heat to the ultimate heat sink. (See Section 3.7.)

2. Fueling

   Each diesel engine has an independent long-term fuel oil storage and transfer system. Each long-term storage tank contains approximately 53,150 gallons of fuel, sufficient for continuous operation of its respective diesel engine at rated capacity for seven days. The fuel oil storage tanks are buried underground adjacent to the diesel generator building. The day tanks are in the diesel generator building.

3. Lubrication

   Each diesel generator has a self-contained lubrication system.

4. Starting

   Each standby diesel generator has two independent, redundant compressed air starting systems.

5. Control power

   Each diesel generator is dependent on 125 VDC power from the respective battery for control power.

6. Diesel room ventilation

   Diesel room ventilation fan cooler units provide room cooling during diesel operation. The coolers are supplied from the Service Water System (see Section 3.7).

C. Switchgear and Battery Room Ventilation

Switchgear rooms and motor control center rooms are cooled by fan cooler units served by the Service Water System (see Section 3.7).

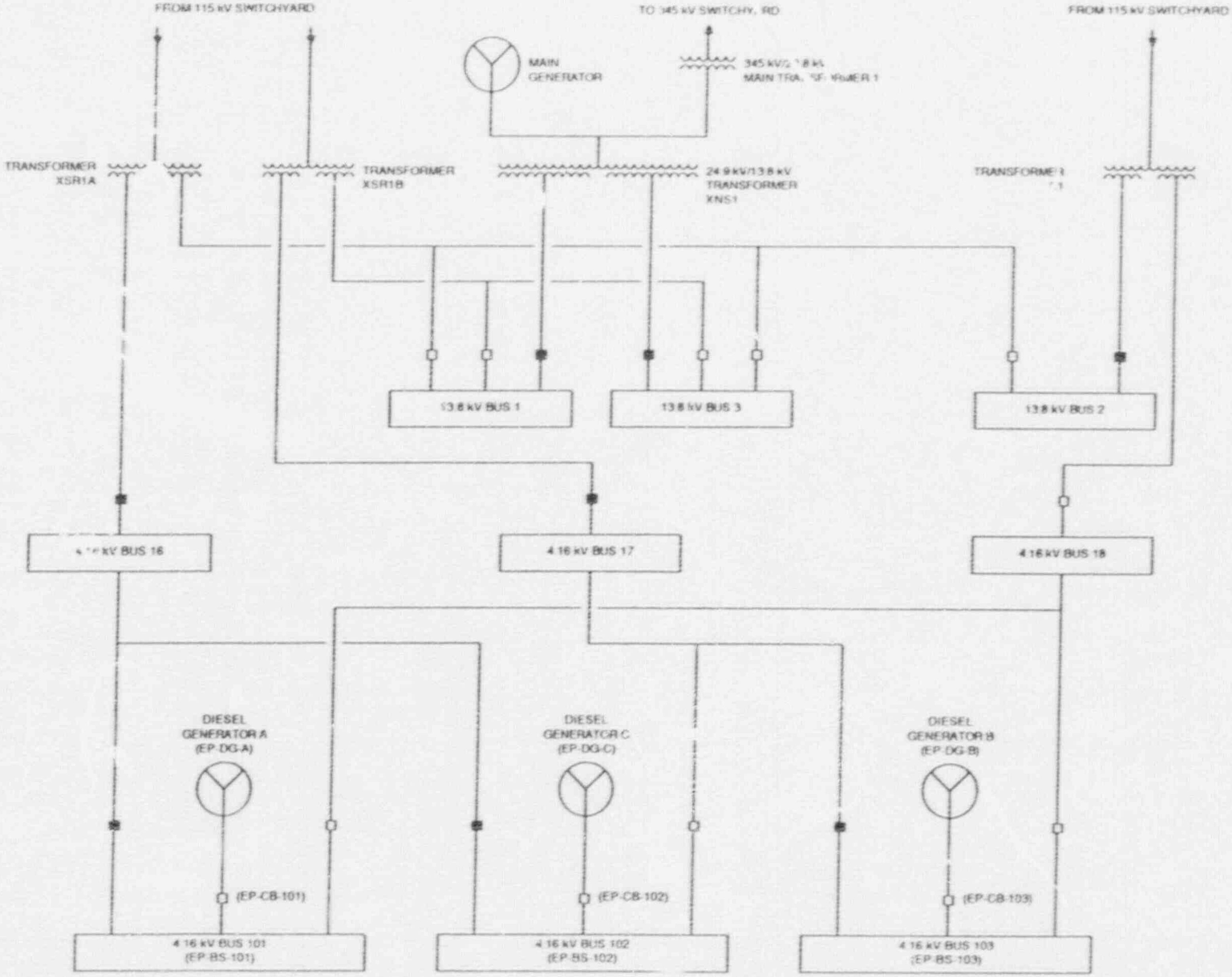
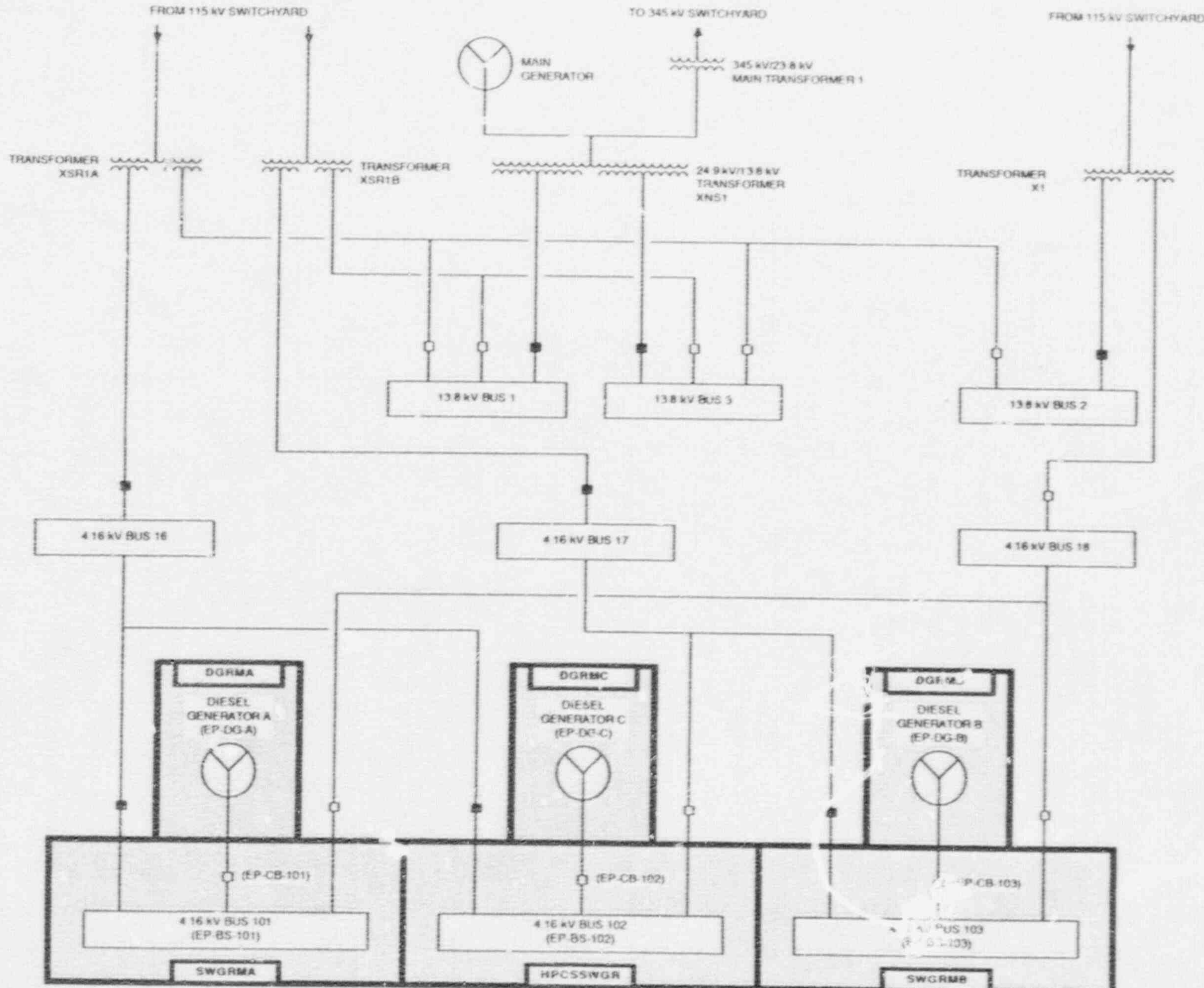


Figure 3.5-1. Nine Mile Point 2 Station Electric Power Distribution System



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS

Figure 3.5-2. Nine Mile Point 2 Station Electric Power Distribution System Showing Component Locations

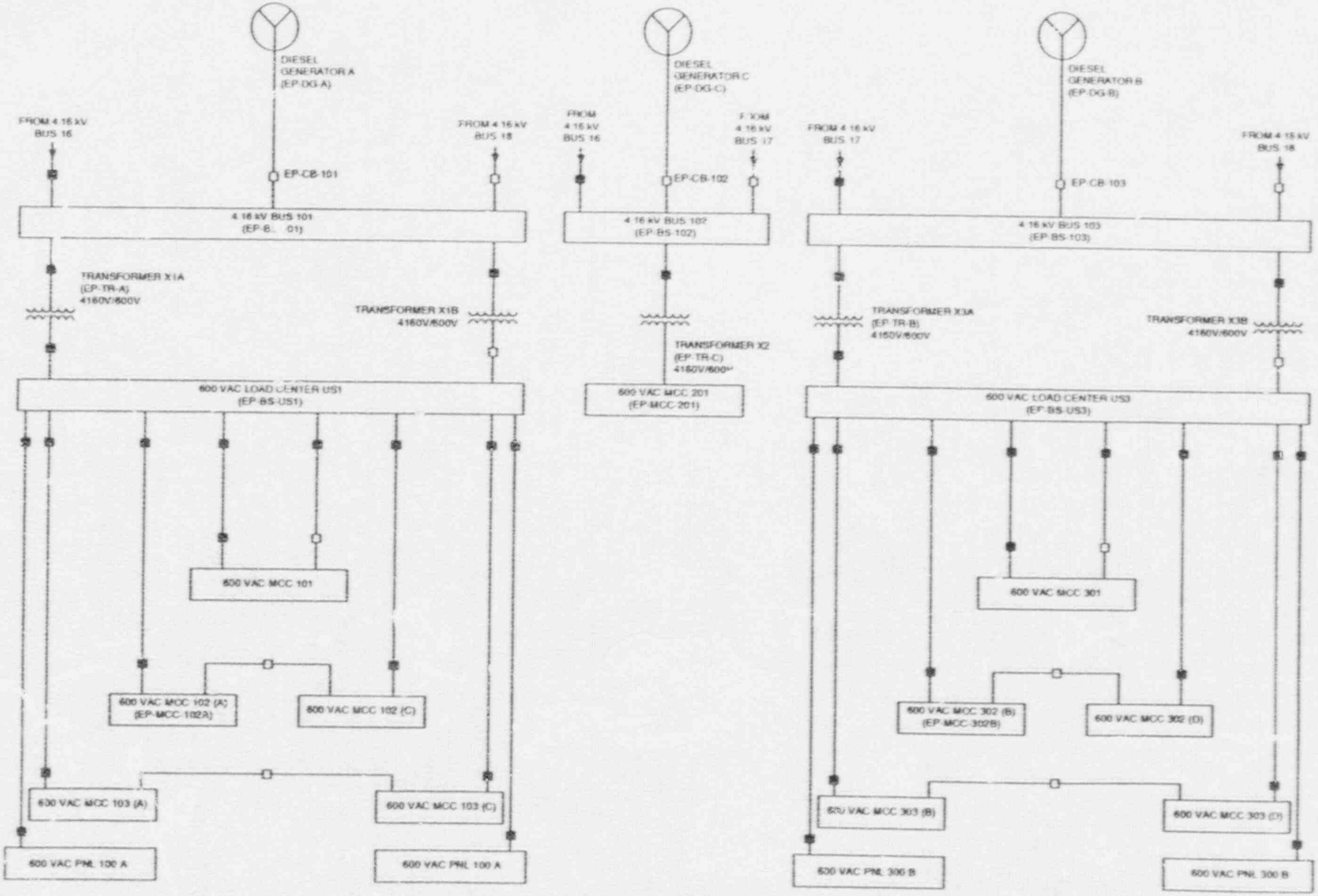
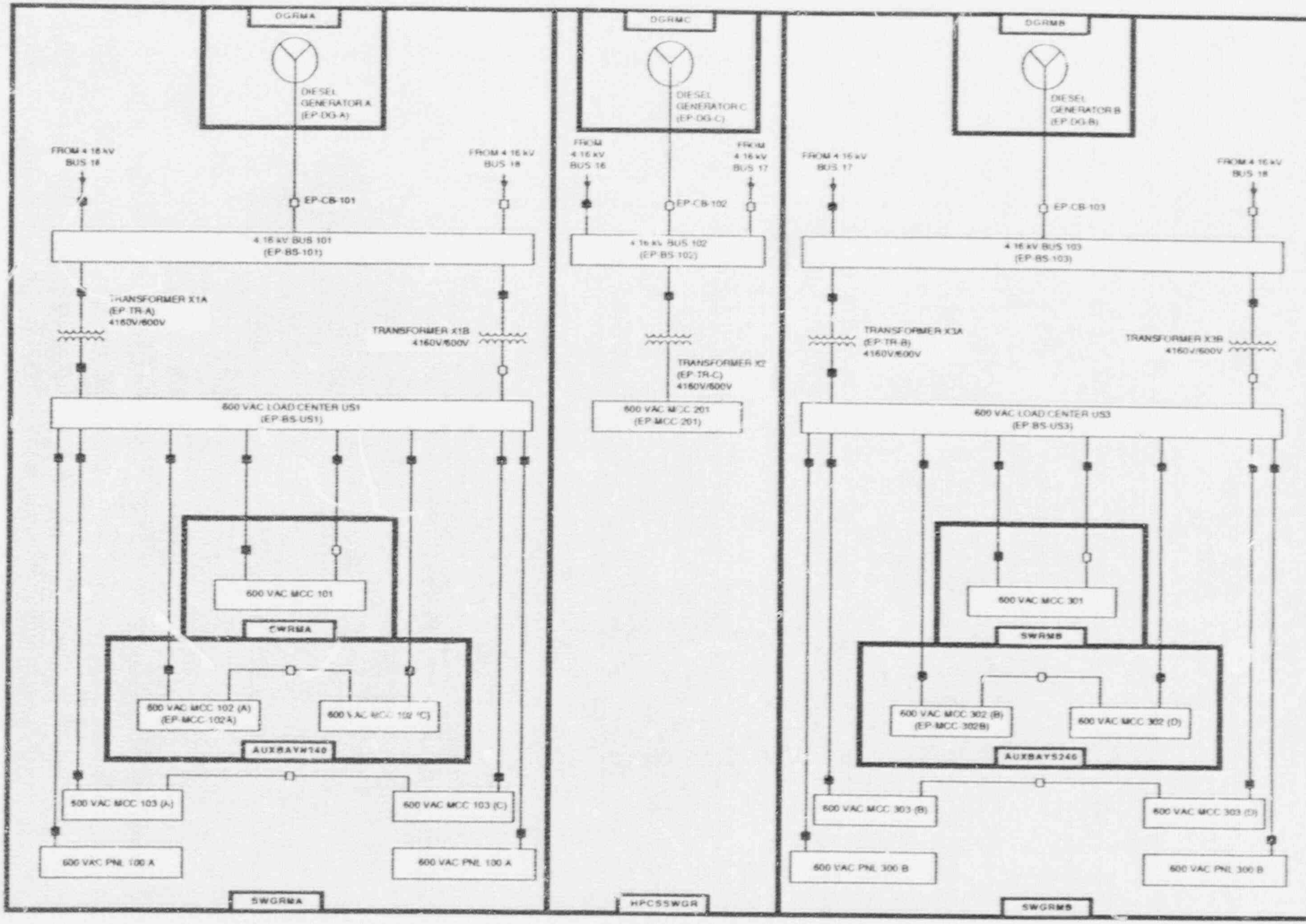


Figure 3.5-3. Nine Mile Point 2 4160 and 600 VAC Electric Power System



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS

Figure 3.5-4. Nine Mile Point 2 4160 and 600 VAC Electric Power System Showing Component Locations

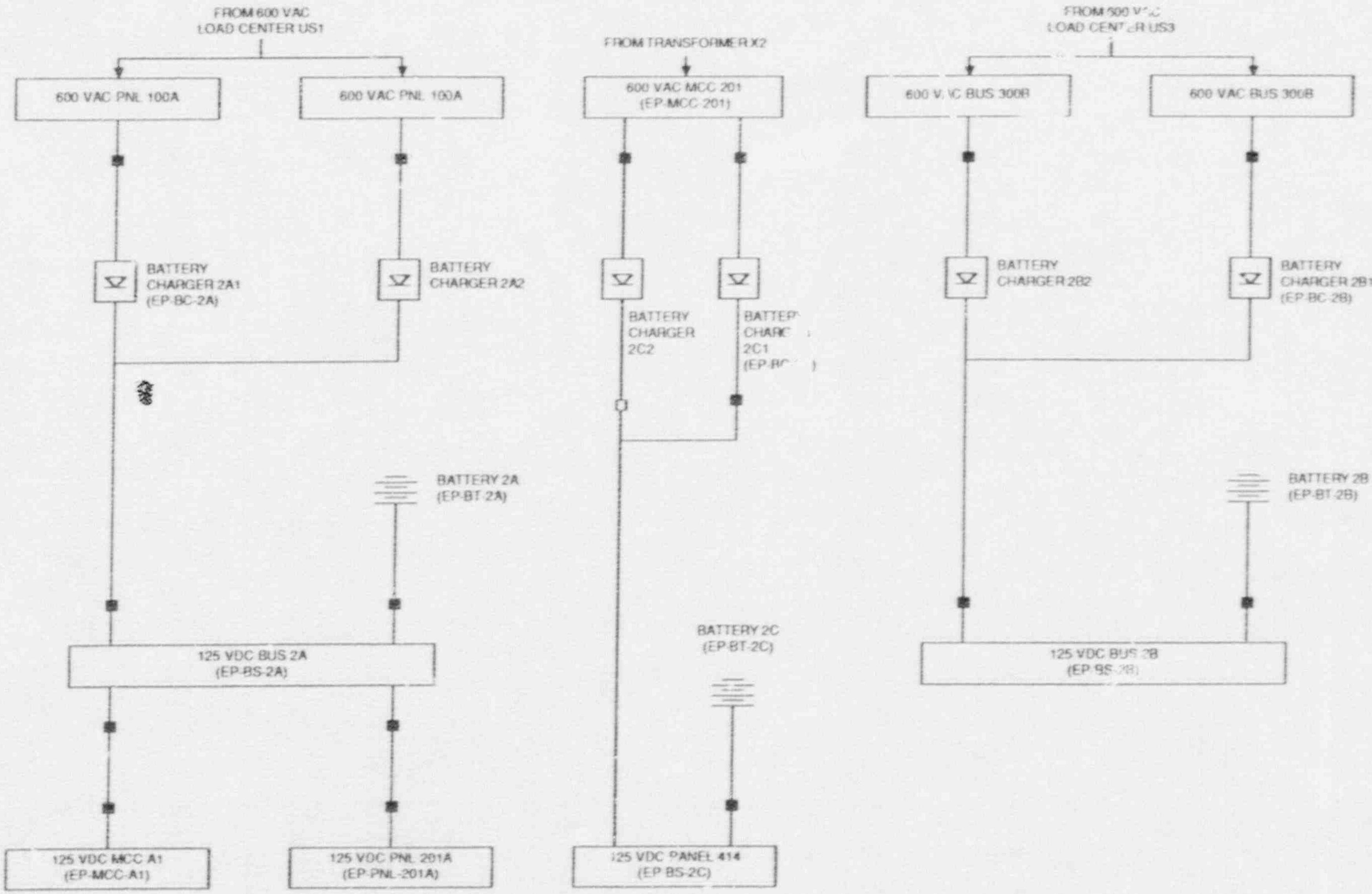
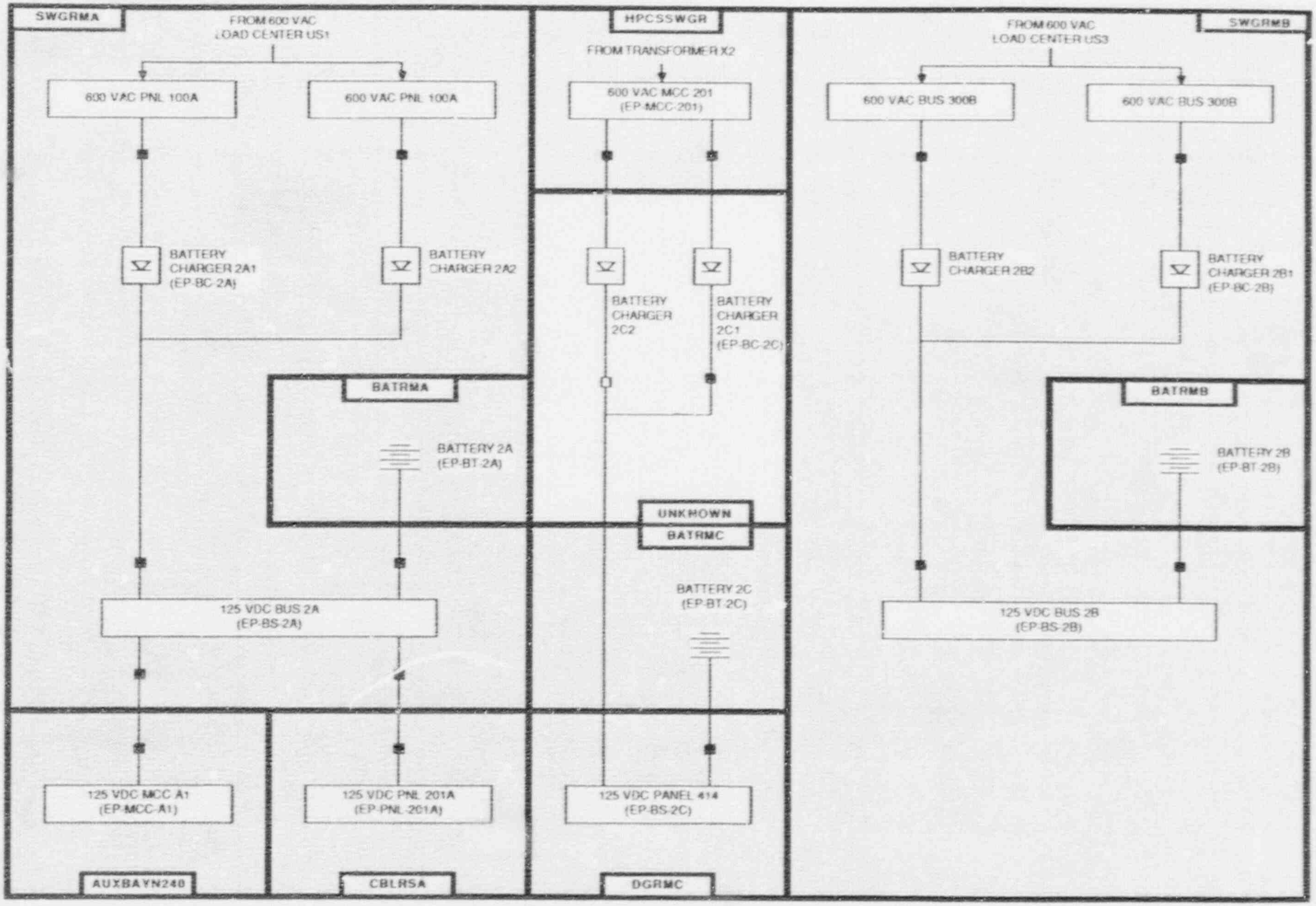


Figure 3.5-5. Nine Mile Point 2 125 VDC Electric Power System



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

Figure 3.5-6. Nine Mile Point 2 125 VDC Electric Power System Showing Component Locations

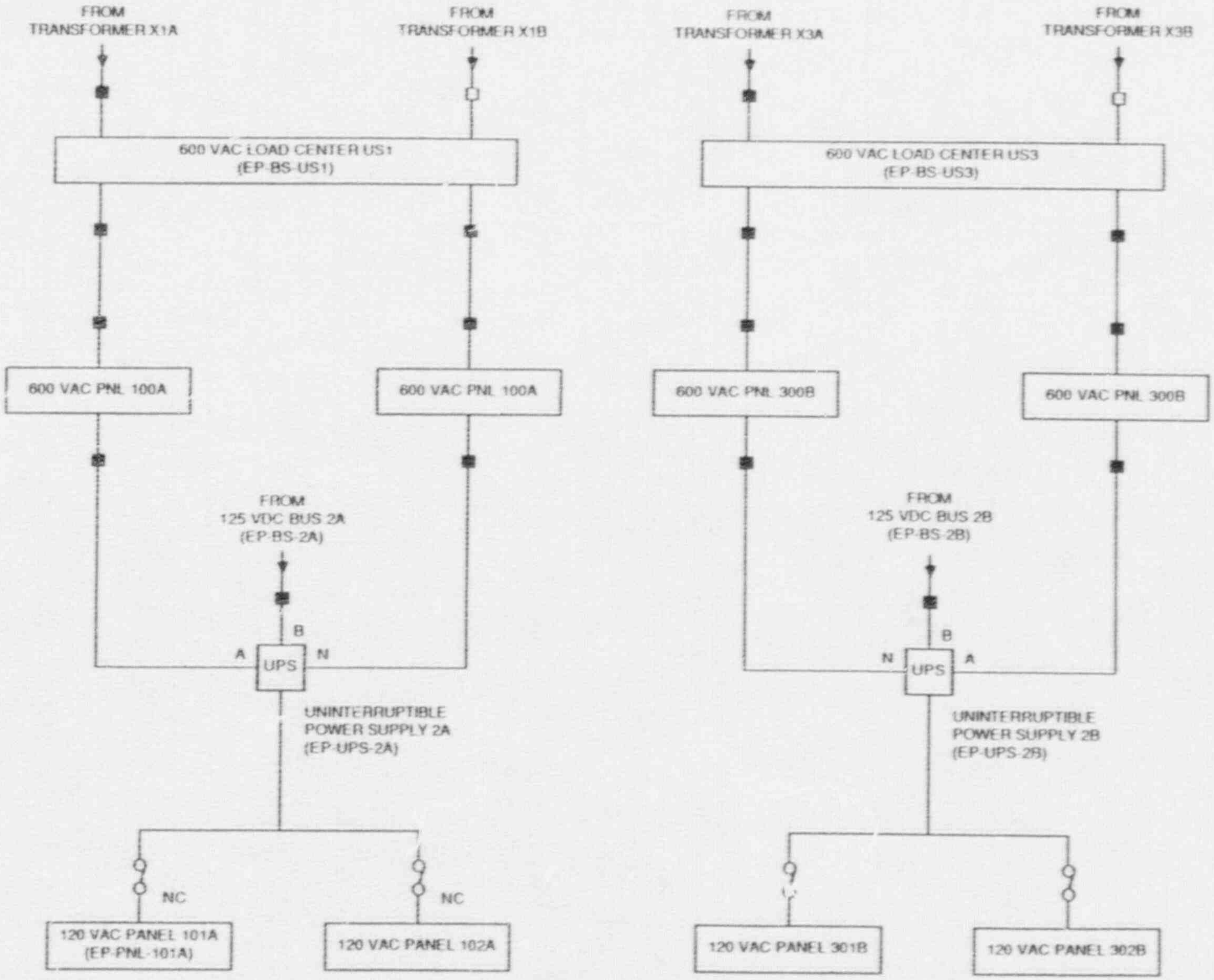
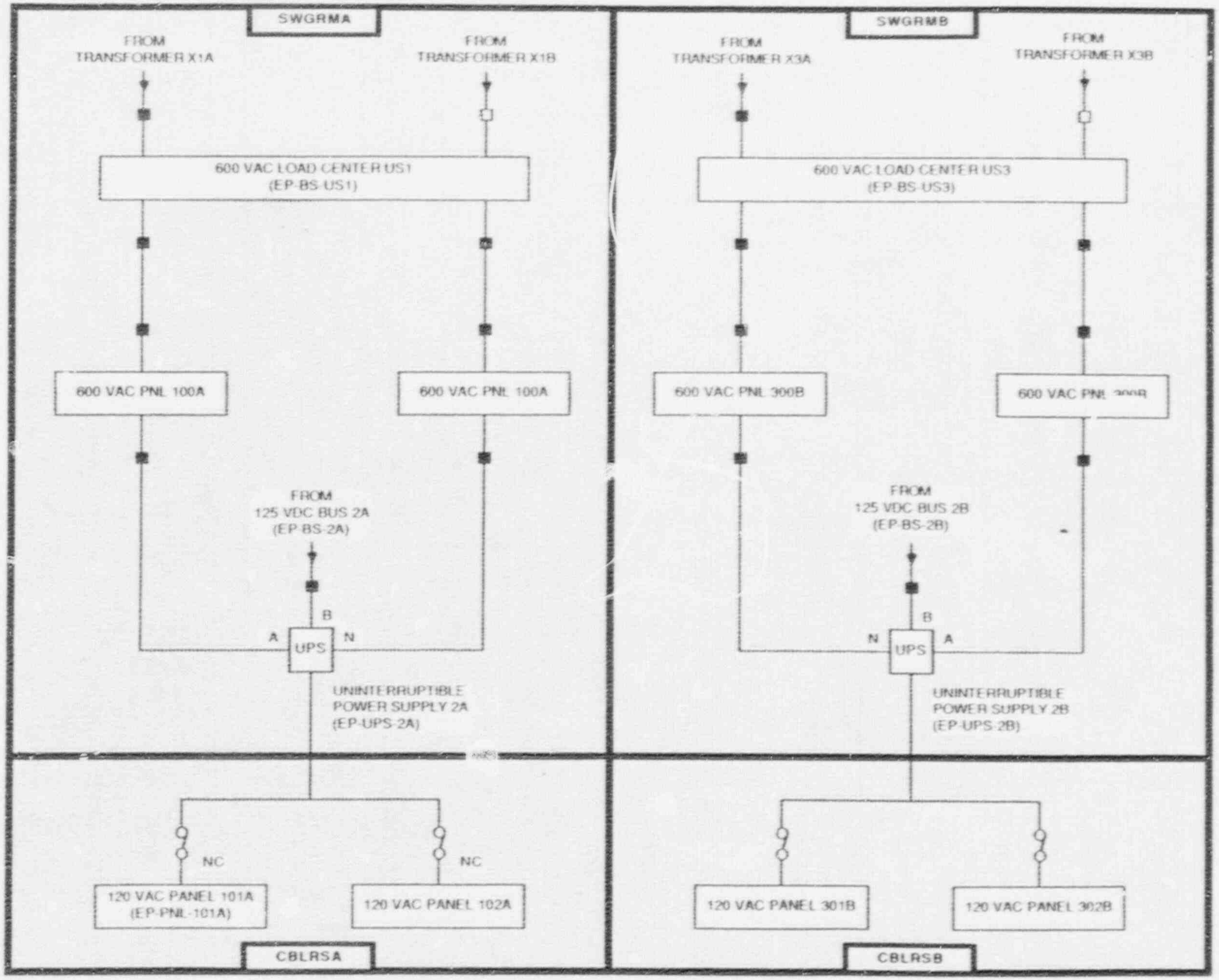


Figure 3.5-7. Nine Mile Point 2 120 VAC Electric Power Distribution System



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

Figure 3.5-8. Nine Mile Point 2 120 VAC Electric Power Distribution System Showing Component Locations

Table 3.5-1. Nine Mile Point 2 Electric Power System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
EP-BC-2A	BC	SWGRMA	EP-BS-US1	600	SWGRMA	AC/I
EP-BC-2B	BC	SWGRMB	EP-BS-US3	600	SWGRMB	AC/II
EP-BS-101	BS	SWGRMA	EP-DG-A	4160	DGRMA	AC/I
EP-BS-102	BS	HPCSSWGR	EP-DG-C	4160	DGRMC	AC/III
EP-BS-103	BS	SWGRMB	EP-DG-B	4160	DGRMB	AC/II
EP-BS-2A	BS	SWGRMA	EP-BC-2A	125	SWGRMA	DC/A
EP-BS-2A	BS	SWGRMA	EP-BC-2A	125	SWGRMA	DC/A
EP-BS-2B	BS	SWGRMB	EP-BC-2B	125	SWGRMB	DC/B
EP-BS-2C	PNL	DGRMC	EP-BC-2C	125	UNKNOWN	DC/C
EP-BS-US1	BS	SWGRMA	EP-TR-A	600	SWGRMA	AC/I
EP-BS-US3	BS	SWGRMB	EP-TR-B	600	SWGRMB	AC/II
EP-BT-2A	BATT	BATRMA	EP-BS-2A	125	SWGRMA	DC/A
EP-BT-2B	BATT	BATRMB	EP-BS-2B	125	SWGRMB	DC/B
EP-BT-2C	BATT	BATRMC	EP-BS-2C	125	DGRMC	DC/C
EP-CB-101	CB	SWGRMA	EP-DG-A	4160	DGRMA	AC/I
EP-CB-102	CB	HPCSSWGR	EP-DG-C	4160	DGRMC	AC/III
EP-CB-103	CB	SWGRMB	EP-DG-B	4160	DGRMB	AC/II
EP-DG-A	DG	DGRMA				AC/I
EP-DG-B	DG	DGRMB				AC/II
EP-DG-C	DG	DGRMC				AC/III
EP-MCC-102A	MCC	AUXBAYN240	EP-BS-US1	600	SWGRMA	AC/I
EP-MCC-201	MCC	HPCSSWGR	EP-TR-C	600	HPCSSWGR	AC/III
EP-MCC-302B	MCC	AUXBAYS240	EP-BS-US3	600	SWGRMB	AC/II
EP-PNL-101A	PNL	CBLRSA	EP-UPS-2A	120	SWGRMA	AC/I
EP-PNL-201A	PNL	CBLRSA	EP-BS-2A	125	SWGRMA	DC/A
EP-TR-A	TR	SWGRMA	EP-BS-101	4160	SWGRMA	AC/I
EP-TR-B	TR	SWGRMB	EP-BS-103	4160	SWGRMB	AC/II

Table 3.5-1. Nine Mile Point 2 Service Water System Data Summary for Selected Components (Continued)

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
EP-TR-C	TR	HPCSSWGR	EP-BS-102	4160	HPCSSWGR	AC/III
EP-UPS-2A	UPS	SWGRMA	EP-BS-US1	600	SWGRMA	AC/I
EP-UPS-2A	UPS	SWGRMA	EP-BS-US1	600	SWGRMA	AC/I
EP-UPS-2B	UPS	SWGRMB	EP-BS-US3	600	SWGRMB	AC/II

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Nine Mile Point 2

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BC-2A	125	DC/A	SWGRMA	EP	EP-BS-2A	BS	SWGRMA
EP-BC-2A	125	DC/A	SWGRMA	EP	EP-BS-2A	BS	SWGRMA
EP-BC-2B	125	DC/B	SWGRMB	EP	EP-BS-2B	BS	SWGRMB
EP-BC-2C	125	DC/C	UNKNOWN	EP	EP-BS-2C	PNL	DGRMC
EP-BS-101	4160	AC/I	SWGRMA	ECCS	LPCS-P1	MDP	LPCSRM
EP-BS-101	4160	AC/I	SWGRMA	ECCS	RHR-PMA	MDP	RHRRMA
EP-BS-101	4160	AC/I	SWGRMA	EP	EP-TR-A	TR	SWGRMA
EP-BS-101	4160	AC/I	SWGRMA	SWS	SWS-P1A	MDP	SWRMA
EP-BS-101	4160	AC/I	SWGRMA	SWS	SWS-P1C	MDP	SWRMA
EP-BS-101	4160	AC/I	SWGRMA	SWS	SWS-P1E	MDP	SWRMA
EP-BS-102	4160	A[illegible]	[illegible]CSSWGR	ECCS	HPCS-P1	MDP	HPCSRM
EP-BS-102	4160	AC/III	HPCSSWGR	EP	EP-TR-C	TR	HPCSSWGR
EP-BS-103	4160	AC/II	SWGRMB	ECCS	RHR-PMB	MDP	RHRRMB
EP-BS-103	4160	AC/II	SWGRMB	ECCS	RHR-PMC	MDP	RHRRMC
EP-BS-103	4160	AC/II	SWGRMB	EP	EP-TR-B	TR	SWGRMB
EP-BS-103	4160	AC/II	SWGRMB	SWS	SWS-P1B	MDP	SWRMB
EP-BS-103	4160	AC/II	SWGRMB	SWS	SWS-P1D	MDP	SWRMB
EP-BS-103	4160	AC/II	SWGRMB	SWS	SWS-P1F	MDP	SWRMB
EP-BS-2A	125	DC/A	SWGRMA	EP	EP-BT-2A	BATT	BATRMA
EP-BS-2A	125	DC/A	SWGRMA	EP	EP-PNL-201A	PNL	CBLRSA
EP-BS-2B	125	DC/B	SWGRMB	EP	EP-BT-2B	BATT	BATRMB
EP-BS-2C	125	DC/C	DGRMC	EP	EP-BT-2C	BATT	BATRMC
EP-BS-B201	600	AC/III	HPCSSWGR	SWS	SWS-94B	MOV	DGRMC
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-12A	MOV	RHRHXRMA175
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-15A	MOV	RB289
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-15A	MOV	RB289
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-1A	MOV	RB196
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-24A	MOV	RB289
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-25A	MOV	RB289
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-25A	MOV	RB289
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-2A	MOV	RHRRMA

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Nine Mile Point 2 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-2A	MOV	RHRRMA
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-30A	MOV	RB196
EP-BS-US1	300	AC/I	SWGRMA	ECCS	RHR-30A	MOV	RB196
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-33A	MOV	RB196
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-33A	MOV	RB196
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-40A	MOV	RB240
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-8A	MOV	RHRRMA
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-8A	MOV	RHRRMA
EP-BS-US1	600	AC/I	SWGRMA	ECCS	RHR-9A	MOV	RHRHXRMA196
EP-BS-US1	600	AC/I	SWGRMA	EP	EP-BC-2A	BC	SWGRMA
EP-BS-US1	600	AC/I	SWGRMA	EP	EP-MCC-102A	MCC	AUXBA[illegible]N240
EP-BS-US1	600	AC/I	SWGRMA	EP	EP-UPS-2A	UPS	SWGRMA
EP-BS-US1	600	AC/I	SWGRMA	EP	EP-UPS-2A	UPS	SWGRMA
EP-BS-US1	600	AC/I	SWGRMA	RCIC	RCIC-22A	MOV	SFCHXRMA215
EP-BS-US1	600	AC/I	SWGRMA	RCIC	RCIC-23A	MOV	SFCHXRMA215
EP-BS-US1	600	AC/I	SWGRMA	RCIC	RCIC-32A	MOV	RHRHXRMA196
EP-BS-US1	600	AC/I	SWGRMA	RCS	RHR-113	MOV	RB240
EP-BS-US1	600	AC/I	SWGRMA	SWS	SWS-3A	MOV	SWPTNL
EP-BS-US1	600	AC/I	SWGRMA	SWS	SWS-66A	MOV	DGRMA
EP-BS-US1	600	AC/I	SWGRMA	SWS	SWS-74A	MOV	SWRMA
EP-BS-US1	600	AC/I	SWGRMA	SWS	SWS-74C	MOV	SWRMA
EP-BS-US1	600	AC/I	SWGRMA	SWS	SWS-74E	MOV	SWRMA
EP-BS-US1	600	AC/I	SWGRMA	SWS	SWS-95A	MOV	DGRMA
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-104	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-104	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-104	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-12B	MOV	RHRHXRMB175
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-15B	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-15B	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-1B	MOV	RB196
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-1C	MOV	RB196

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Nine Mile Point 2 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHP-24B	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-24C	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-25B	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-25B	MOV	RB289
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-2B	MOV	RB196
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-2B	MOV	RB196
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-30B	MOV	RB196
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-30B	MOV	RB196
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-38B	MOV	RB215
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-38B	MOV	RB215
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-38C	MOV	RB215
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-40B	MOV	RB240
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-8B	MOV	RHRRMB
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-8B	MOV	RHRRMB
EP-BS-US3	600	AC/II	SWGRMB	ECCS	RHR-9B	MOV	RHRHXRMB196
EP-BS-US3	600	AC/II	SWGRMB	EP	EP-BC-2B	BC	SWGRMB
EP-BS-US3	600	AC/II	SWGRMB	EP	EP-MCC-302B	MCC	AUXBAYS240
EP-BS-US3	600	AC/II	SWGRMB	EP	EP-UPS-2B	UPS	SWGRMB
EP-BS-US3	600	AC/II	SWGRMB	RCIC	RCIC-22B	MOV	RB196
EP-BS-US3	600	AC/II	SWGRMB	RCIC	RCIC-23B	MOV	RB196
EP-BS-US3	600	AC/II	SWGRMB	RCS	RHR-112	MOV	RC
EP-BS-US3	600	AC/II	SWGRMB	SWS	SWS-3B	MOV	SWPTNL
EP-BS-US3	600	AC/II	SWGRMB	SWS	SWS-66B	MOV	DGRMB
EP-BS-US3	600	AC/II	SWGRMB	SWS	SWS-74B	MOV	SWRMB
EP-BS-US3	600	AC/II	SWGRMB	SWS	SWS-74D	MOV	SWRMB
EP-BS-US3	600	AC/II	SWGRMB	SWS	SWS-74F	MOV	SWRMB
EP-BS-US3	600	AC/II	SWGRMB	SWS	SWS-95B	MOV	DGRMB
EP-DG-A	4160	AC/I	DGRMA	EP	EP-BS-101	BS	SWGRMA
EP-DG-A	4160	AC/I	DGRMA	EP	EP-CB-101	CB	SWGRMA
EP-DG-B	4160	AC/II	DGRMB	EP	EP-BS-103	BS	SWGRMB
EP-DG-B	4160	AC/II	DGRMB	EP	EP-CB-103	CB	SWGRMB

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Nine Mile Point 2 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-DG-C	4160	AC/III	DGRMC	EP	EP-BS-102	BS	HPCSSWGR
EP-DG-C	4160	AC/III	DGRMC	EP	EP-CB-102	CB	HPCSSWGR
EP-MCC-102A	600	AC/I	AUXBAYN240	ECCS	LPCS-104	MOV	RB289
EP-MCC-102A	600	AC/I	AUXBAYN240	ECCS	LPCS-112	MOV	RB196
EP-MCC-102A	600	AC/I	AUXBAYN240	ECCS	LPCS-114	MOV	RB196
EP-MCC-102A	600	AC/I	AUXBAYN240	RCS	RCS-112	MOV	STMTNL
EP-MCC-102A	600	AC/I	AUXBAYN240	RCS	RCS-119	MOV	RC
EP-MCC-102A	600	AC/I	AUXBAYN240	RCS	RWCU-112	MOV	RB240
EP-MCC-102A	600	AC/I	AUXBAYN240	SWS	SWS-33A	MOV	RHRHXRMA175
EP-MCC-102A	600	AC/I	AUXBAYN240	SWS	SWS-90A	MOV	RHRHXRMA175
EP-MCC-201	600	AC/III	HPCSSWGR	ECCS	HPCS-101	MOV	RB175
EP-MCC-201	600	AC/III	HPCSSWGR	ECCS	HPCS-107	MOV	RB289
EP-MCC-201	600	AC/III	HPCSSWGR	ECCS	HPCS-110	MOV	RB196
EP-MCC-201	600	AC/III	HPCSSWGR	ECCS	HPCS-111	MOV	RB215
EP-MCC-201	600	AC/III	HPCSSWGR	ECCS	HPCS-112	MOV	RB196
EP-MCC-201	600	AC/III	HPCSSWGR	ECCS	HPCS-118	MOV	RB196
EP-MCC-302B	600	AC/II	AUXBAYS240	RCIC	RCIC-128	MOV	RC
EP-MCC-302B	600	AC/II	AUXBAYS240	RCIC	RCIC-128	MOV	RC
EP-MCC-302B	600	AC/II	AUXBAYS240	RCS	RCS-111	MOV	RC
EP-MCC-302B	600	AC/II	AUXBAYS240	RCS	RCS-118	MOV	RC
EP-MCC-302B	600	AC/II	AUXBAYS240	RCS	RWCU-102	MOV	RC
EP-MCC-302B	600	AC/II	AUXBAYS240	SWS	SWS-33B	MOV	RHRHXRMB175
EP-MCC-302B	600	AC/II	AUXBAYS240	SWS	SWS-90B	MOV	RHRHXRMB175
EP-MCC-A1	125	DC/A	AUXBAYN240	ECCS	RCIC-126	MOV	RB289
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-108	MOV	RB196
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-116	MOV	RCICRM
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-120	MOV	RCICRM
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-121	MOV	RB261
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-121	MOV	RB261
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-124	MOV	RB196
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-126	MOV	RB289

Table 3.5-2. Partial Listing of Electrical Sources and Loads at Nine Mile Point 2 (Continued)

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-129	MOV	RB196
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-136	MOV	RB196
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-143	MOV	RB196
EP-MCC-A1	125	DC/A	AUXBAYN240	RCIC	RCIC-150	MOV	RCICRM
EP-TR-A	600	AC/I	SWGRMA	EP	EP-BS-US1	BS	SWGRMA
EP-TR-B	600	AC/II	SWGRMB	EP	EP-BS-US3	BS	SWGRMB
EP-TR-C	600	AC/III	HPCSSWGR	EP	EP-MCC-201	MCC	HPCSSWGR
EP-UPS-2A	120	AC/I	SWGRMA	EP	EP-PNL-101A	PNL	CBLRSA
UNKNOWN				RCIC	RCIC-151	HV	RCICRM
UNKNOWN				RCS	RCS-207	MOV	RC

3.6 CONTROL ROD DRIVE HYDRAULIC SYSTEM (CRDHS)

3.6.1 System Function

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

3.6.2 System Definition

The CRDHS consists of a high-head, low-flow CRD supply pump, piping, filters, control valves, one hydraulic control unit for each control rod drive mechanism, and instrumentation. Another pump is provided for standby. Water is supplied from the main condensate system or the condensate storage tanks. The CRDHS also includes scram valves, scram accumulators, and a scram discharge volume. Details of the scram portion of a typical BWR CRDHS is shown in Figure 3.6-1. Note that the interface with the Redundant Reactivity Control System (RRCS, see Section 3.4) is not shown in this diagram.

3.6.3 System Operation

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

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

The control rod drive accumulators are necessary to scram the control rods within the required time. It should be noted that each drive has an internal ball check valve which allows reactor pressure to be admitted under the drive piston. If reactor pressure exceeds the supply pressure at the drive, the ball check valve ensures rod insertion in the event that the scram accumulator is not charged or the inlet scram valve fails to open. The insertion time, however, will be slower than the scram time with a properly functioning scram system.

Although not intended as a makeup system, the CRDHS can provide a source of cooling water to the RCS during vessel isolation. In BWR/5 plants, RCS makeup at high pressure is performed by the RCIC (see Section 3.2) and HPCS (see Section 3.3) systems. The maximum RCS makeup rate of the CRDHS is roughly 200 gpm (Ref. 1).

3.6.4 System Success Criteria

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

- A scram signal must be transmitted by the RPS or the RRCS to the actuated devices (i.e., the scram pilot valves or the Alternate Rod Insertion (ARI) valves, respectively) in the CRDHS.

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

3.6.5 Component Information

A. Control rod drive pump
   1. Rated capacity: 100% (for control rod drive function)
   2. Type: centrifugal

B. Condensate Storage Tank
   1. Capacity: 135,000 gal

C. Scram Accumulator
   1. Normal pressure: 1400 to 1500 psig

D. Scram Discharge Volume
   1. Normal pressure: Atmospheric

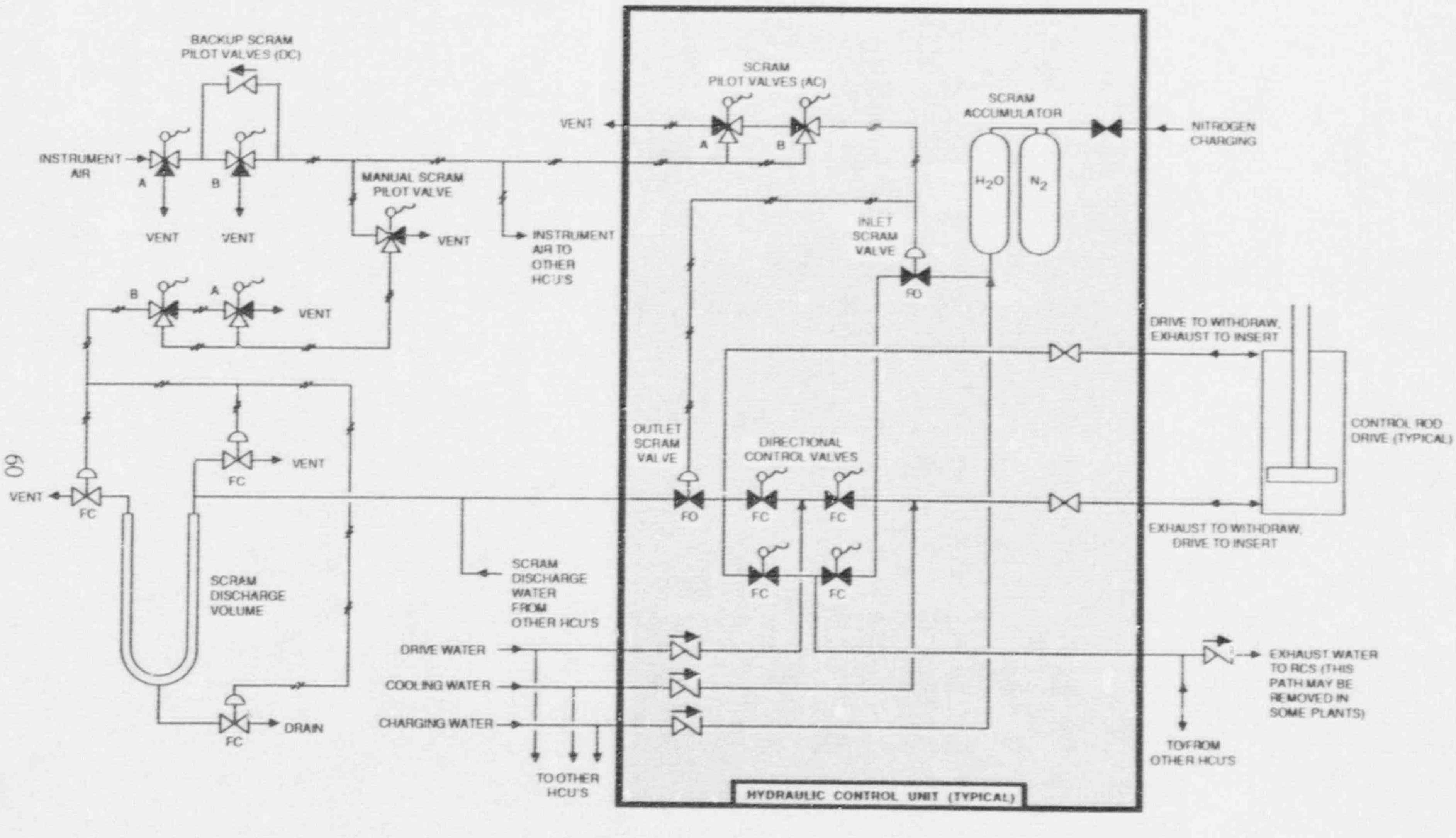
3.6.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. The RPS transmits scram commands to solenoid pilot valves which control the pneumatic scram valves
      b. The RRCS transmits trip commands under ATWS conditions to operate the ARI valves.
   2. Remote Manual
      a. A reactor scram can be initiated manually from the control room
      b. The RRCS can be initiated manually from the control room
      c. The CRDHS can be operated manually from the control room to insert and withdraw rods, or to inject water into the RCS.

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

3.6.7 Section 3.6 References

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



NOTE: INTERFACE WITH ALTERNATE ROD INSERTION (ARI) VALVES IS NOT SHOWN.

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

3.7 SERVICE WATER SYSTEM (SWS)

3.7.1 System Function

The service water system (SWS) is designed to provide a reliable supply of cooling water from the ultimate heat sink to essential and non-essential components and systems, including the RHR heat exchangers (completing the decay heat removal path to the ultimate heat sink) and diesel generator coolers. In addition, an intertie with the RHR system is provided to allow flooding of the core, if required, during the post-LOCA recovery period.

3.7.2 System Definition

The SWS is a once-through system which utilizes raw lake water from Lake Ontario. The SWS is designed with three loops, two of which (loops A and B) are redundant and feed all safety-related components. The third SWS loop is a nonessential loop that is isolated during an accident.

SWS loop A consists of three motor-driven pumps (P1A, P1C, P1E), and distribution piping serving the associated heat loads. SWS loop B consists of three motor-driven pumps (P1B, P1D, P1F), and distribution piping serving the associated heat loads. Note that the HPCS diesel generator (diesel generator C) receives a redundant supply of cooling water from either the A or B loop of the SWS.

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

3.7.3 System Operation

Water enters the SWS from Lake Ontario through two intake structures, passes through trash racks and travelling water screens, and enters the SWS intake bay. Six SWS pumps located in the intake bay pump supply a common header in the screenwell building. Two motor-operated isolation valves, 50A and 50B, which close on loss of offsite power (LOSPW), are provided in the header which separate the SWS into two separate, redundant systems, an A loop and a B loop. A summary of equipment served by the SWS is provided in Table 3.7-2.

After supplying the various heat loads, service water discharge from all buildings is combined outside the buildings in two separate, redundant discharge headers. The service water discharge is then returned to Lake Ontario through a discharge tunnel and diffuser system.

All six service water pumps are controlled automatically or manually by the required combination and sequence of signals generated following a LOSPW, considering automatic load sequencing requirements, and prior pump status. On LOSPW, all running pumps are stopped and restarted automatically in timed sequence. If a running pump fails to restart in time, a standby pump is started automatically to assure at least one pump is running in each loop.

3.7.4 System Success Criteria

The success criteria for a particular SWS loop is that one of three SWS pumps must operate, have access to a water supply from the intake bay, and an intact and unblocked flow path must be available to supply essential heat loads served by the SWS loop.

3.7.5 Component Information

A. Service Water Pumps (6)
   1. Rated flow: 10,000 gpm each @ 185 ft. head (80 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      - On loss of offsite power (LOSPW), all running SWS pumps are deenergized and restarted automatically in timed sequence.
      - The service water pump discharge valves open or close automatically when the associated pump is started or stopped, respectively.
      - The isolation valves 3A and 3B that separate the safety related portions of the SWS from the nonsafety related portions close automatically when there is a LOSPW.
   2. Remote manual
      The SWS pumps can be actuated by remote manual means from the main control room.

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

C. Other
   1. SWS pump cooling and lubrication are assumed to be provided locally
   2. SWS pump room cooling is provided by fan cooler units supplied from the Service Water System.

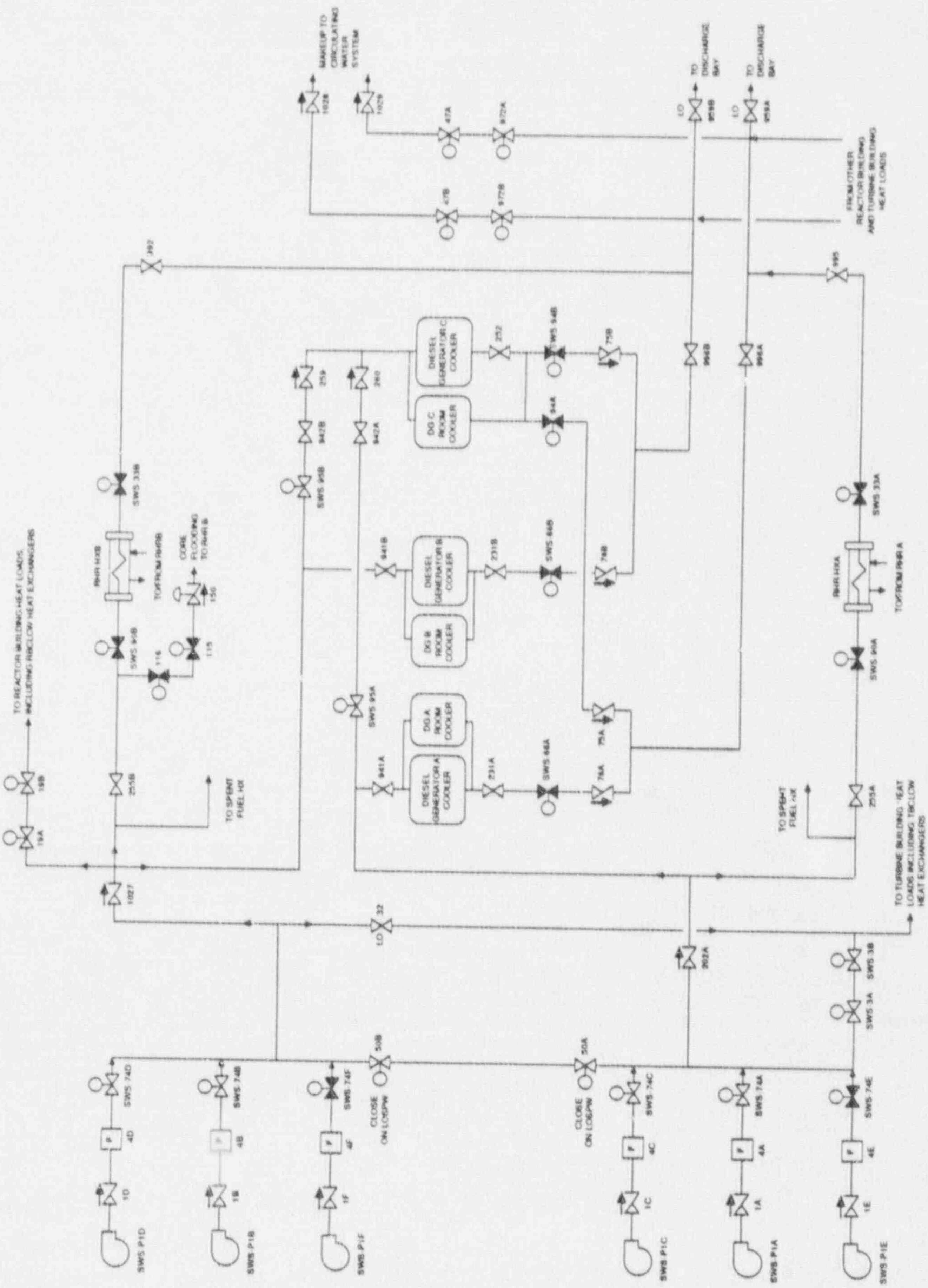


Figure 3.7-1. Nine Mile Point 2 Service Water System

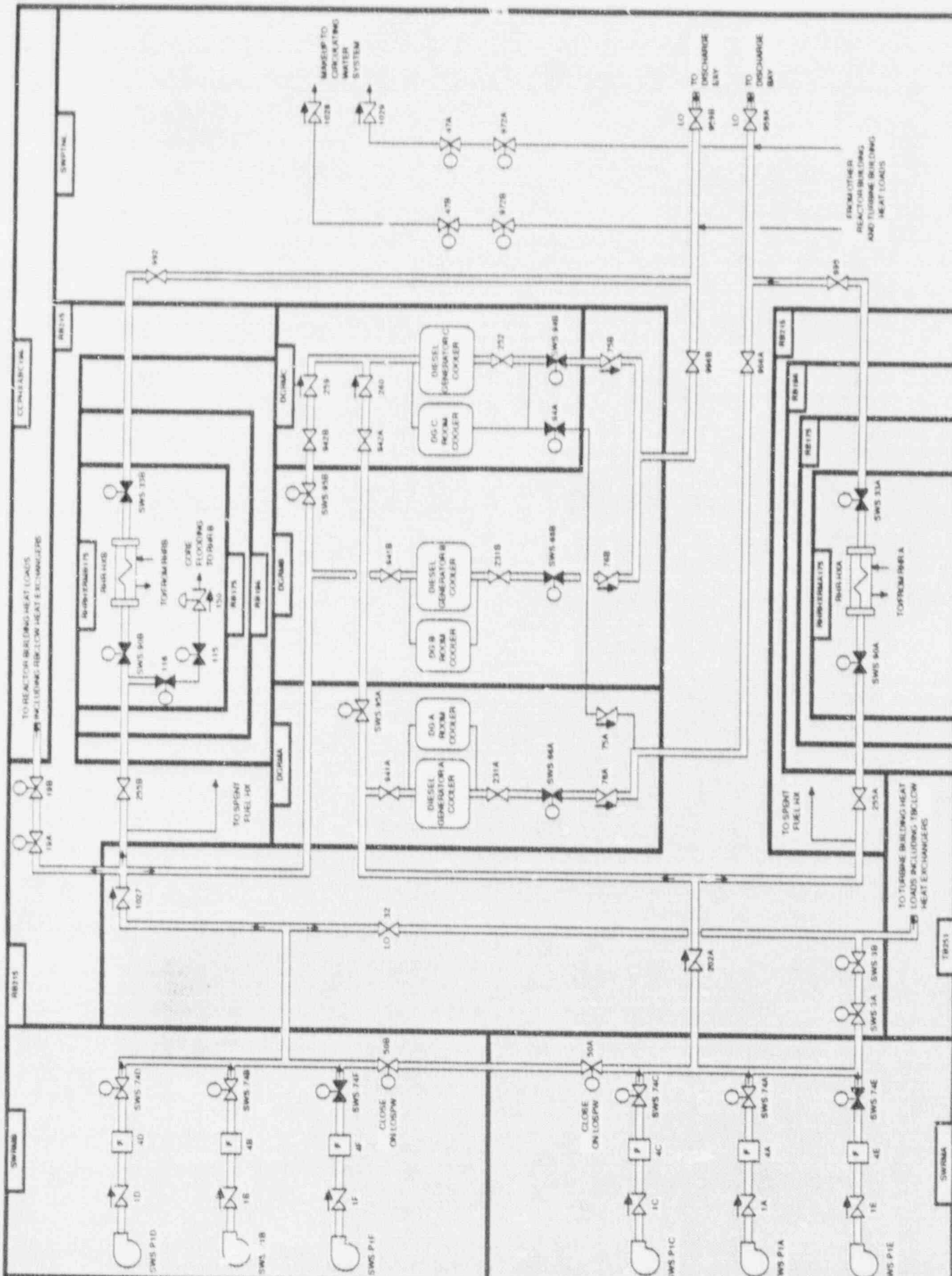


Figure 3.7-2. Nine Mile Point 2 Service Water System Showing Component Locations

Table 3.7-1. Nine Mile Point 2 Service Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
SWS-33A	MOV	RHRHXRMA175	EP-MCC-102A	600	AUXBAYN240	AC/I
SWS-33B	MOV	RHRHXRMB175	EP-MCC-302B	600	AUXBAYS240	AC/II
SWS-3A	MOV	SWPTNL	EP-BS-US1	600	SWGRMA	AC/I
SWS-3B	MOV	SWPTNL	EP-BS-US3	600	SWGRMB	AC/II
SWS-66A	MOV	DGRMA	EP-BS-US1	600	SWGRMA	AC/I
SWS-66B	MOV	DGRMB	EP-BS-US3	600	SWGRMB	AC/II
SWS-74A	MOV	SWRMA	EP-BS-US1	600	SWGRMA	AC/I
SWS-74B	MOV	SWRMB	EP-BS-US3	600	SWGRMB	AC/II
SWS-74C	MOV	SWRMA	EP-BS-US1	600	SWGRMA	AC/I
SWS-74D	MOV	SWRMB	EP-BS-US3	600	SWGRMB	AC/II
SWS-74E	MOV	SWRMA	EP-BS-US1	600	SWGRMA	AC/I
SWS-74F	MOV	SWRMB	EP-BS-US3	600	SWGRMB	AC/II
SWS-90A	MOV	RHRHXRMA175	EP-MCC-102A	600	AUXBAYN240	AC/I
SWS-90B	MOV	RHRHXRMB175	EP-MCC-302B	600	AUXBAYS240	AC/II
SWS-94B	MOV	DGRMC	EP-BS-B201	600	HPCSSWGR	AC/III
SWS-95A	MOV	DGRMA	EP-BS-US1	600	SWGRMA	AC/I
SWS-95B	MOV	DGRMB	EP-BS-US3	600	SWGRMB	AC/II
SWS-P1A	MDP	SWRMA	EP-BS-101	4160	SWGRMA	AC/I
SWS-P1B	MDP	SWRMB	EP-BS-103	4160	SWGRMB	AC/II
SWS-P1C	MDP	SWRMA	EP-BS-101	4160	SWGRMA	AC/I
SWS-P1D	MDP	SWRMB	EP-BS-103	4160	SWGRMB	AC/II
SWS-P1E	MDP	SWRMA	EP-BS-101	4160	SWGRMA	AC/I
SWS-P1F	MDP	SWRMB	EP-BS-103	4160	SWGRMB	AC/II

Table 3.7-2. Nine Mile Point 2 Systems and Equipment Served by the Service Water System

- Residual Heat Removal (RHR) heat exchangers
- Diesel generator coolers
- DBA hydrogen recombiners
- Reactor building ventilation recirculation cooling coils
- Equipment room and area coolers (for RCIC, ECCS, diesel room, switchgear and MCC room, SWS pump bay, and other essential fan cooler units)
- Control building chillers
- Reactor Building Closed Loop Cooling Water (RBCLCW) System
    - Spent fuel pool heat exchangers
    - Reactor water cleanup system non-regenerative heat exchangers and pump coolers
    - Drywell space coolers
    - Reactor recirculation pump coolers
    - RHR pump seal coolers
    - Control rod drive pump coolers
    - Instrument air and ADS air compressor coolers
    - Various drain and sample coolers
- Turbine Building Closed Loop Cooling Water (TBCLCW) System
- Reactor core flooding (via RHR train B)
- RHR pump seal coolers (backup to RBCLCW)
- Spent fuel pool heat exchangers (backup to RBCLCW)
- Reactor recirculation pump coolers (backup to RBCLCW)
- Spent fuel pool emergency makeup

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The Nine Mile Point Nuclear Station Unit 2 is located on the western portion of the Nine Mile Point promontory approximately 900 ft. due east of Unit 1. The site is adjacent to Lake Ontario (southeast shore) in Oswego County, NY, approximately 6.2 miles northeast of the city of Oswego. A general view of the site is shown in Figure 4-1 (Ref. 1), and a more detailed site plan is shown in Figure 4-2.

The reactor building for Unit 2 is just east of the turbine building, north of the control and diesel generator buildings, and south of the condensate storage tank building. It houses the primary containment, refueling and reactor servicing equipment, new and spent fuel storage facilities, and other reactor auxiliary and service equipment. The control building contains the control room, cable-spreading rooms, battery rooms, and the relay rooms. The diesel generator building, which is directly south of the control building, houses the three standby diesel generators.

Two condensate storage tanks (CSTs) are provided for Unit 2, and they are located in the CST building. Adjacent to the CST building, directly west, are the radwaste building, service water bays, and the screenwell building. The turbine building is directly south of the screenwell building and houses the main steam turbines.

4.2 FACILITY LAYOUT DRAWINGS

Simplified layout drawings for Unit 2 are presented in Figures 4-3 to 4-16. Figures 4-3 to 4-6 show the reactor building, Figures 4-7 to 4-10 show the reactor and turbine buildings, Figures 4-11 to 4-13 show the control and diesel generator buildings, and Figures 4-14 to 4-16 show the CST and adjacent buildings. 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 3, Oak Ridge National Laboratory, April 1974.

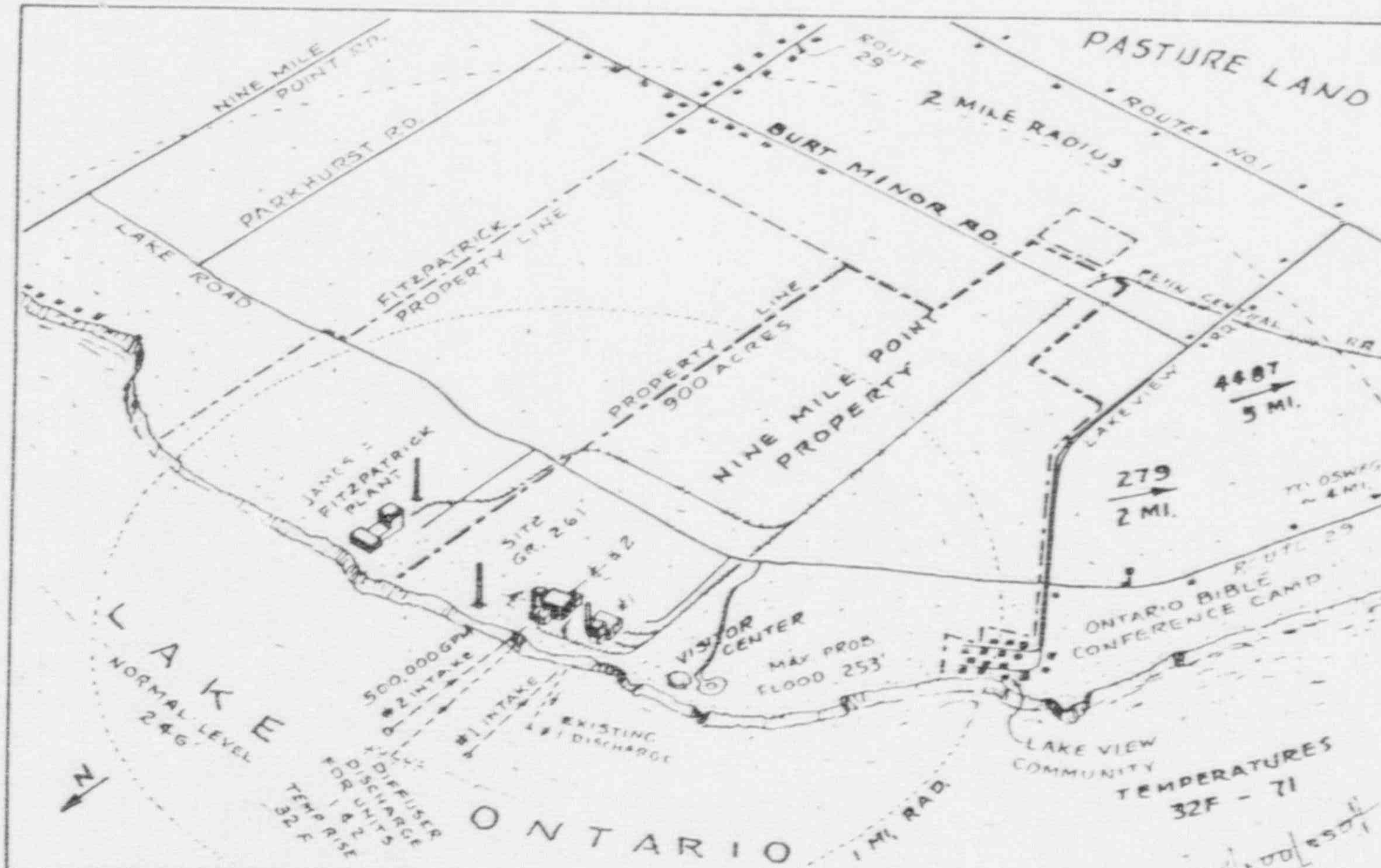


Figure 4-1. General View of the Nine Mile Point 2 Site and Vicinity

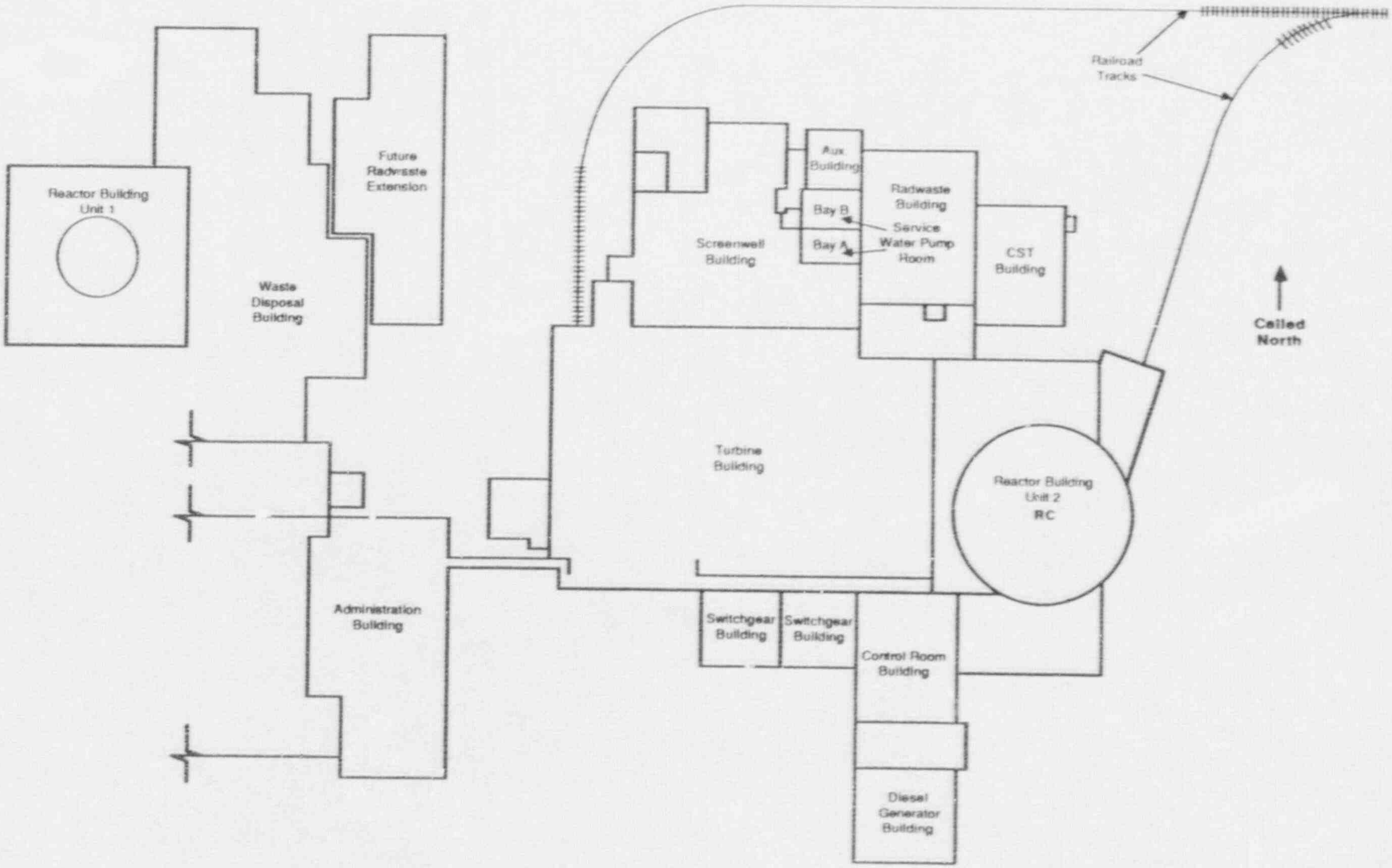


Figure 4-2. Nine Mile Point 2 Simplified Site Plan

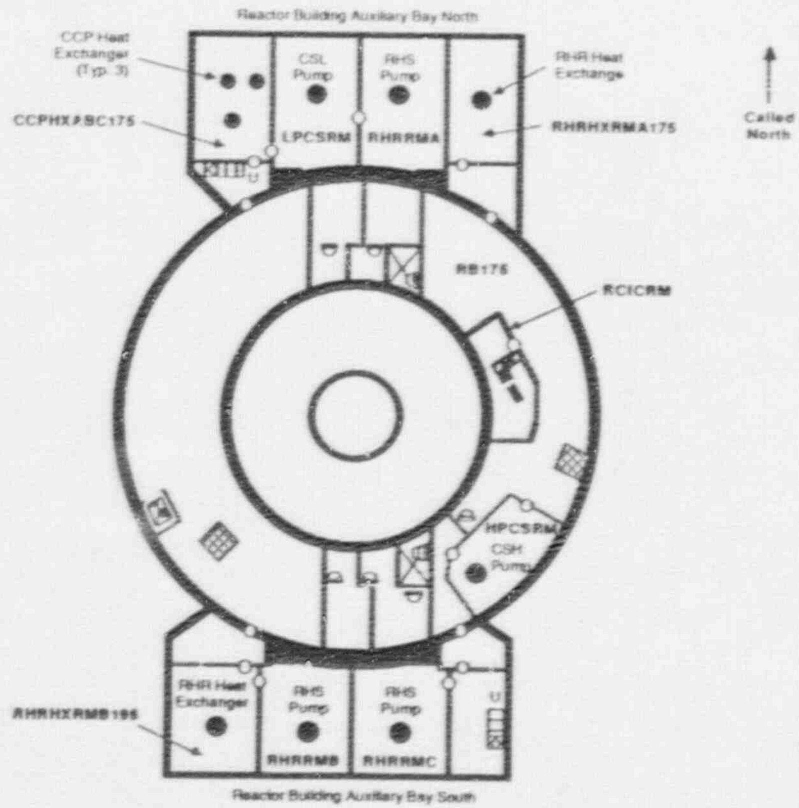


Figure 4-3. Nine Mile Point 2 Reactor Building, Elevation 175'-0"

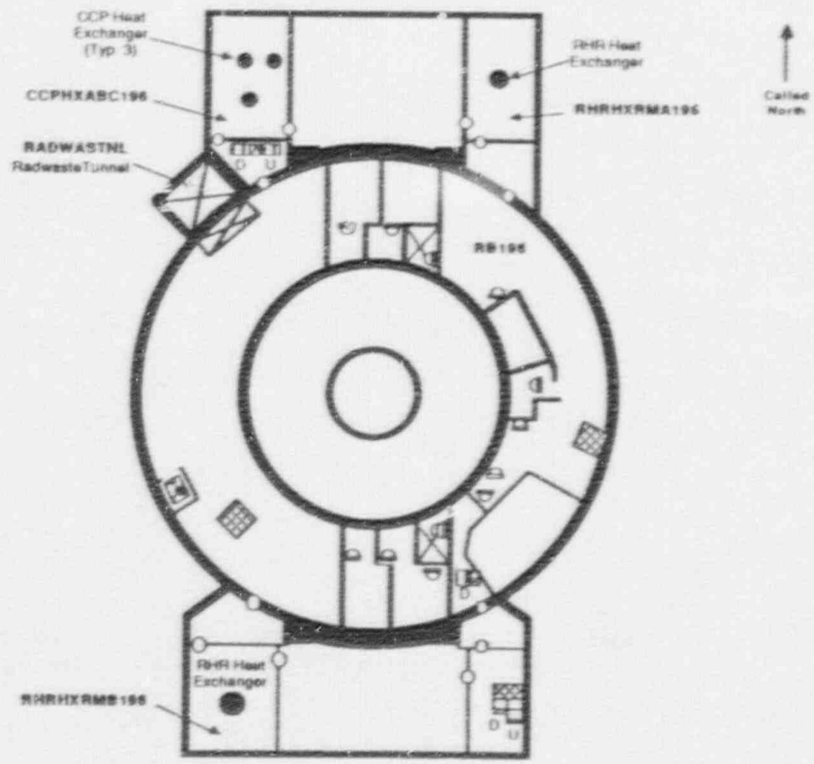


Figure 4-4. Nine Mile Point 2 Reactor Building, Elevation 196'-0"

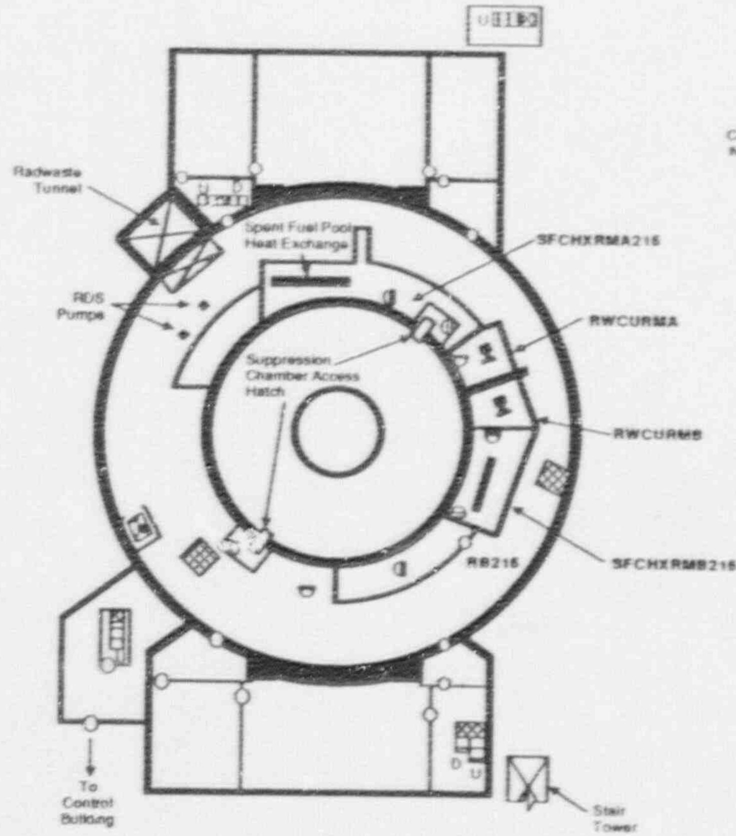


Figure 4-5. Nine Mile Point 2 Reactor Building, Elevation 215'-0"

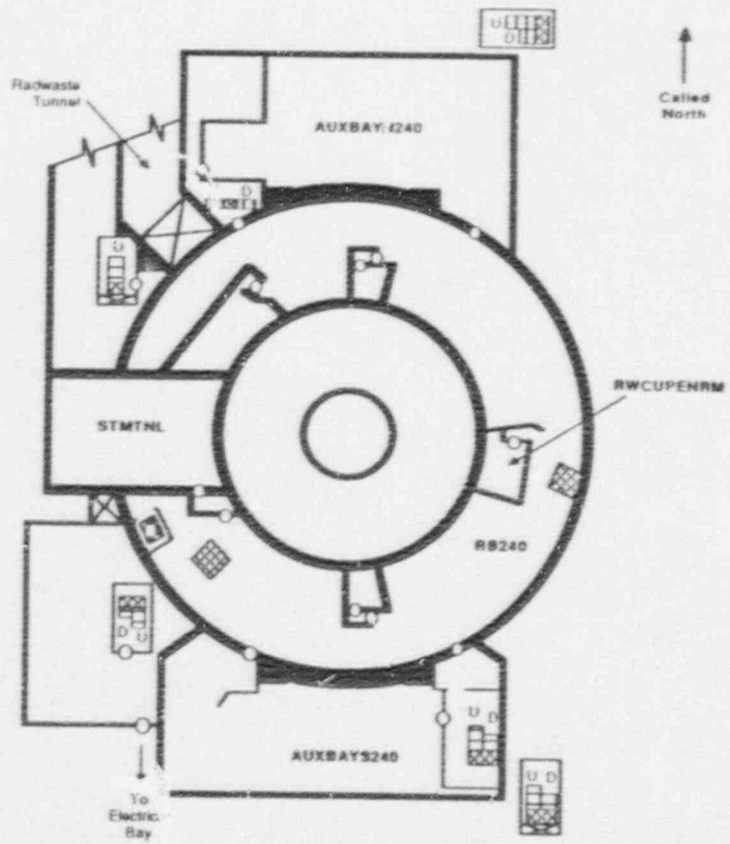


Figure 4-6. Nine Mile Point 2 Reactor Building, Elevation 240'-0"

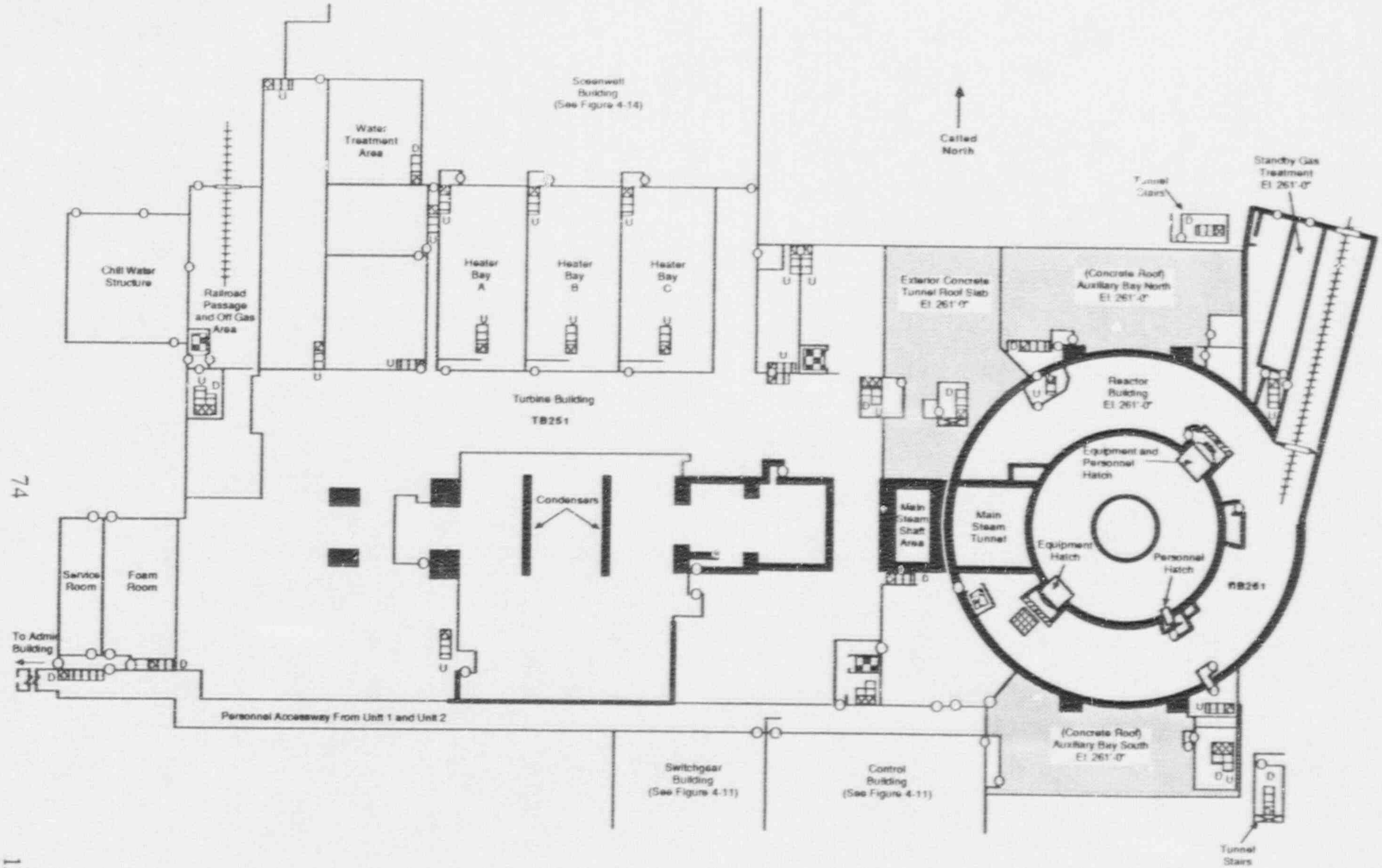


Figure 4-7. Nine Mile Point 2 Reactor and Turbine Buildings, Elevations 251'-0" and 261'-0"

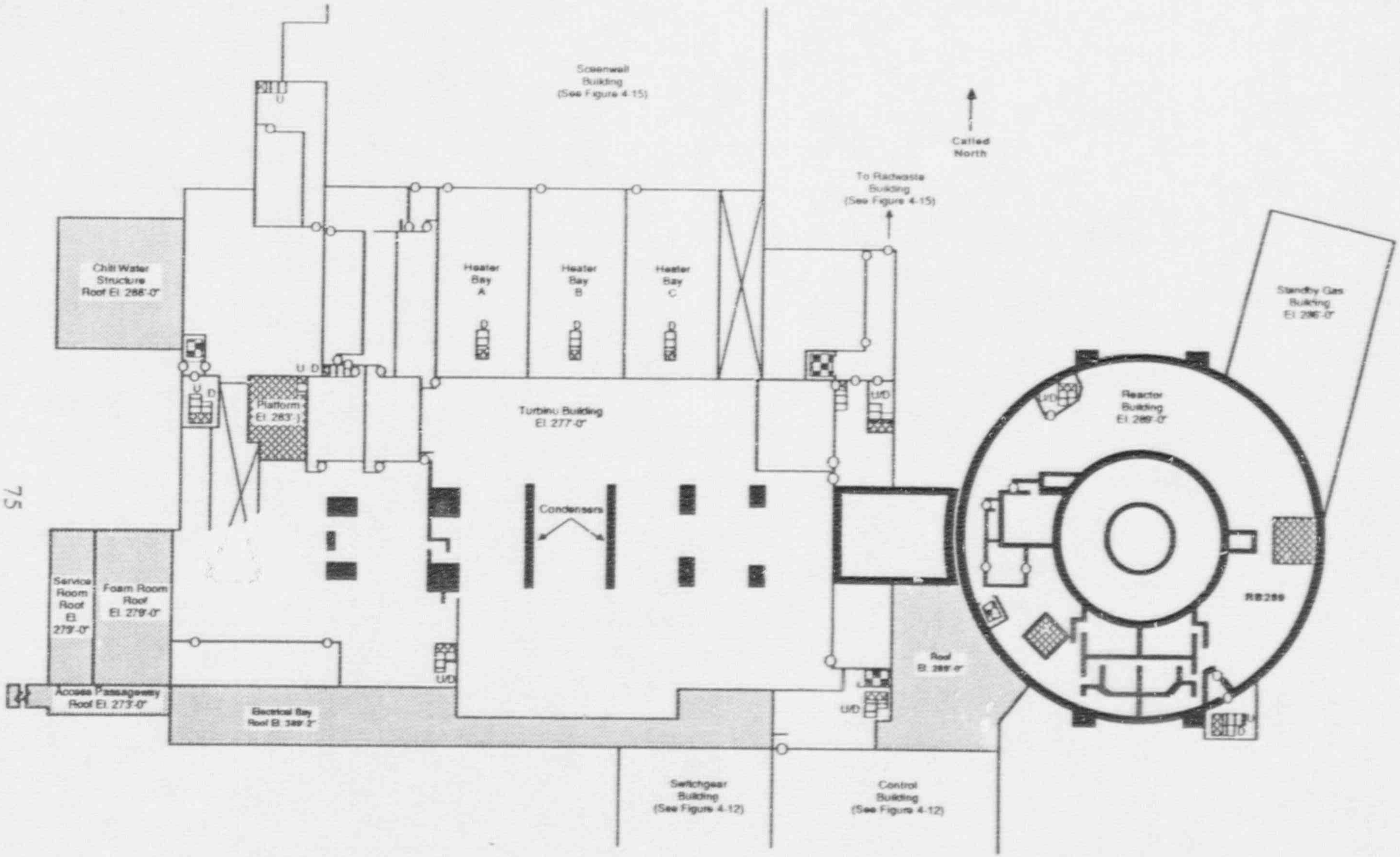


Figure 4-8. Nine Mile Point 2 Reactor and Turbine Buildings, Elevation 289'-0"

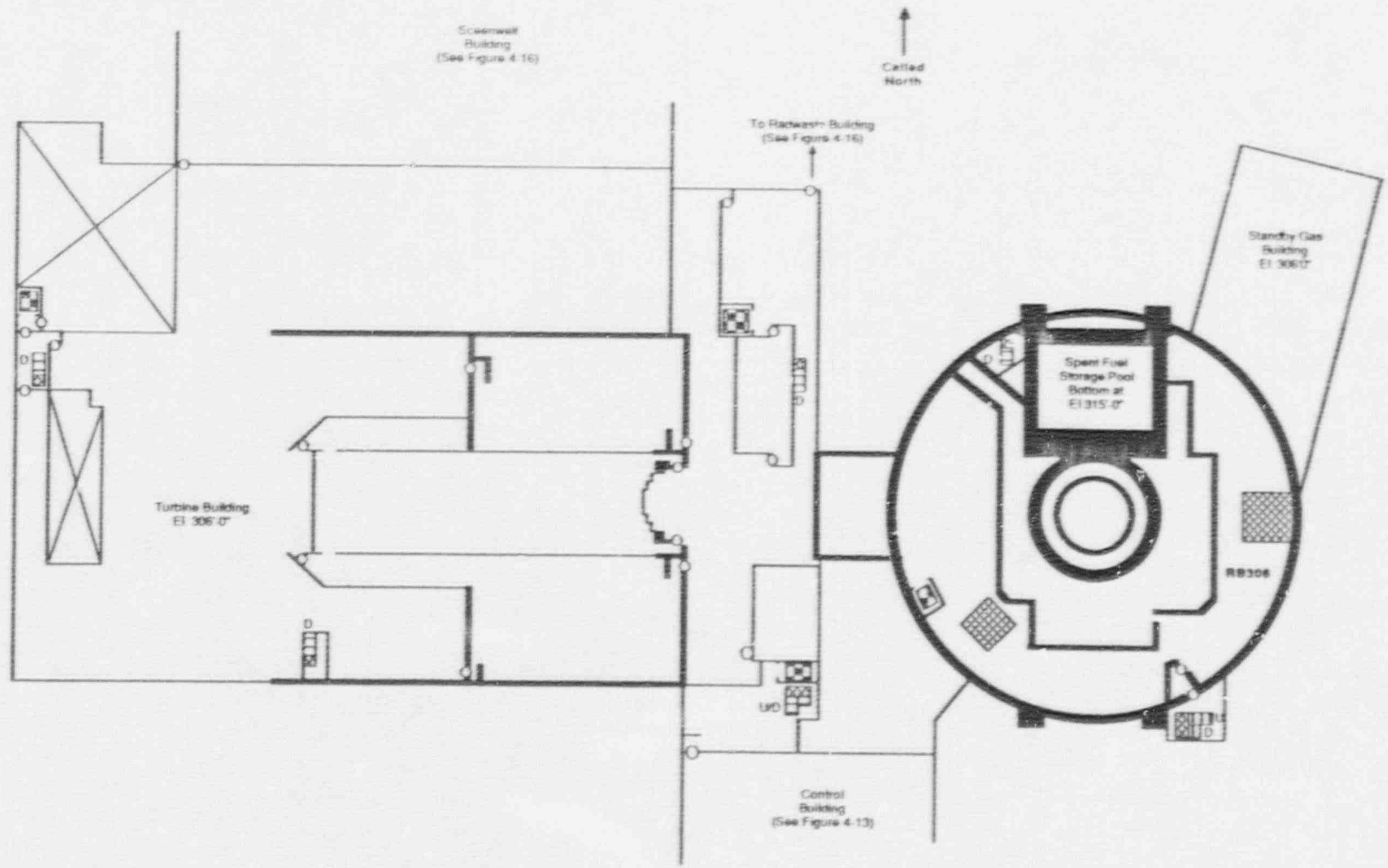


Figure 4-9. Nine Mile Point 2 Reactor and Turbine Buildings, Elevation 306'-0"

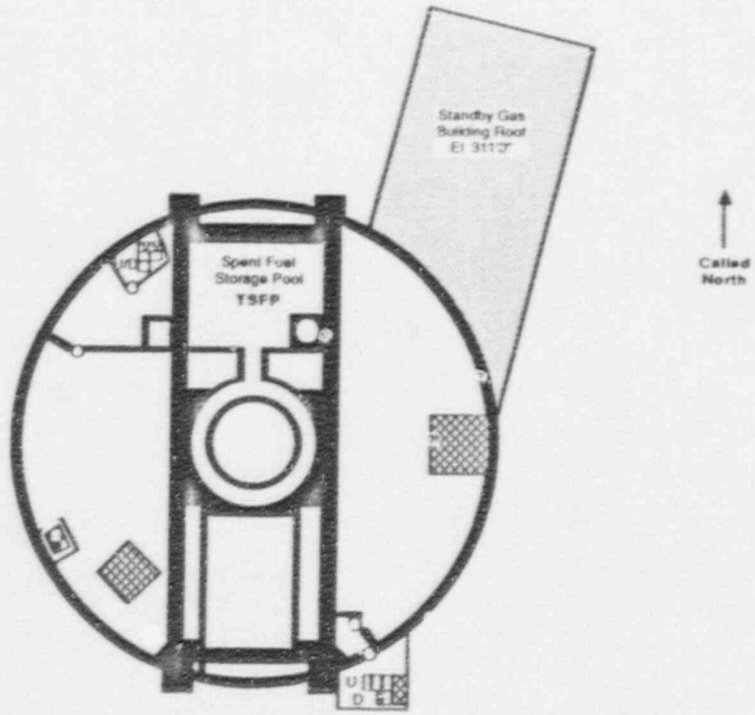


Figure 4-10. Nine Mile Point 2 Reactor Building, Elevation 328'-10"

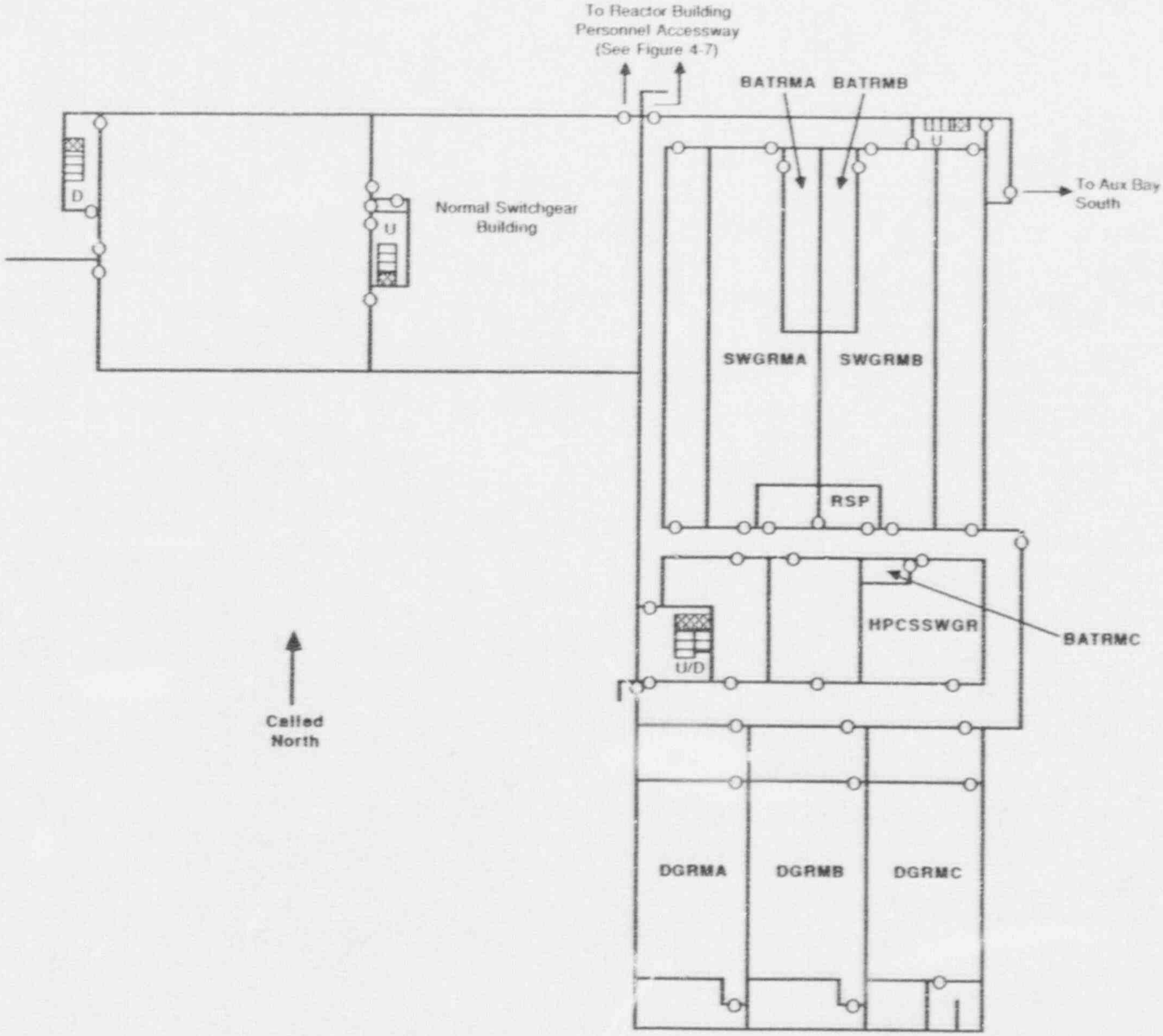


Figure 4-11. Nine Mile Point 2 Diesel Generator and Control Buildings, Elevation 261'-0"

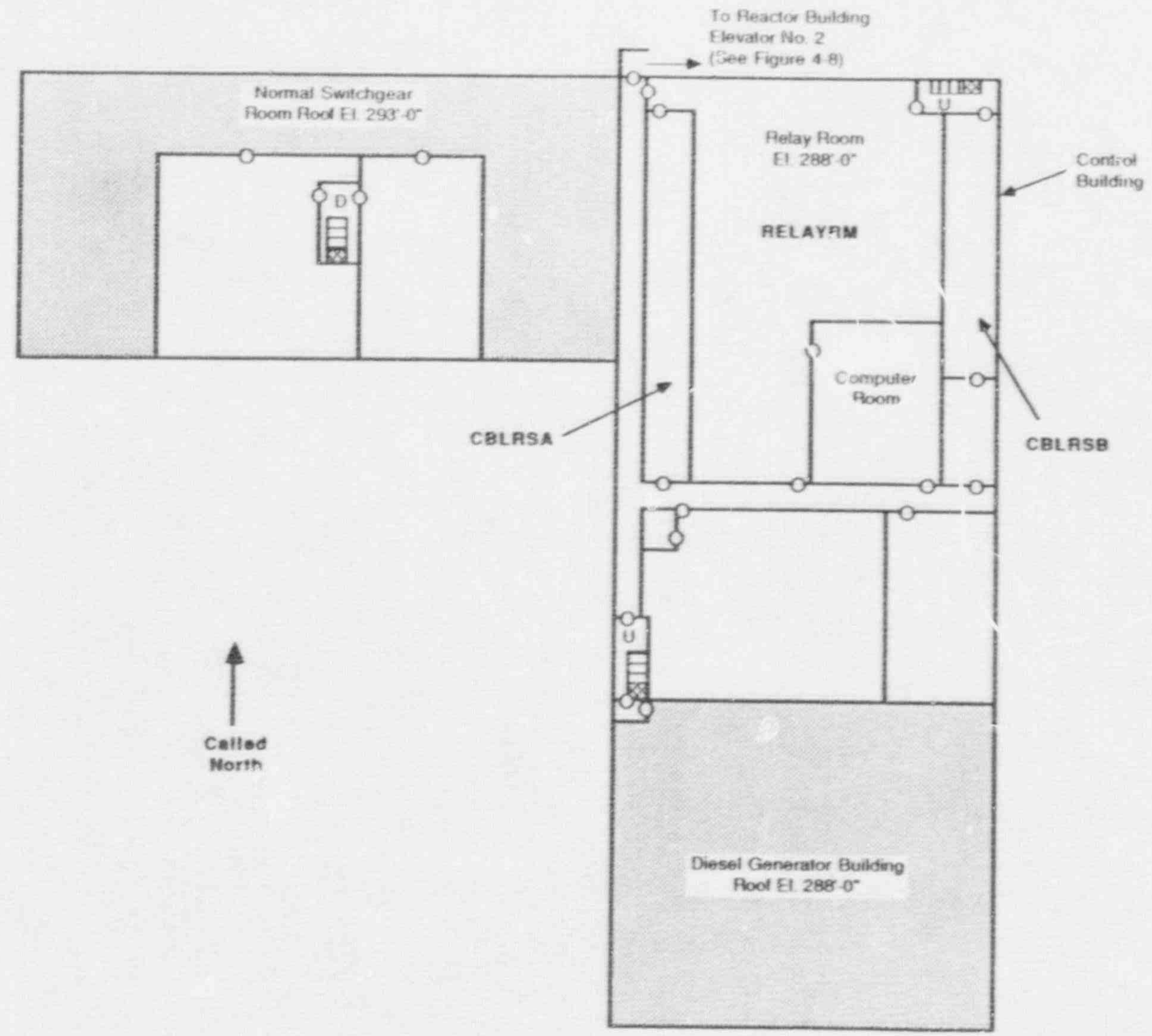


Figure 4-12. Nine Mile Point 2 Diesel Generator and Control Buildings, Elevation 289'-0"

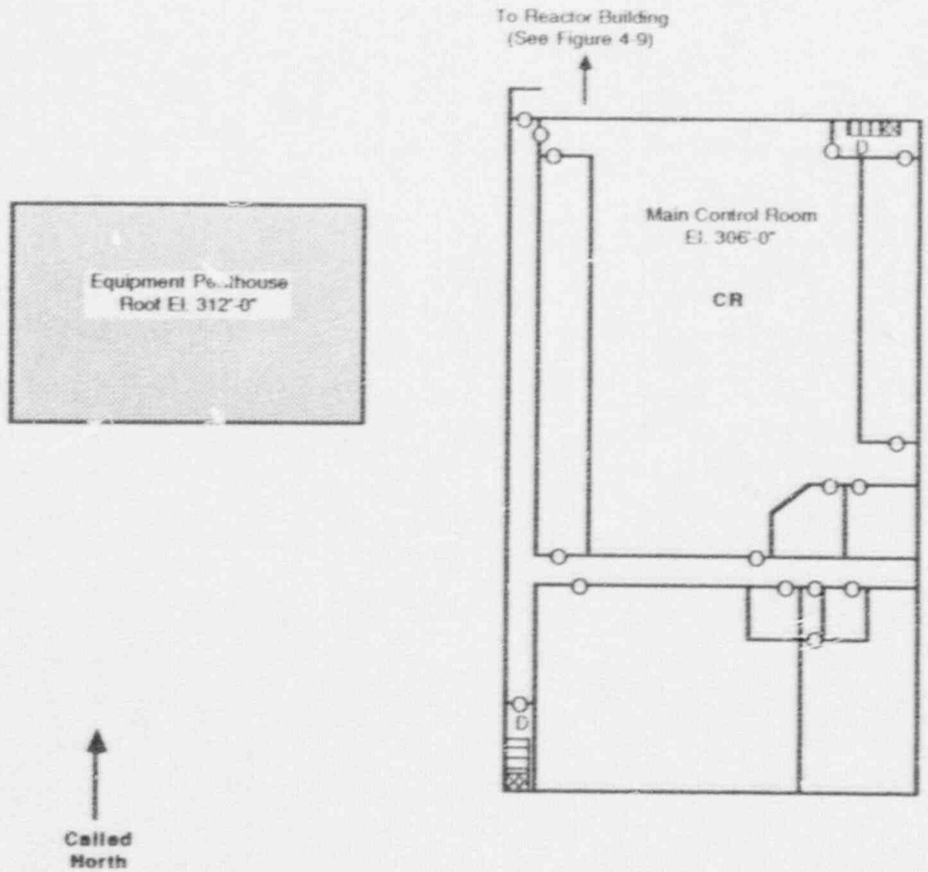


Figure 4-13. Nine Mile Point 2 Control Building, Elevation 306'-0"

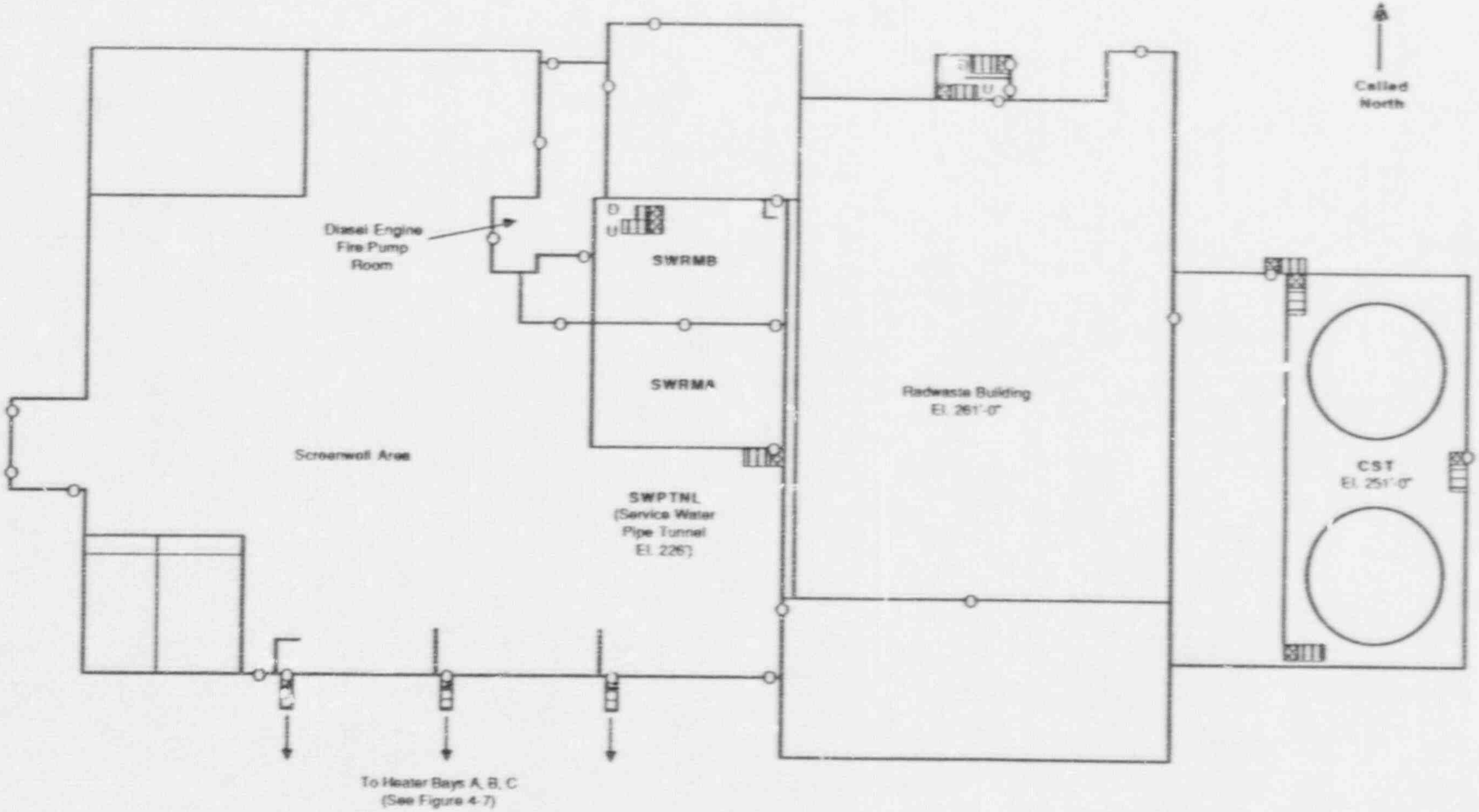


Figure 4-14. Nine Mile Point 2 Condensate Storage Tank and Adjacent Buildings, Elevation 261'-0"

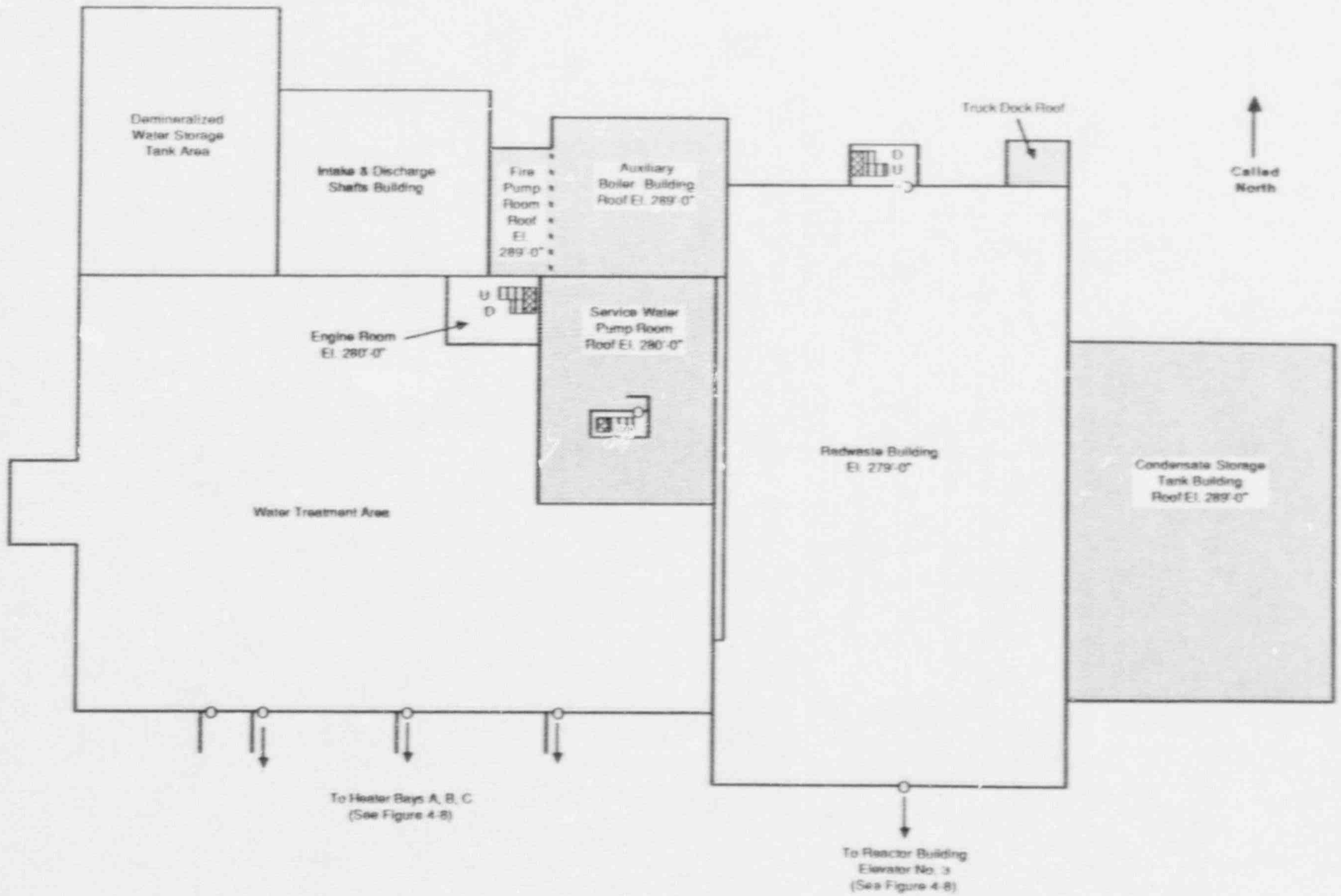


Figure 4-15. Nine Mile Point 2 Condensate Storage Tank and Adjacent Buildings, Elevation 289'-0"

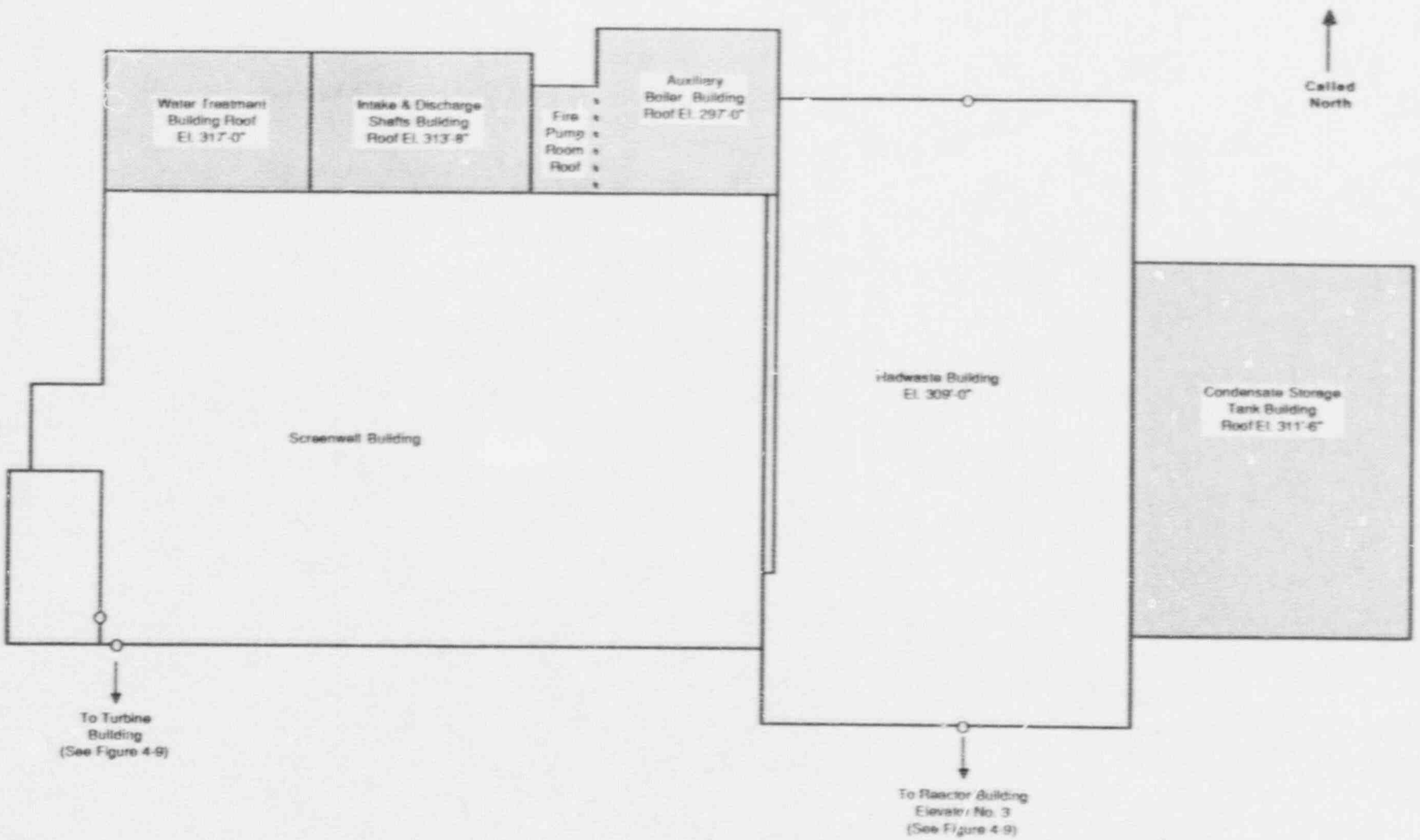


Figure 4-16. Nine Mile Point 2 Condensate Storage Tank and Adjacent Buildings, Elevation 306'-0"

Table 4-1. Definition of Nine Mile Point 2 Building and Location Codes

	Codes	Descriptions
1.	AUXBAYN240	Auxiliary bay north, located at the north end of the reactor building at elevation 240'.
2.	AUXBAYS240	Auxiliary bay south, located at the south end of the reactor building at elevation 240'.
3.	BATRMA	Battery Room A, located in the control building at elevation 261'.
4.	BATRMB	Battery Room B, located in the control building at elevation 261'.
5.	BATRMC	Battery Room C, located in the control building at elevation 261'.
6.	CABCHSEA	Cable chase for Division I.
7.	CABCHSEB	Cable chase for Division II.
8.	CABCHSEC	Cable chase for Division III.
9.	CBLRSA	Cable run room A, located in the control building at elevation 289'.
10.	CBLRSB	Cable run room B, located in the control building at elevation 289'.
11.	CCPHXABC175	Component cooling primary HX room, located in the reactor building at elevation 175'.
12.	CCPHXABC196	Component cooling primary HX room, located in the reactor building at elevation 196'.
13.	CR	Control room, located in the control building at elevation 306'.
14.	CST	Condensate storage tank located in the condensate storage tank building.
15.	DGRMA	Diesel generator room A, located in the diesel generator building at elevation 261'.
16.	DGRMB	Diesel generator room B, located in the diesel generator building at elevation 261'.
17.	DGRMC	Diesel generator room C, located in the diesel generator building at elevation 261'.
18.	HPCSSWGR	High pressure core spray switchgear room, located in the control building at elevation 261'.

Table 4-1. Definition of Nine Mile Point 2 Building and Location Codes (Continued)

Codes	Descriptions
19. HPCSRM	High pressure core spray pump room, located in the reactor building at elevation 175'.
20. LPCSRM	Low pressure core spray pump room, located in the reactor building at elevation 175'.
21. PIPECHASE	Pipe chase.
22. RB175	Reactor building, elevation 175'.
23. RB196	Reactor building, elevation 196'.
24. RB215	Reactor building, elevation 215'.
25. RB240	Reactor building, elevation 240'.
26. RB261	Reactor building, elevation 261'.
27. RB289	Reactor building, elevation 289'.
28. RB306	Reactor building, elevation 306'.
29. RADWASTNL	Rad waste tunnel.
30. RC	Reactor containment (drywell area of the Mark II containment)
31. RCICRM	Reactor core isolation cooling pump room, located in the reactor building at elevation 175'.
32. RCICSTMTNL	Reactor core isolation cooling steam tunnel.
33. RELAYRM	Relay room, located in the control building at elevation 289'.
34. RHRHXRMA175	Residual heat removal heat exchanger room A, located in the reactor building at elevation 175'.
35. RHRHXRMA196	Residual heat removal heat exchanger room A, located in the reactor building at elevation 196'.
36. RHRHXRMB175	Residual heat removal heat exchanger room B, located in the reactor building at elevation 175'.
37. RHRHXRMB196	Residual heat removal heat exchanger room B, located in the reactor building at elevation 196'.
38. RHRRMA	Residual heat removal pump A room, located in the reactor building at elevation 175'.
39. RHRRMB	Residual heat removal pump B room, located in the reactor building at elevation 175'.

Table 4-1. Definition of Nine Mile Point 2 Building and Location Codes (Continued)

Codes	Descriptions
40. RHRRMC	Residual heat removal pump C room, located in the reactor building at elevation 175'.
41. RSP	Remote shutdown panel, located in the control building at elevation 261'.
42. RWCUPIPCH	Reactor water cleanup pipe chase.
43. RWCURMA	Reactor water cleanup pump A room, located in the reactor building at elevation 215'.
44. RWCURMB	Reactor water cleanup pump B room, located in the reactor building at elevation 215'.
45. RWCUPENRM	Reactor water cleanup penetration room, located in the reactor building at elevation 240'.
46. SFCHXRMA215	Spent fuel cooling heat exchanger A room, located in the reactor building at elevation 215'.
47. SFCHXRMB215	Spent fuel cooling heat exchanger B room, located in the reactor building at elevation 215'.
48. SP	Suppression pool.
49. SWGRMA	Switchgear room A, located in the control building at elevation 261'.
50. SWGRMB	Switchgear room B, located in the control building at elevation 261'.
51. SWPTNL	Service water pipe tunnel, located in the screenwell area at elevation 226'.
52. SWRMA	Service water pumps A, C, E room, located in Bay A at elevation 261'.
53. SWRMB	Service water pumps B, D, F room, located in Bay B at elevation 261'.
54. STMTNL	Steam tunnel, located in the reactor building at elevation 240'.
55. TB251	Turbine building, elevation 251'.
56. TSFP	Spent fuel pool operating floor, located in the reactor building at elevation 328'.

Table 4-2. Partial Listing of Components by Location at Nine Mile Point 2

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
AUXBAYN240	EP	EP-MCC-102A	MCC
AUXBAYS240	EP	EP-MCC-302B	MCC
BATRMA	EP	EP-BT-2A	BATT
BATRMB	EP	EP-BT-2B	BATT
BATRMC	EP	EP-BT-2C	BATT
CBLRSA	EP	EP-PNL-101A	PNL
CBLRSA	EP	EP-PNL-201A	PNL
CST	ECCS	HPCS-CST-B	TK
CST	RCIC	RCIC-CST-A	TK
DGRMA	EP	EP-DG-A	DG
DGRMA	SWS	SWS-95A	MOV
DGRMA	SWS	SWS-66A	MOV
DGRMB	EP	EP-DG-B	DG
DGRMB	SWS	SWS-95B	MOV
DGRMB	SWS	SWS-66B	MOV
DGRMC	EP	EP-DG-C	DG
DGRMC	EP	EP-BS-2C	PNL
DGRMC	SWS	SWS-94B	MOV
HPCSRM	ECCS	HPCS-P1	MDP
HPCSSWGR	EP	EP-CB-102	CB
HPCSSWGR	EP	EP-BS-102	BS
HPCSSWGR	EP	EP-MCC-201	MCC
HPCSSWGR	EP	EP-TR-C	TR
LPCSRM	ECCS	LPCS-P1	MDP
RB175	ECCS	HPCS-101	MOV
RB196	ECCS	HPCS-110	MOV
RB196	ECCS	HPCS-112	MOV
RB196	ECCS	HPCS-118	MOV
RB196	ECCS	RHR-1A	MOV
RB196	ECCS	RHR-30A	MOV
RB196	ECCS	RHR-38A	MOV

Table 4-2. Partial Listing of Components by Location at Nine Mile Point 2 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RB196	ECCS	RHR-1B	MOV
RB196	ECCS	RHR-2B	MOV
RB196	ECCS	RHR-30B	MOV
RB196	ECCS	RHR-1C	MOV
RB196	ECCS	LPCS-112	MOV
RB196	ECCS	LPCS-114	MOV
RB196	ECCS	RHR-38A	MOV
RB196	ECCS	RHR-30A	MOV
RB196	ECCS	RHR-30B	MOV
RB196	ECCS	RHR-2B	MOV
RB196	RCIC	RCIC-108	MOV
RB196	RCIC	RCIC-124	MOV
RB196	RCIC	RCIC-129	MOV
RB196	RCIC	RCIC-136	MOV
RB196	RCIC	RCIC-22B	MOV
RB196	RCIC	RCIC-23B	MOV
RB196	RCIC	RCIC-143	MOV
RB215	ECCS	HPCS-111	MOV
RB215	ECCS	RHR-38B	MOV
RB215	ECCS	RHR-38C	MOV
RB215	ECCS	RHR-38B	MOV
RB240	ECCS	RHR-40A	MOV
RB240	ECCS	RHR-40B	MOV
RB240	RCS	RHR-113	MOV
RB240	RCS	RWCU-112	MOV
RB261	RCIC	RCIC-121	MOV
RB261	RCIC	RCIC-121	MOV
RB289	ECCS	HPCS-107	MOV
RB289	ECCS	RHR-15A	MOV
RB289	ECCS	RHR-24A	MOV
RB289	ECCS	RHR-25A	MOV

Table 4-2. Partial Listing of Components by Location at Nine Mile Point 2 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RB289	ECCS	RHR-24B	MOV
RB289	ECCS	RHR-15B	MOV
RB289	ECCS	RHR-25B	MOV
RB289	ECCS	RHR-24C	MOV
RB289	ECCS	LPCS-104	MOV
RB289	ECCS	RHR-104	MOV
RB289	ECCS	RHR-15A	MOV
RB289	ECCS	RHR-25A	MOV
RB289	ECCS	RHR-15B	MOV
RB289	ECCS	RHR-25B	MOV
RB289	ECCS	RHR-104	MOV
RB289	ECCS	RCIC-126	MOV
RB289	ECCS	RHR-104	MOV
RB289	RCIC	RCIC-126	MOV
RC	ECCS	RCS-RV	RV
RC	ECCS	RCS-RV	RV
RC	ECCS	RCS-RV	RV
RC	ECCS	RCS-RV	RV
RC	ECCS	RCS-RV	RV
RC	RCIC	RCS-RV	RV
RC	RCIC	RCIC-128	MOV
RC	RCIC	RCIC-128	MOV
RC	RCS	RCS-118	MOV
RC	RCS	RCS-119	MOV
RC	RCS	RCS-6	AOV
RC	RCS	RCS-111	MOV
RC	RCS	RCS-207	MOV
RC	RCS	RCS-RV	RV
RC	RCS	RHR-112	MOV
RC	RCS	RWCU-102	MOV
RCICRM	RCIC	RCIC-TPM1	TDP

Table 4-2. Partial Listing of Components by Location at Nine Mile Point 2 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RCICRM	RCIC	RCIC-120	MOV
RCICRM	RCIC	RCIC-150	MOV
RCICRM	RCIC	RCIC-151	HV
RCICRM	RCIC	RCIC-116	MOV
RHRHXRMA175	ECCS	RHR-12A	MOV
RHRHXRMA175	ECCS	RHR-HXA	HX
RHRHXRMA175	SWS	SWS-90A	MOV
RHRHXRMA175	SWS	SWS-33A	MOV
RHRHXRMA196	ECCS	RHR-9A	MOV
RHRHXRMA196	RCIC	RCIC-32A	MOV
RHRHXRMB175	ECCS	RHR-12B	MOV
RHRHXRMB175	ECCS	RHR-HXB	HX
RHRHXRMB175	SWS	SWS-90B	MOV
RHRHXRMB175	SWS	SWS-33B	MOV
RHRHXRMB196	ECCS	RHR-9B	MOV
RHRRMA	ECCS	RHR-PMA	MDP
RHRRMA	ECCS	RHR-2A	MOV
RHRRMA	ECCS	RHR-8A	MOV
RHRRMA	ECCS	RHR-2A	MOV
RHRRMA	ECCS	RHR-8A	MOV
RHRRMB	ECCS	RHR-PMB	MDP
RHRRMB	ECCS	RHR-8B	MOV
RHRRMB	ECCS	RHR-8B	MOV
RHRRMC	ECCS	RHR-PMC	MDP
SFCHXRMA215	RCIC	RCIC-22A	MOV
SFCHXRMA215	RCIC	RCIC-23A	MOV
SP	ECCS	HPCS-SP	SP
SP	ECCS	RHR-SP	SP
SP	ECCS	RHR-SP	SP
SP	ECCS	RHR-SP	SP
SP	ECCS	LPCS-SP	SP

Table 4-2. Partial Listing of Components by Location at Nine Mile Point 2 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
SP	RCIC	RCIC-SP	SP
STMTNL	RCS	RCS-7	AOV
STMTNL	RCS	RCS-112	MOV
SWGRMA	EP	EP-UPS-2A	UPS
SWGRMA	EP	EP-CB-101	CB
SWGRMA	EP	EP-BC-2A	BC
SWGRMA	EP	EP-BS-101	BS
SWGRMA	EP	EP-BS-2A	BS
SWGRMA	EP	EP-BS-2A	BS
SWGRMA	EP	EP-BS-US1	BS
SWGRMA	EP	EP-TR-A	TR
SWGRMA	EP	EP-UPS-2A	UPS
SWGRMB	EP	EP-CB-103	CB
SWGRMB	EP	EP-BC-2B	BC
SWGRMB	EP	EP-BS-103	BS
SWGRMB	EP	EP-BS-2B	BS
SWGRMB	EP	EP-BS-US3	BS
SWGRMB	EP	EP-TR-B	TR
SWGRMB	EP	EP-UPS-2B	UPS
SWPTNL	SWS	SWS-3A	MOV
SWPTNL	SWS	SWS-3B	MOV
SWRMA	SWS	SWS-74A	MOV
SWRMA	SWS	SWS-P1A	MDP
SWRMA	SWS	SWS-74C	MOV
SWRMA	SWS	SWS-P1C	MDP
SWRMA	SWS	SWS-74E	MOV
SWRMA	SWS	SWS-P1E	MDP
SWRMB	SWS	SWS-74B	MOV
SWRMB	SWS	SWS-P1B	MDP
SWRMB	SWS	SWS-74D	MOV
SWRMB	SWS	SWS-P1D	MDP

Table 4-2. Partial Listing of Components by Location at Nine Mile Point 2 (Continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
SWRMB	SWS	SWS-74F	MOV
SWRMB	SWS	SWS-P1F	MDP

5. BIBLIOGRAPHY FOR NINE MILE POINT 2

1. NUREG-1047, "Safety Evaluation Report Related to the Operation of Nine Mile Point Nuclear Station, Unit No. 2," USNRC Division of Licensing, February 1985.

2. NUREG-1085, "Final Environmental Statement Related to the Operation of Nine Mile Point Nuclear Station, Unit No. 2," USNRC Division of Licensing, May 1985.

3. NUREG-1193, "Technical Specifications for Nine Mile Point Nuclear Station, Unit 2," USNRC Division of Boiling Water Reactor (BWR) Licensing, October 1986.

4. NUREG-1253, "Technical Specifications for Nine Mile Point Nuclear Station, Unit 2," USNRC Division of Reactor Projects - I/II, July 1987.

5. NUREG/CR-2746, Vol. 6, "Socioeconomic Impacts of Nuclear Generating Stations: Nine Mile Point and Fitzpatrick Case Study," Social Impact Research, Inc., July 1982.

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

A1. SYSTEM DRAWINGS

A1.1 Fluid System Drawings

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

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

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

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

A1.2 Electrical System Drawings

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

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

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

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

A2. SITE AND LAYOUT DRAWINGS

A2.1 Site Drawings

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

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

A2.2 Layout Drawings

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

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

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

A3. APPENDIX A REFERENCES

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

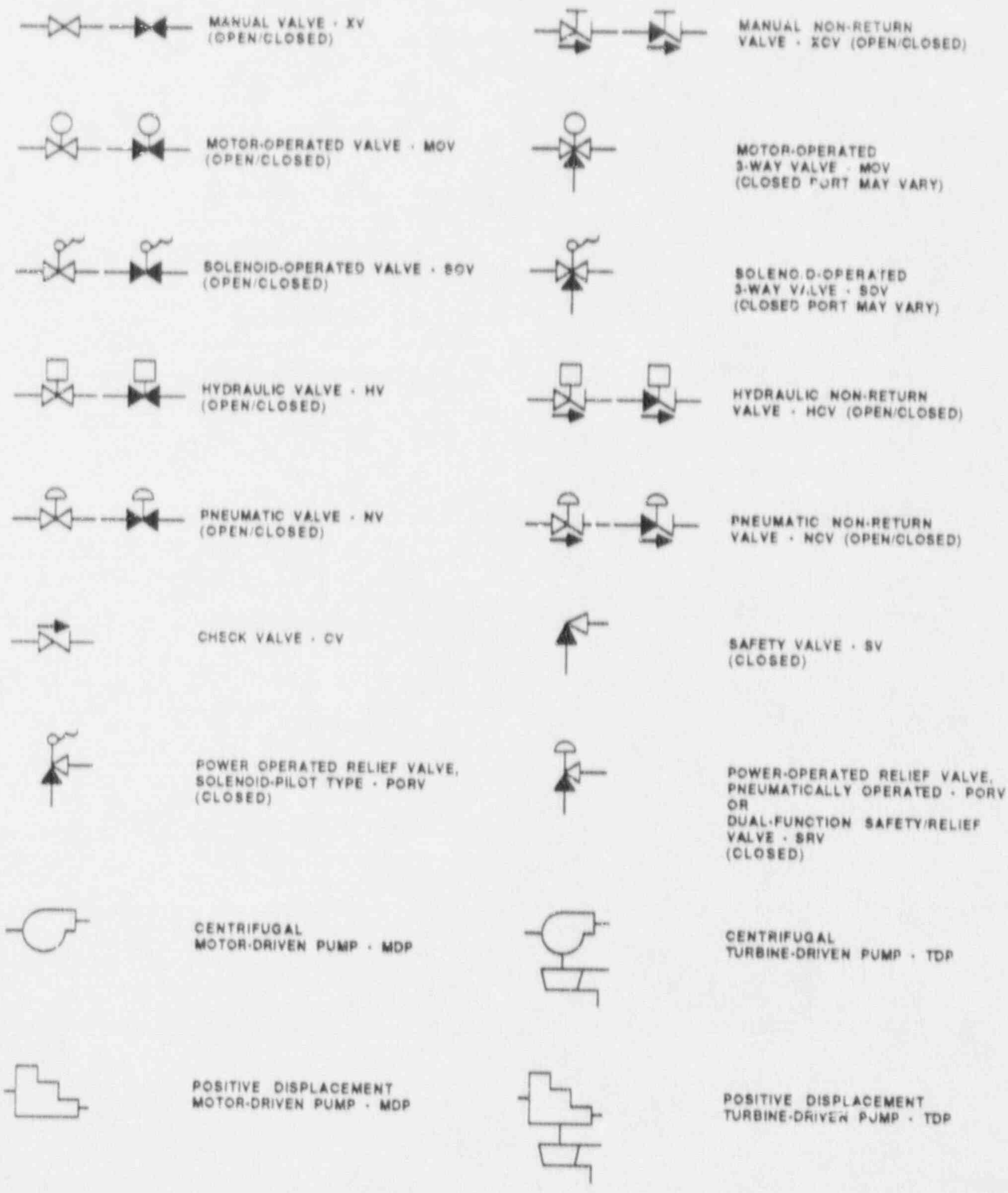


Figure A-1. Key To Symbols In Fluid System Drawings

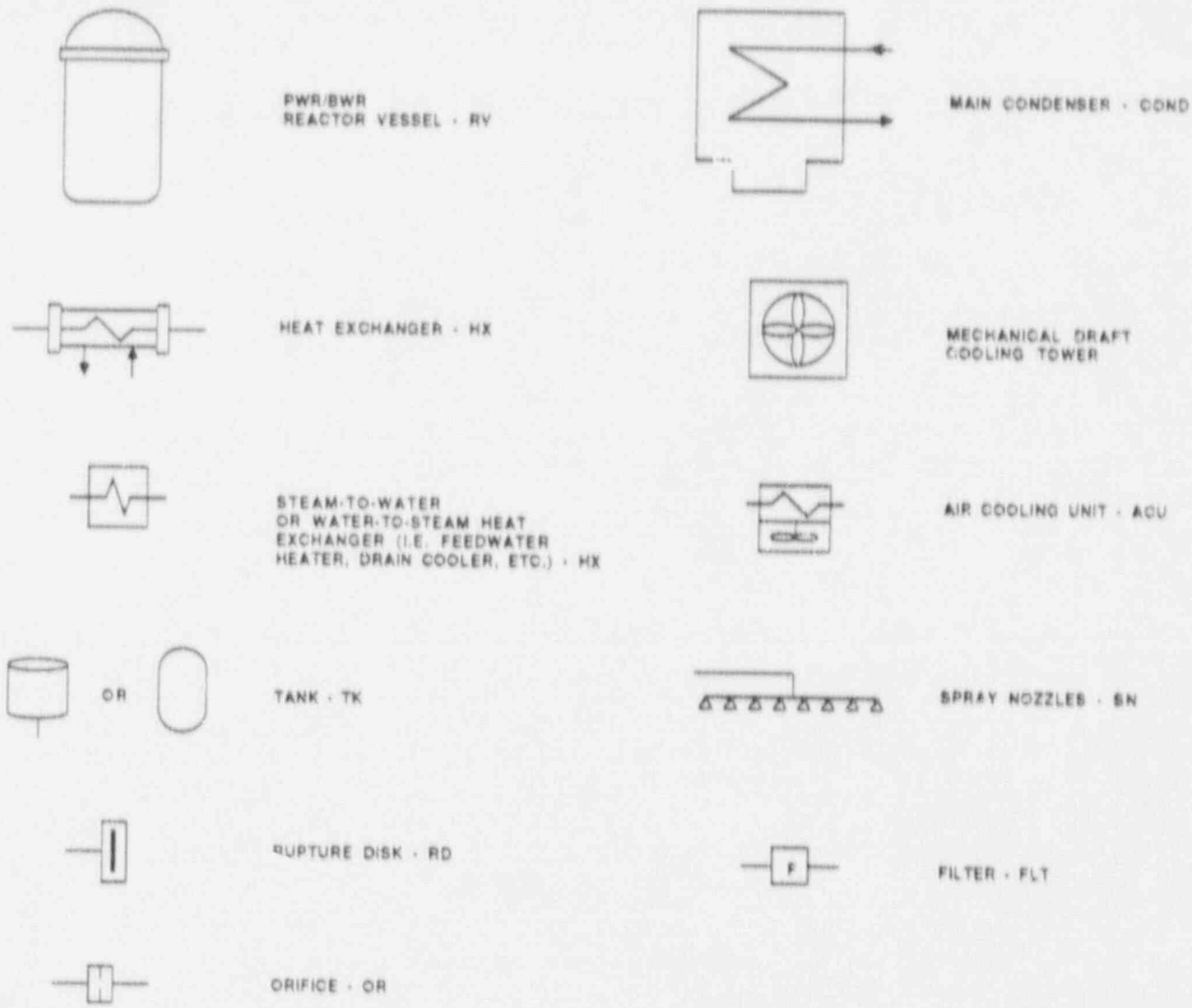


Figure A-1. Key To Symbols In Fluid System Drawings (Continued)

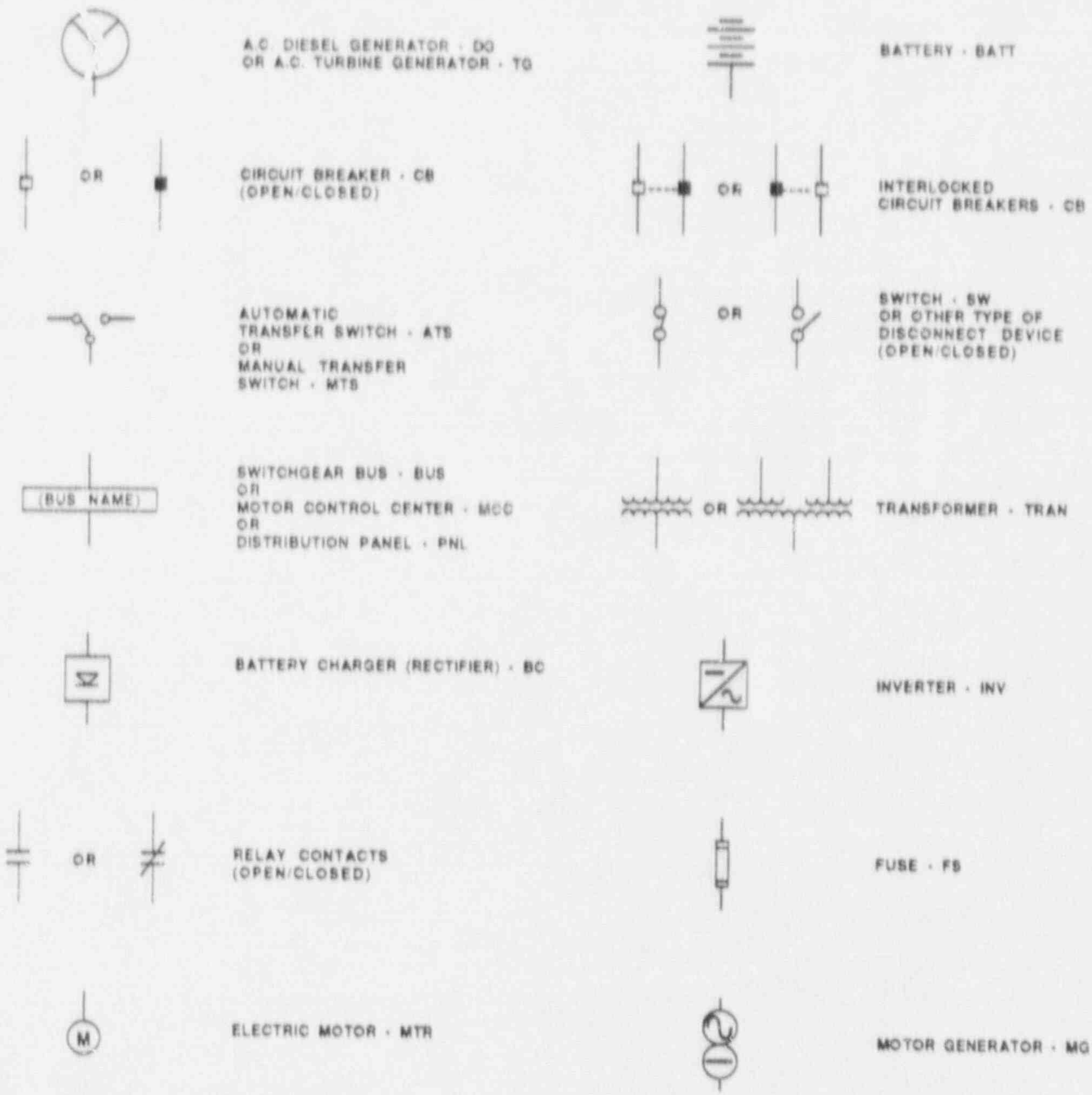


Figure A-2. Key To Symbols In Electrical System Drawings

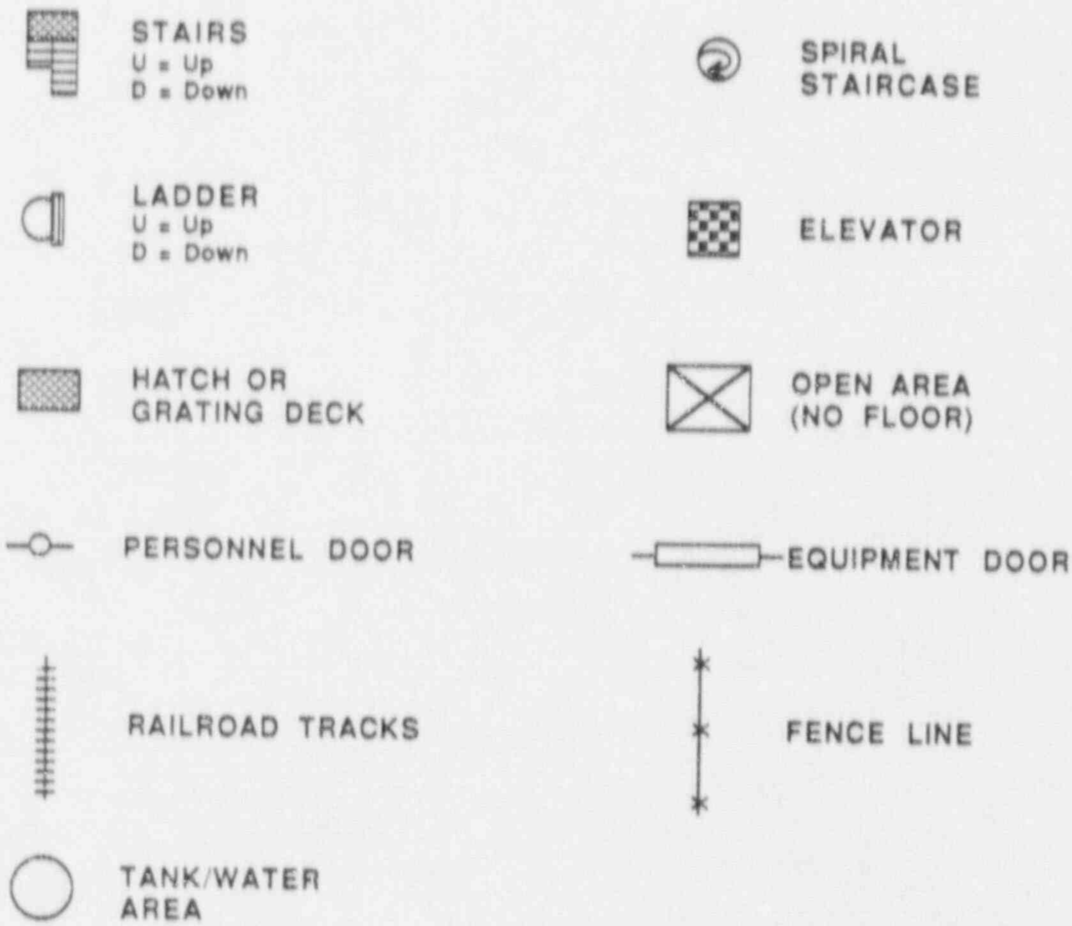


Figure A-3. Key To Symbols In Facility Layout Drawings

APPENDIX B
DEFINITION OF TERMS USED IN THE DATA TABLES

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

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

Code	Definition
RCS	Reactor Coolant System
RCIC	Reactor Core Isolation Cooling System
ECCS	Emergency Core Cooling Systems (including HPCS, LPCI, LPCS and ADS)
EP	Electric Power System
SWS	Service Water System

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

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

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

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

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

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

TABLE B-1. COMPONENT TYPE CODES

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

TABLE B-1. COMPONENT TYPE CODES (Continued)

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