SAIC 89/1530

NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

OYSTER CREEK

50-219

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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.

OYSTER CREEK
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	9/89	Original report

OYSTER CREEK SYSTEM SOURCEBOOK

This sourcebook contains summary information on the Oyster Creek 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 Oyster Creek nuclear power plant is listed below:

- Docket number — 50-219
- Operator — Jersey Central Power and Light
- Location — New Jersey, 2 miles south of Forked River
- Commercial operation date — 12/69
- Reactor type — BWR
- NSSS vendor — General Electric
- Power (MWt/MWe) — 1930/670
- Architect-engineer — Burns and Roe
- Containment type — Mark I

2. IDENTIFICATION OF SIMILAR NUCLEAR POWER PLANTS

The Oyster Creek plant has a General Electric BWR/2 nuclear steam supply system (NSSS), isolation condensers, and a Mark I type containment. Other BWRs with isolation condensers are Nine Mile Point-1 (BWR/2), Dresden 2 and 3 (BWR/3), and Millstone-1 (BWR/3).

Oyster Creek employs different systems for core coolant injection and shutdown cooling than most BWRs.

3. SYSTEM INFORMATION

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

Generic System Name	Plant-Specific System Name	Report Section	UFSAR Section Reference
Reactor Heat Removal Systems			
- Reactor Coolant System (RCS)	Same	3.1	5
- Isolation Condenser System (ICS)	Same	3.2	6.3.1.1, 6.3.2
- Reactor Core Isolation Cooling (RCIC) Systems	None	-	-
- Emergency Core Cooling Systems (ECCS)	Same	-	
- High-Pressure Injection & Recirculation	None		
- Low-pressure Injection & Recirculation	Core Spray (CRS) System,	3.3	6.3.1.3, 6.3.2
- Automatic Depressurization System (ADS)	Same	3.3	6.3.1.2, 6.3.2
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Shutdown Cooling (SCS) System	3.10	5.4.7, 9.2.2.3
- Main Steam and Power Conversion Systems	Main Steam Supply System,	X	10.3
	Condensate and Feedwater System,	X	10.4.7
	Circulating Water System	X	10.4.5
- Other Heat Removal Systems	Head Cooling System	X	5.4.11

Table 3-1. Summary of Oyster Creek Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	UFSAR 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	3.7	4.6.1.2
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	6.2.3
- Containment Heat Removal Systems			
- Containment Spray System	Same (also cools torus)	3.4	6.2.2
- Containment Fan Cooler System	Reactor Building Heating and Ventilating Systems	X	9.4.2
- Containment Normal Ventilation Systems	Reactor Building Heating and Ventilating Systems	X	9.4.2
- Combustible Gas Control Systems	Containment Inerting System, Hydrogen/Oxygen Monitoring System	X X	6.2.5.2.1 6.2.5.2.2

Table 3-1. Summary of Oyster Creek Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	UFSAR Section Reference
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	4
- Control Rod System	Control Rod Drive Mechanisms	X	4.6.1.1, 4.6.2
- Chemical Poison System	Standby Liquid Control System (SLCS)	X	4.6.4.1, 9.3.5
Instrumentation & Control (I&C) Systems			
- Reactor Protection System (RPS)	Reactor Trip System	3.5	7.2
- Engineered Safety Feature Actuation System (ESFAS)	Engineered Safety Feature Systems	3.5	7.3
- Remote Shutdown System	Local control panels	3.5	7.5.2.4.2
- Other I&C Systems	Various other systems	X	7.4 to 7.7
Support Systems			
- Class 1E Electric Power System	Same	3.6	8.3
- Non-Class 1E Electric Power System	Same	3.6	8.2, 8.3
- Diesel Generator Auxiliary Systems	Same	3.6	8.3.1.1.5, 9.5.4 to 9.5.9
- Component Cooling Water (CCW) System	Reactor Building Closed Cooling Water (RBCCW) System	X	9.2.2.2

Table 3-1. Summary of Oyster Creek Systems Covered in this Report (Continued)

Generic System Name	Plant-Specific System Name	Report Section	UFSAR Section Reference
Support Systems (continued)			
- Service Water System (SWS)	Service Water System,	X	9.2.1.1
	Emergency Service Water System	3.9	9.2.2.1
- Other Cooling Water Systems	Turbine Building Closed Cooling Water (TBCCW) System,	X	9.2.1.5
	New Service Water System,	X	9.2.1.2
	Augmented Offgas Closed Cooling Water System,	X	9.2.1.3
	New Radwaste Closed Cooling Water System,	X	9.2.1.4
	Stator Liquid Cooling System,	X	9.2.1.6
	Phase Duct Cooling System	X	9.2.1.7
- Fire Protection Systems	Same	3.8	9.5.1
- Room Heating, Ventilating, and Air-Conditioning (HVAC) Systems	Same	X	9.4
- Instrument and Service Air Systems	Same	X	9.3.1
- Refueling and Fuel Storage Systems	Fuel Storage and Handling	X	9.1
- Radioactive Waste Systems	Radioactive Waste Management Systems	X	11
- Radiation Protection Systems	Same	X	12

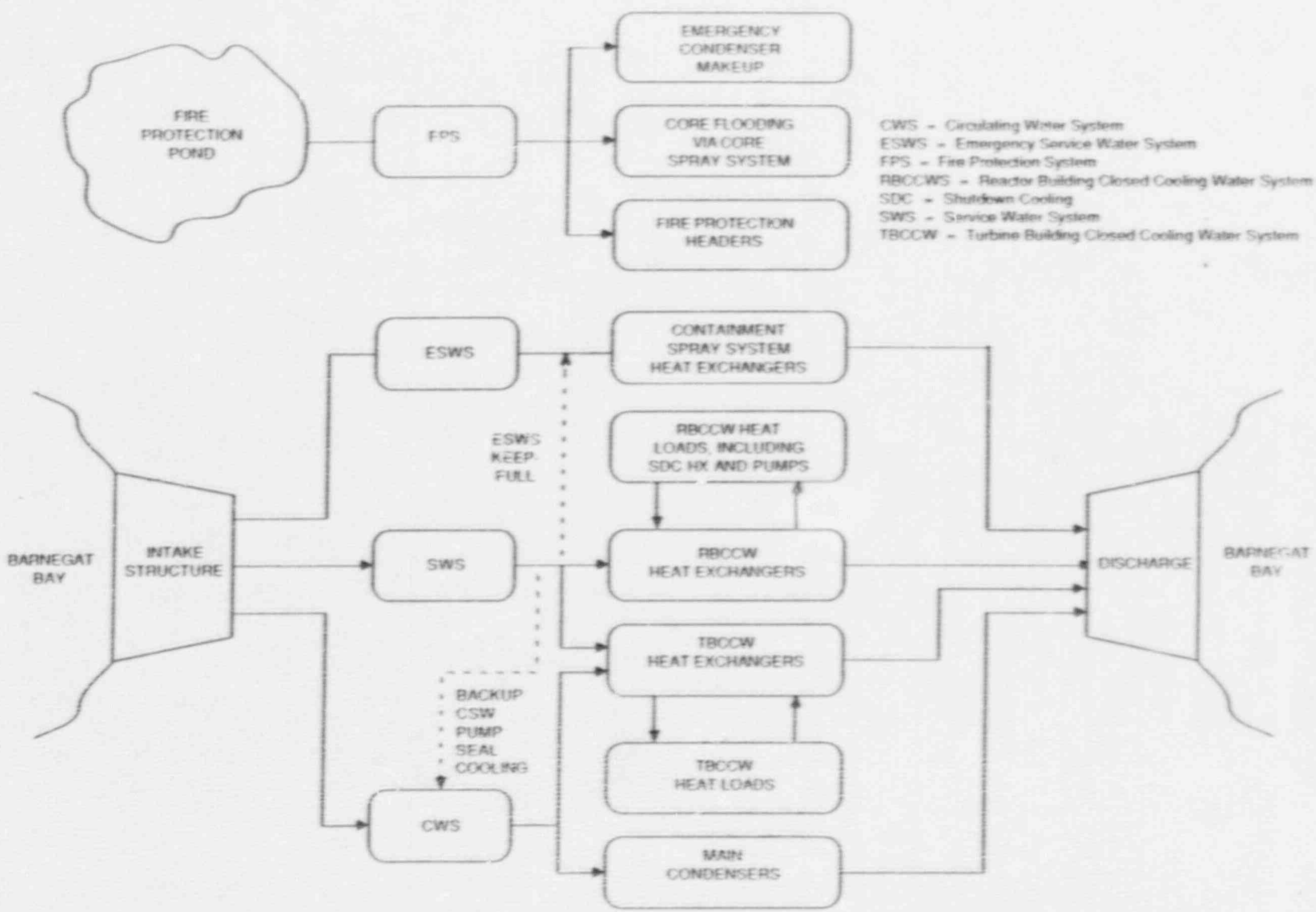


Figure 3-1. Cooling Water Systems Functional Diagram for Oyster Creek

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) five recirculation loops, (c) recirculation pumps, (d) relief valves, (e) safety valves, and (f) connected piping out to a suitable isolation valve boundary. Simplified diagrams of the RCS and important system interfaces are shown in Figure 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 five recirculation loops. The steam that is produced by the reactor is piped to the turbine via the two main steam lines. Condensate from the turbine is returned to the RCS as feedwater.

Following a transient that involves the loss of the normal heat transfer path, heat transfer from the RCS is accomplished by: (a) emergency condensers which vent directly to atmosphere (see Section 3.2), or (b) by opening the automatic depressurization system (ADS) valves and dumping heat into the containment (see Section 3.3). In the latter case, and in the case of a LOCA, heat is transferred from the containment to the ultimate heat sink by the containment spray system (see Section 3.4), and a low pressure injection system provides RCS makeup. Actuation systems provide for automatic closure of the main steam isolation valves (MSIVs) and isolation of other lines connected to the RCS.

3.1.4 System Success Criteria

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

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

3.1.5 Component Information

A. RCS
   1. Volume: unknown
   2. Normal operating pressure: 1000 psig at 547° F

B. Safety Valves (16)
   1. Set pressure: 1212 to 1239 psig
   2. Relief capacity: 634,000 lb/hr each

C. Power-Operated Relief Valves (5)
   1. Set pressure: unknown
   2. Relief capacity: 600,000 lb/hr each
   3. Type: Electromatic

D. Recirculation Pumps (5)
   1. Rated flow: 32,000 gpm @ 120 ft. head (52 psid)
   2. Type: Vertical centrifugal

3.1.6 Support Systems and Interfaces

A. Motive Power
The recirculation pumps are supplied from Non-Class 1E switchgear.

B. MSIV Operating Power
The instrument air system supports normal operation of the MSIVs. Valve operation is controlled by an AC and a DC solenoid pilot valve. Both solenoid valves must be deenergized to cause MSIV closure. This design prevents spurious closure of an MSIV if a single solenoid valve should fail. MSIVs are designed to fail closed if instrument air is lost or if both AC and DC control power is lost to the solenoid pilot valves. This is achieved by a local dedicated air accumulator for each MSIV and an independent valve closing spring.

C. Recirculation Pump Cooling
The reactor building closed cooling water system provides cooling water to the recirculation pump coolers.

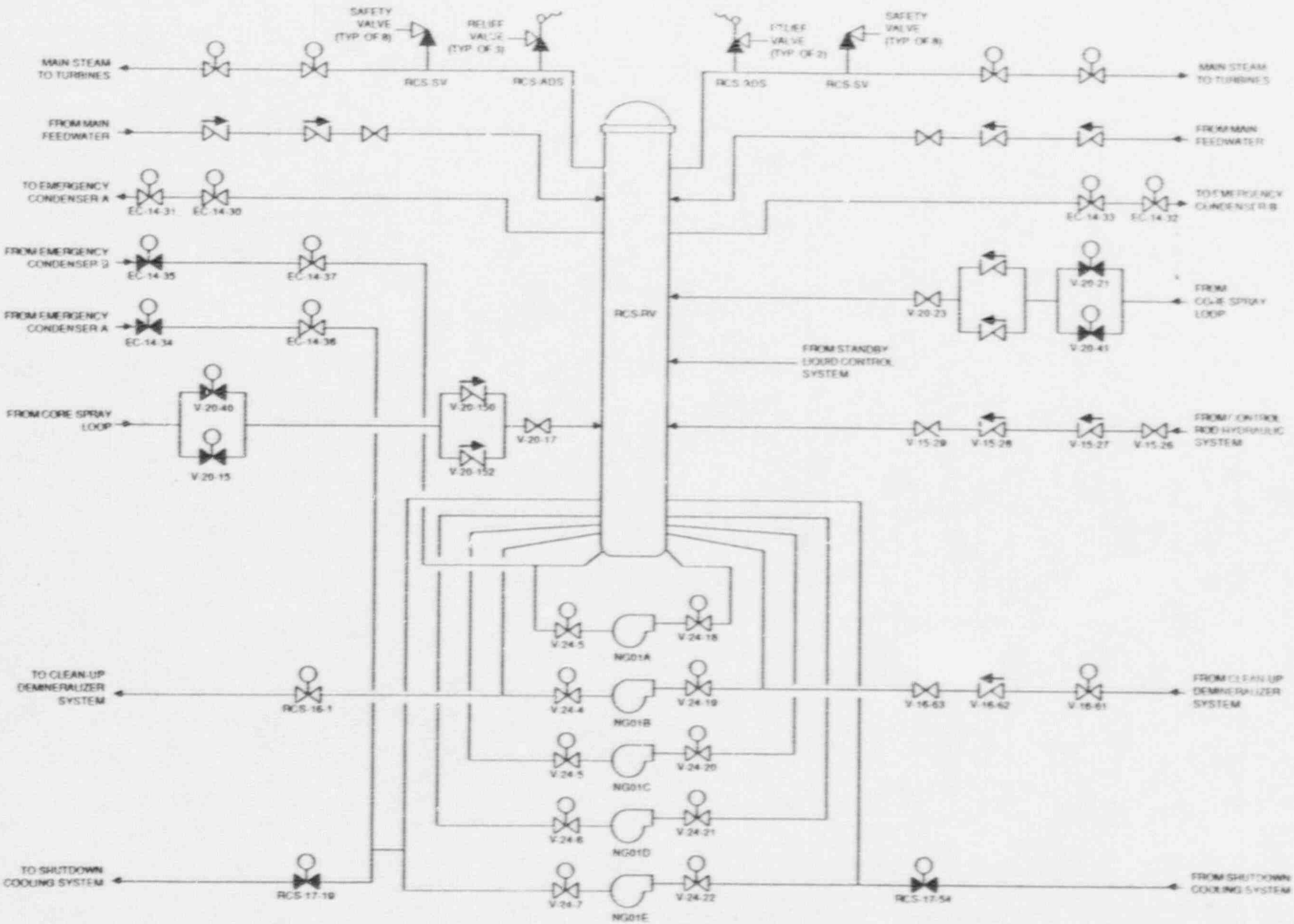


Figure 3.1-1. Oyster Creek Reactor Coolant System

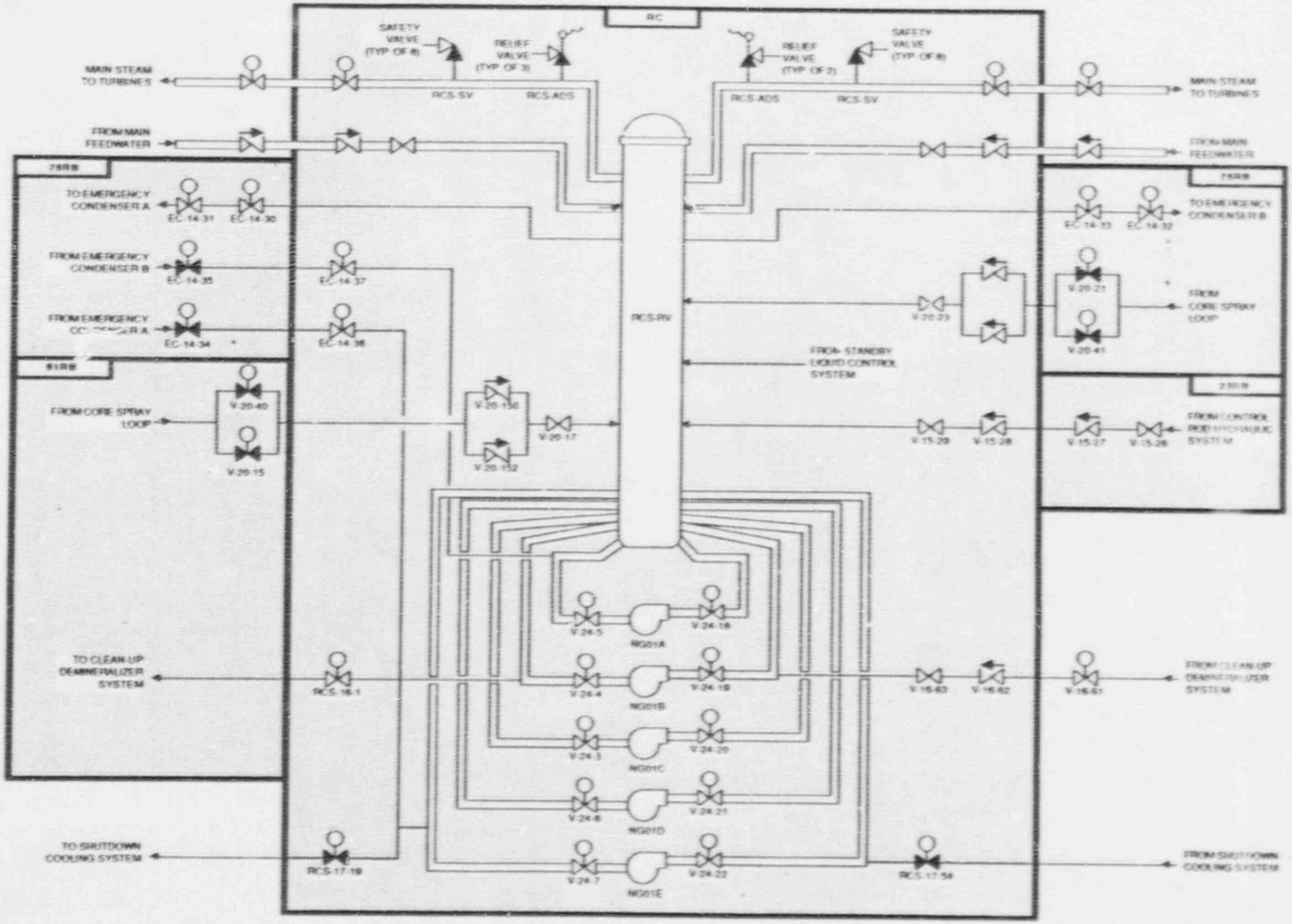


Figure 3.1-2. Oyster Creek Reactor Coolant System Showing Component Location

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RCS-16-1	MOV	RC	MCC 1AB2	460	23RB	A/B
RCS-17-19	MOV	RC	MCC 1AB2	460	23RB	A/B
RCS-17-54	MOV	RC	MCC 1AB2	460	23RB	A/B
RCS-RV	RV	RC				
RCS-SV	SRV	RC				

3.2 ISOLATION CONDENSER SYSTEM (ICS)

3.2.1 System Function

The ICS (also called the Emergency Condenser System) provides a backup heat sink for reactor heat when the main condenser is unavailable. The system provides a natural circulation heat transfer path for the RCS, with heat transferred to the environment by boiling secondary-side water in the isolation condensers and venting steam directly to atmosphere. Because of its role in emergency cooling, the ICS is considered part of the Emergency Core Cooling System (ECCS, see Section 3.3).

3.2.2 System Definition

The ICS consists of two full-capacity isolation condensers, each with a closed-loop flow path to and from the reactor and a vent to atmosphere. The inlet piping to the isolation condensers each contain two normally open AC-powered motor-operated isolation valves. The outlet piping contains one normally closed DC-powered MOV and one normally open AC-powered MOV. The use of DC-powered isolation valves ensures successful operation of the system if there is a loss of AC power. Makeup to the condensers is provided by the Fire Protection System (see Section 3.8) and the condensate transfer system.

Simplified drawings of the ICS are shown in Figures 3.2-1 and 3.2-2. The makeup path from the condensate transfer system to the emergency condensers is shown in Figure 3.2-3. A summary of data on selected ICS components is presented in Table 3.2-1.

3.2.3 System Operation

During normal operation the isolation condensers are in standby, and are placed in service automatically when needed to provide heat transfer to the environment. The system is started by opening motor operated valves in the condensate return lines. These valves can also be remotely actuated from the control room.

Steam from the reactor is piped to the tube side of the isolation condensers. There are two internal sets of condensing tube bundles in each isolation condenser. Emergency cooling is accomplished by condensing steam from the reactor in the tube side of the condenser, which initially heats the stored water in the tank which eventually boils and vents to atmosphere.

Condensate flows from the isolation condensers back to the reactor through two of the recirculation loops. Flow is maintained by the thermal siphon established by the difference in density between the condensate in the return line and the steam in the supply line.

Steam generated in the isolation condenser shell is normally non-radioactive, and is vented directly to atmosphere. Water storage in the isolation condenser is sufficient for about one hour and forty minutes without makeup. The fire protection system can provide makeup to the condenser.

3.2.4 System Success Criteria

One of two isolation condensers can provide adequate RCS heat removal following a transient. Makeup to the condenser from the fire protection system is required after one hour and forty minutes of operation.

Due to RCS losses and shrinkage associated with ICS operation, makeup to the RCS eventually is required. The Control Rod Drive Hydraulic System (see Section 3.7) can provided RCS makeup at high pressures.

3.2.5 Component Information

A. Isolation Condensers (2)
1. Rated duty: 205 x 10^6 Btu/hr at 1000 psig and 546°F
2. Rated capacity: 100%
3. Secondary side water volume: 22,730 gallons

3.2.6 Support Systems and Interfaces

A. Control signals
1. Automatic
The DC-powered motor operated valves on the condensate return line are automatically opened by persistent signals of either high reactor pressure or low reactor water level. The ICS is put into operation by the opening of these valves.
2. Remote manual
The ICS motor-operated valves can be actuated by remote manual means from the main control room.

B. Motive Power
The ICS motor-operated valves are Class 1E AC or DC loads that can be supplied from the emergency diesel generator or station battery, as described in Section 3.6.

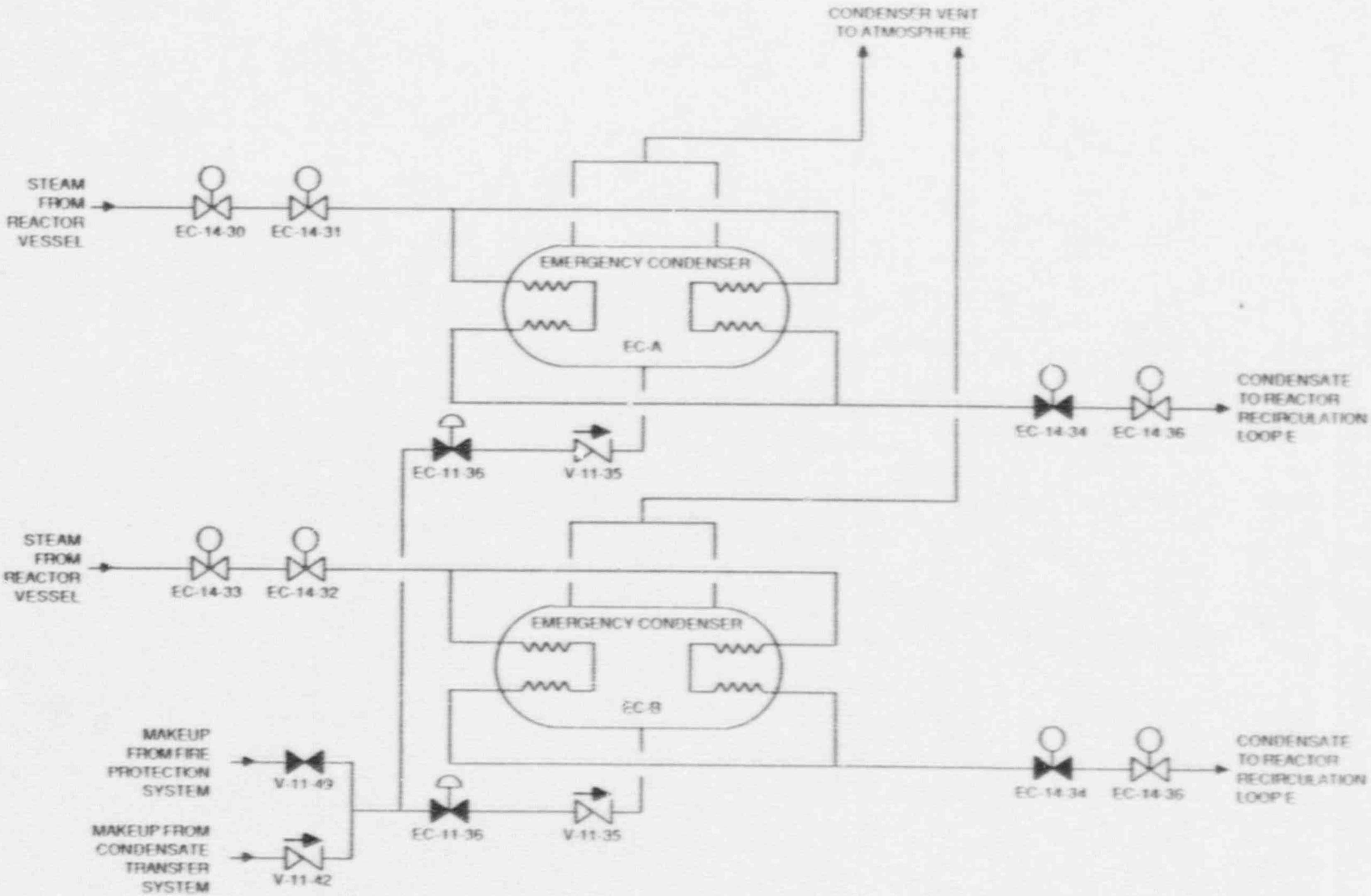


Figure 3.2-1. Oyster Creek Emergency Condenser System

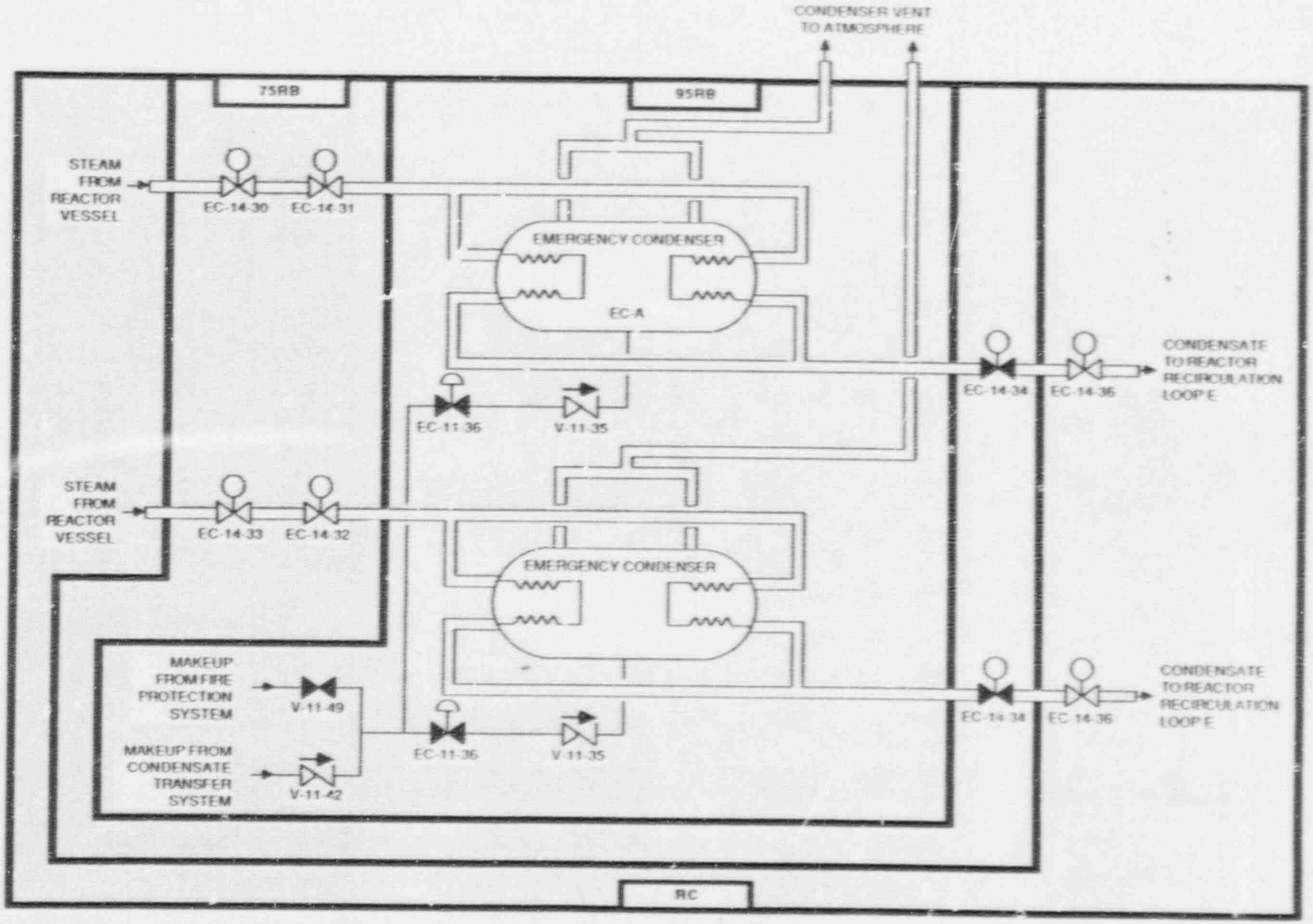


Figure 3.2-2. Oyster Creek Emergency Condenser System Showing Component Location

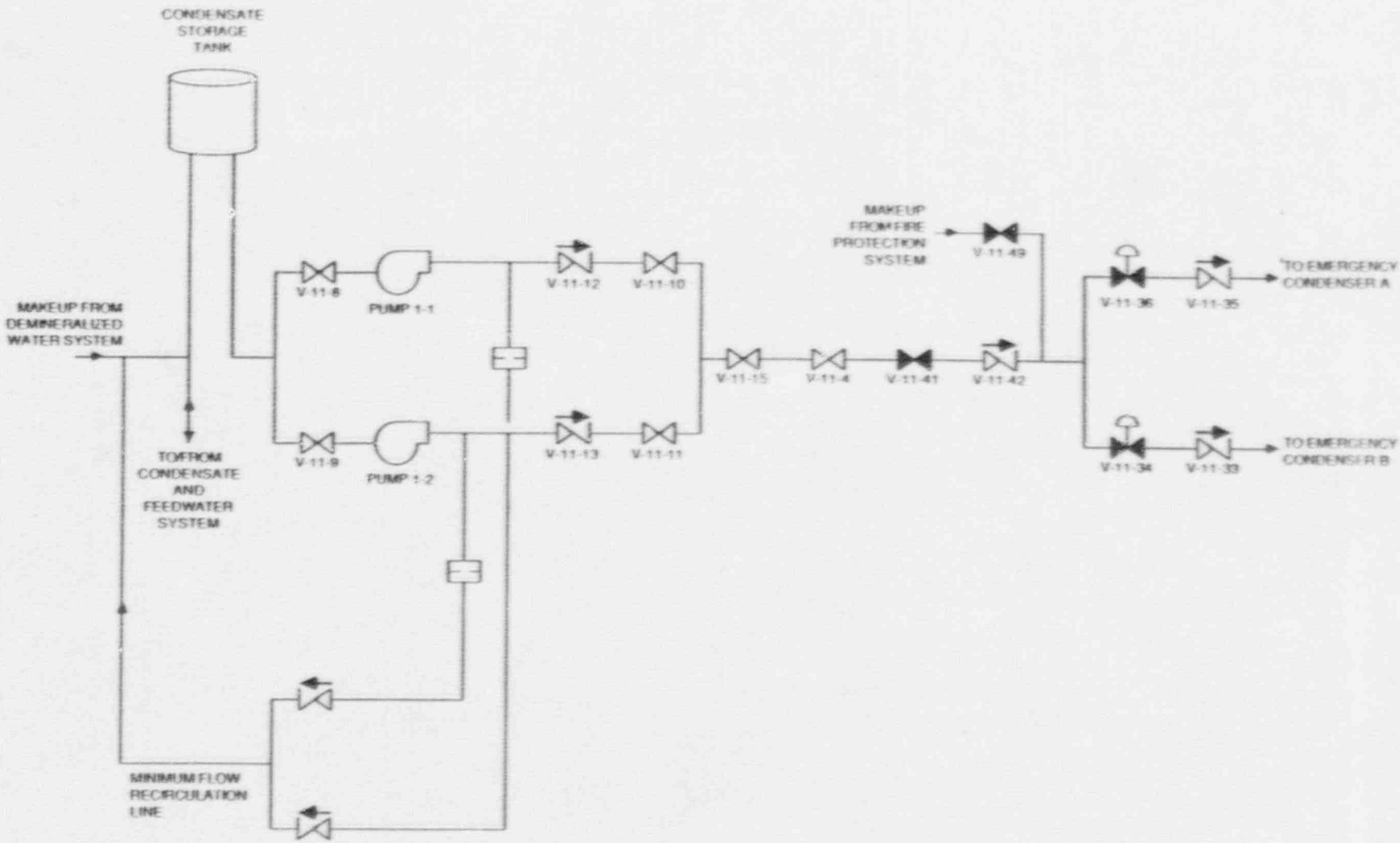


Figure 3.2-3. Oyster Creek Condensate Transfer System Makeup to Emergency Condensers

Table 3.2-1. Oyster Creek Isolation Condenser System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
EC-11-34	NV	95RB				
EC-11-36	NV	95RB				
EC-14-30	MOV	75RB	MCC 1AB2	460	23RB	A/B
EC-14-31	MOV	75RB	MCC DC-1	125	23RB	B
EC-14-32	MOV	75RB	MCC 1AB2	460	23RB	A/B
EC-14-33	MOV	75RB	MCC DC-1	125	23RB	B
EC-14-34	MOV	75RB	MCC DC-1	125	23RB	B
EC-14-35	MOV	75RB	MCC DC-2	125	75RB	A
EC-14-36	MOV	RC	MCC 1AB2	460	23RB	A/B
EC-14-37	MOV	RC	MCC 1AB2	460	23RB	A/B
EC-A	HX	95RB				
EC-B	HX	95RB				

3.3 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.3.1 System Function

The ECCS is an integrated set of subsystems that perform emergency coolant injection and recirculation functions to maintain reactor core coolant inventory and adequate decay heat removal following a LOCA or loss of the normal heat removal path via the main condenser.

3.3.2 System Definition

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

- Isolation Condenser System (ICS, see Section 3.2)
- Automatic Depressurization System (ADS)
- Core Spray System (CRS)

The ADS is used to depressurize the RCS to the point where the core spray system pumps can provide makeup. The CRS delivers water from the suppression pool to the reactor vessel through the core spray spargers. The alternate supply of cooling water for the Core Spray System is the Condensate Storage Tank, and as a last resort water is provided by the Fire Protection System. The Containment Spray System (Section 3.4) has heat exchangers to remove heat from the suppression pool to the ultimate heat source. The isolation condenser system is described in Section 3.2.

Simplified drawings of the core spray system are shown in Figure 3.3-1 and 3.3-2. Interfaces between this system and the RCS and the location of the ADS valves are shown in Section 3.1. A summary of data on selected ECCS components is presented in Table 3.3-1.

3.3.3 System Operation

During normal operation the ECCS is in standby. Following a LOCA the core spray system is activated to deliver water to the core spray spargers. The normal water supply is the suppression pool.

Each core spray loop consists of two main pumps, two booster pumps, two sets of parallel isolation valves inside and outside the drywell, a spray sparger, and associated piping, instrumentation and controls. The water supply for the system is held in the torus and is drawn through three strainers to a common header. The header also feeds the containment spray system. The discharge from each main pump flows into one of two headers (one header for Loop I and another for Loop II). The header connects the discharge of the main pumps to the suction of the booster pumps, with a bypass line around the booster pumps.

For small LOCAs it is necessary to first depressurize the RCS before the core spray system can deliver water to the RCS. This is accomplished automatically by the ADS. The ADS consists of five "Electromatic" relief valves. Any four of five ADS valves are sufficient to depressurize the system.

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 ECI system success criterion for a large LOCA is the following:

- 1 of 4 core spray pumps and a corresponding booster pump with a suction on the suppression pool.

The ECI system success criterion for a small LOCA is the following:

- The automatic depressurization system and 1 of 4 core spray pumps and a corresponding booster pump with a suction on the suppression pool.

Any four of five ADS valves are sufficient to depressurize the RCS. It is possible that the coolant inventory contról function for some small LOCAs can be satisfied by low-capacity high-pressure injection system such as the control rod drive hydraulic system (CRDHS, see Section 3.7) Use of the CRDHS in this role is not considered an ECCS function.

The ECR success criteria for LOCAs are related to the ECI success criteria above. The core spray system is essentially operating in a recirculation mode when drawing water from the suppression pool.

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

- Either the isolation condenser system (see Section 3.2), or
- Small LOCA mitigating systems

3.3.5 Component Information

A. Core Spray Main Pumps (4)
   1. Rated flow: 3700 gpm @ 450 ft head (195 psid)
   2. Rated capacity: 100% in tandem with one booster pump
   3. Type: horizontal centrifugal

B. Core Spray Booster Pumps (4)
   1. Rated flow: 3700 gpm @ 250 ft. head (108 psid)
   2. Rated capacity: 100% in tandem with one main pump
   3. Type: horizontal centrifugal

C. Suppression Pool (Torus)
   1. Normal water volume: 87,660 ft^3
   2. Minimum water volume: 82,500 ft^3
   3. Maximum normal operating temperature: 90 to 95°F (est)
   4. Design temperature: 281°F
   5. Design pressure: 56 psig

D. Condensate Storage Tank
   1. Capacity: 525,000 gallons

3.3.6 Support Systems and Interfaces

A. Control signals
   1. Automatic
      a. The core spray pumps are started upon a high containment pressure or low reactor water level.
      b. The ADS is actuated upon a low reactor water level, coincident with high containment pressure. In addition, the core spray pumps must be in operation.
      c. Once reactor pressure drops below 285 psig and the core spray pumps are operating, the four parallel normally closed isolation valves (two in each loop) are opened.

2. Remote manual
   ECCS pumps and valves 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 and DC loads that can be supplied from the emergency diesel generator or station battery, as described in Section 3.6.
   2. The ADS valves are DC solenoid pilot-operated valves. These valves do not require a pneumatic system.

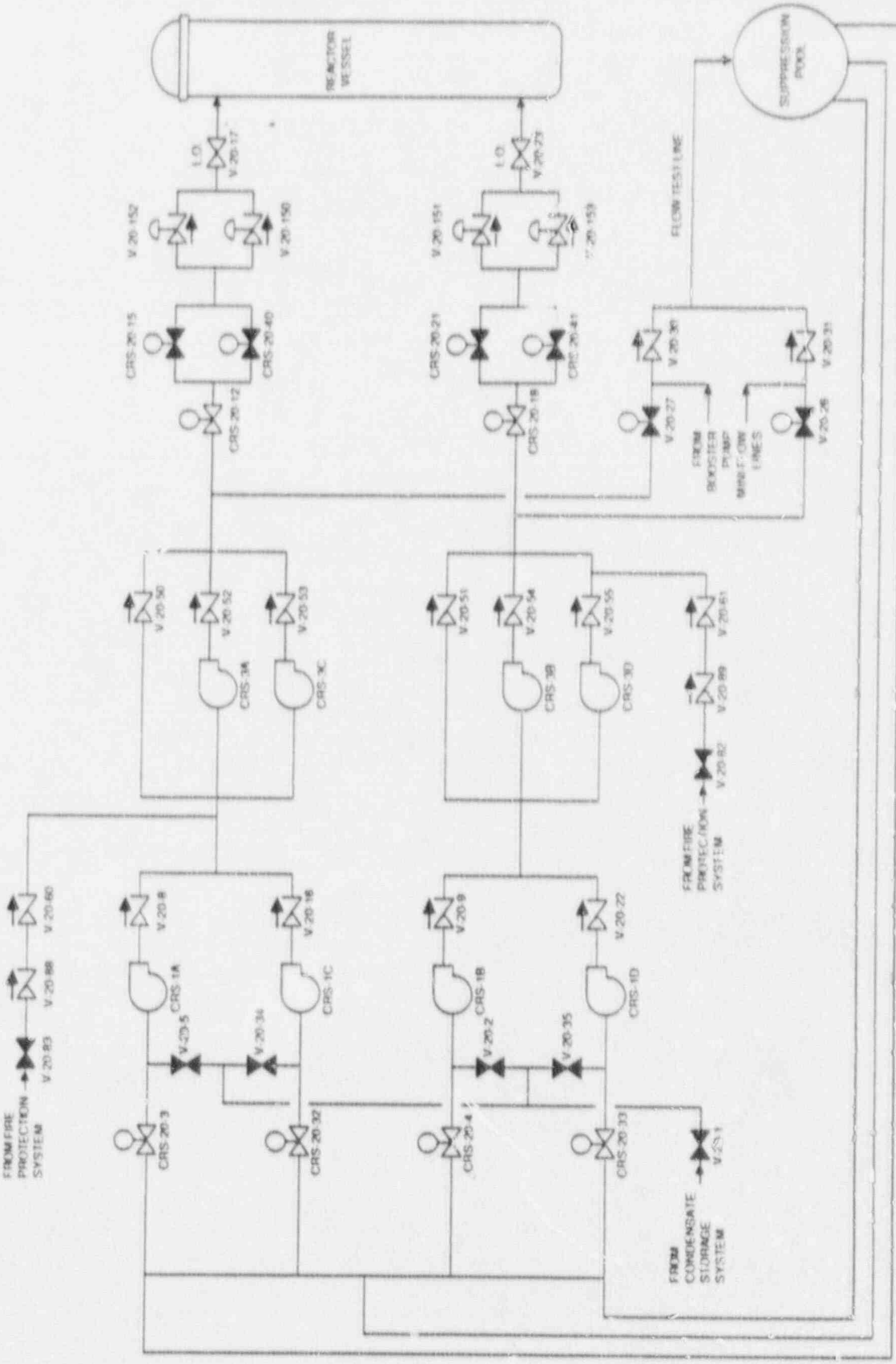


Figure 3.3-1. Oyster Creek Core Spray System

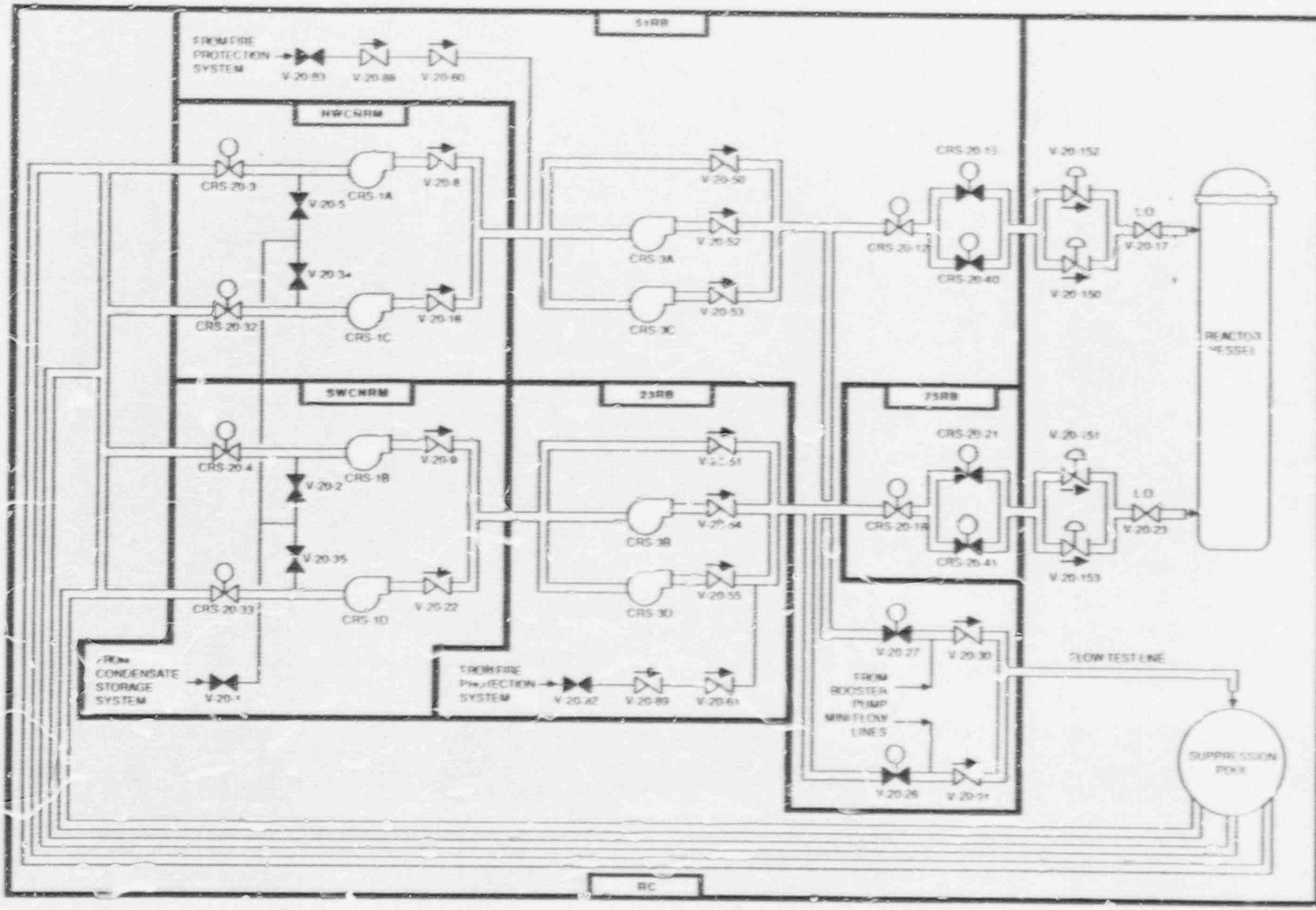


Figure 3.3-2. Oyster Creek Core Spray System Showing Component Location

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CRS-1A	MDP	NWCNRM	BUS 1C	[illegible]	[illegible]CRM	A
CRS-1B	MDP	[illegible]WCNRM	BUS 1[illegible]	4160	[illegible]1DRM	
CRS-1C	MDP	N[illegible]CNRM	BUS 1D	4160	[illegible]KV1DRM	B
CRS-1D	MDP	S[illegible]CNRM	BUS 1C	4160	4KV1CRM	A
CRS-20-12	MOV	[illegible]	MCC 1A21A	[illegible]60	23RB	[illegible]
CRS-20-15	MOV	[illegible]	MCC 1A2	[illegible]60	[illegible]GRM	A
CRS-20-18	MOV	75RB	MCC 1B21A	460	23RB	[illegible]
CRS-20-21	MOV	75RB	MCC [illegible]	460	480VSWGRM	A
CRS-20-26	[illegible]	51RB	MCC 1B21A	460	23RB	B
CRS-20-27	[illegible]	51RB	MCC 1A21B	460	23RB	A
CRS-20-3	MOV	NWCNRM	MCC 1A21A	460	23RB	A
CRS-20-32	MO[illegible]	NWCNRM	MCC 1B21A	460	23RB	B
[illegible]-20-33	MOV	SWCNRM	MCC 1A21A	460	23RB	A
CRS-20-4	MOV	SWCNRM	MCC 1B21A	460	23RB	B
CRS-20-40	MOV	51RB	MCC 1B21A	460	23RB	B
CRS-20-41	MOV	75RB	MCC 1AB2	460	23RB	A/B
CRS-3A	MDP	51RB	BUS 1A2	460	480VSWGRM	A
CRS-3B	MDP	23RB	BUS 1B2	460	480VSWGRM	B
CRS-3C	MDP	51RB	BUS 1B2	460	480VSWGRM	B
[illegible]-3D	MDP	23RB	BUS 1A2	460	480VSWGRM	A
RCS-ADS	SRV	RC	PANEL D OR F	125	UNKNOWN	A/B
RCS-ADS	SRV	RC	PANEL [illegible] OR F	125	[illegible]KNOWN	

3.4 CONTAINMENT SPRAY SYSTEM (CNS)

3.4.1 System Function

The CNS, in conjunction with the Emergency Service Water System complete the heat transfer path from the containment to the ultimate heat sink. The CNS, is designed to reduce containment temperature and pressure by delivering water from the suppression pool, through heat exchangers, to spray headers in the drywell and torus.

3.4.2 System Definition

The CNS consists of two redundant loops, each of which contain two 100% pumps in parallel, two 100% heat exchangers in parallel and independent sets of spray headers. Both loops share a common suction header from the suppression pool. Simplified drawings of the containment spray system are shown in Figures 3.4-1 and 3.4-2. A summary of data on selected CNS components is presented in Table 3.4-1.

3.4.3 System Operation

During normal operation the CNS is in standby. Following a LOCA the CNS system pumps water from the suppression pool header, through heat exchangers and then back to the containment through spray headers. The ESW system removes heat from the CNS heat exchangers.

3.4.4 System Success Criteria

Successful containment heat removal can be achieved by either CNS train. For a given train, one of two pumps must operate, taking suction on the suppression pool, and delivering water through one of two heat exchangers to the spray headers in the drywell and torus.

3.4.5 Component Information

A. Containment Spray Pumps (4)
   1. Rated Flow: 3000 gpm at 260 ft head (113 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

B. Containment Spray Heat Exchangers
   1. Rated Duty: 42×10^6 Btu/hr
   2. Type. vertical tube-shell

3.4.6 Support System and Interfaces

A. Control Signals
   1. Automatic
      The CNS is actuated automatically on coincidence of high drywell pressure and low reactor water level.
   2. Remote Manual
      The CNS pumps can be actuated by remote manual means from the control room.

B. Motive Power
   1. The CNS pumps are Class 1E AC loads that can be supplied from the emergency diesel generator as described in Section 3.6.

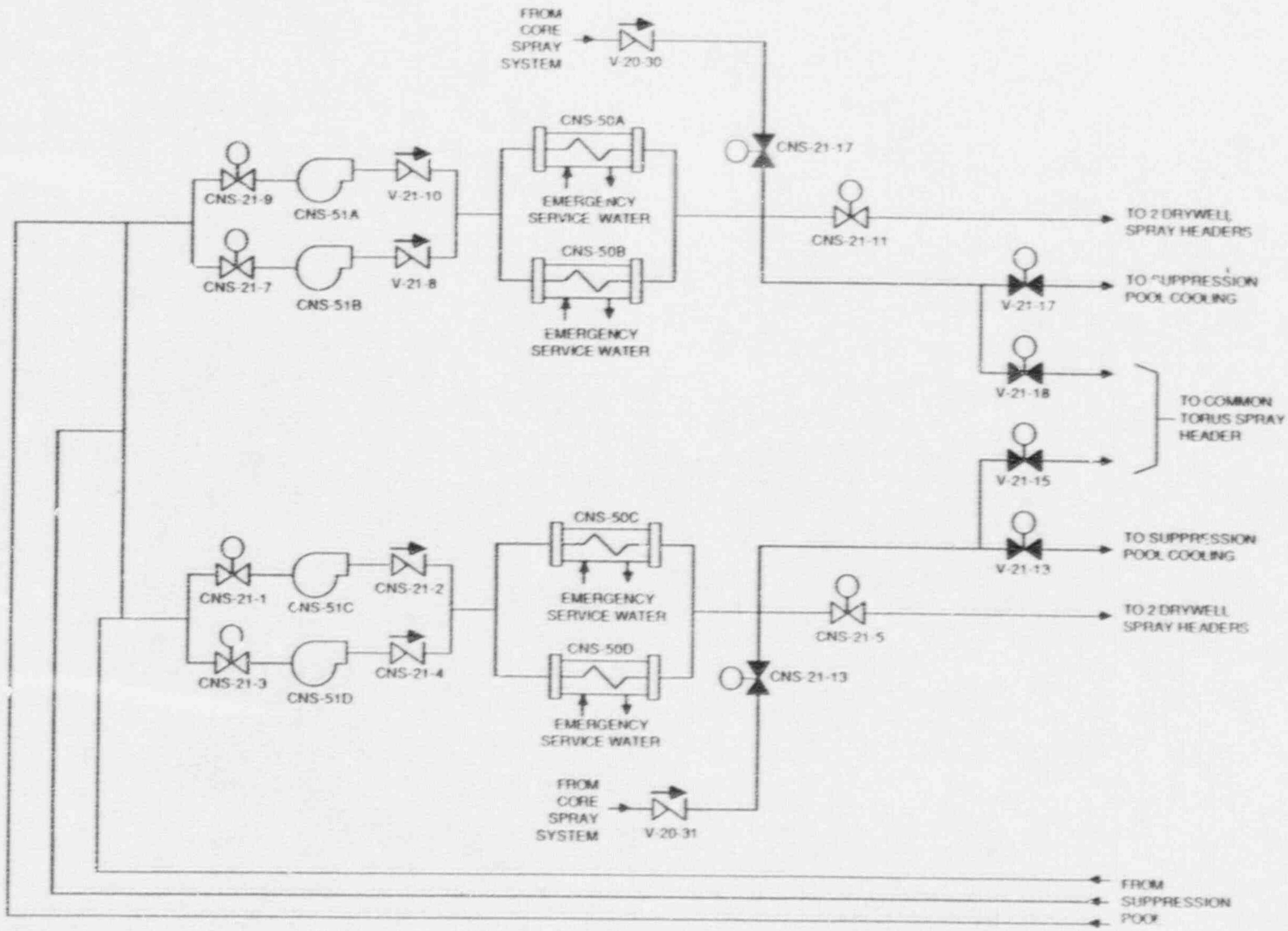


Figure 3.4-1. Oyster Creek Containment Spray System

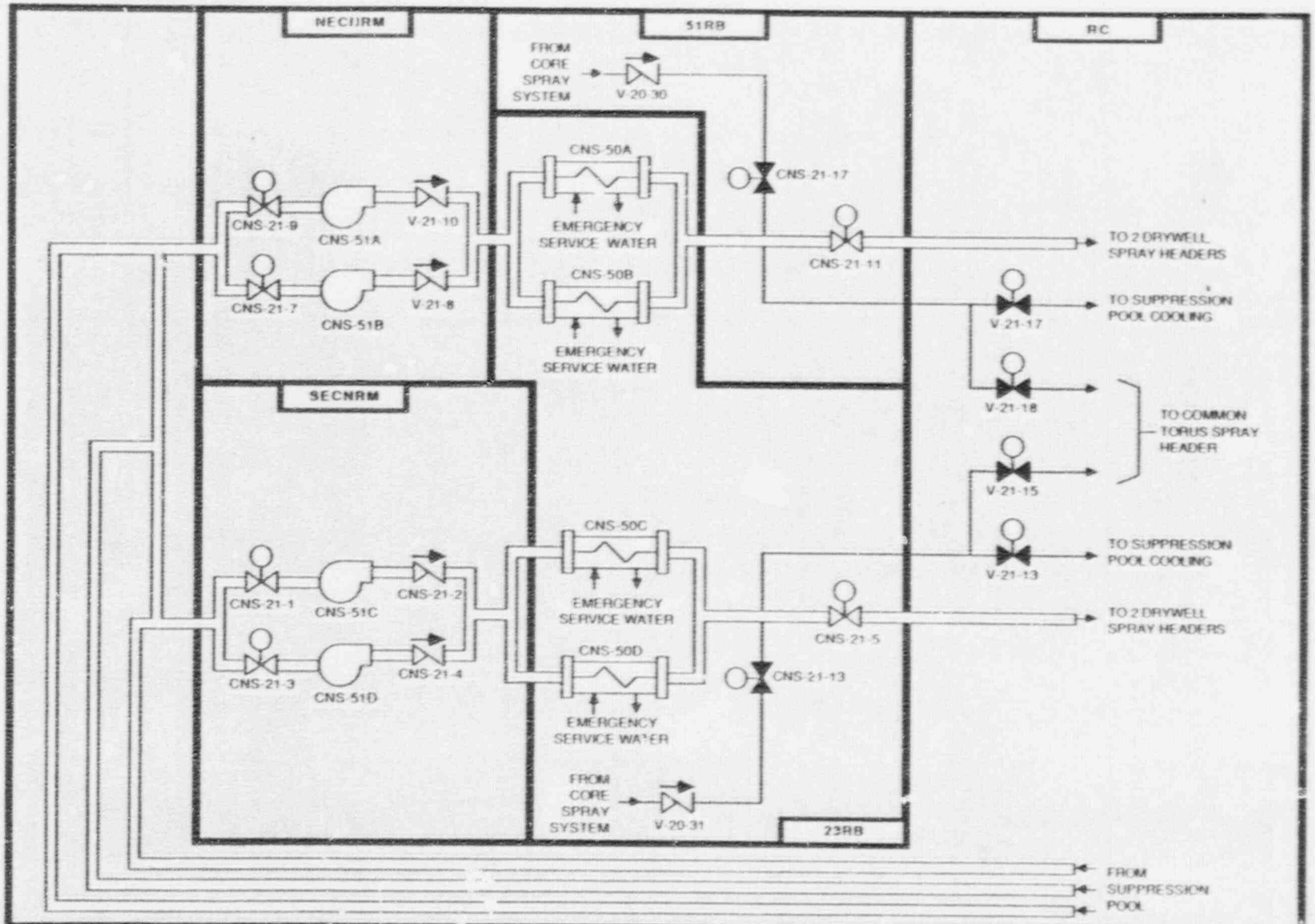


Figure 3.4-2. Oyster Creek Containment Spray System Showing Component Location

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CNS-21-1	MOV	SECNRM	MCC 1B21B	460	23RB	B
CNS-21-11	MOV	51RB	MCC 1A21B	460	23RB	A
CNS-21-13	MOV	23RB	MCC 1B21B	460	23RB	B
CNS-21-17	MOV	51RB	MCC 1A21B	460	23RB	A
CNS-21-3	MOV	SECNRM	MCC 1B21B	460	23RB	B
CNS-21-5	MOV	23RB	MCC 1B21B	460	23RB	B
CNS-21-7	MOV	NECNRM	MCC 1A21B	460	23RB	A
CNS-21-9	MOV	NECNRM	MCC 1A21B	460	23RB	A
CNS-51A	MDP	NECNRM	BUS 1A2	460	480VSWGRM	A
CNS-51B	MDP	NECNRM	BUS 1A2	460	480VSWGRM	A
CNS-51C	MDP	SECNRM	BUS 1B2	460	480VSWGRM	B
CNS-51D	MDP	SECNRM	BUS 1B2	460	480VSWGRM	B
CNS-H50A	HX	23RB				
CNS-H50B	HX	23RB				
CNS-H50C	HX	23RB				
CNS-H50D	HX	23RB				

3.5 INSTRUMENTATION AND CONTROL (I&C) SYSTEMS

3.5.1 System Function

The instrumentation and control systems consist of the Reactor Protection System (RPS) and systems for the display of plant information to the operators. The RPS monitors the reactor plant, and alerts 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. It will also automatically actuate selected safety systems based on the specific limits or combinations of limits that are exceeded.

3.5.2 System Definition

The RPS includes sensor and transmitter units, logic units, and output trip relays that interface with the control circuits for components in the Control Rod Drive Hydraulic System (see Section 3.6) Under certain circumstances components in other safety systems will also be actuated. Operator instrumentation display systems consist of display panels that are powered by 120 VAC power (see Section 3.6).

3.5.3 System Operation

A. RPS

The RPS has four input instrument channels and two output actuation trains. RPS inputs are listed below:

- High neutron flux
- High reactor pressure
- Low water level in reactor vessel
- High Containment Pressure
- Closure of main steam isolation valves
- High condenser pressure
- Loss of auxiliary power
- High scram dump tank level
- High radiation in main steam lines
- Manual

Both output channels must be deenergized to initiate a scram. The failure of a single component or power supply does not prevent a desired scram or cause an unwanted scram.

B. Other Safety Systems

In addition to the scram function, RPS instrumentation is used to actuate other safety systems. The core spray system is actuated upon high containment pressure or low reactor water level. The automatic depressurization system is actuated upon a low reactor water level, coincident with high containment pressure. The motor operated valves of the emergency condensers are automatically opened by signals of either high reactor pressure or low reactor water level. The containment spray pumps are actuated on high drywell pressure and low reactor water level. The emergency diesel generators are started upon loss of auxiliary power.

C. Remote Shutdown
No information was found in the FSAR regarding a remote shutdown capability. Such a capability is expected to exist.

3.5.4 System Success Criteria

A. RPS
The RPS uses hindrance logic (normal = 1, trip = 0) in both the input and output logic. Therefore, a channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). A reactor scram will occur upon loss of control power to the RPS. A reactor scram is implemented by the scram pilot valves in the control rod drive hydraulic system (see Section 3.7). In addition to the scram function, RPS instrumentation is used to actuate other safety systems. Details of the RPS for Oyster Creek have not been determined.

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

3.5.5 Support Systems and Interfaces

A. Control Power
1. RPS
   The RPS is powered from two 120 VAC buses (see Section 3.5).
2. Operator Instrumentation
   Operator instrumentation displays are powered from 120 VAC buses (see Section 3.5).

3.6 ELECTRIC POWER SYSTEM

3.6.1 System Function

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

3.6.2 System Definition

The onsite Class 1E electric power system consists of two 4160 VAC trains, two 460 VAC subsystems, two 125 VDC subsystems, and two 120 VAC subsystems. Two emergency diesel generators supply power to the 4160 VAC system for motor operated valve and pump operation. Three station batteries supply power to the 125 VDC system for normal switchgear control, turbine control, and various emergency functions. The 120 VAC system supplies power to the reactor instrumentation and protection circuits.

Simplified one-line diagrams of the electric power systems are shown in Figures 3.6-1, 3.6-2, and 3.6-3. A summary of data on selected electric power system components is presented in Table 3.6-1. A partial listing of electrical sources and loads is presented in Table 3.6-2.

3.6.3 System Operation

The auxiliary power system is the normal source of station service power under both normal operating and shutdown conditions. Auxiliary power is obtained from the main generator, through the station service transformer connected to 4160 volt buses 1A and 1B.

Upon loss of auxiliary power the emergency diesel generators are automatically started, supplying power to 4160 VAC buses 1C and 1D, which in turn supply power to 460 VAC buses 1A1, 1A2, 1A3, 1B1, 1B2, and 1B3 through a series of transformers. These buses constitute the two separate 460 VAC trains, distributing power to rest of the system.

The normal source of power for the 125 VDC system are three station batteries. Battery A can be energized by Battery charger B or MG Set A that are connected to motor control center 1B2. Battery B can be energized by Battery charger B or MG Set B which is also connected to MCC 1B2. Battery C can be energized by either battery charger C1 or battery charger C2 which are both connected to MCC1A2.

There are eight 120 VAC instrument and protection buses. Three of these buses are supplied by motor generator sets connected to buses 1A2 and 1B2. Four more are supplied by the same buses through transformers. The last one is supplied by the DC system through a rotary inverter.

Redundant safety equipment such as motor driven pumps and motor operated valves are supplied by different 480 VAC buses. For the purpose of discussion, this equipment has been grouped into "load groups". Load group A contains components receiving electric power from bus 1C. Load group B contains components powered by bus 1D.

3.6.4 System Success Criteria

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

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

3.6.5 Component Information

A. Standby diesel generators (2)
   1. Power rating: 2500 kW
   2. Rated voltage: 4160 VAC
   3. Manufacturer: General Motors

B. Station batteries (3)
   1. Type: Lead-acid
   2. Cells: 60
   3. Capacity: 90 minutes supporting essential DC loads (estimated)

3.6.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The standby diesel generator is automatically started based on loss of auxiliary power.
   2. Remote manual
      The diesel generators can be started, and many distribution circuit breakers can be operated from the main control room.

B. Diesel Generator Auxiliary Systems
   The following auxiliaries are provided for the emergency diesel generator:
   - Cooling
     Each diesel generator is provided with its own closed cooling water system that transfers heat to the ultimate heat sink by means of a water-to-air radiator. Support from an external service water system is not required.
   - Fueling
     The diesel fuel oil supply in the diesel fuel tank room is capable of supporting long-term diesel operation (approximately three-day supply).
   - Lubrication
     Each diesel generator has an independent lubricating oil system.
   - Starting
     Each diesel generator has its own 125 volt starting battery located in the respective diesel room. The diesel generators are not dependent on the 125 VDC station batteries for starting.
   - Ventilation
     Details on the diesel room ventilation system have not been determined.

C. Switchgear and Battery Room Ventilation Systems
   Details on the systems providing switchgear and battery room ventilation have not been determined.

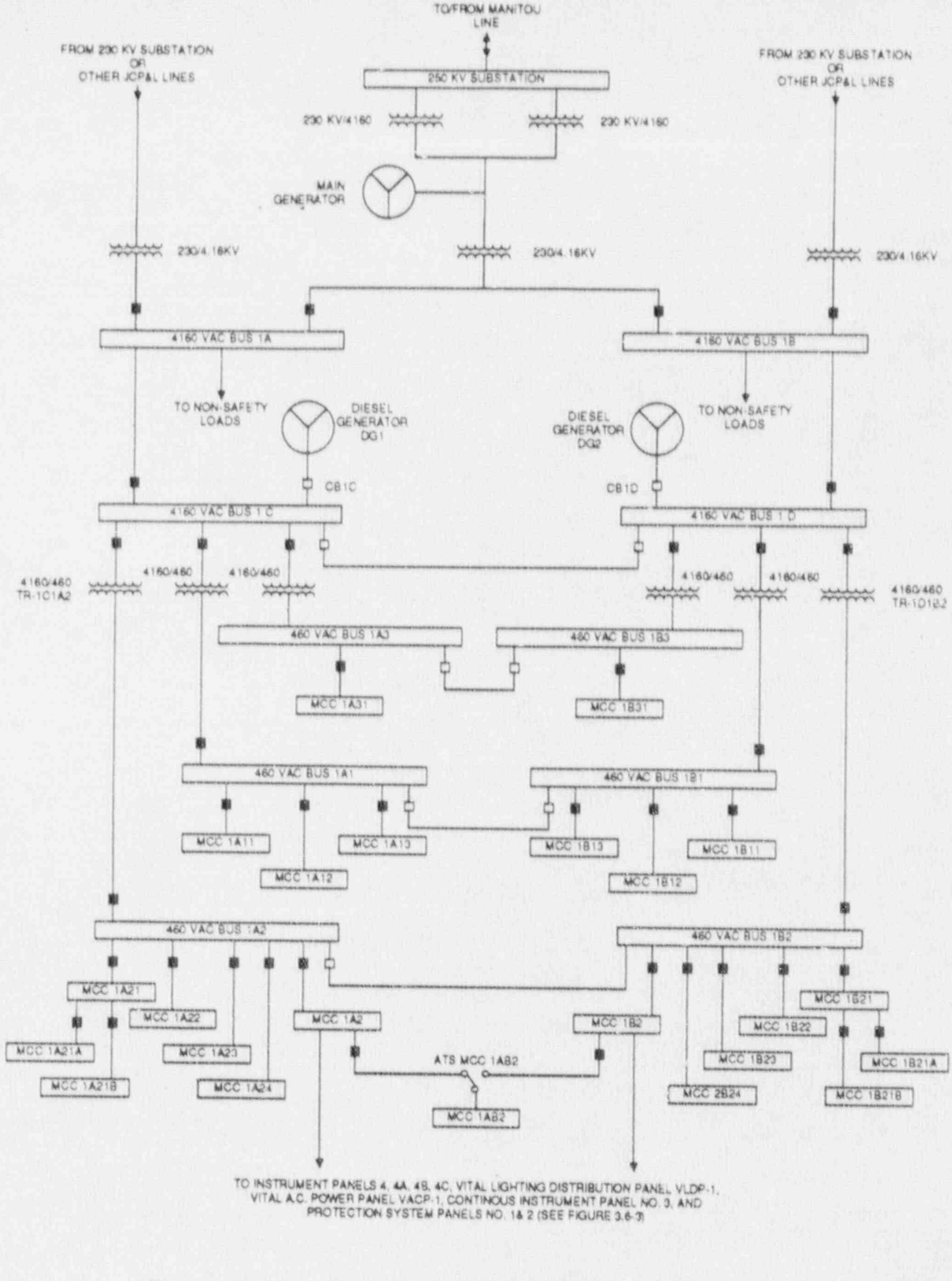


Figure 3.6-1. Oyster Creek 4160 and 460 VAC Electric Power Distribution System

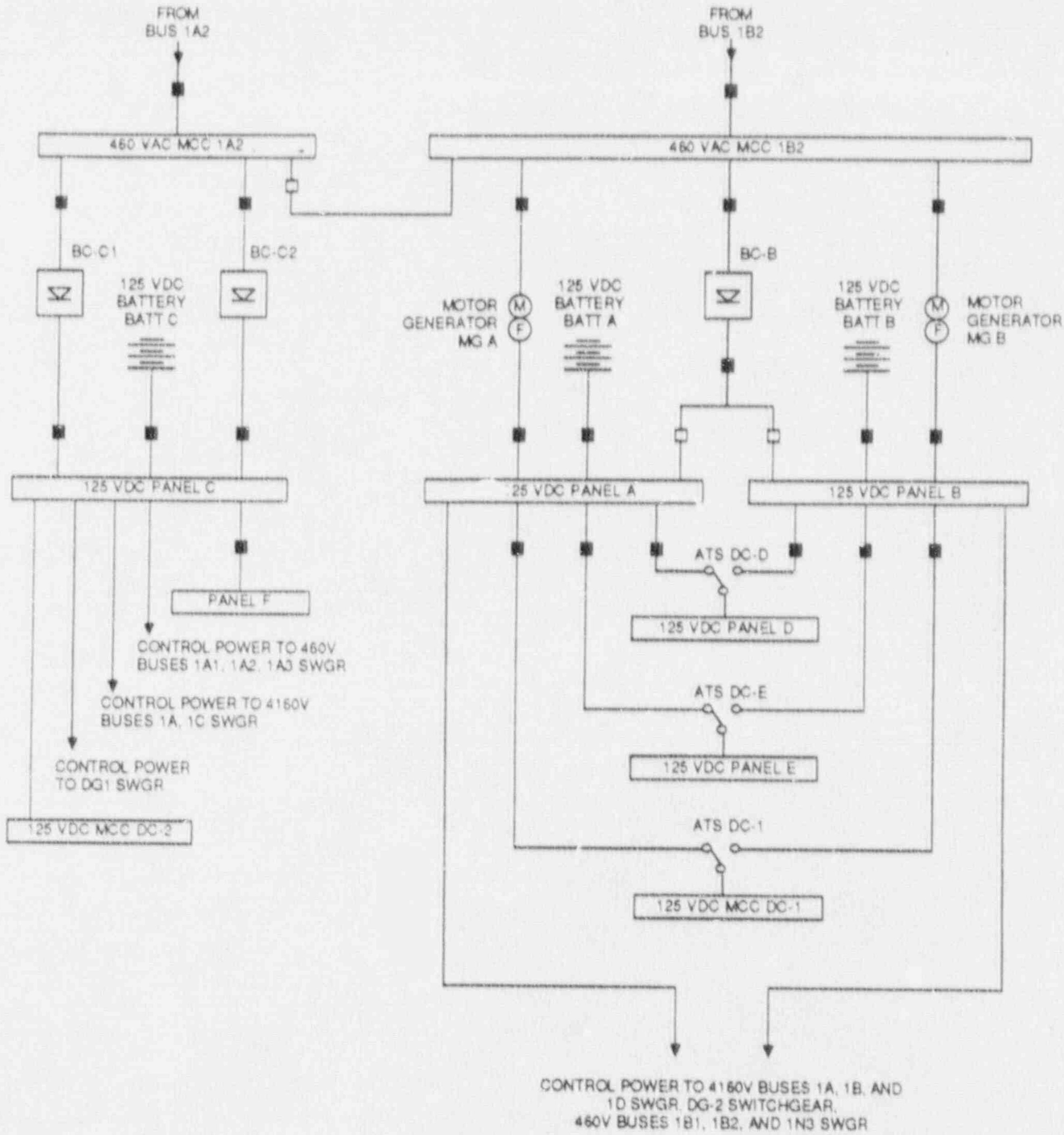


Figure 3.6-2. Oyster Creek DC Power Distribution System

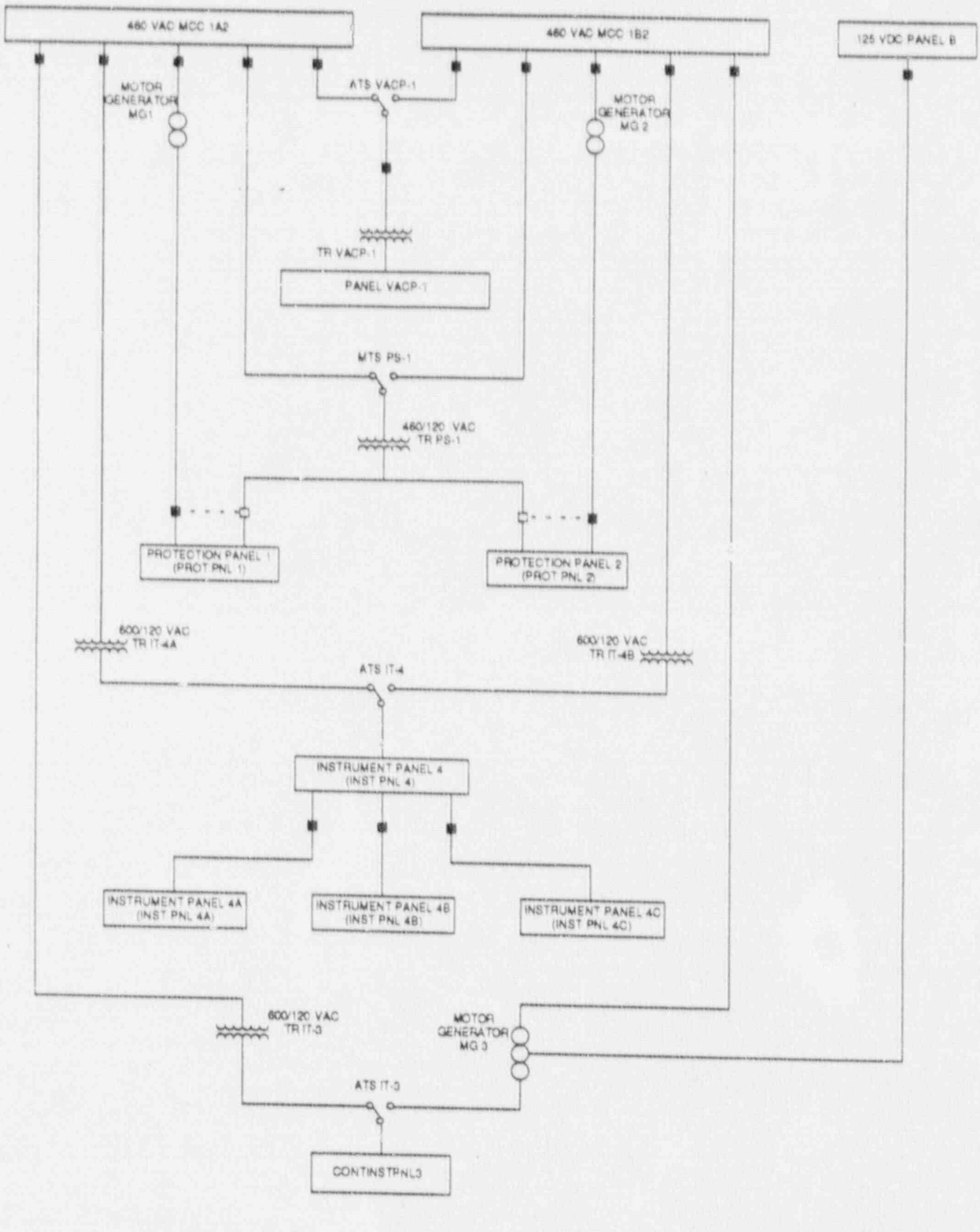


Figure 3.6-3. Oyster Creek 120 VAC Instrumentation Power Distribution System

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
ATS DC-1	ATS	UNKNOWN	PANEL B	125	ABBATTRM	B
ATS DC-1	ATS	UNKNOWN	PANEL A	125	ABBATTRM	B
ATS DC-D	ATS	UNKNOWN	PANEL B	125	ABBATTRM	B
ATS DC-D	ATS	UNKNOWN	PANEL A	125	ABBATTRM	B
ATS DC-E	ATS	UNKNOWN	PANEL B	125	ABBATTRM	B
ATS DC-E	ATS	UNKNOWN	PANEL A	125	ABBATTRM	B
ATS IT-3	ATS	UNKNOWN	TR IT-3	120	UNKNOWN	A/B
ATS IT-3	ATS	UNKNOWN	MG 3	120	UNKNOWN	A/B
ATS IT-4	ATS	UNKNOWN	TR IT-4B	120	UNKNOWN	A/B
ATS IT-4	ATS	UNKNOWN	TR IT-4A	120	UNKNOWN	A/B
ATS MCC 1AB2	ATS	UNKNOWN	MCC 1A2	460	480VSWGRM	A/B
ATS MCC 1AB2	ATS	UNKNOWN	MCC 1B2	460	480VSWGRM	A/B
ATS VACP-1	ATS	UNKNOWN	MCC 1A2	460	480VSWGRM	A/B
ATS VACP-1	ATS	UNKNOWN	MCC 1B2	460	480VSWGRM	A/B
BATT A	BATT	ABBATTRM		125		
BATT B	BATT	ABBATTRM		125		B
BATT C	BATT	CBATTRM		125		A
BC-B	BC	ABBATTRM	MCC 1B2	460	480VSWGRM	B
BC-C1	BC	4KVABRM	MCC 1A2	460	480VSWGRM	A
BC-C2	BC	4KVABRM	MCC 1A2	460	480VSWGRM	A
BUS 1A2	BUS	480VSWGRM	TR-1C1A2	460	480VSWGRM	A
BUS 1B2	BUS	480VSWGRM	TR-1D1B2	460	480VSWGRM	B
BUS 1C	BUS	4KV1CRM	CB1C	4160	DG1RM	A
BUS 1D	BUS	4KV1DRM	CB1D	4160	DG2RM	B
CB1C	CB	DG1RM	DG1	4160	DG1RM	A
CB1D	CB	DG2RM	DG2	4160	DG2RM	B

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CONTINSTPNL3	BUS	480VSWGRM	ATS IT-3	120	UNKNOWN	A/B
DG1	DG	DG1RM		4160		A
DG1BATT	BATT	DG1RM		125		A
DG1BUS	BUS	DG1RM	DG1BATT	125	DG1RM	A
DG2	DG	DG2RM		4160		B
DG2BATT	BATT	DG2RM		125		B
DG2BUS	BUS	DG2RM	DG2BATT	125	DG2RM	B
INSTPNL4	BUS	480VSWGRM	ATS IT-4	120	UNKNOWN	A/B
INSTPNL4A	BUS	480VSWGRM	INSTPNL4	120	480VSWGRM	A/B
INSTPNL4B	BUS	480VSWGRM	INSTPNL4	120	480VSWGRM	A/B
INSTPNL4C	BUS	480VSWGRM	INSTPNL4	120	480VSWGRM	A/B
MCC 1A2	MCC	480VSWGRM	BUS 1A2	460	480VSWGRM	A
MCC 1A21	MCC	480VSWGRM	BUS 1A2	460	480VSWGRM	A
MCC 1A21A	MCC	23RB	MCC 1A21	460	480VSWGRM	A
MCC 1A21B	MCC	23RB	MCC 1A21	460	480VSWGRM	A
MCC 1AB2	MCC	23RB	ATS MCC 1AB2	460	UNKNOWN	A/B
MCC 1B2	MCC	480VSWGRM	BUS 1B2	460	480VSWGRM	B
MCC 1B21	MCC	480VSWGRM	BUS 1B2	460	480VSWGRM	B
MCC 1B21A	MCC	23RB	MCC 1B21	460	480VSWGRM	B
MCC 1B21B	MCC	23RB	MCC 1B21	460	480VSWGRM	B
MCC DC-1	MCC	23RB	ATS DC-1	125	UNKNOWN	B
MCC DC-2	MCC	75RB	PANEL C	125	4KVABRM	A
MG 1	MG	UNKNOWN	MCC 1A2	460	480VSWGRM	A
MG 2	MG	UNKNOWN	MCC 1B2	460	480VSWGRM	B
MG 3	MG	UNKNOWN	MCC 1B2	460	480VSWGRM	B
MG 3	MG	UNKNOWN	PANEL B	125	ABBATTRM	B

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
MG A	MG	UNKNOWN	MCC 1B2	460	480VSWGRM	
MG B	MG	UNKNOWN	MCC 1B2	460	480VSWGRM	B
MTS PS-1	MTS	UNKNOWN	MCC 1A2	460	480VSWGRM	A/B
MTS PS-1	MTS	UNKNOWN	MCC 1B2	460	480VSWGRM	A/B
PANEL A	BUS	ABBATTRM	BATT A	125	ABBATTRM	
PANEL A	BUS	ABBATTRM	MG A	125	UNKNOWN	
PANEL B	BUS	ABBATTRM	BATTB	125	ABBATTRM	B
PANEL B	BUS	ABBATTRM	MG B	125	UNKNOWN	B
PANEL B	BUS	ABBATTRM	BC-B	125	ABBATTRM	B
PANEL C	BUS	4KVABRM	BATTC	125	CBATTRM	A
PANEL C	BUS	4KVABRM	BC-C2	125	UNKNOWN	A
PANEL C	BUS	4KVABRM	BC-C1	125	UNKNOWN	A
PANEL D	BUS	ABBATTRM	ATS DC-D	125	UNKNOWN	B
PANEL E	BUS	UNKNOWN	ATS DC-E	125	UNKNOWN	B
PANEL F	BUS	UNKNOWN	PANEL C	125	4KVABRM	A
PROTPNL1	BUS	CSR	TR PS-1	120	UNKNOWN	A/B
PROTPNL1	BUS	CSR	MG 2	120	UNKNOWN	A/B
PROTPNL2	BUS	CSR	TR PS-1	120	UNKNOWN	A/B
PROTPNL2	BUS	CSR	MG 1	120	UNKNOWN	A/B
TR IT-3	XFMR	UNKNOWN	MCC 1A2	460	480VSWGRM	A
TR IT-4A	XFMR	UNKNOWN	MCC 1A2	460	480VSWGRM	A
TR IT-4B	XFMR	UNKNOWN	MCC 1B2	460	480VSWGRM	B
TR PS-1	XFMR	UNKNOWN	MTS PS-1	460	UNKNOWN	A/B
TR VACP-1	XFMR	UNKNOWN	ATS VACP-1	460	UNKNOWN	A/B
TR-1C1A2	XFMR	480VSWGRM	BUS 1C	4160	4KV1CRM	A
TR-1D1B2	XFMR	480VSWGRM	BUS 1D	4160	4KV1DRM	B

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
VACP-1	BUS	480VSWGRM	TR VACP-1	120	UNKNOWN	A/B

Table 3.6-2. Partial Listing of Electrical Sources and Loads at Oyster Creek

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BUS 1B2	460	B	480VSWGRM	ECCS	CRS-3B	MDP	23RB
MG A	125		UNKNOWN	EP	PANEL A	BUS	ABBATTRM
PANEL C	125	A	4KVABRM	EP	PANEL F	BUS	UNKNOWN
ATS DC-1	125	B	UNKNOWN	EP	MCC DC-1	MCC	23RB
ATS DC-D	125	B	UNKNOWN	EP	PANEL D	BUS	ABBATTRM
ATS DC-E	125	B	UNKNOWN	EP	PANEL E	BUS	UNKNOWN
ATS IT-3	120	A/B	UNKNOWN	EP	CONTINSTPNL3	BUS	480VSWGRM
ATS IT-4	120	A/B	UNKNOWN	EP	INSTPNL4	BUS	480VSWGRM
ATS MCC 1AB2	460	A/B	UNKNOWN	EP	MCC 1AB2	MCC	23RB
ATS VACP-1	460	A/B	UNKNOWN	EP	TR VACP-1	XFMR	UNKNOWN
BATT A	125		ABBATTRM	EP	PANEL A	BUS	ABBATTRM
BATTB	125	B	ABBATTRM	EP	PANEL B	BUS	ABBATTRM
BATTC	125	A	CBATTRM	EP	PANEL C	BUS	4KVABRM
BC-B	125	B	ABBATTRM	EP	PANEL B	BUS	ABBATTRM
BC-C1	125	A	UNKNOWN	EP	PANEL C	BUS	4KVABRM
BC-C2	125	A	UNKNOWN	EP	PANEL C	BUS	4KVABRM
BUS 1A2	460	A	480VSWGRM	CNS	CNS-51A	MDP	NECNRM
BUS 1A2	460	A	480VSWGRM	CNS	CNS-51B	MDP	NECNRM
BUS 1A2	460	A	480VSWGRM	CRHS	CRHS-8A	MDP	CRDRM
BUS 1A2	460	A	480VSWGRM	ECCS	CRS-3A	MDP	51RB
BUS 1A2	460	A	480VSWGRM	ECCS	CRS-3D	MDP	23RB
BUS 1A2	460	A	480VSWGRM	EP	MCC 1A2	MCC	480VSWGRM
BUS 1A2	460	A	480VSWGRM	EP	MCC 1A21	MCC	480VSWGRM
BUS 1B2	460	B	480VSWGRM	CNS	CNS-51C	MDP	SECNRM
BUS 1B2	460	B	480VSWGRM	CNS	CNS-51D	MDP	SECNRM
BUS 1B2	460	B	480VSWGRM	CRHS	CRHS-8B	MDP	CRDRM
BUS 1B2	460	B	480VSWGRM	ECCS	CRS-3C	MDP	51RB
BUS 1B2	460	B	480VSWGRM	EP	MCC 1B2	MCC	480VSWGRM
BUS 1B2	460	B	480VSWGRM	EP	MCC 1B21	MCC	480VSWGRM
BUS 1C	4160	A	4KV1CRM	ECCS	CRS-1A	MDP	NWCNRM
BUS 1C	4160	A	4KV1CRM	ECCS	CRS-1D	MDP	SWCNRM

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
BUS 1C	4160	A	4KV1CRM	EP	TR-1C1A2	XFMR	480VSWGRM
BUS 1C	4160	A	4KV1CRM	ESW	ESW-52A	MDP	INTAKE
BUS 1C	4160	A	4KV1CRM	ESW	ESW-52B	MDP	INTAKE
BUS 1D	4160		4KV1DRM	ECCS	CRS-1B	MDP	SWCNRM
BUS 1D	4160	B	4KV1DRM	ECCS	CRS-1C	MDP	NWCNRM
BUS 1D	4160	B	4KV1DRM	EP	TR-1D1B2	XFMR	480VSWGRM
BUS 1D	4160	B	4KV1DRM	ESW	ESW-52C	MDP	INTAKE
BUS 1D	4160	B	4KV1DRM	ESW	ESW-52D	MDP	INTAKE
CB1C	4160	A	DG1RM	EP	BUS 1C	BUS	4KV1CRM
CB1D	4160	B	DG2RM	EP	BUS 1D	BUS	4KV1DRM
DG1	4160	A	DG1RM	EP	CB1C	CB	DG1RM
DG1BATT	125	A	DG1RM	EP	DG1BUS	BUS	DG1RM
DG2	4160	B	DG2RM	EP	CB1D	CB	DG2RM
DG2BATT	125	B	DG2RM	EP	DG2BUS	BUS	DG2RM
INSTPNL4	120	A/B	480VSWGRM	EP	INSTPNL4A	BUS	480VSWGRM
INSTPNL4	120	A/B	480VSWGRM	EP	INSTPNL4B	BUS	480VSWGRM
INSTPNL4	120	A/B	480VSWGRM	EP	INSTPNL4C	BUS	480VSWGRM
MCC 1A2	460	A	480VSWGRM	ECCS	CRS-20-15	MOV	51RB
MCC 1A2	460	A/B	480VSWGRM	EP	ATS MCC 1AB2	ATS	UNKNOWN
MCC 1A2	460	A/B	480VSWGRM	EP	ATS VACP-1	ATS	UNKNOWN
MCC 1A2	460	A	480VSWGRM	EP	BC-C1	BC	4KVABRM
MCC 1A2	460	A	480VSWGRM	EP	BC-C2	BC	4KVABRM
MCC 1A2	460	A	480VSWGRM	EP	MG 1	MG	UNKNOWN
MCC 1A2	460	A/B	480VSWGRM	EP	MTS PS-1	MTS	UNKNOWN
MCC 1A2	460	A	480VSWGRM	EP	TR IT-3	XFMR	UNKNOWN
MCC 1A2	460	A	480VSWGRM	EP	TR IT-4A	XFMR	UNKNOWN
MCC 1A21	460	A	480VSWGRM	ECCS	CRS-20-21	MOV	75RB
MCC 1A21	460	A	480VSWGRM	EP	MCC 1A21A	MCC	23RB
MCC 1A21	460	A	480VSWGRM	EP	MCC 1A21B	MCC	23RB
MCC 1A21A	460	A	23RB	ECCS	CRS-20-12	MOV	51RB
MCC 1A21A	460	A	23RB	ECCS	CRS-20-3	MOV	NWCNRM

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC 1A21A	460	A	23RB	ECCS	CRS-20-33	MOV	SWCNRM
MCC 1A21B	460	A	23RB	CNS	CNS-21-11	MOV	51RB
MCC 1A21B	460	A	23RB	CNS	CNS-21-17	MOV	51RB
MCC 1A21B	460	A	23RB	CNS	CNS-21-7	MOV	NECNRM
MCC 1A21B	460	A	23RB	CNS	CNS-21-9	MOV	NECNRM
MCC 1A21B	460	A	23RB	ECCS	CRS-20-27	MOV	51RB
MCC 1A21B	460	A	23RB	ESW	ESW-3-88	MOV	23RB
MCC 1AB2	460	A/B	23RB	ECCS	CRS-20-41	MOV	75RB
MCC 1AB2	460	A/B	23RB	RCS	RCS-16-1	MOV	RC
MCC 1AB2	460	A/B	23RB	RCS	RCS-17-19	MOV	RC
MCC 1AB2	460	A/B	23RB	RCS	RCS-17-54	MOV	RC
MCC 1AB2	460	A/B	23RB	XC	EC-14-30	MOV	75RB
MCC 1AB2	460	A/B	23RB	XC	EC-14-32	MOV	75RB
MCC 1AB2	460	A/B	23RB	XC	EC-14-36	MOV	RC
MCC 1AB2	460	A/B	23RB	XC	EC-14-37	MOV	RC
MCC 1B2	460	A/B	480VSWGRM	EP	ATS MCC 1AB2	ATS	UNKNOWN
MCC 1B2	460	A/B	480VSWGRM	EP	ATS VACP-1	ATS	UNKNOWN
MCC 1B2	460	B	480VSWGRM	EP	BC-B	BC	ABBATTRM
MCC 1B2	460	B	480VSWGRM	EP	MG 2	MG	UNKNOWN
MCC 1B2	460	B	480VSWGRM	EP	MG 3	MG	UNKNOWN
MCC 1B2	460		480VSWGRM	EP	MG A	MG	UNKNOWN
MCC 1B2	460	B	480VSWGRM	EP	MG B	MG	UNKNOWN
MCC 1B2	460	A/B	480VSWGRM	EP	MTS PS-1	MTS	UNKNOWN
MCC 1B2	460	B	480VSWGRM	EP	TR IT-4B	XFMR	UNKNOWN
MCC 1B21	460	B	480VSWGRM	EP	MCC 1B21A	MCC	23RB
MCC 1B21	460	B	480VSWGRM	EP	MCC 1B21B	MCC	23RB
MCC 1B21A	460	B	23RB	ECCS	CRS-20-18	MOV	75RB
MCC 1B21A	460	B	23RB	ECCS	CRS-20-26	MOV	51RB
MCC 1B21A	460	B	23RB	ECCS	CRS-20-32	MOV	NWCNRM
MCC 1B21A	460	B	23RB	ECCS	CRS-20-4	MOV	SWCNRM
MCC 1B21A	460	B	23RB	ECCS	CRS-20-40	MOV	51RB

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
MCC 1B21B	460	B	23RB	CNS	CNS-21-1	MOV	SECNRM
MCC 1B21B	460	B	23RB	CNS	CNS-21-13	MOV	23RB
MCC 1B21B	460	B	23RB	CNS	CNS-21-3	MOV	SECNRM
MCC 1B21B	460	B	23RB	CNS	CNS-21-5	MOV	23RB
MCC 1B21B	460	B	23RB	ESW	ESW-3-87	MOV	23RB
MCC DC-1	125	B	23RB	XC	EC-14-31	MOV	75RB
MCC DC-1	125	B	23RB	XC	EC-14-33	MOV	75RB
MCC DC-1	125	B	23RB	XC	EC-14-34	MOV	75RB
MCC DC-2	125	A	75RB	XC	EC-14-35	MOV	75RB
MG 1	120	A/B	UNKNOWN	EP	PROTPNL2	BUS	CSR
MG 2	120	A/B	UNKNOWN	EP	PROTPNL1	BUS	CSR
MG 3	120	A/B	UNKNOWN	EP	ATS IT-3	ATS	UNKNOWN
MG B	125	B	UNKNOWN	EP	PANEL B	BUS	ABBATTRM
MTS PS-1	460	A/B	UNKNOWN	EP	TR PS-1	XFMR	UNKNOWN
PANEL A	125	B	ABBATTRM	EP	ATS DC-1	ATS	UNKNOWN
PANEL A	125	B	ABBATTRM	EP	ATS DC-D	ATS	UNKNOWN
PANEL A	125	B	ABBATTRM	EP	ATS DC-E	ATS	UNKNOWN
PANEL B	125	B	ABBATTRM	EP	ATS DC-1	ATS	UNKNOWN
PANEL B	125	B	ABBATTRM	EP	ATS DC-D	ATS	UNKNOWN
PANEL B	125	B	ABBATTRM	EP	ATS DC-E	ATS	UNKNOWN
PANEL B	125	B	ABBATTRM	EP	MG 3	MG	UNKNOWN
PANEL C	125	A	4KVABRM	EP	MCC DC-2	MCC	75RB
PANEL D OR F	125	A/B	UNKNOWN	ECCS	RCS-ADS	SRV	RC
PANEL D OR F	125		UNKNOWN	ECCS	RCS-ADS	SRV	RC
TR IT-3	120	A/B	UNKNOWN	EP	ATS IT-3	ATS	UNKNOWN
TR IT-4A	120	A/B	UNKNOWN	EP	ATS IT-4	ATS	UNKNOWN
TR IT-4B	120	A/B	UNKNOWN	EP	ATS IT-4	ATS	UNKNOWN
TR PS-1	120	A/B	UNKNOWN	EP	PROTPNL1	BUS	CSR
TR PS-1	120	A/B	UNKNOWN	EP	PROTPNL2	BUS	CSR
TR VACP-1	120	A/B	UNKNOWN	EP	VACP-1	BUS	480VSWGRM
TR-1C1A2	460	A	480VSWGRM	EP	BUS 1A2	BUS	480VSWGRM

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
TR-1D1B2	460	B	480VSWGRM	EP	BUS 1B2	BUS	480VSWGRM

3.7 CONTROL ROD DRIVE HYDRAULIC SYSTEM (CRDHS)

3.7.1 System Function

The CRDHS supplies pressurized water to operate 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.

3.7.2 System Definition

The CRDHS consists of two high-head, low-flow pumps, piping, filters, control valves, one hydraulic control unit for each control rod drive mechanism, and instrumentation. Water is supplied from condensate and from the condensate storage tank. The CRDHS also includes scram valves, scram accumulators, and a scram discharge volume (dump tank).

A simplified drawings of the CRDHS is shown in Figure 3.7-1 and 3.7-2. Details of the scram portion of a typical BWR system are shown in Figure 3.7-3 (adapted from Ref. 1). A summary of data on selected CRDHS components is presented in Table 3.7-1.

3.7.3 System Operation

During normal operation the CRDHS pumps provide 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 dump tank (scram discharge volume). This coordinated action results in rapid insertion of control rods into the reactor. As shown in Figure 3.7-3, the scram portion of the CRDHS bypasses the normal rod control portion of the system.

Although not intended as a makeup system, the CRDHS can provide a source of cooling water to the RCS during vessel isolation. It is noted in NUREG-0626 (Ref. 2), that this function is particularly important for some BWR/1 plants and BWR/2 (i.e., Oyster Creek) plants for which the CRDHS is the primary source of makeup on vessel isolation. The maximum RCS makeup rate of the CRDHS is about 200 gpm with both pumps operating (Ref. 3).

3.7.4 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 to the actuated devices (i.e., pilot valves) 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, or
  - Either backup scram pilot valve must be energized.
- 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 responds and insert into the reactor core (specific number needed is not known).

During isolation condenser operation, RCS makeup can be provided by one control rod drive pumps. It may be possible to utilize the CRDHS to mitigate small LOCAs. In this case both pumps probably would be required.

3.7.5 Component Information

A. Control rod drive pumps (2)
   1. Rated capacity: 100% (for control rod drive function)
   2. Flow rate: about 120 gpm @ 1500 psig
   3. Type: centrifugal

B. Condensate Storage Tank
   1. Capacity: 525,000 gallons.

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The RPS transmits scram commands to solenoid pilot valves which control the pneumatic scram valves
   2. Remote Manual
      a. A reactor scram can be initiated manually from the control room
      b. 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 3.6.

3.7.7 Section 3.7 References

1. NEDO-24708A, "Additional Information Required for NRC Staff Generic Report on Boiling Water Reactors," General Electric Company, December 1980.

2. NUREG-0626, "Generic Evaluation of Feedwater Transients and Small Break Loss-of-Coolant-Accidents in GE-designed Operating Plants and Near-term Operating License Applications," USNRC, January 1980.

3. 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.

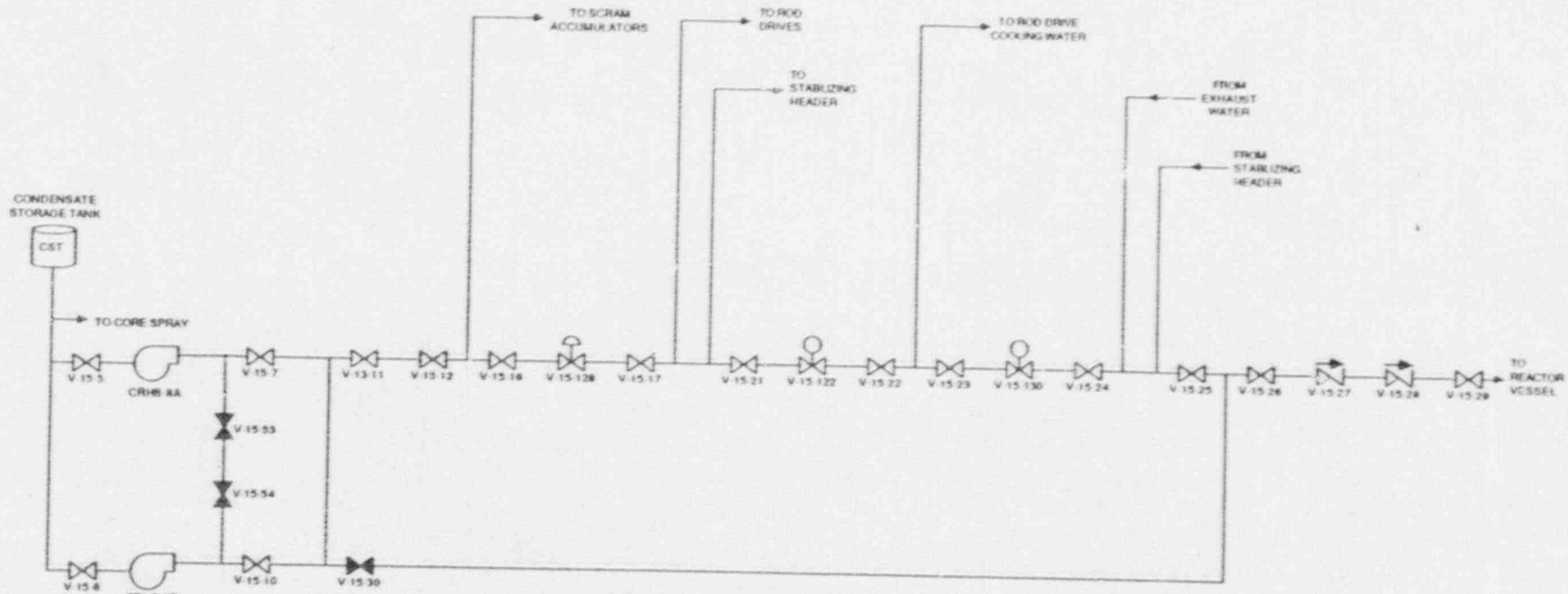


Figure 3.7-1. Oyster Creek Control Rod Drive Hydraulic System

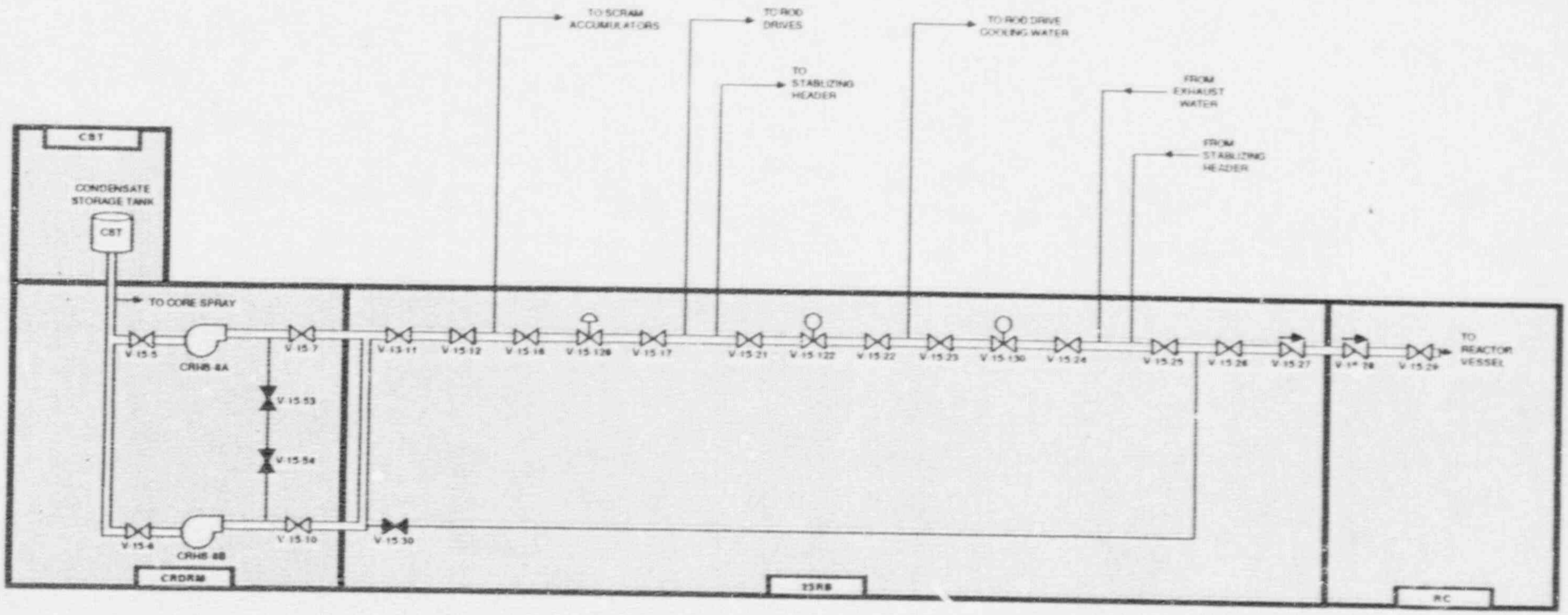


Figure 3.7-2. Oyster Creek Control Rod Drive Hydraulic System Showing Component Locations

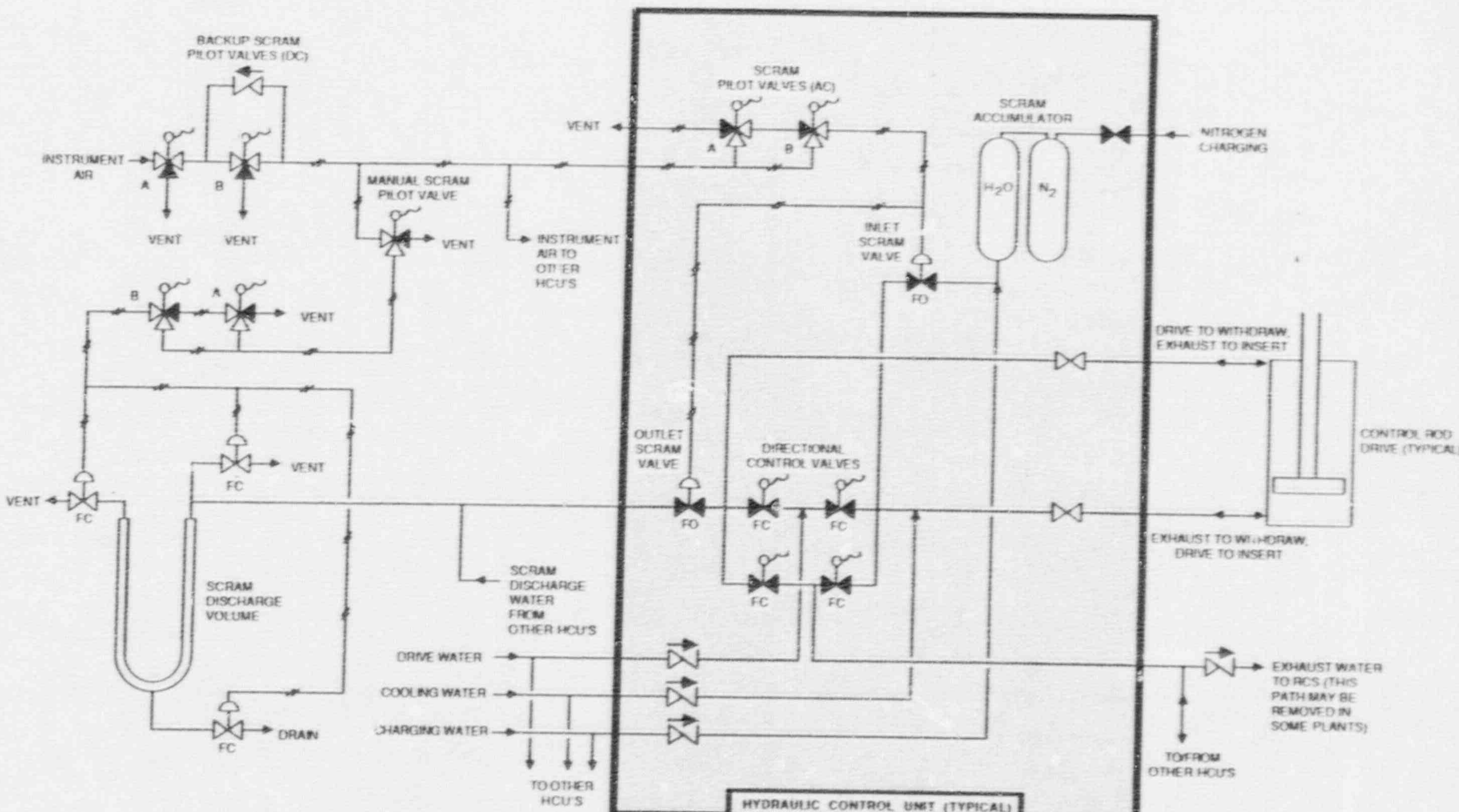


Figure 3.7-3. Simplified Diagram Of Portions Of The Control Rod Drive Hydraulic System That Are Related To The Scram Function

Table 3.7-1. Oyster Creek Control Rod Drive Hydraulic System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CRHS-8A	MDP	CRDRM	BUS 1A2	460	480VSWGRM	A
CRHS-8B	MDP	CRDRM	BUS 1B2	460	480VSWGRM	B
CST	TK	CST				

3.8 FIRE PROTECTION (FP) SYSTEM

3.8.1 System Function

The fire protection system provides water to various plant locations for fire fighting. In addition, the FP system is used as a source of makeup water for the shell sides of the emergency condensers.

3.8.2 System Definition

The fire protection system consists of two diesel-driven pumps and the various valves and piping required to deliver water to the plant. The source of water is a pond containing 7.2 million gallons. Simplified drawings of the fire protection system are shown in Figure 3.8-1 and 3.8-2. A summary of data on selected fire protection system components is presented in Table 3.8-1.

3.8.3 System Operation

During normal operation the FP system is in standby, kept under constant pressure by two small electric pond pumps. The FP pumps are arranged to start automatically if system pressure drops due to large water demand.

3.8.4 System Success Criteria

For makeup to the isolation condensers, one of two fire protection pumps is required.

3.8.5 Component Information

A. Fire Protection Pumps (2)
  1. Rated flow: 2000 gpm at 165 psig
  2. Rated capacity: 100%
  3. Type: vertical centrifugal, diesel-driven

3.8.6 Support Systems and Interfaces

A. Control Signals
  1. Automatic
     The fire protection pumps start automatically upon low pressure in the FP system.
  2. Remote Manual
     The FP pumps can be started manually from the control room or at the pump house.

B. Motive Power
   The FP pumps are powered by their own dedicated diesel drives.

C. Diesel Pump Auxiliary Systems
   The following auxiliaries are provided for the diesel-driven FP pumps:

  1. Cooling
     A simple jacket cooling water system and water-to-air radiator is provided for diesel engine cooling.
  2. Fueling
     Fuel tanks for each diesel driven pump are located outside the pumphouse.

3. Lubrication
It is assumed that each diesel-driven FP pump has an independent lubrication system.
4. Starting
Each diesel driven pump has its own 24 volt starting battery. These pumps are not dependent on the 125 VDC station batteries for starting.

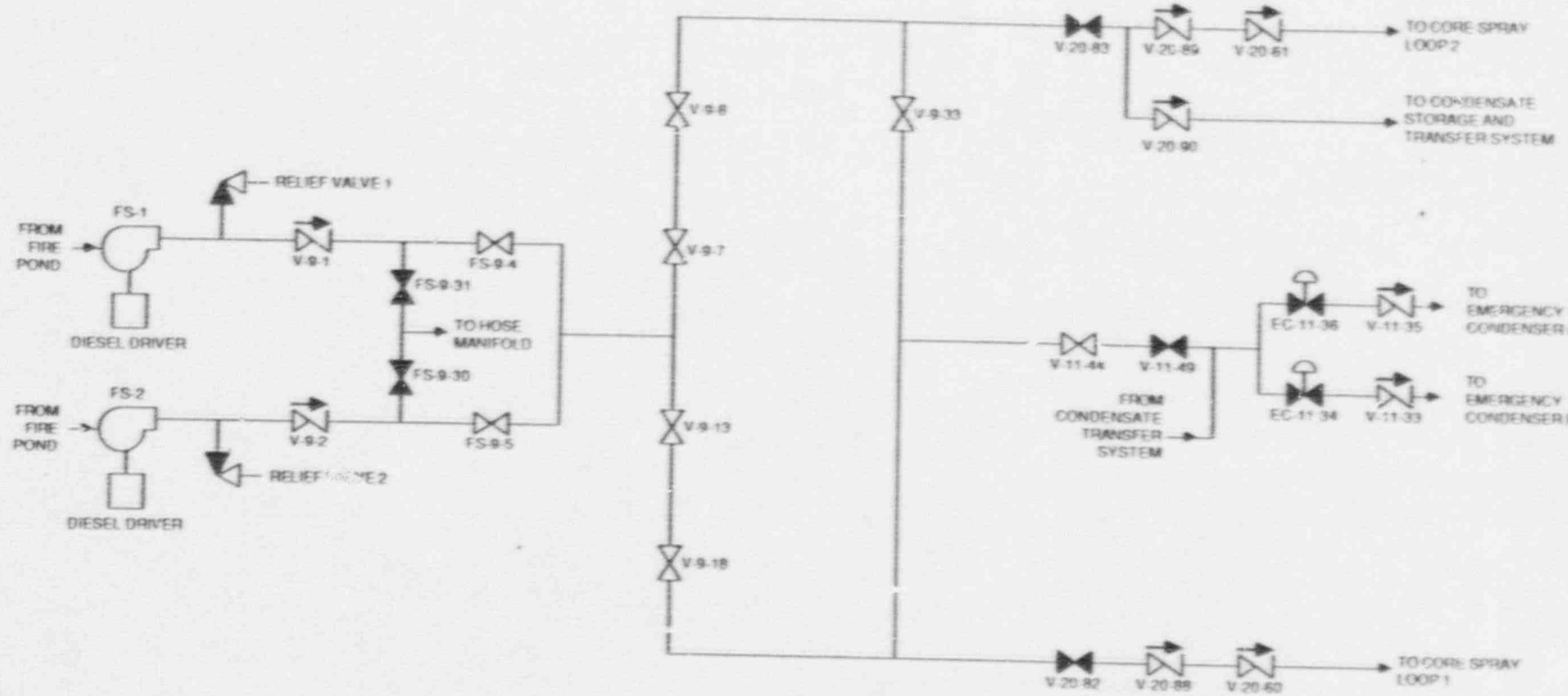


Figure 3.8-1. Oyster Creek Fire Protection System

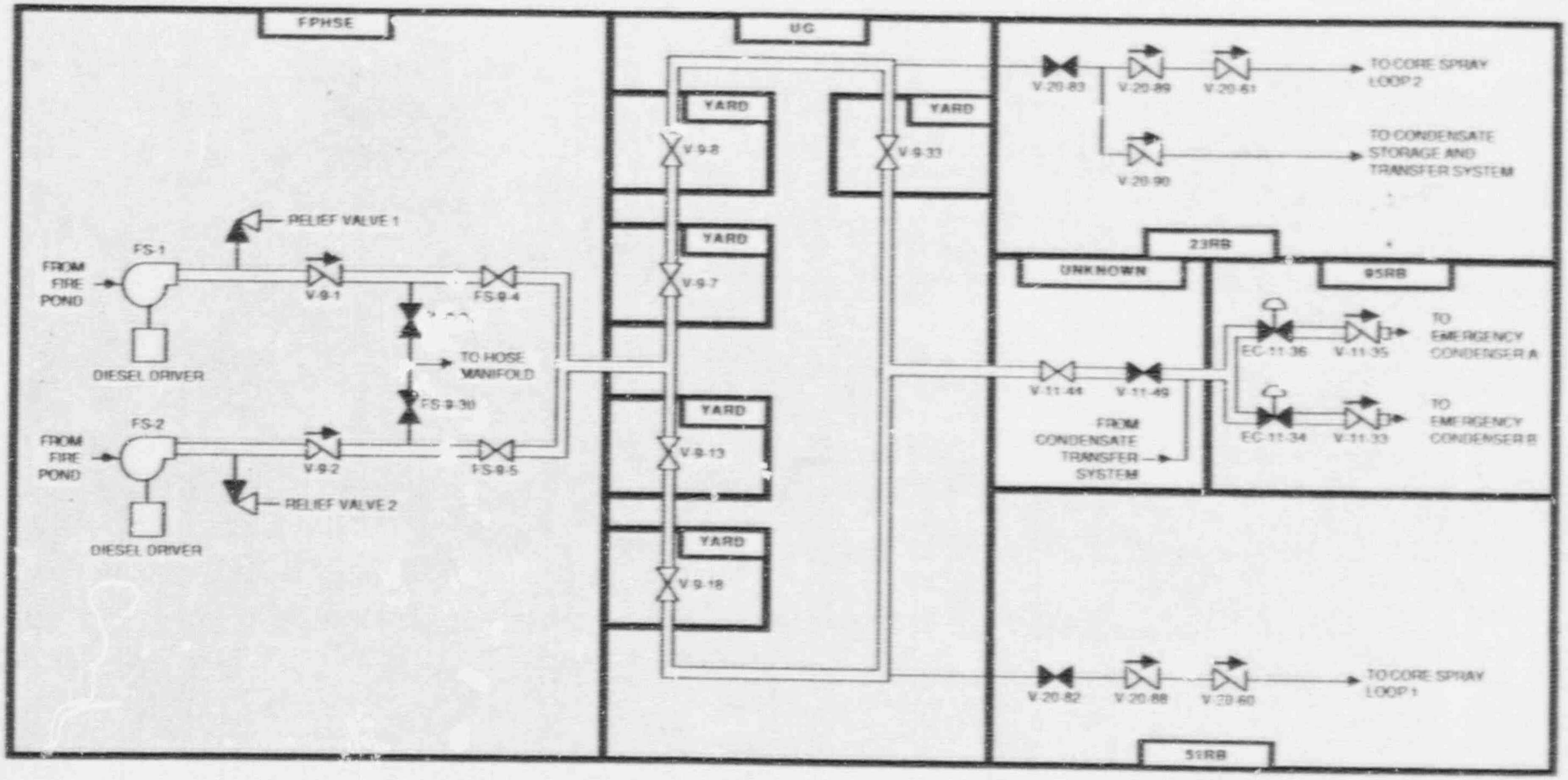


Figure 3.8-2. Oyster Creek Fire Protection System Showing Component Location

Table 3.8-1. Oyster Creek Fire Protection System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
FS-1	DDP	FPHSE				
FS-2	DDP	FPHSE				
FS-9-30	XV	FPHSE				
FS-9-31	XV	FPHSE				
FS-9-4	XV	FPHSE				
FS-9-5	XV	FPHSE				
FSBATT1	BATT	FPHSE		24		
FSBATT2	BATT	FPHSE		24		
FSBUS1	BUS	FPHSE		24		
FSBUS2	BUS	FPHSE		24		

3.9 EMERGENCY SERVICE WATER SYSTEM (ESWS)

3.9.1 System Function

The Emergency Service Water System (ESWS) provide cooling water to the heat exchangers for the containment spray system. In conjunction with the containment spray system, the ESWS completes the heat transfer path from the containment to the ultimate heat sink.

3.9.2 System Definition

The ESWS system consists of two redundant loops, each consisting of two full capacity pumps connected to a header that supplies two containment spray heat exchangers. The source of water is the raw service water intake structure and water discharge is to the normal service water discharge. Simplified drawings of the Emergency Service Water System are shown in Figures 3.9-1 and 3.9-2. A summary of data on selected ESWS components is presented in Table 3.9-1.

3.9.3 System Operation

During normal operation the ESWS is in standby. When actuated by low reactor water level and high drywell pressure, the ESWS pumps take suction on the raw service water, delivering water to the ESW heat exchangers and discharging it to the service water discharge line.

3.9.4 System Success Criteria

The FSAR (Ref. 1) states that each ESW pump is 100% capacity. It is assumed this means that a single ESW pump can cool both containment spray heat exchangers in the same loop.

3.9.5 Component Information

A. ESWS pumps (4)
   1. Rated flow: 3000 gpm @ 100 ft. head (43 psid)
   2. Rated capacity: 100%
   3. Type: vertical centrifugal

B. ESW heat exchangers (4)
   1. Rated duty: 42×10^6 Btu/hr

3.9.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The ESWS pumps are started automatically on coincident low reactor water level and high drywell pressure signals.
   2. Remote manual
      The ESWS pumps can be started manually in the control room or locally at the pumps.

B. Motive Power
   The ESWS pumps are Class 1E AC loads that can be supplied from the emergency diesel generator as described in Section 3.6.

3.9.7 Section 3.9 References

1. Oyster Creek FSAR, Section 6.2.2

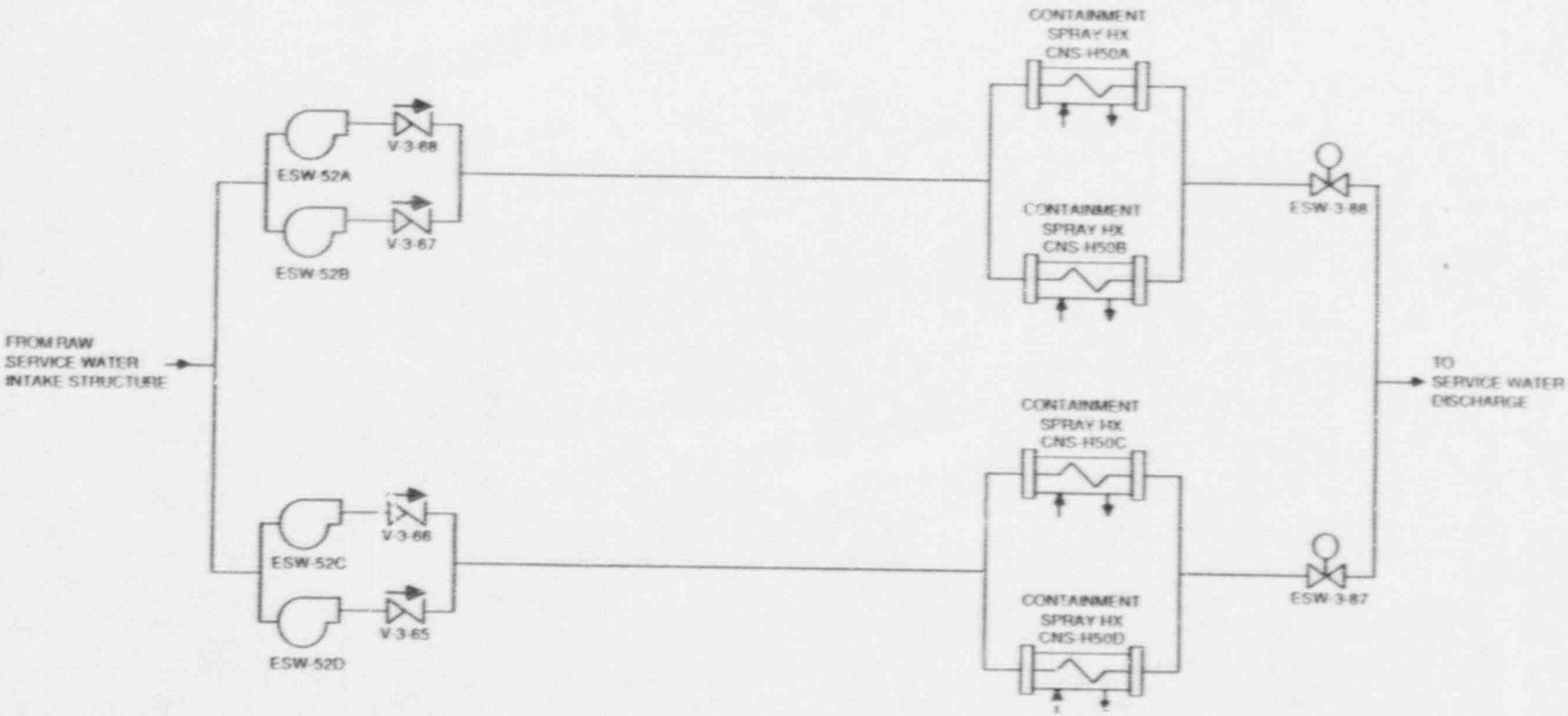


Figure 3.9-1. Oyster Creek Emergency Service Water System

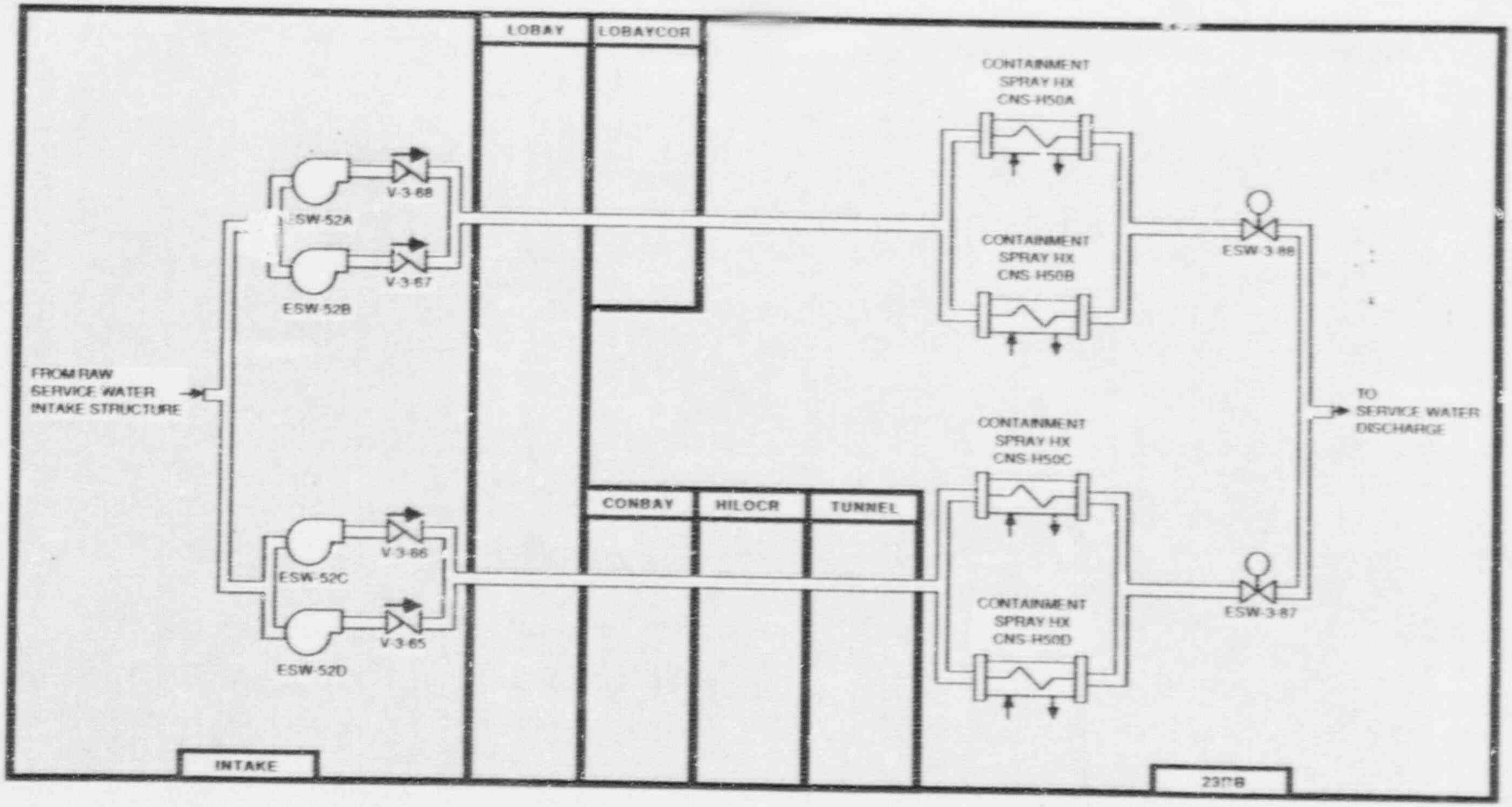


Figure 3.9-2. Oyster Creek Emergency Service Water System Showing Component Location

Table 3.9-1. Oyster Creek Emergency Service Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
ESW-3-87	MOV	23RB	MCC 1B21B	460	23RB	B
ESW-3-88	MOV	23RB	MCC 1A21B	460	23RB	A
ESW-52A	MDP	INTAKE	BUS 1C	4160	4KV1CRM	A
ESW-52B	MDP	INTAKE	BUS 1C	4160	4KV1CRM	A
ESW-52C	MDP	INTAKE	BUS 1D	4160	4KV1DRM	B
ESW-52D	MDP	INTAKE	BUS 1D	4160	4KV1DRM	B

3.10 SHUTDOWN COOLING SYSTEM

3.10.1 System Function

The shutdown cooling system (SCS) provides for shutdown cooling of the reactor after the RCS has been depressurized to less than 150 psig. The SCS transfers decay heat to the reactor closed cooling water system. This system is not part of the Emergency Core Cooling System.

3.10.2 System Definition

The SCS is essentially a single train system with three parallel SCS pumps and three parallel SCS heat exchangers. The system takes a suction on, and returns coolant to RCS recirculation loop E. Simplified drawings of the shutdown cooling system are shown in Figures 3.10-1 and 3.10-2.

3.10.3 System Operation

During normal operation, the SCS is shutdown and isolated from the RCS. Following reactor shutdown, RCS cooling is provided by steaming on the turbine bypass system and providing makeup to the RCS with the main condensate and feedwater system. The SCS is manually actuated during RCS cooldown and depressurization when RCS pressure is less than 150 psig and temperature is less than 280°F. The SCS is designed with sufficient capacity to remove decay heat being generated by the core 24 hours after shutdown and hold RCS temperature at 125°F (Ref. 1).

3.10.4 System Success Criteria

Not determined.

3.10.5 Component Information

A. SDC pumps (3)
   1. Type: Centrifugal
   2. Capacity: 3,000 gpm (approx.) at unknown head

B. SDC heat exchangers (3)
   1. Type: Horizontal u-tube
   2. Heat removal capacity: 11×10^6 Btu/hr

3.10.6 Support Systems and Interfaces

A. Control Signals
   1. The SCS is controlled from the reactor control room
   2. An interlock prevents opening the isolation valves between the RCS and SCS under any of the following conditions:
      - RCS pressure greater than 150 psig
      - Low-low RCS water level
      - High drywell pressure

B. Motive Power

The SCS pumps can be powered from the diesel generators.

C. Others

The reactor building closed cooling water (RBCCW) system provides cooling water to the SCS heat exchangers and to the SCS pump bearings.

3.10.7 Section 3.10 References

1. Oyster Creek FSAR, Section 5.4.7.

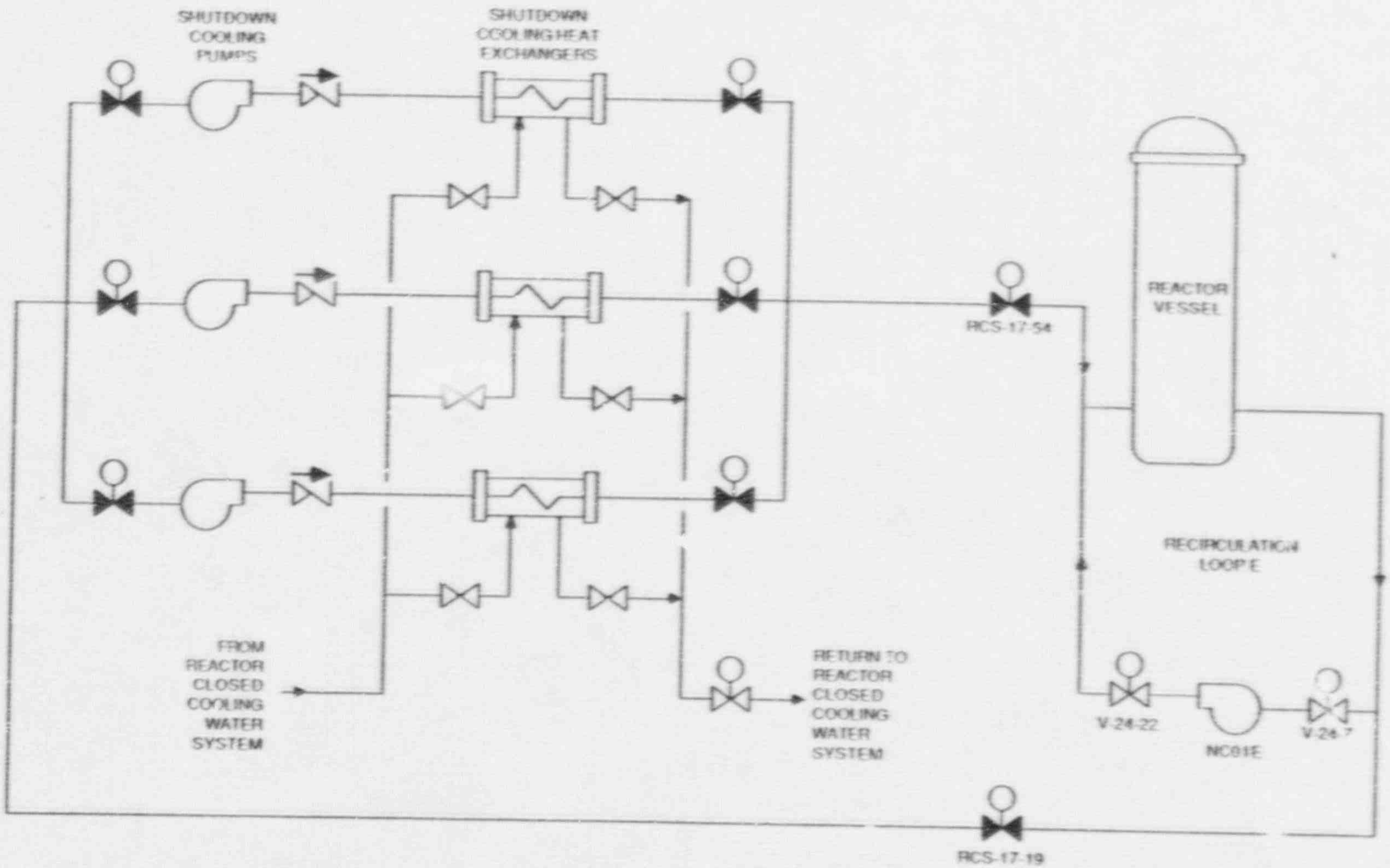


Figure 3.10-1. Oyster Creek Reactor Shutdown Cooling System

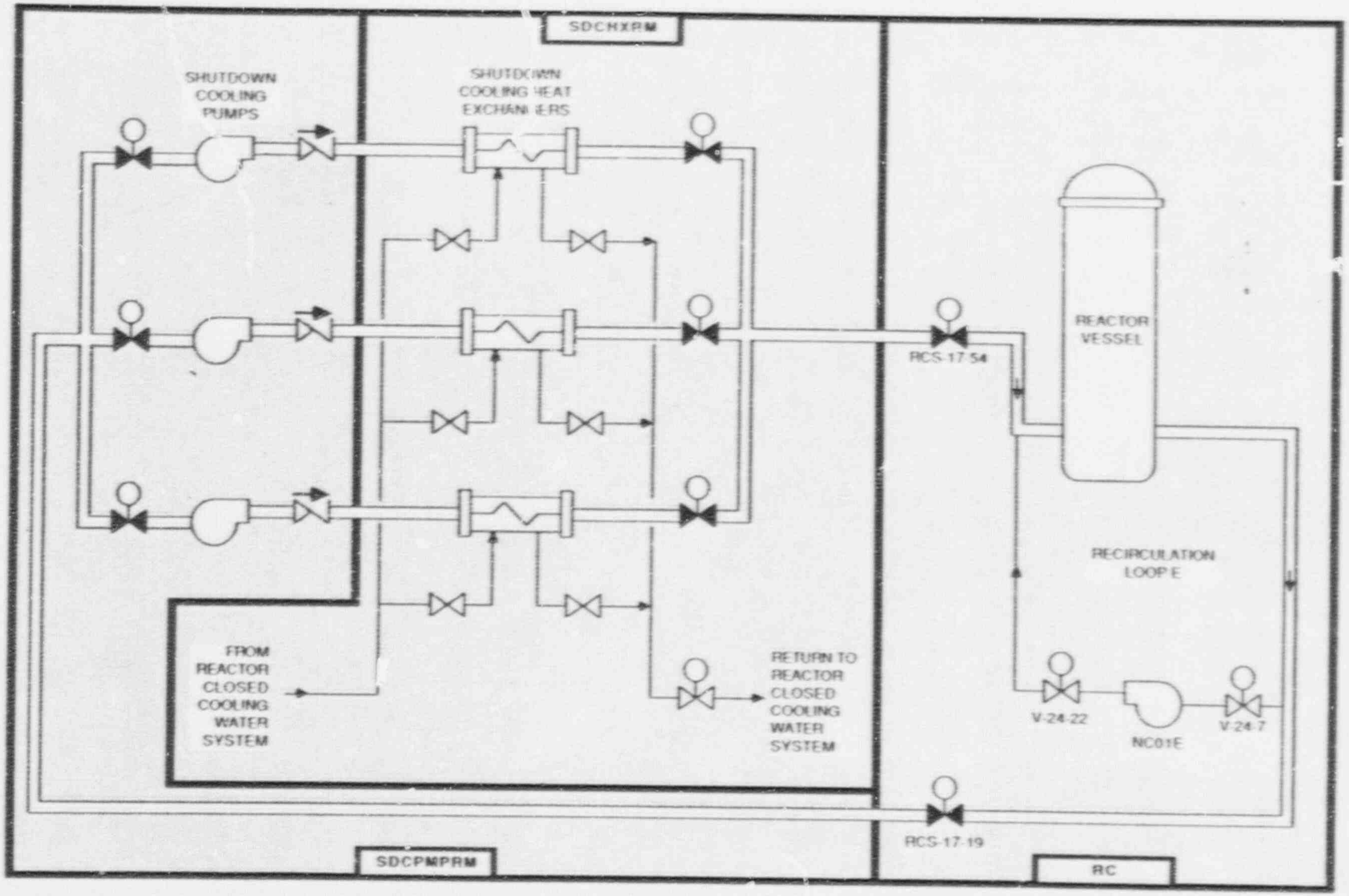


Figure 3.10-2. Oyster Creek Reactor Shutdown Cooling System Showing Component Locations

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The Oyster Creek nuclear power plant is located on a site of approximately 800 acres near the Atlantic Ocean within the State of New Jersey. The site is in Ocean County, about 2 miles inland from the shore of Barnegat Bay. The site is approximately 9 miles south of Toms River, N.J., about 50 miles east of Philadelphia, PA, and 60 miles south of Newark, N.J.. Figure 4-1 is a general view of the plant and vicinity (from Ref 1).

The major structures at this unit include the reactor building, turbine building, office building, maintenance building, and materials warehouse. A site plot plan is shown in Figure 4-2.

The primary containment consists of two large chambers, the drywell and the torus. The drywell houses the reactor vessel, the reactor coolant recirculating loops, and other components associated with the reactor system. It is a 70 ft diameter spherical steel shell with a 33 ft. by 23 ft. high cylindrical steel shell extending from the top. The torus is a steel shell, located below and around the base of the drywell. It has a major diameter of 101 ft., a chamber diameter of 30 ft. and is filled to approximately 12 ft. depth with water. The two chambers are interconnected through ten vents, 6.5 ft. in diameter, equally spaced around the circumference of the torus. An elevation drawing of the Oyster Creek reactor building is shown in Figure 4-3.

The turbine building is a reinforced concrete structure which houses the power conversion equipment, related auxiliary systems, the plant control room and electrical equipment.

4.2 FACILITY LAYOUT DRAWINGS

Figures 4-4 through 4-11 are simplified building layout drawings for the Oyster Creek reactor building. The turbine and office building layouts are shown in Figures 4-12 to 4-16. The intake structure is shown in Figure 4-17. The freshwaster pumphouse is shown in Figure 4-18, and the diesel generator building is shown in Figure 4-19. 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 1, Oak Ridge National Laboratory, Nuclear Safety Information Center, December 1973.

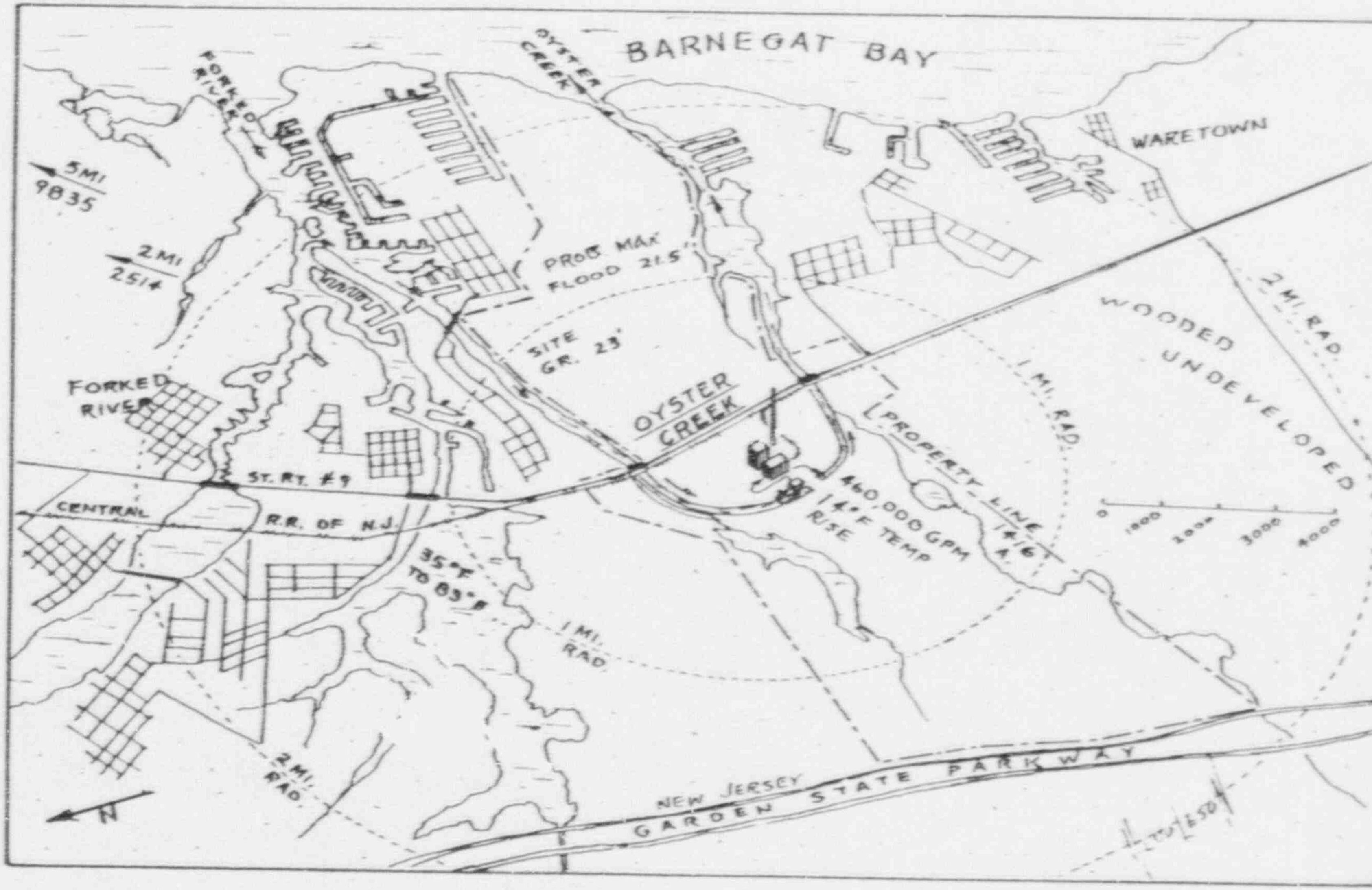


Figure 4-1. General View of Oyster Creek Nuclear Power Plant and Vicinity.

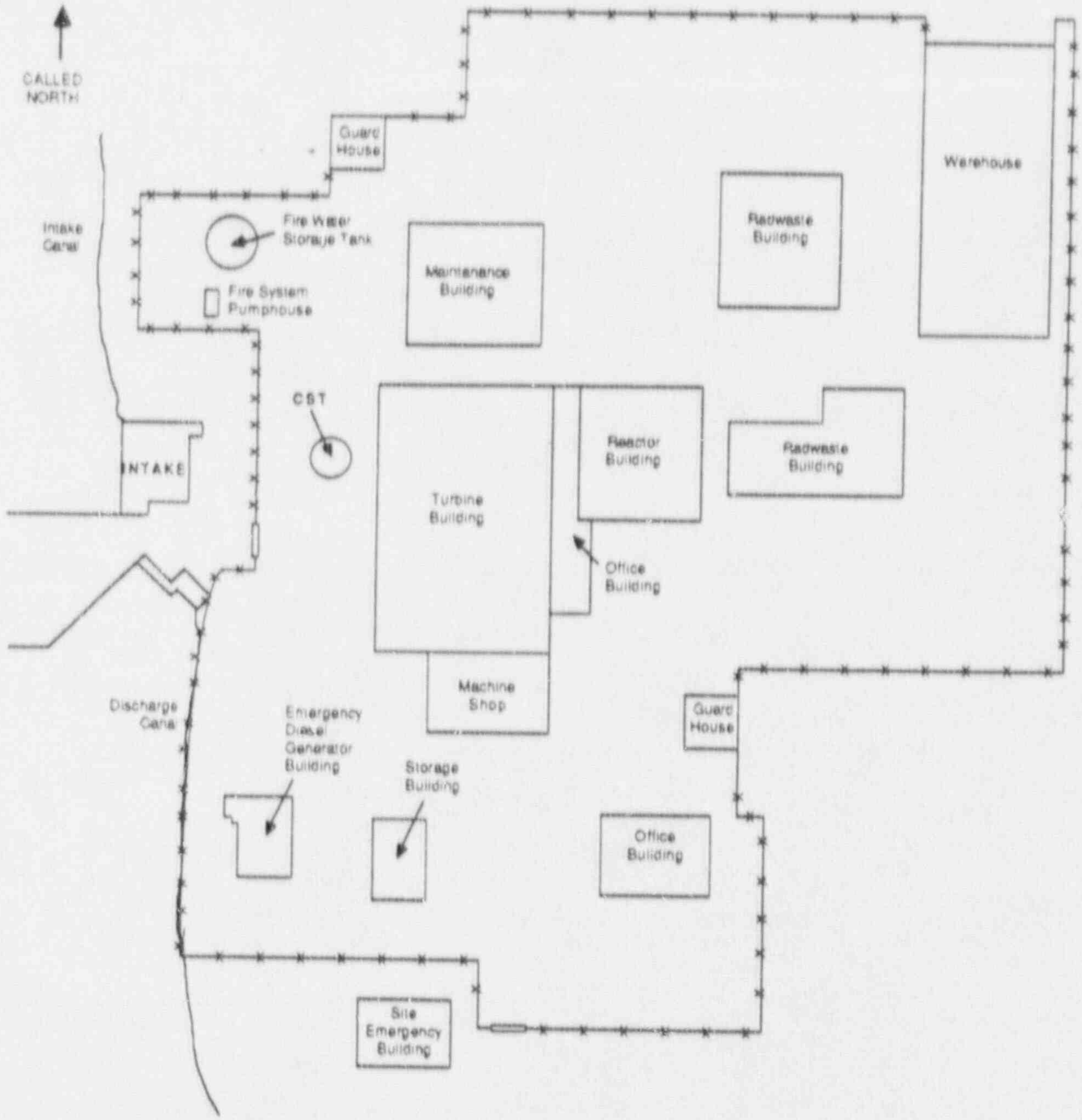


Figure 4-2. Oyster Creek General Site Plan

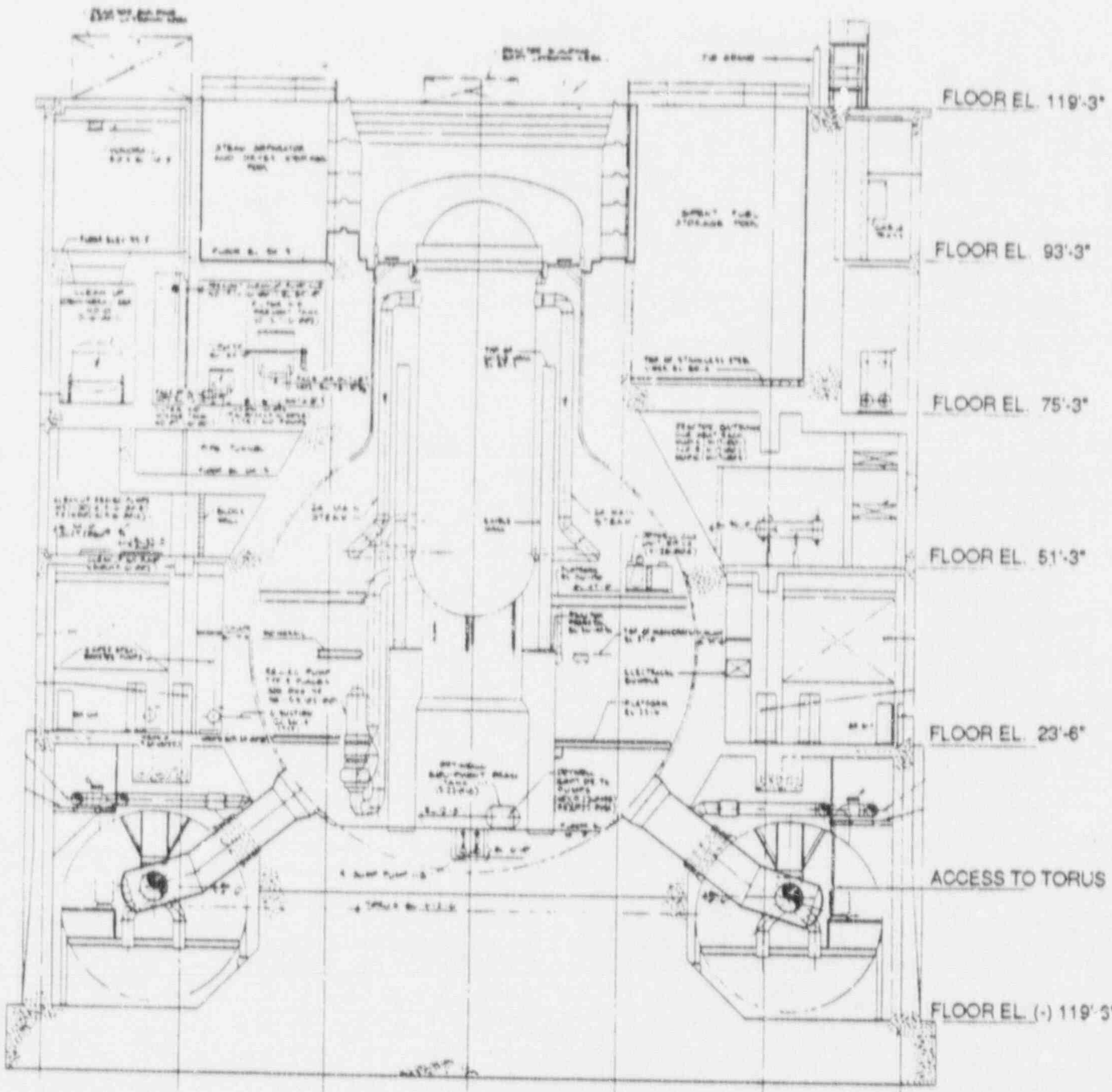


Figure 4-3. Oyster Creek Reactor Building Elevation Drawing.

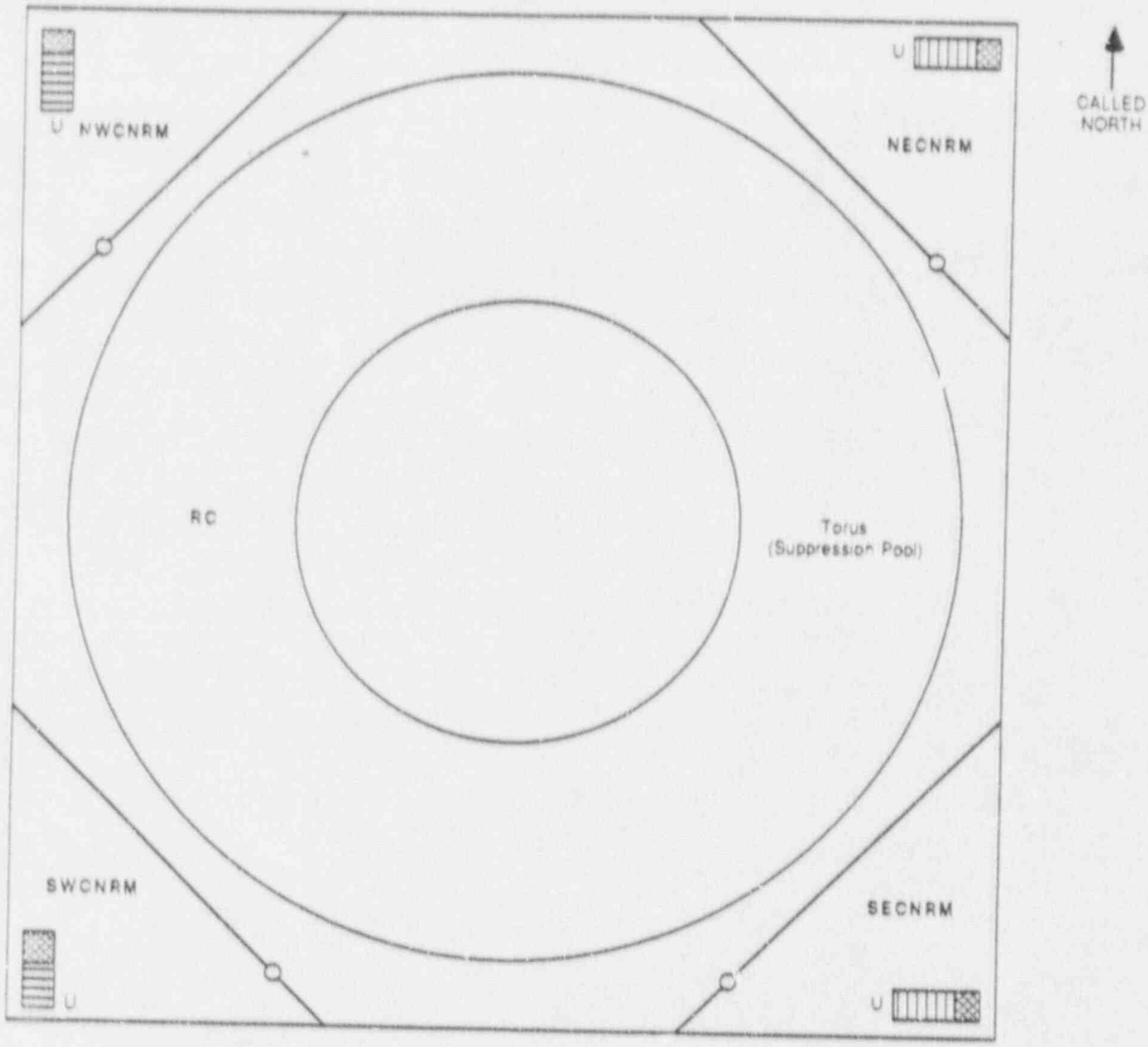


Figure 4-4. Oyster Creek Reactor Building - Elevation (-) 19'-6"

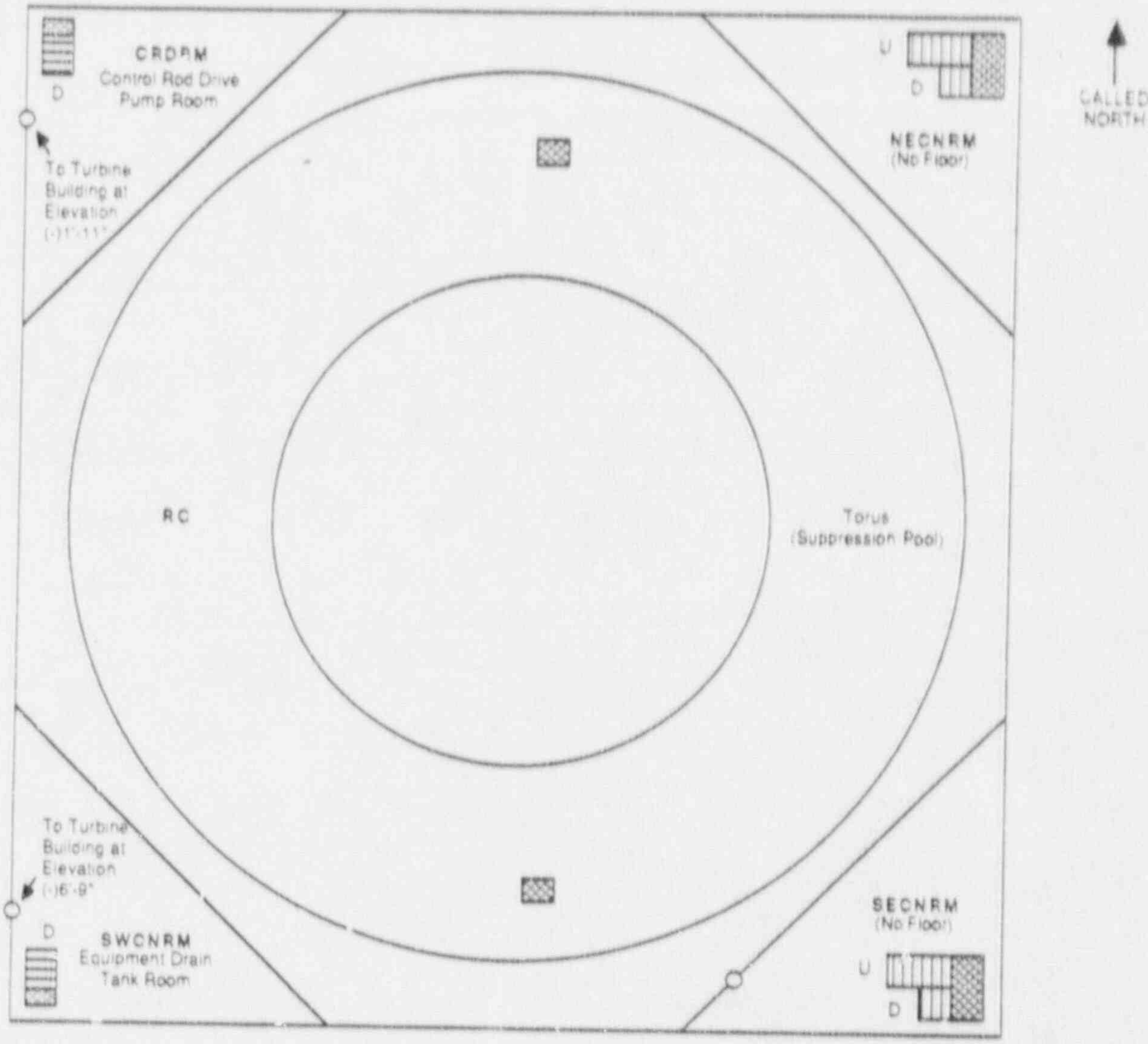


Figure 4-5. Oyster Creek Reactor Building - Elevation (-) 6'-5" and (-) 1'-11"

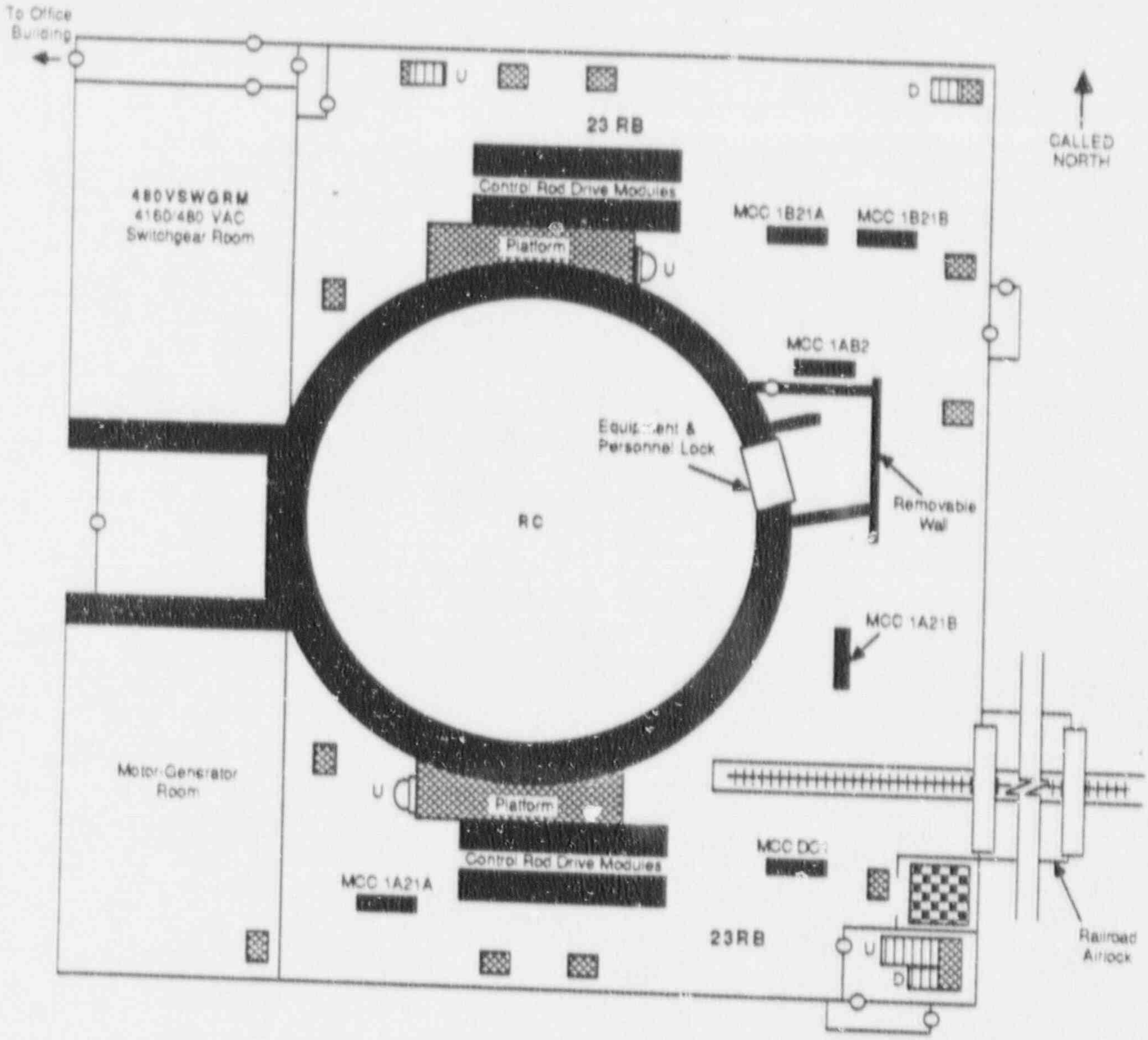


Figure 4-6. Oyster Creek Reactor Building - Elevation 23'-6"

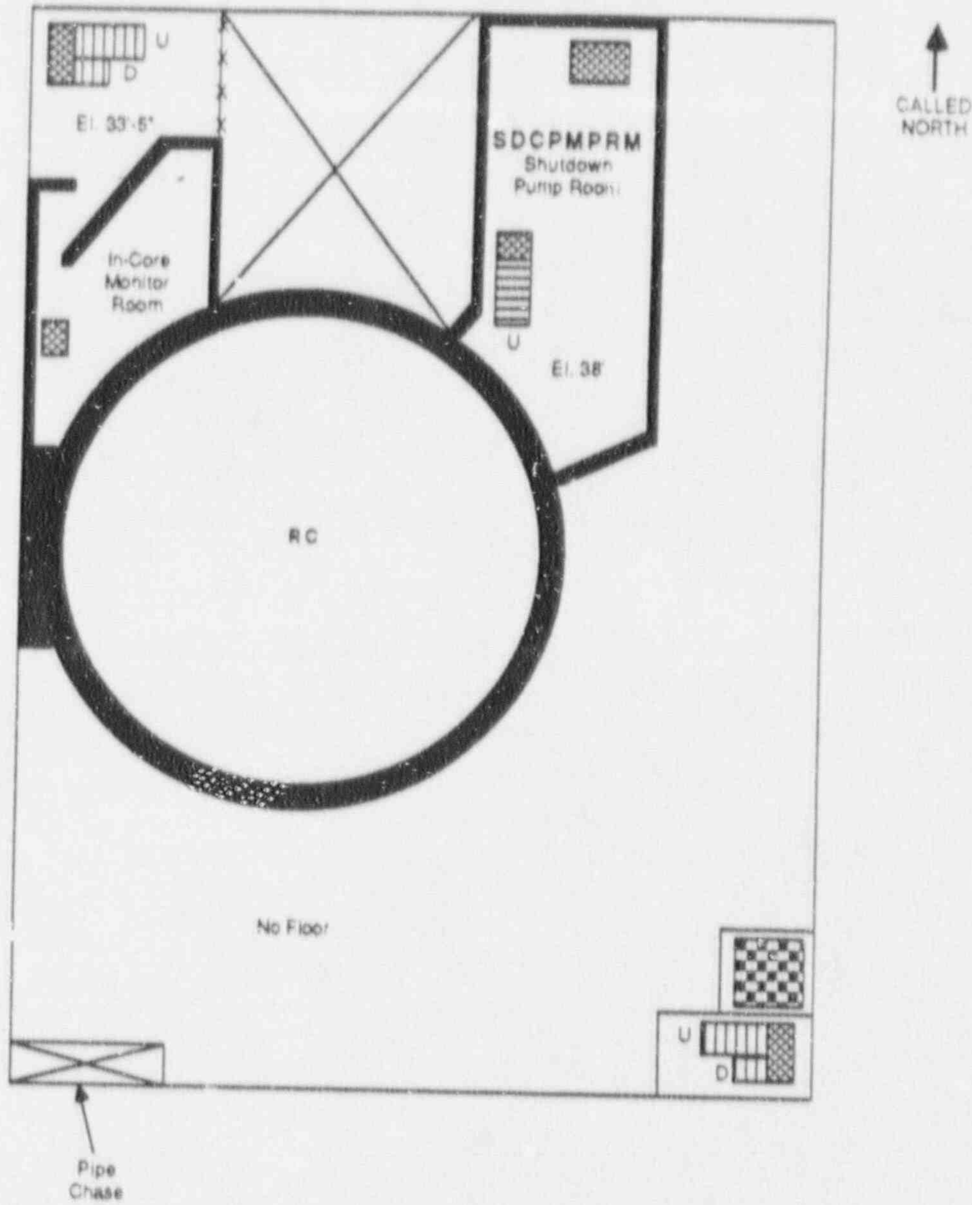


Figure 4-7. Oyster Creek Reactor Building - Elevations 33'-5" to 38'-0"

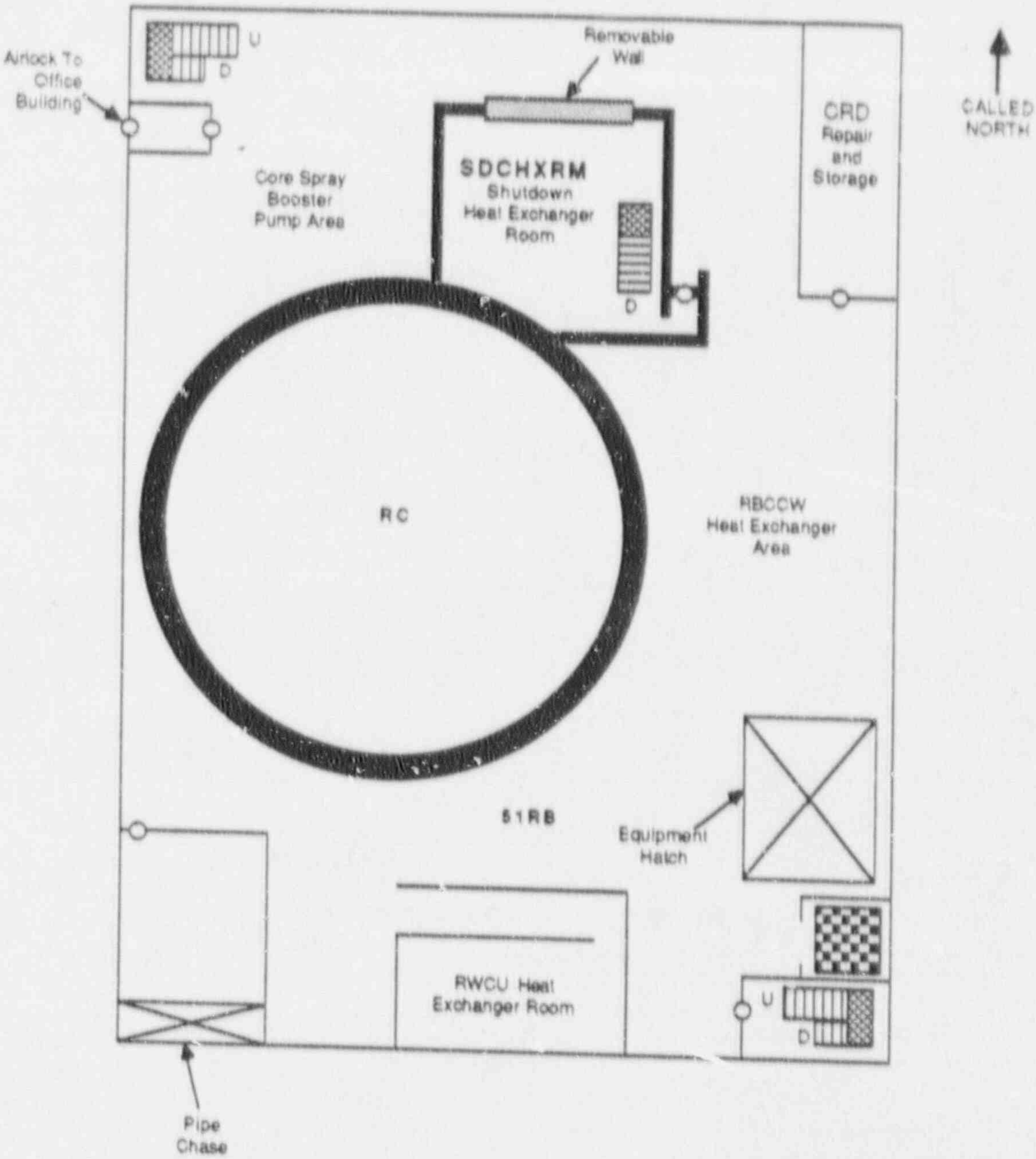


Figure 4-8. Oyster Creek Reactor Building - Elevation 51'-3"

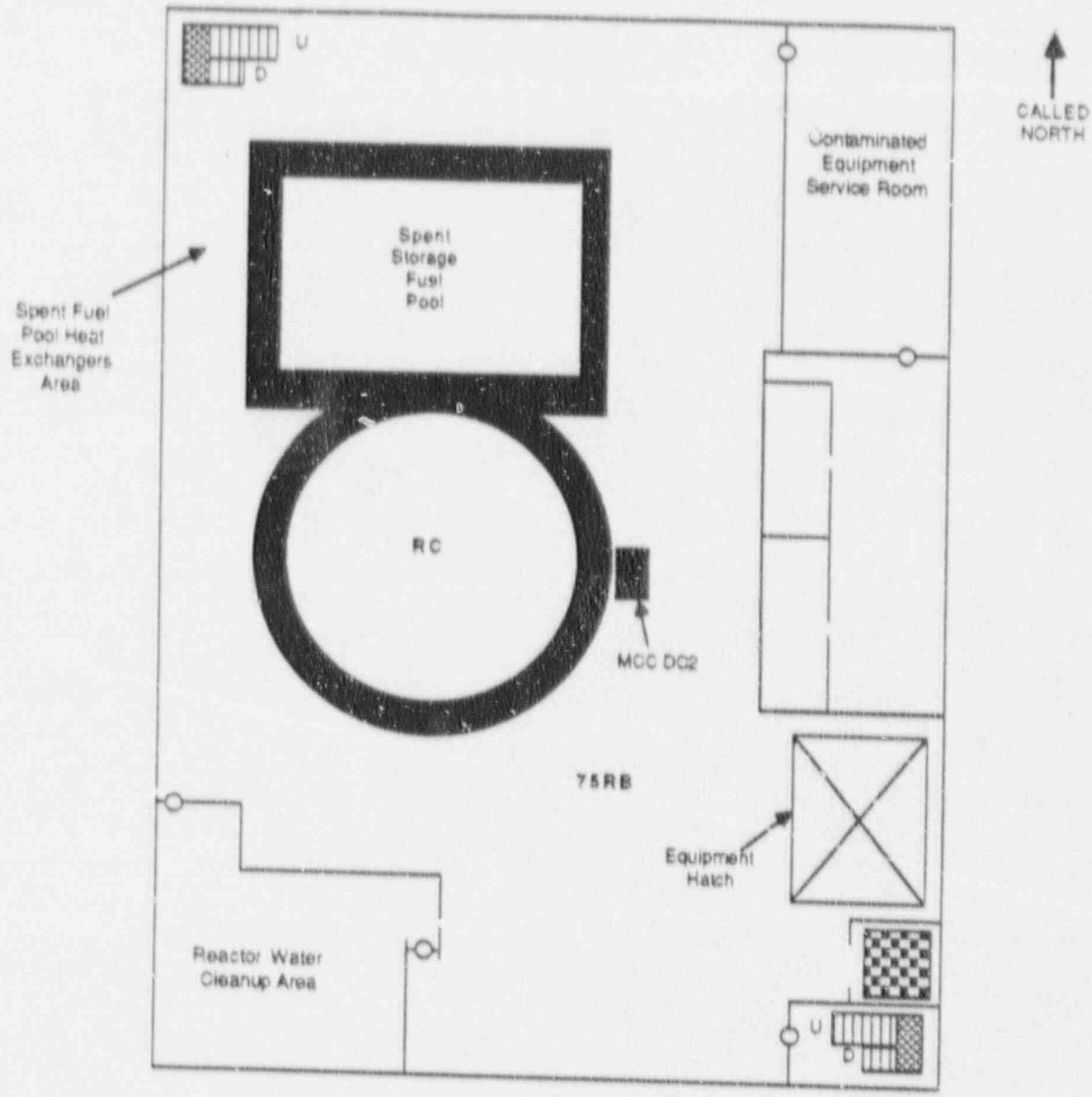


Figure 4-9. Oyster Creek Reactor Building - Elevation 75'-3"

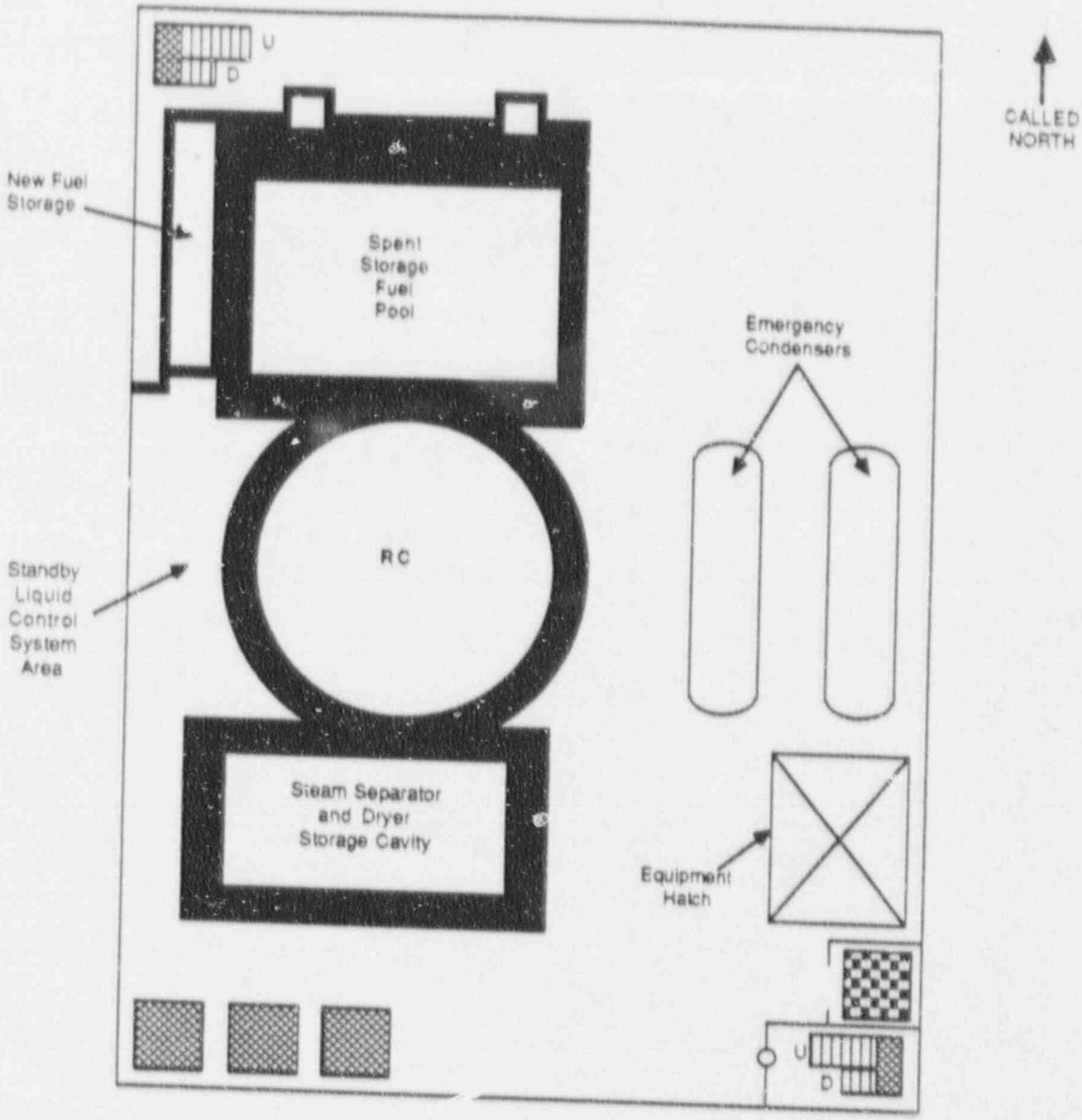


Figure 4-10. Oyster Creek Reactor Building - Elevation 95'-3"

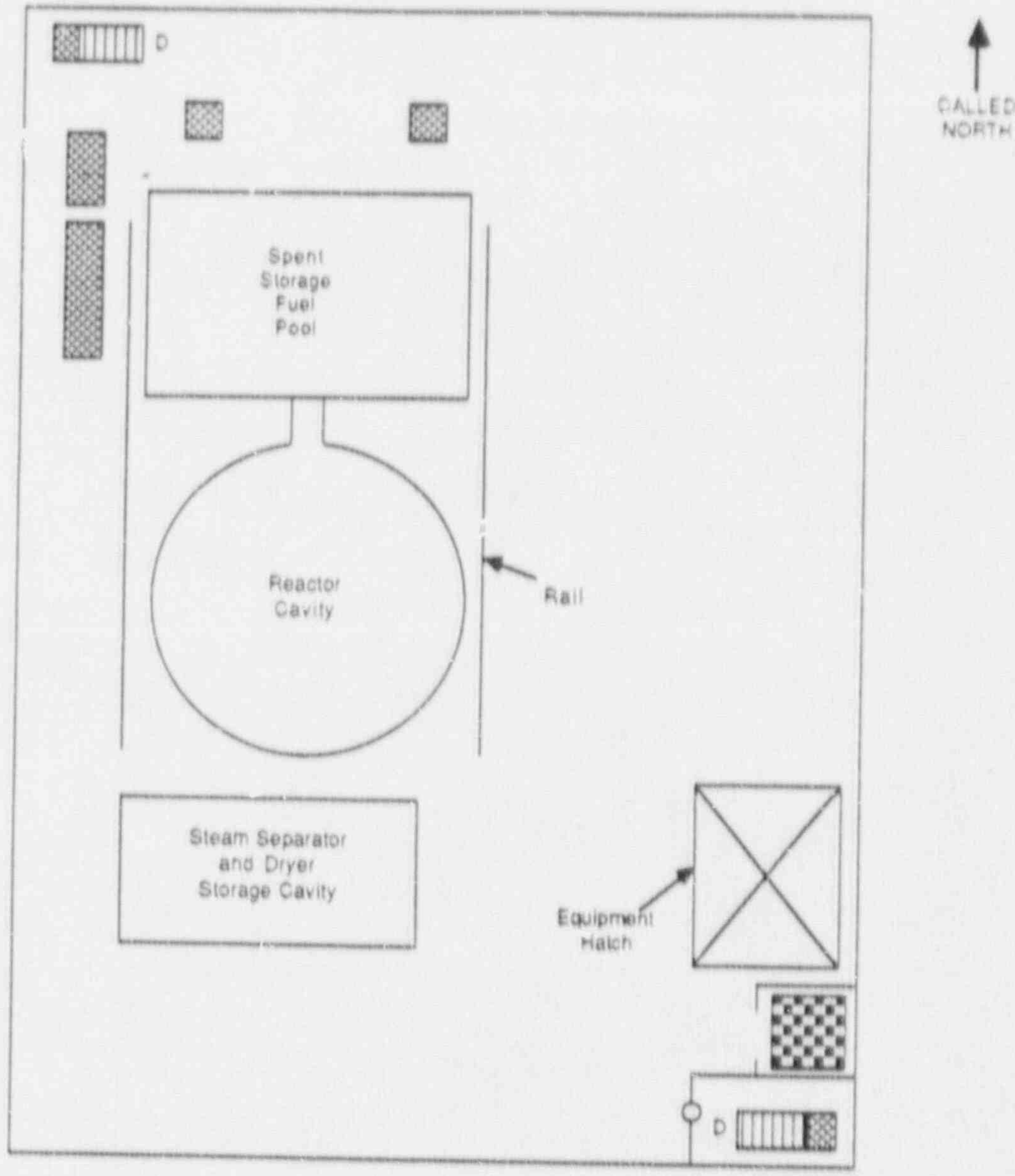
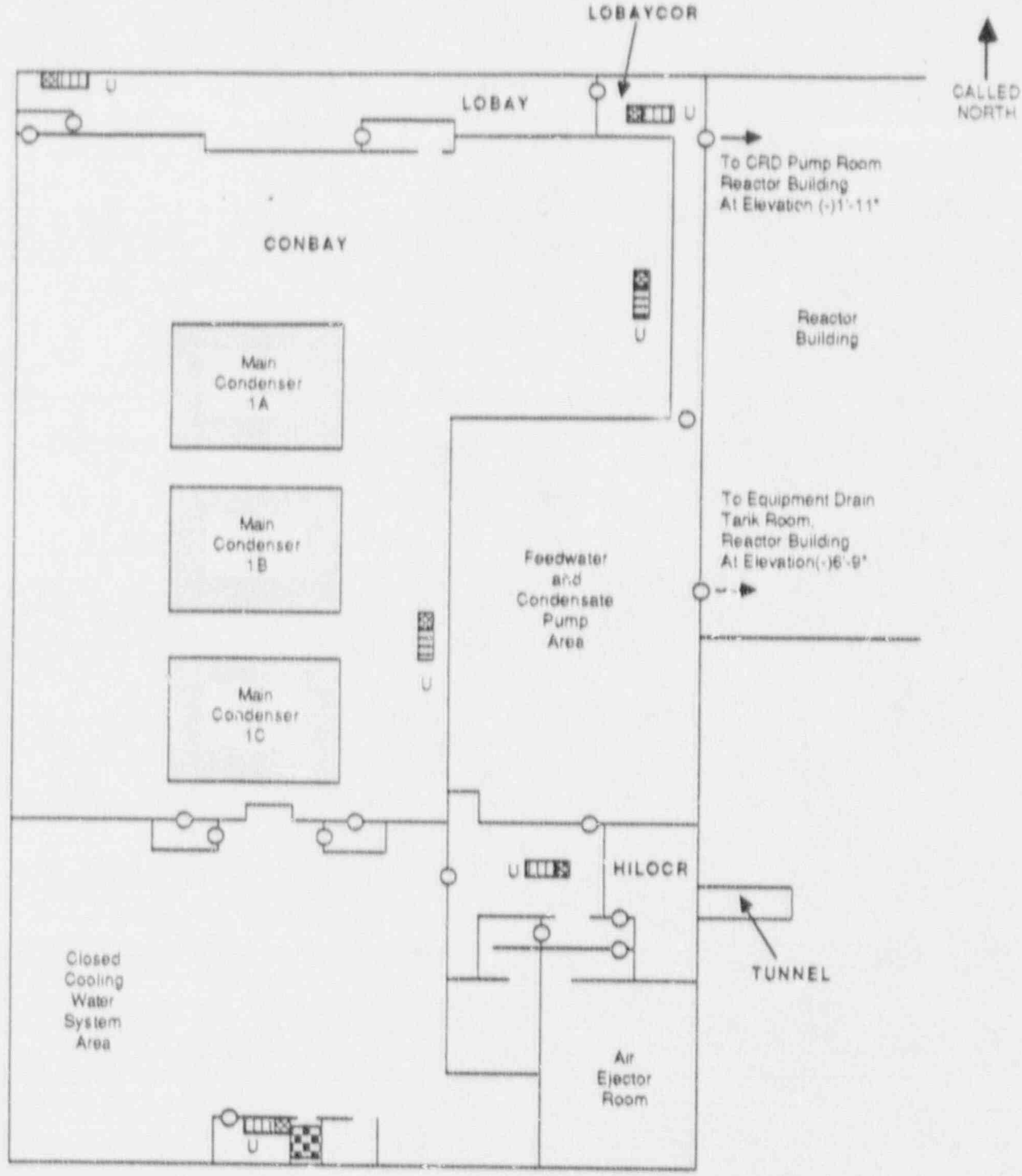
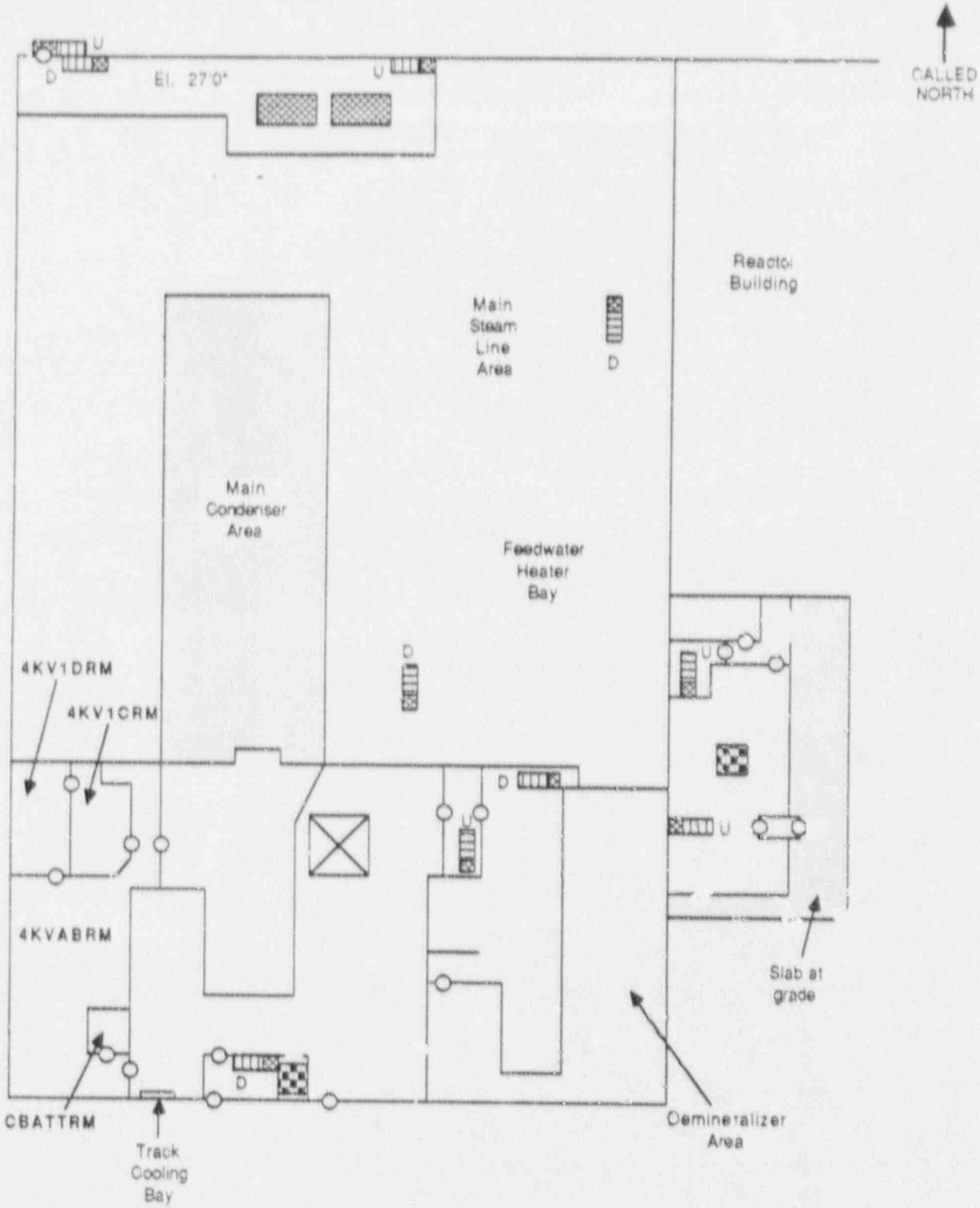


Figure 4-11. Oyster Creek Reactor Building - Elevation 119'-3"



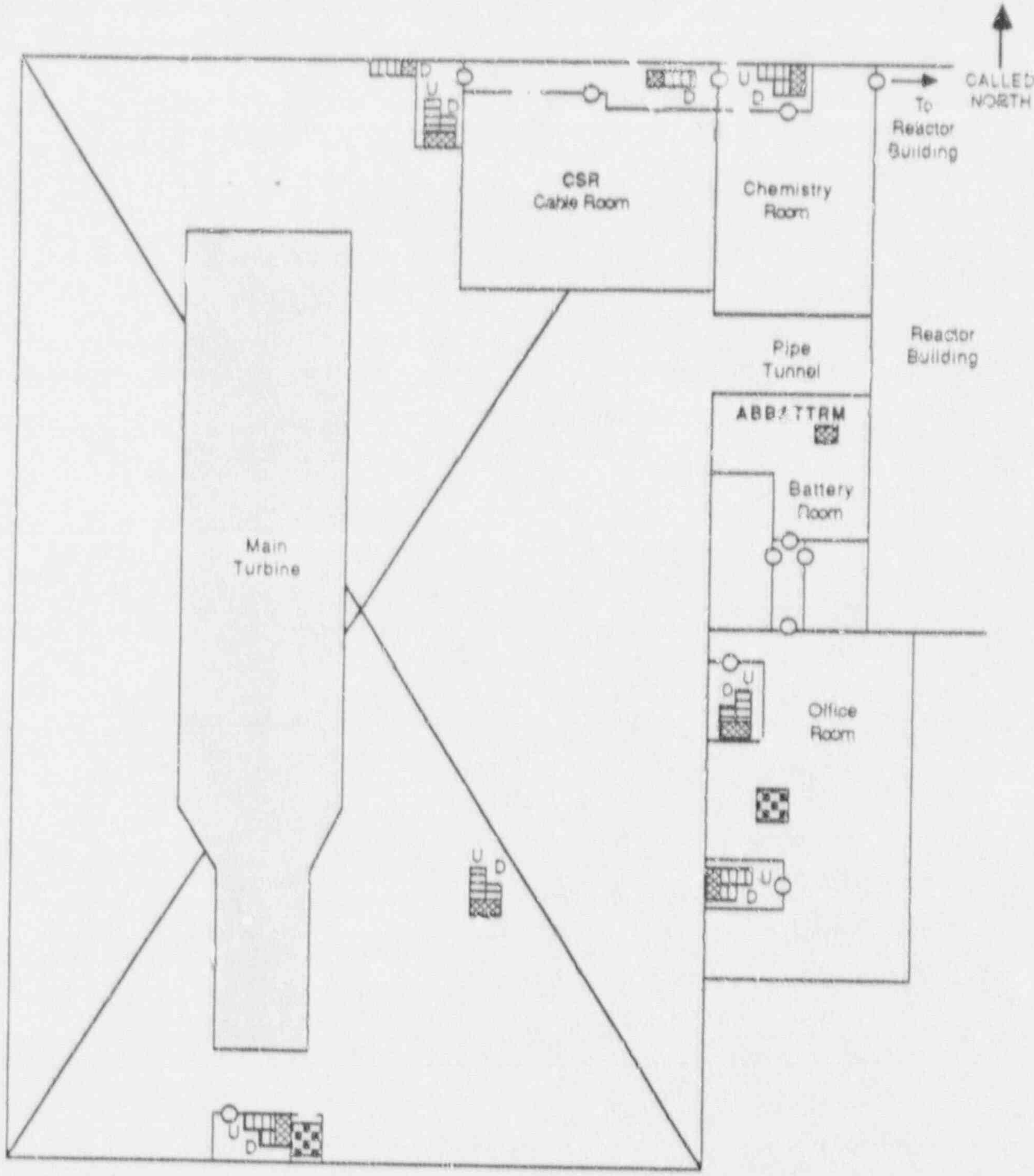
Note: Drawing scale is different than for reactor building drawings

Figure 4-12. Oyster Creek Turbine Building - Elevation 0'-0" and 3'-6"



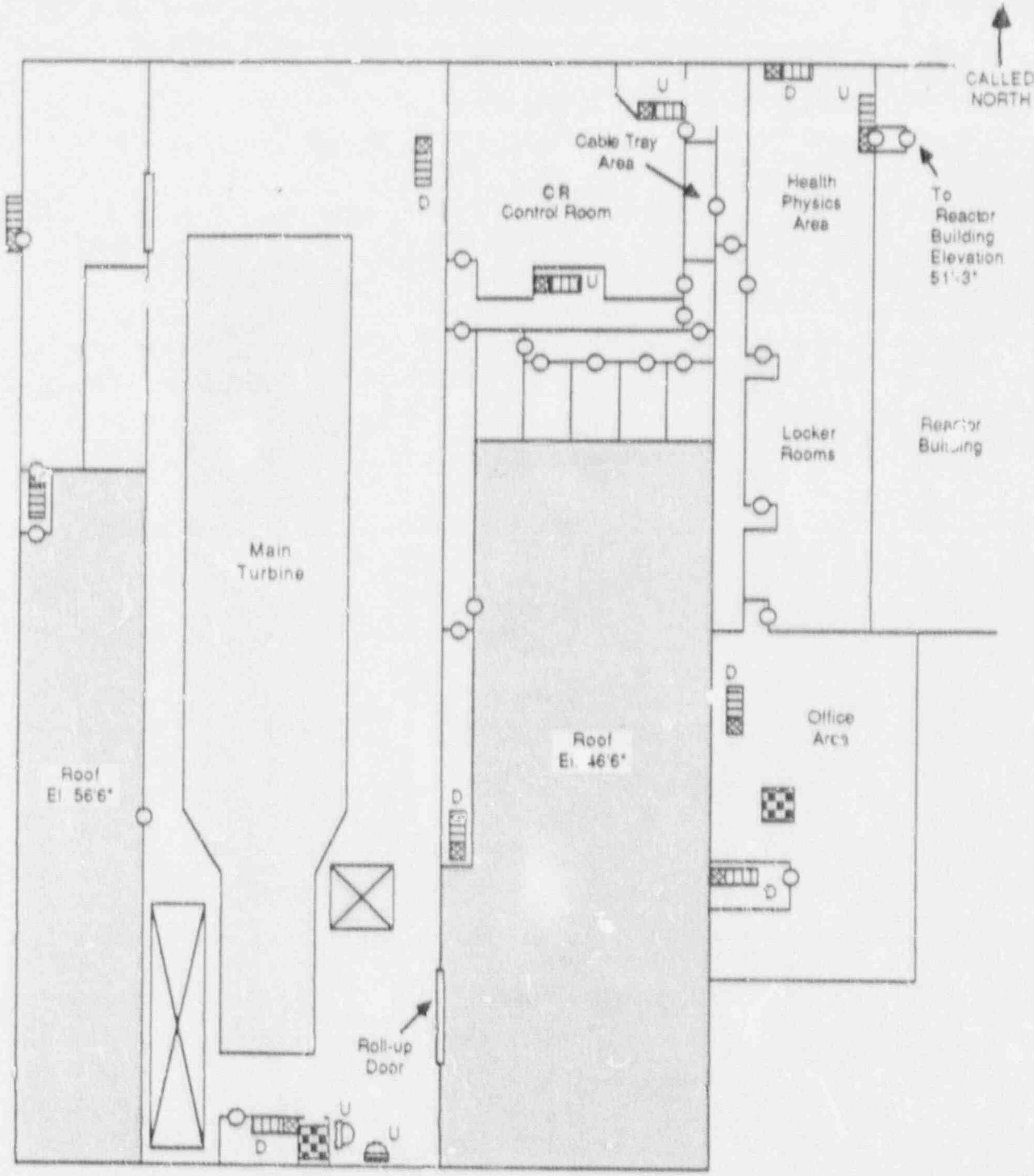
Note: Drawing scale is different than for reactor building drawings

Figure 4-13. Oyster Creek Turbine and Office Buildings - Elevations 23'-6" to 27'0"



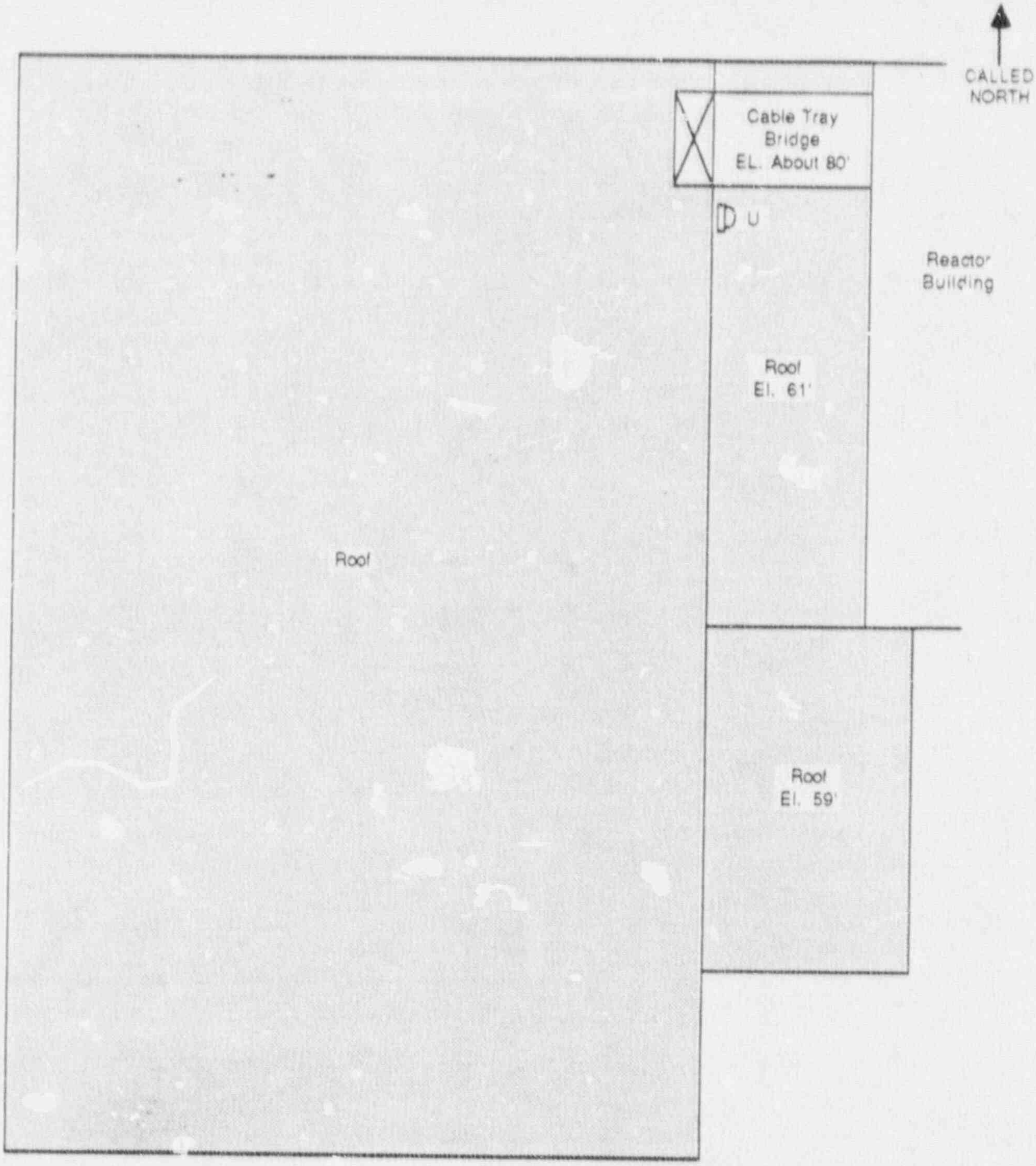
Note: Drawing scale is different than for reactor building drawings

Figure 4-14. Oyster Creek Turbine and Office Buildings - Elevation 35'-0"



Note: Drawing scale is different than for reactor building drawings

Figure 4-15. Oyster Creek Turbine and Office Buildings - Elevation 46'-6"



Note: Drawing scale is different than for reactor building drawings

Figure 4-16. Oyster Creek Turbine and Office Buildings - Roof Elevations

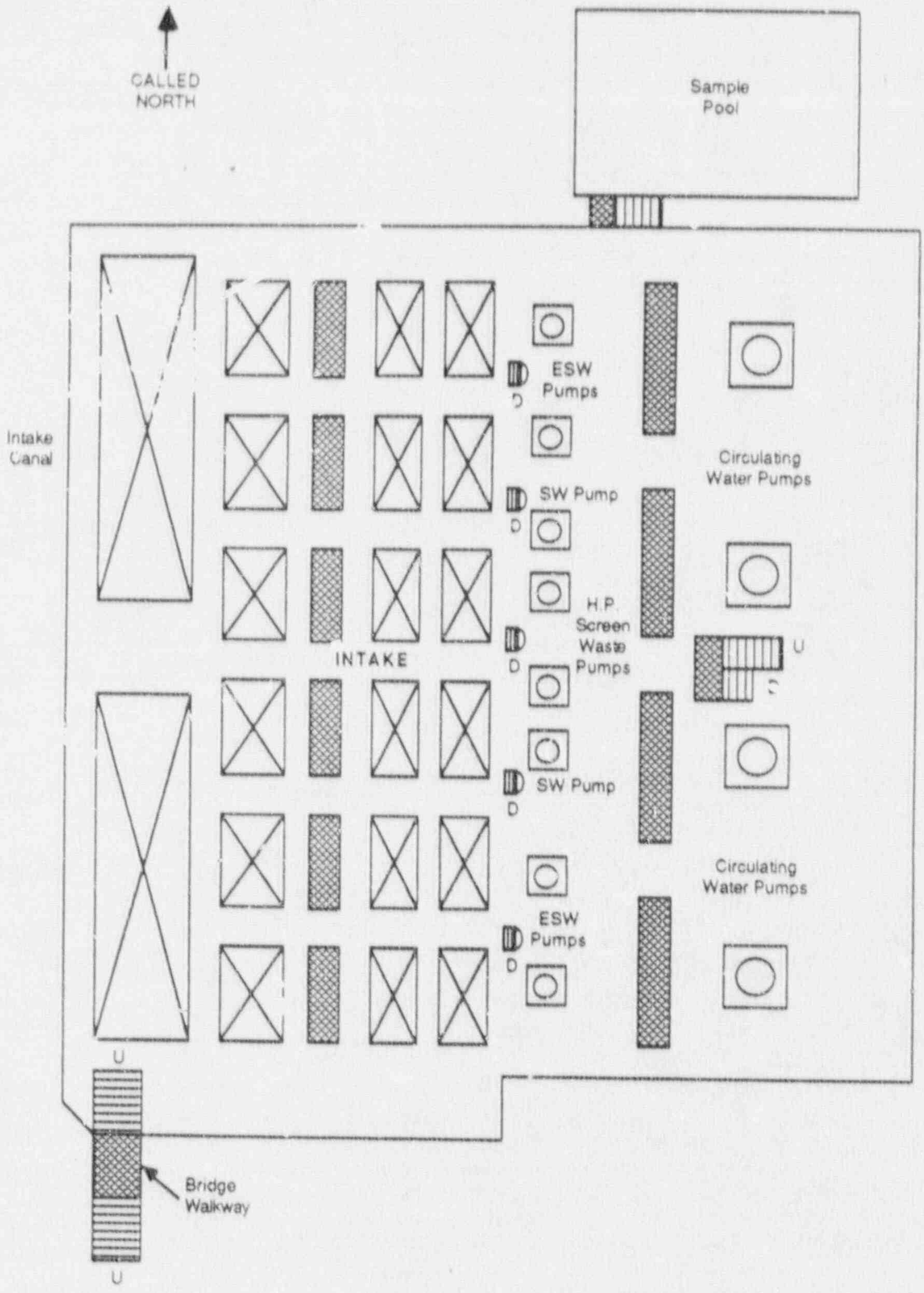


Figure 4-17. Oyster Creek Intake Structure, Elevation 6'0"

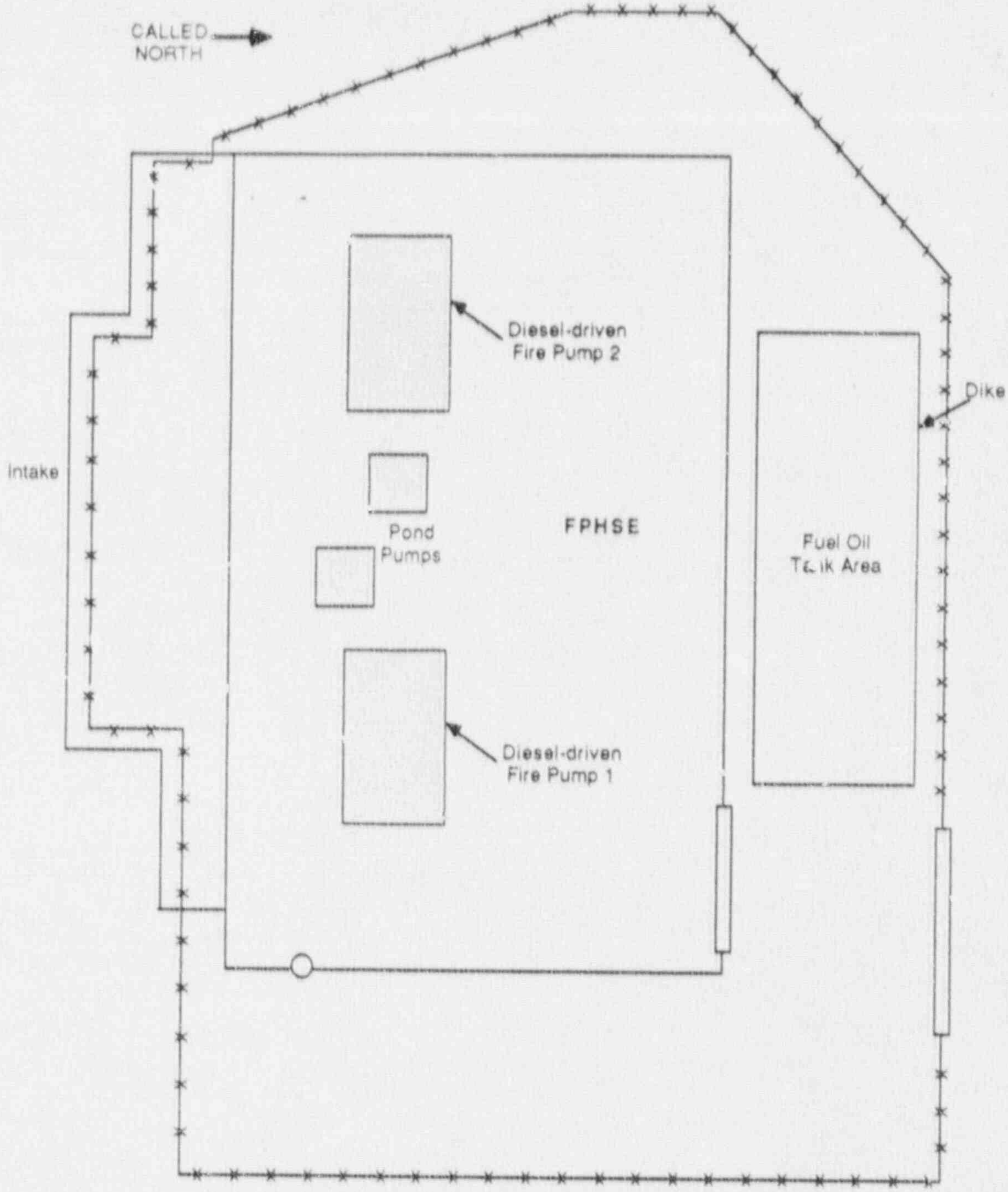


Figure 4-18. Oyster Creek Freshwater Pump House, Elevation 23'0"

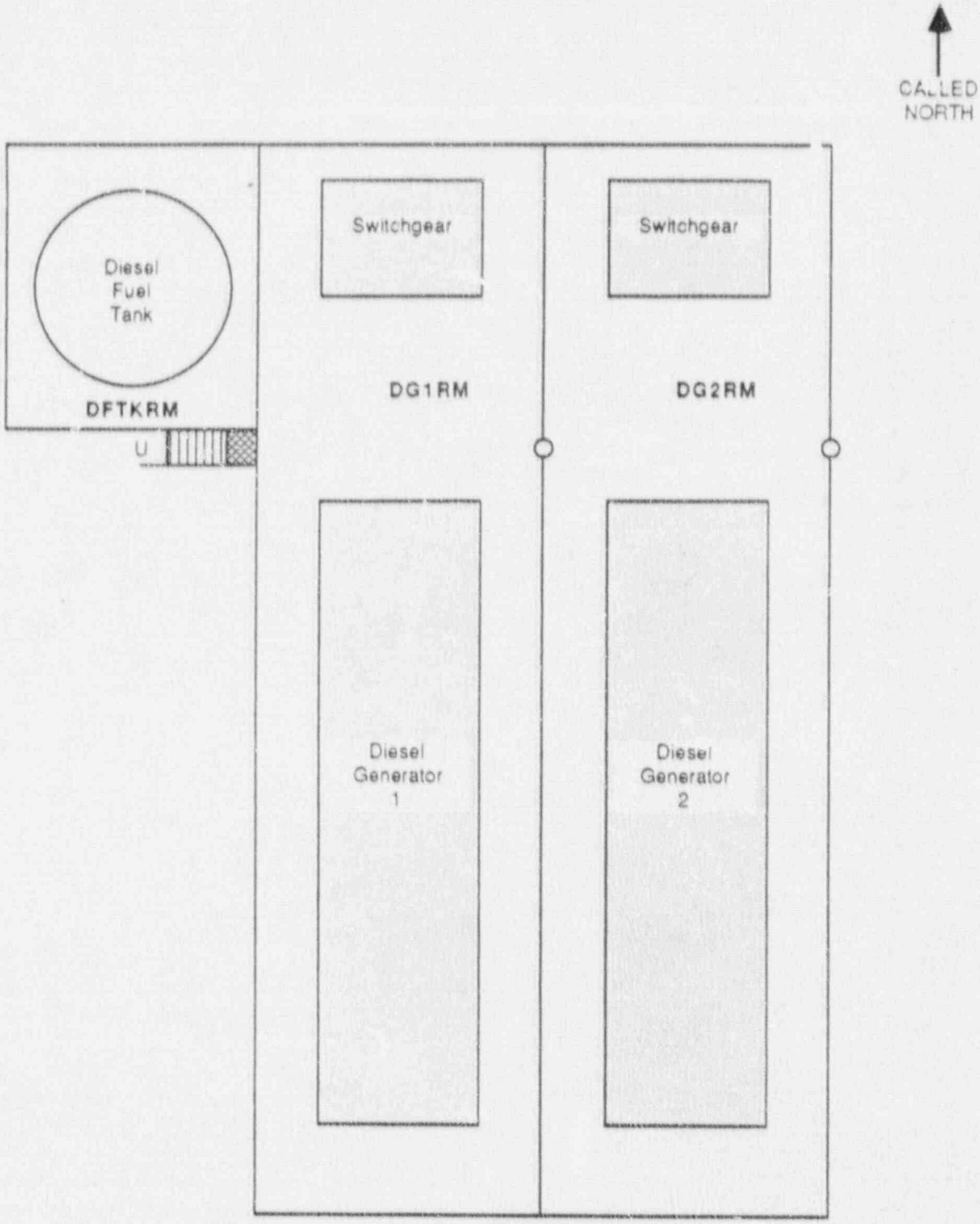


Figure 4-19. Oyster Creek Emergency Diesel Generator Building, Elevation 23'0"

Table 4-1. Definition of Oyster Creek Building and Location Codes

Codes	Descriptions
1. 1A21A	Motor Control Center #1A21A, located on the 23' elevation of the Reactor Building - northeast corner
2. 1A21B	Motor Control Center #1A21B, located on the 23' elevation of the Reactor Building - northeast corner
3. 1AB2	Motor Control Center #1AB2, located on the 23' elevation of the Reactor Building - south side
4. 1B21A	Motor Control Center #1AB2A, located on the 23' elevation of the Reactor Building - northeast corner
5. 1B21B	Motor Control Center #1B2B, located on the 23' elevation of the Reactor Building
6. 4KV1CRM	4160V Switchgear Room #1C, located on the 23' elevation of the Turbine Building
7. 4KV1DRM	4160V Switchgear Room #1D, located on the 23' elevation of the Turbine Building
8. 4KVABRM	4160V Switchgear Room #1AB, located on the 23' of the Turbine Building
9. 23RB	23' elevation of the Reactor Building
10. 51RB	51' elevation of the Reactor Building
11. 75RB	75' elevation of the Reactor Building
12. 95RB	95' elevation of the Reactor Building
13. 480VSWGRM	480V Switchgear Room, located on the 23' elevation of the Reactor Building - northwest corner
14. AABATRM	Battery Room #AB, located on the 35' elevation of the Office Building
15. CBATTRM	Battery Room #C, located on the 23' elevation of the Turbine Building - southwest corner
16. CONBAY	Condenser Bay, located on the 0' elevation of the Turbine Building
17. CR	Control Room, located on the 46' elevation of the Turbine Building - northwest corner

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

Codes	Descriptions
18. CRDRM	Control Rod Drive Water Pump Room, located on the -1' elevation of the Reactor Building - northwest corner
19. CSR	Cable Spreading Room, located on the 36' elevation of the Turbine Building - northwest corner
20. CST	Condensate Storage Tank, located outside in Yard
21. DC1	DC Motor Control Center #DC1, located on the 23' elevation of the Reactor Building - southwest corner
22. DC2	DC Motor Control Center #DC2, located on the 75' elevation of the Reactor Building
23. DFTKRM	Diesel Generator Fuel Tank Room, located in the Emergency Diesel Generator Building
24. DG1RM	Diesel Generator Room #1, located in the Emergency Diesel Generator Building
25. DG2RM	Diesel Generator Room #2, located in the Emergency Diesel Generator Building
26. HILOCR	High/Low Conductivity Room, located on the 0' elevation of the Turbine Building - east side
27. INTAKE	Emergency Service Water Intake Structure, located next to the Intake Canal
28. LOBAY	Lubrication Oil Bay, located on the 0' elevation of the Turbine Building - north side
29. LOBAYCOR	Lubrication Oil Bay Corridor, located on the 3' elevation of the Turbine Building - east side
30. NECNRM	Northeast Corner Room, located on the -19' elevation of the Reactor Building
31. NWCNRM	Northwest Corner Room, located on the -19' elevation of the Reactor Building
32. RC	Reactor Containment, includes both drywell and torus
33. SDCHXRM	Shutdown Cooling Heat Exchanger Room, the 51'3" elevation of the Reactor Building

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

Codes	Descriptions
34. SDCPMPRM	Shutdown Cooling Pump Room, on the 38' elevation of the Reactor Building
35. SECNRM	Southeast Corner Room, located on the -19' elevation of the Reactor Building
36. SWCNRM	Southwest Corner Room, located on the -19' elevation of the Reactor Building
37. TUNNEL	Pipe Tunnel, extends between the Turbine Building and Reactor Building - contains emergency service water system piping

Table 4-2. Partial Listing of Components by Location at Oyster Creek

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
23RB	CNS	CNS-H50A	HX
23RB	CNS	CNS-21-5	MOV
23RB	CNS	CNS-21-13	MOV
23RB	CNS	CNS-H50C	HX
23RB	CNS	CNS-H50A	HX
23RB	CNS	CNS-H50B	HX
23RB	CNS	CNS-H50C	HX
23RB	CNS	CNS-H50D	HX
23RB	CNS	CNS-H50B	HX
23RB	CNS	CNS-H50D	HX
23RB	ECCS	CRS-3B	MDP
23RB	ECCS	CRS-3D	MDP
23RB	EP	MCC DC-1	MCC
23RB	EP	MCC 1A21A	MCC
23RB	EP	MCC 1A21B	MCC
23RB	EP	MCC 1B21A	MCC
23RB	EP	MCC 1B21B	MCC
23RB	EP	MCC 1AB2	MCC
23RB	ESW	ESW-3-88	MOV
23RB	ESW	ESW-3-87	MOV
480VSWGRM	EP	BUS 1B2	BUS
480VSWGRM	EP	TR-1D1B2	XFMR
480VSWGRM	EP	BUS 1A2	BUS
480VSWGRM	EP	TR-1C1A2	XFMR
480VSWGRM	EP	MCC 1B2	MCC
480VSWGRM	EP	MCC 1A2	MCC
480VSWGRM	EP	MCC 1A21	MCC
480VSWGRM	EP	MCC 1B21	MCC
480VSWGRM	EP	CONTINSTPNL3	BUS
480VSWGRM	EP	INSTPNL4A	BUS

Table 4-2. Partial Listing of Components by Location at Oyster Creek (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
480VSWGRM	EP	INSTPNL4B	BUS
480VSWGRM	EP	INSTPNL4C	BUS
480VSWGRM	EP	INSTPNL4	BUS
480VSWGRM	EP	VACP-1	BUS
4KV1CRM	EP	BUS 1C	BUS
4KV1DRM	EP	BUS 1D	BUS
4KVABRM	EP	PANEL C	BUS
4KVABRM	EP	BC-C1	BC
4KVABRM	EP	PANEL C	BUS
4KVABRM	EP	PANEL C	BUS
4KVABRM	EP	BC-C2	BC
51RB	CNS	CNS-21-11	MOV
51RB	CNS	CNS-21-17	MOV
51RB	ECCS	CRS-20-12	MOV
51RB	ECCS	CRS-20-40	MOV
51RB	ECCS	CRS-20-15	MOV
51RB	ECCS	CRS-3A	MDP
51RB	ECCS	CRS-3C	MDP
51RB	ECCS	CRS-20-27	MOV
51RB	ECCS	CRS-20-26	MOV
75RB	ECCS	CRS-20-18	MOV
75RB	ECCS	CRS-20-41	MOV
75RB	ECCS	CRS-20-21	MOV
75RB	EP	MCC DC-2	MCC
75RB	XC	EC-14-30	MOV
75RB	XC	EC-14-31	MOV
75RB	XC	EC-14-34	MOV
75RB	XC	EC-14-32	MOV
75RB	XC	EC-14-33	MOV
75RB	XC	EC-14-35	MOV

Table 4-2. Partial Listing of Components by Location at Oyster Creek (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
95RB	XC	EC-A	HX
95RB	XC	EC-B	HX
95RB	XC	EC-11-36	NV
95RB	XC	EC-11-34	NV
ABBATTRM	EP	PANEL B	BUS
ABBATTRM	EP	BATT B	BATT
ABBATTRM	EP	BC-B	BC
ABBATTRM	EP	PANEL B	BUS
ABBATTRM	EP	PANEL B	BUS
ABBATTRM	EP	PANEL D	BUS
ABBATTRM	EP	PANEL A	BUS
ABBATTRM	EP	PANEL A	BUS
ABBATTRM	EP	BATT A	BATT
CBATTRM	EP	BATT C	BATT
CR	I & C	INSTPNLS	I & C
CRDRM	CRHS	CRHS-8A	MDP
CRDRM	CRHS	CRHS-8B	MDP
CSR	EP	PROTPNL1	BUS
CSR	EP	PROTPNL1	BUS
CSR	EP	PROTPNL2	BUS
CSR	EP	PROTPNL2	BUS
CST	CRHS	CST	TK
DG1RM	EP	CB1C	CB
DG1RM	EP	DG1	DG
DG1RM	EP	DG1BATT	BATT
DG1RM	EP	DG1BUS	BUS
DG2RM	EP	CB1D	CB
DG2RM	EP	DG2	DG
DG2RM	EP	DG2BATT	BATT
DG2RM	EP	DG2BUS	BUS

Table 4-2. Partial Listing of Components by Location at Oyster Creek (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
FPHSE	FS	FS-9-30	XV
FPHSE	FS	FS-9-31	XV
FPHSE	FS	FS-1	DDP
FPHSE	FS	FS-9-4	XV
FPHSE	FS	FSBUS1	BUS
FPHSE	FS	FSBATT1	BATT
FPHSE	FS	FS-2	DDP
FPHSE	FS	FS-9-5	XV
FPHSE	FS	FSBUS2	BUS
FPHSE	FS	FSBATT2	BATT
INTAKE	ESW	ESW-52A	MDP
INTAKE	ESW	ESW-52B	MDP
INTAKE	ESW	ESW-52C	MDP
INTAKE	ESW	ESW-52D	MDP
NECNRM	CNS	CNS-21-7	MOV
NECNRM	CNS	CNS-21-9	MOV
NECNRM	CNS	CNS-51A	MDP
NECNRM	CNS	CNS-51B	MDP
NWCNRM	ECCS	CRS-20-3	MOV
NWCNRM	ECCS	CRS-1A	MDP
NWCNRM	ECCS	CRS-20-32	MOV
NWCNRM	ECCS	CRS-1C	MDP
RC	CNS	RCS-RV	RV
RC	CNS	RCS-RV	RV
RC	CRHS	RCS-RV	RV
RC	ECCS	RCS-RV	RV
RC	ECCS	RCS-RV	RV
RC	ECCS	RCS-ADS	SRV
RC	ECCS	RCS-ADS	SRV
RC	RCS	RCS-SV	SRV

Table 4-2. Partial Listing of Components by Location at Oyster Creek (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RC	RCS	RCS-RV	RV
RC	RCS	RCS-17-54	MOV
RC	RCS	RCS-17-19	MOV
RC	RCS	RCS-16-1	MOV
RC	XC	EC-14-36	MOV
RC	XC	EC-14-37	MOV
SECNRM	CNS	CNS-21-3	MOV
SECNRM	CNS	CNS-21-1	MOV
SECNRM	CNS	CNS-51C	MDP
SECNRM	CNS	CNS-51D	MDP
SWCNRM	ECCS	CRS-20-4	MOV
SWCNRM	ECCS	CRS-1B	MDP
SWCNRM	ECCS	CRS-20-33	MOV
SWCNRM	ECCS	CRS-1D	MDP
UNKNOWN	EP	MG B	MG
UNKNOWN	EP	ATS DC-1	ATS
UNKNOWN	EP	ATS DC-D	ATS
UNKNOWN	EP	PANEL F	BUS
UNKNOWN	EP	ATS DC-1	ATS
UNKNOWN	EP	PANEL E	BUS
UNKNOWN	EP	ATS DC-E	ATS
UNKNOWN	EP	ATS DC-E	ATS
UNKNOWN	EP	ATS DC-D	ATS
UNKNOWN	EP	MG A	MG
UNKNOWN	EP	ATS MCC 1AB2	ATS
UNKNOWN	EP	ATS IT-3	ATS
UNKNOWN	EP	TR IT-3	XFMR
UNKNOWN	EP	MG 3	MG
UNKNOWN	EP	MG 3	MG
UNKNOWN	EP	ATS IT-4	ATS

Table 4-2. Partial Listing of Components by Location at Oyster Creek (continued)

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
UNKNOWN	EP	ATS IT-4	ATS
UNKNOWN	EP	TR IT-4A	XFMR
UNKNOWN	EP	TR IT-4B	XFMR
UNKNOWN	EP	MG 1	MG
UNKNOWN	EP	MG 2	MG
UNKNOWN	EP	TR PS-1	XFMR
UNKNOWN	EP	MTS PS-1	MTS
UNKNOWN	EP	MTS PS-1	MTS
UNKNOWN	EP	TR VACP-1	XFMR
UNKNOWN	EP	ATS VACP-1	ATS
UNKNOWN	EP	ATS VACP-1	ATS
UNKNOWN	EP	ATS MCC 1AB2	ATS
UNKNOWN	EP	ATS IT-3	ATS

5. BIBLIOGRAPHY FOR OYSTER CREEK

1. "Final Environmental Statement Related to Operation of Oyster Creek Nuclear Generating Station", USNRC Directorate of Licensing, December 1974.

2. NUREG-0822, "Integrated Plant Safety Assessment - Systematic Evaluation Program - Oyster Creek Nuclear Generating Station" USNRC, July 1988 (Supplement 1).

3. NUREG/CR-1015, "Analysis of Boring and Fouling Organisms in the Vicinity of the Oyster Creek Nuclear Generating Station", Lehigh University, 1979 (and earlier reports with the same title: NUREG/CR-0896 and NUREG/CR-0812).

4. NUREG/CR-3446, "Ecological Studies of Wood-boring Bivalves in the Vicinity of the Oyster Creek Nuclear Generating Station", Academy of Natural Sciences of Philadelphia, October 1983 (and earlier progress report NUREG/CR-2727).

5. PLG-0100, "Oyster Creek Probabilistic Safety Analysis", Pickard, Lowe and Garrick, Inc., August 1979 (draft).

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 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)

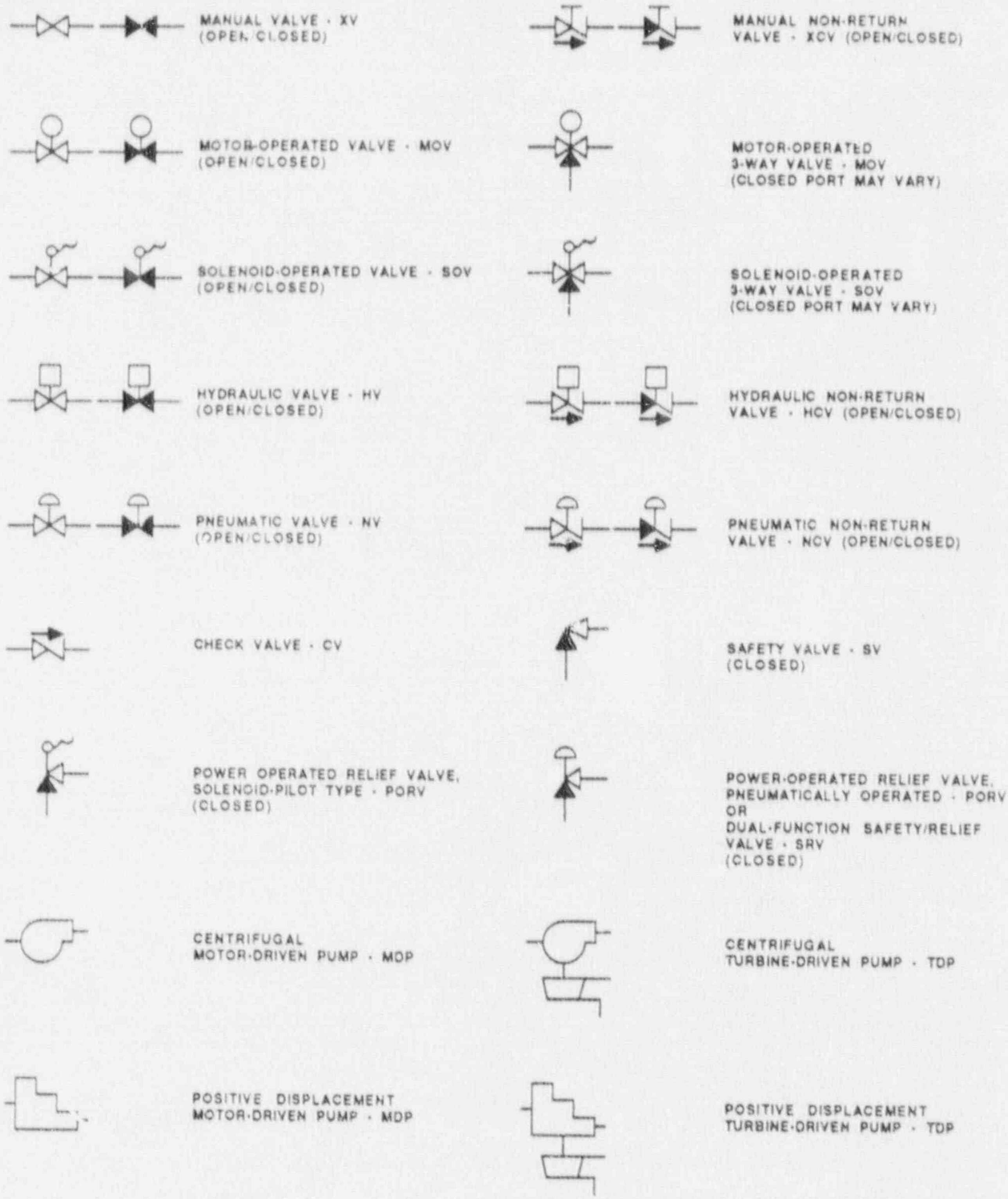


Figure A-1. Key To Symbols In Fluid System Drawings

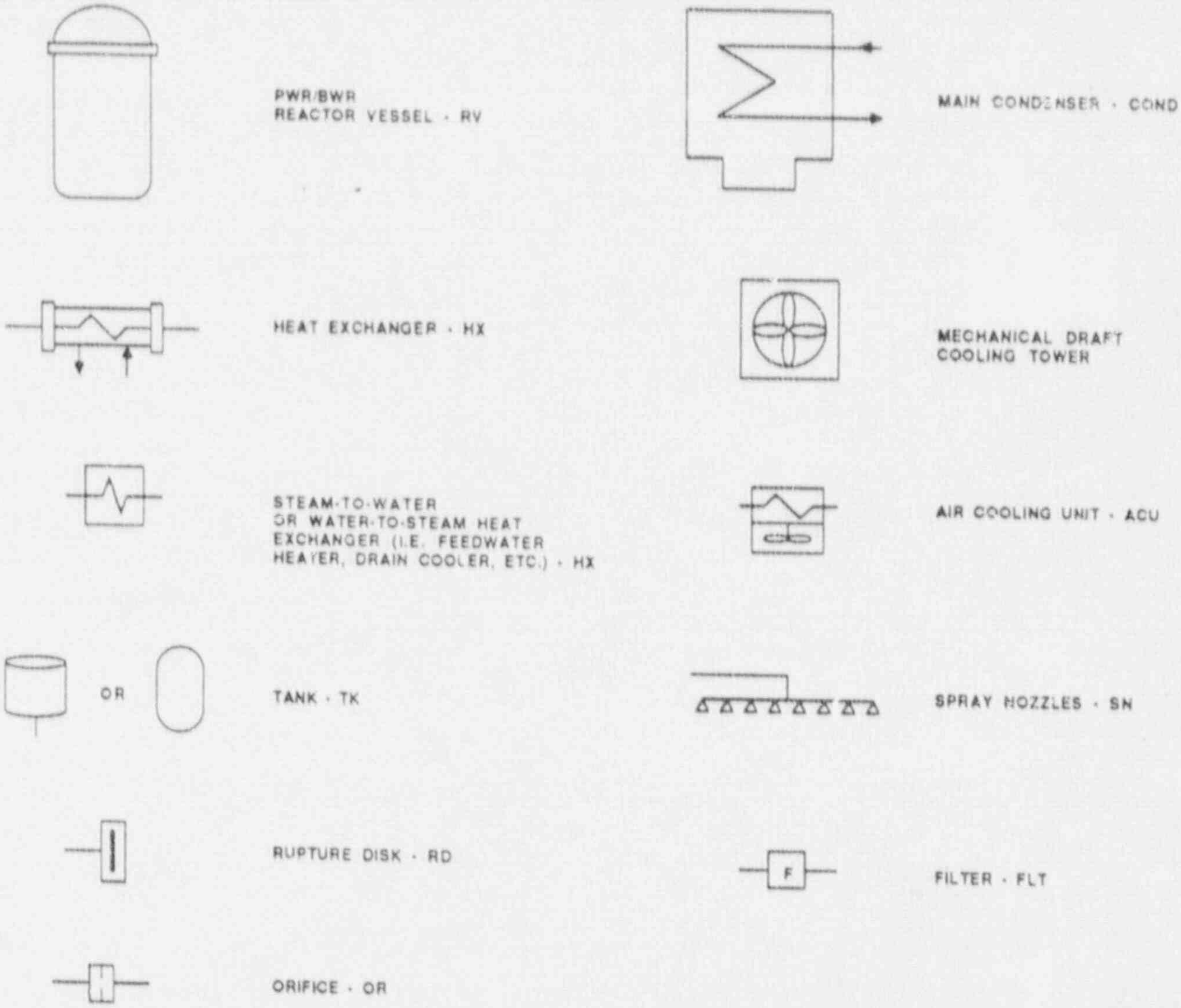


Figure A-1. Key To Symbols In Fluid System Drawings (Continued)

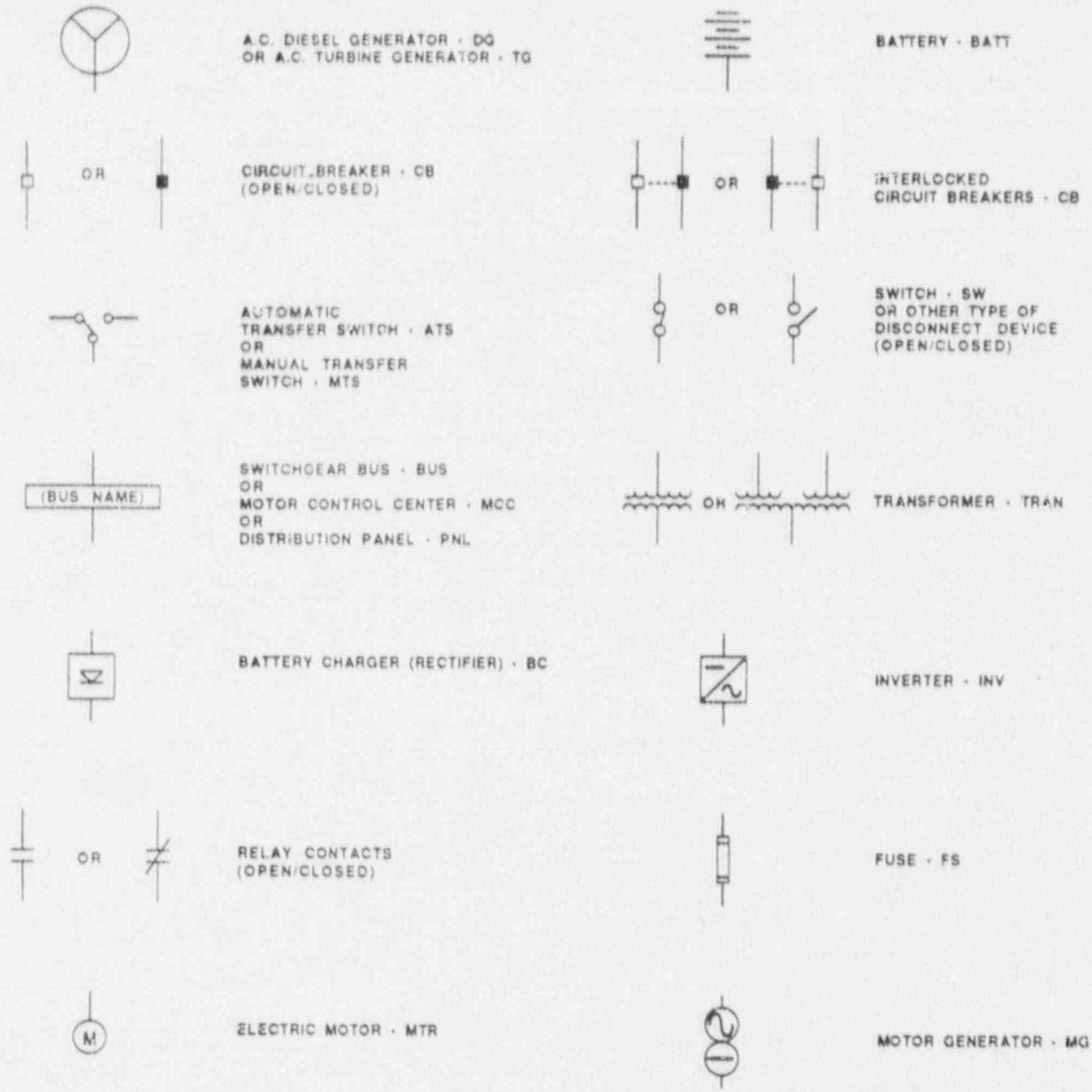


Figure A-2. Key To Symbols In Electrical System Drawings

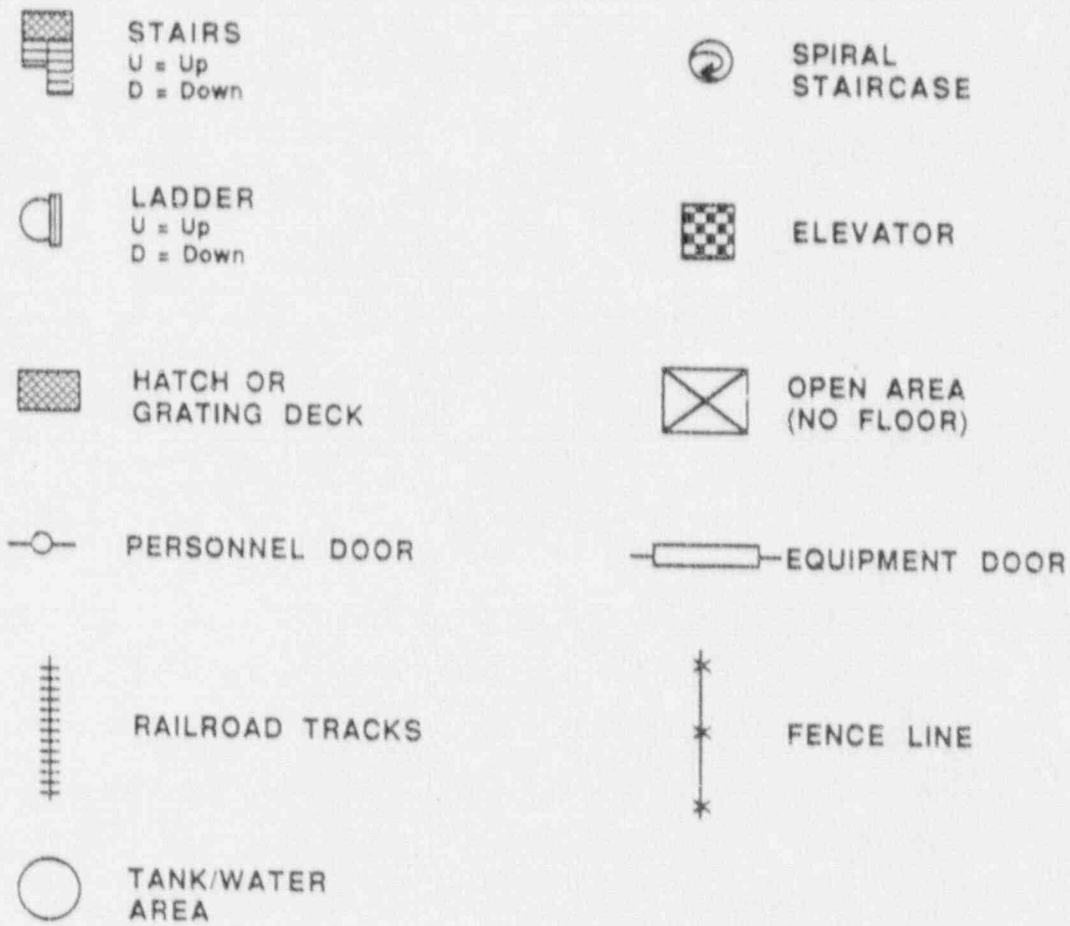


Figure A-3. Key To Symbols In Facility Layout Drawings

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
XC	Emergency (Isolation) Condenser System
ECCS	Emergency Core Cooling Systems (core spray system and ADS)
CNS	Containment Spray System
EP	Electric Power System
CRHS	Control Rod Drive Hydraulic System
FS	Fire Protection System
ESW	Emergency 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
Pneumati: 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