UNITED STATES NUCLEAR REGULATORY COMMISSION

NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

VOGTLE 1 & 2

50-424 and 50-425

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SAIC-89/1540

NUCLEAR POWER PLANT SYSTEM SOURCEBOOK

VOGTLE 1 & 2

50-424 and 50-425

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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.

VOGTLE 1 & 2
RECORD OF REVISIONS

REVISION	ISSUE	COMMENTS
0	12/89	Original report

VOGTLE 1 & 2 SYSTEM SOURCEBOOK

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

1. SUMMARY DATA ON PLANT

Basic information on the Vogtle 1 and 2 nuclear power plants is listed below:

- Docket number	50-424 and 50-425
- Operator	Georgia Power Company
- Location	Waynesboro, Georgia
- Commercial operation date	5/87 (Unit 1), 6/89 (Unit 2)
- Reactor type	PWR
- NSSS vendor	Westinghouse
- Number of loops	4
- Power (MWt/MWe)	3425/1157
- Architect-engineer	Southern Services, Inc./Bechtel Corporation
- Containment type	Reinforced concrete cylinder with steel liner

2. IDENTIFICATION OF SIMILAR NUCLEAR POWER PLANTS

Vogtle 1 and 2 utilize a Westinghouse PWR four-loop nuclear steam supply system (NSSS). Other four-loop Westinghouse plants in the United States include:

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

3. MAJOR SYSTEM DIFFERENCES FROM OTHER SIMILAR PLANTS

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

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

Table 3-1. Summary of Vogtle 1 & 2 Systems Covered in this Report

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Reactor Heat Removal Systems			
- Reactor Coolant System (RCS)	Same	3.1	5
- Auxiliary Feedwater (AFW) and Secondary Steam Relief (SSR) Systems	Same	3.2	7.4.1.1, 10.4.9
- Emergency Core Cooling Systems (ECCS)	Same		
- High-Pressure Injection & Recirculation	Safety Injection System, CVCS	3.3	6.3, 9.3.4
- Low-pressure Injection & Recirculation	Residual Heat Removal System	3.3	6.3
- Decay Heat Removal (DHR) System (Residual Heat Removal (RHR) System)	Residual Heat Removal (RHR) System	3.3	5.4.7, 6.3
- Main Steam and Power Conversion Systems	Main Steam Supply System Condensate and Feedwater System, Circulating Water System	X	10.3 10.4.7 10.4.5
- Other Heat Removal Systems	None identified	-	-
Reactor Coolant Inventory Control Systems			
- Chemical and Volume Control System (CVCS) (Charging System)	Same	3.4	9.3.4
- ECCS	See ECCS, above	-	-

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

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Containment Systems			
- Containment	Same	X	6.2.1
- Containment Heat Removal Systems	Same	3.9	6.2.2, 6.5.2
- Containment Spray System	Same	3.9	6.2.2.2, 6.5.2
- Containment Fan Cooler System	Containment Cooling System	3.9	6.2.2.1
- Containment Normal Ventilation Systems	Containment Building Ventilation System	X	9.4.6
- Combustible Gas Control Systems	Same	X	6.2.5
Reactor and Reactivity Control Systems			
- Reactor Core	Same	X	4
- Control Rod System	Control Rod Drive System	X	4.6
- Boration Systems	See CVCS, above	-	-
Instrumentation & Control (I&C) Systems			
- Reactor Protection System (RPS)	Reactor Trip System	3.5	7.2
- Engineered Safety Feature Actuation System (ESFAS)	Engineered Safety Features Systems	3.5	7.3
- Remote Shutdown System	Shutdown Panels	3.5	7.4.3
- Other I&C Systems	Various systems	X	7.5, 7.6, 7.7

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

Generic System Name	Plant-Specific System Name	Report Section	FSAR Section Reference
Support Systems			
- Class IE Electric Power System	Same	3.6	8.1.3, 8.3.1, 8.3.2
- Non-Class IE Electric Power System	Same	X	8.1.1, 8.1.2, 8.2
- Diesel Generator Auxiliary Systems	Same	3.6	9.5.4 thru 9.5.8
- Component Cooling Water (CCW) System	Same	3.7	9.2.2
- Service Water System (SWS)	Nuclear Service Cooling Water System	3.8	9.2.1
- Other Cooling Water Systems	Auxiliary Component Cooling Water System	X	9.2.8
- Fire Protection Systems	Same	X	9.5.1
- Room Heating, Ventilating, and Air-Conditioning (HVAC) Systems	Same	X	9.4.1 thru 9.4.9
- Instrument and Service Air Systems	Compressed Air System	X	9.3.1
- Refueling and Spent Fuel Systems	Spent Fuel Pool Cooling and Purification System, Light Load Handling System	X	9.1.3, 9.1.4
- Radioactive Waste Systems	Radioactive Waste Management Systems	X	11
- Radiation Protection Systems	Same	X	12

ACCW - Auxiliary Component Cooling Water System
CCW - Component Cooling Water System
CS - Containment Spray System
ESF - Engineered Safety Feature
NSCWS - Nuclear Service Cooling Water System
RHR - Residual Heat Removal System
SI - Safety Injection System

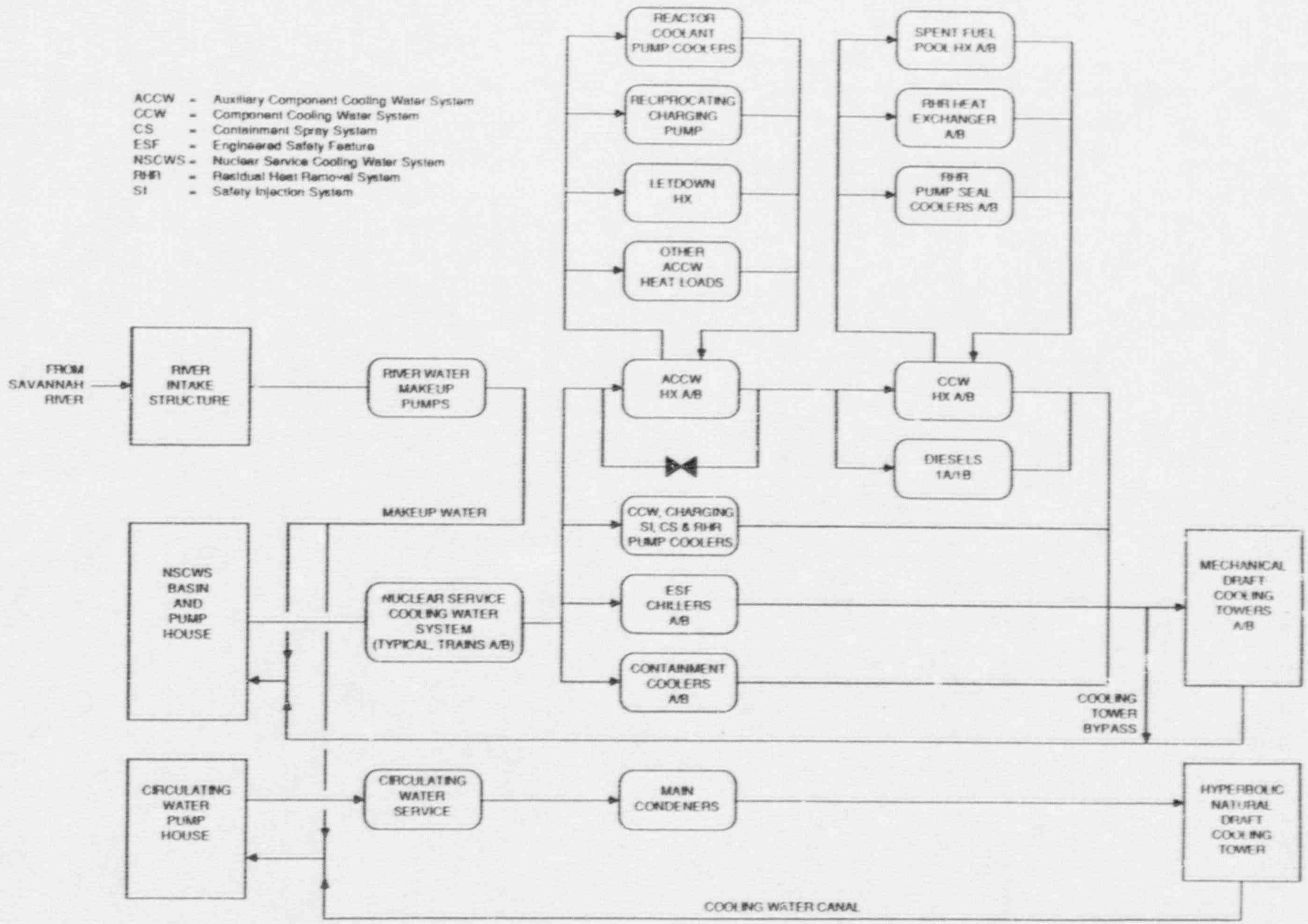


Figure 3-1. Cooling Water Systems Functional Diagram for Vogtle

3.1 REACTOR COOLANT SYSTEM (RCS)

3.1.1 System Function

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

3.1.2 System Definition

The RCS includes: (a) the reactor vessel, (b) four parallel reactor coolant loops, (c) reactor coolant pumps, (d) the primary side of the steam generators, (e) a pressurizer, and (f) connected piping out to a suitable isolation valve boundary. An isometric drawing of a four-loop Westinghouse RCS is shown in Figure 3.1-1. Simplified diagrams of the RCS and important system interfaces are shown in Figures 3.1-2 and 3.1-3. 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 reactor coolant pump in each of the four reactor coolant loops. RCS pressure is maintained within a prescribed band by the combined action of pressurizer heaters and pressurizer spray. RCS coolant inventory is measured by pressurizer water level which is maintained within a prescribed band by the chemical and volume control system (CVCS).

At power, core heat is transferred to secondary coolant (feedwater) in the steam generators. The heat transfer path to the ultimate heat sink is completed by the main steam and power conversion system and the circulating water system.

Following a transient or small LOCA (if RCS inventory is maintained), reactor core heat is still transferred to secondary coolant in the steam generators. Flow in the RCS is maintained by the reactor coolant pumps or by natural circulation. The heat transfer path to the ultimate heat sink can be established by using the secondary steam relief system to vent main steam to atmosphere when the power conversion and circulating water systems are not available. If reactor core heat removal by this alternate path is not adequate, the RCS pressure will increase and a heat balance will be established in the RCS by venting steam or reactor coolant to the quench tank through the pressurizer relief valves. There are two power-operated relief valves (each in series with a motor-operated block valve) and three safety valves on the pressurizer. A continued inability to establish adequate heat transfer to the steam generators will result in a LOCA-like condition (i.e., continuing loss of reactor coolant through the pressurizer relief valves). Repeated cycling of these relief valves has resulted in valve failure (i.e., relief valve stuck open).

Following a large LOCA, reactor core heat is dumped to the containment as reactor coolant and ECCS makeup water spills from the break. For a short period, the containment can act as a heat sink; however, the containment cooling systems must operate in order to complete a heat transfer path to the ultimate heat sink.

3.1.4 System Success Criteria

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

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

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

3.1.5 Component Information

A. RCS
1. Total system volume, including pressurizer: 12,462 ft^3
2. Normal operating pressure: 2235 psig

B. Pressurizer
1. Water volume, full power: 1080 ft^3
2. Steam volume, full power: 720 ft^3

C. Reactor Coolant Pumps (4)
1. Rated flow: 100,600 gpm @ 288 ft. head (125 psid)
2. Type: Vertical, single-stage, centrifugal

D. Power-Operated Relief Valves (2)
1. Set pressure: 2335 psig
2. Relief capacity: 210,000 lb/hr (each) @ 2385 psig

E. Safety Valves (3)
1. Set pressure: 2485 psig
2. Relief capacity: 420,000 lb/hr (each)

F. Steam Generators (4)
1. Type: Vertical shell and U-Tube

3.1.6 Support Systems and Interfaces

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

B. Reactor Coolant Pump Seal Injection Water System
The chemical and volume control system supplies seal water to cool the reactor coolant pump shaft seals and to maintain a controlled in leakage of seal water into the RCS. Loss of seal water flow may result in RCS leakage through the pump shaft seals which will resemble a small LOCA. If loss of seal injection flow should occur, the thermal barrier heat exchanger, which is cooled by the auxiliary component cooling water system, cools the reactor coolant to an acceptable level before it enters the pump bearing and the shaft seal area (Ref. 1).

3.1.7 Section 3.1 References

1. Vogtle 1 and 2 FSAR, Section 5.4.1.2.3.

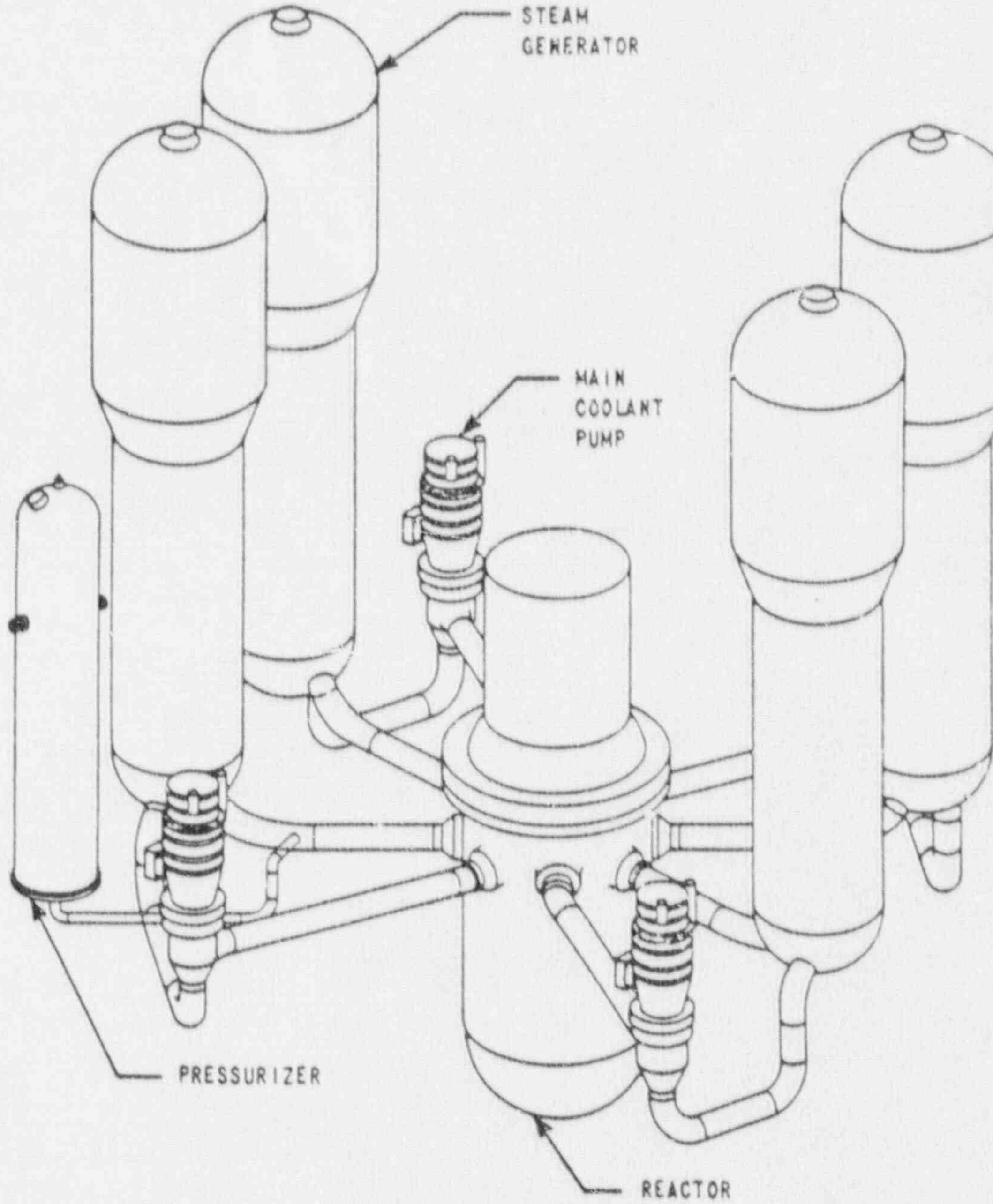


Figure 3.1-1. Isometric View of a 4-Loop Westinghouse RCS.

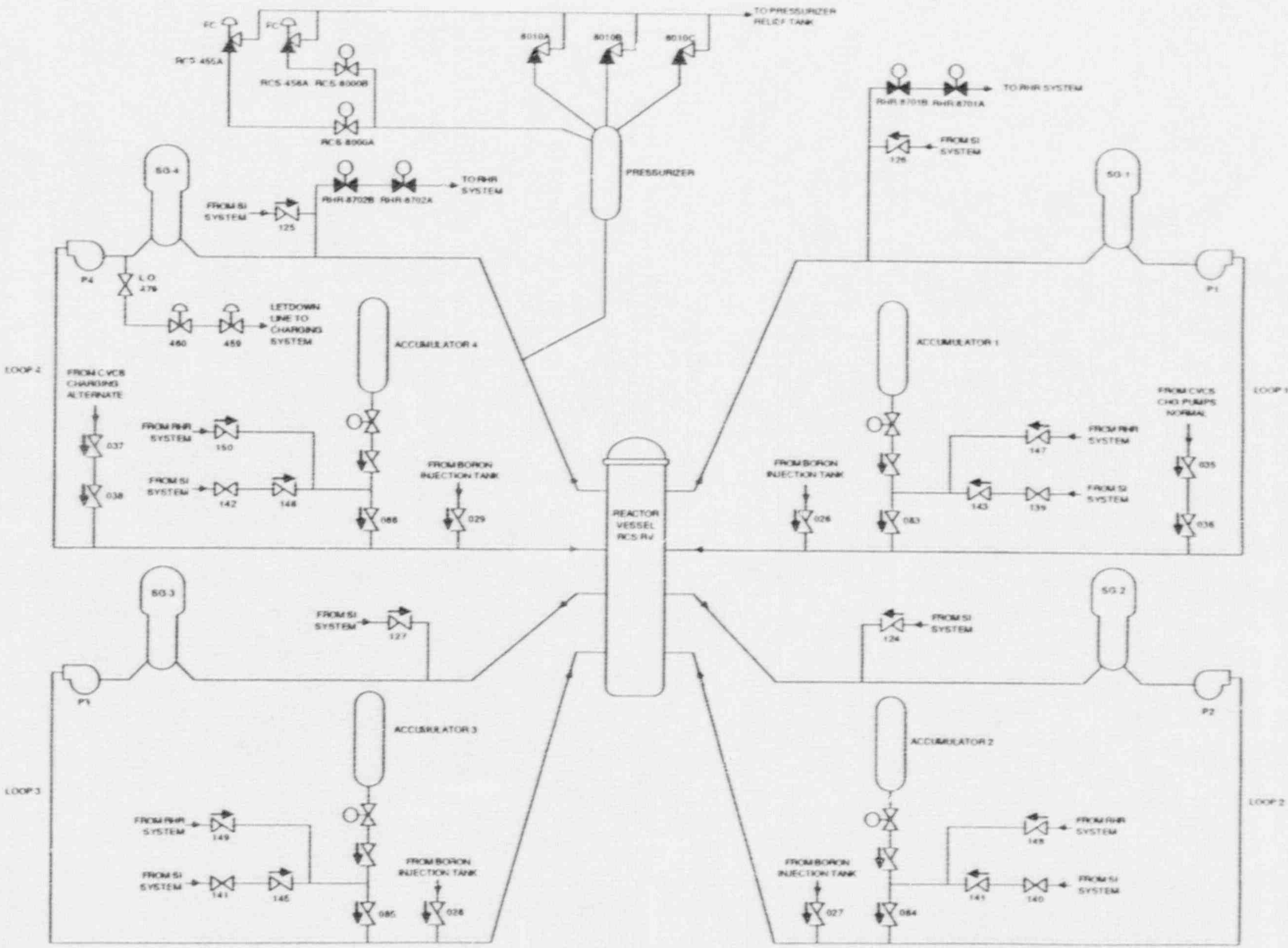


Figure 3.1-2. Vogtle 1 Reactor Coolant System

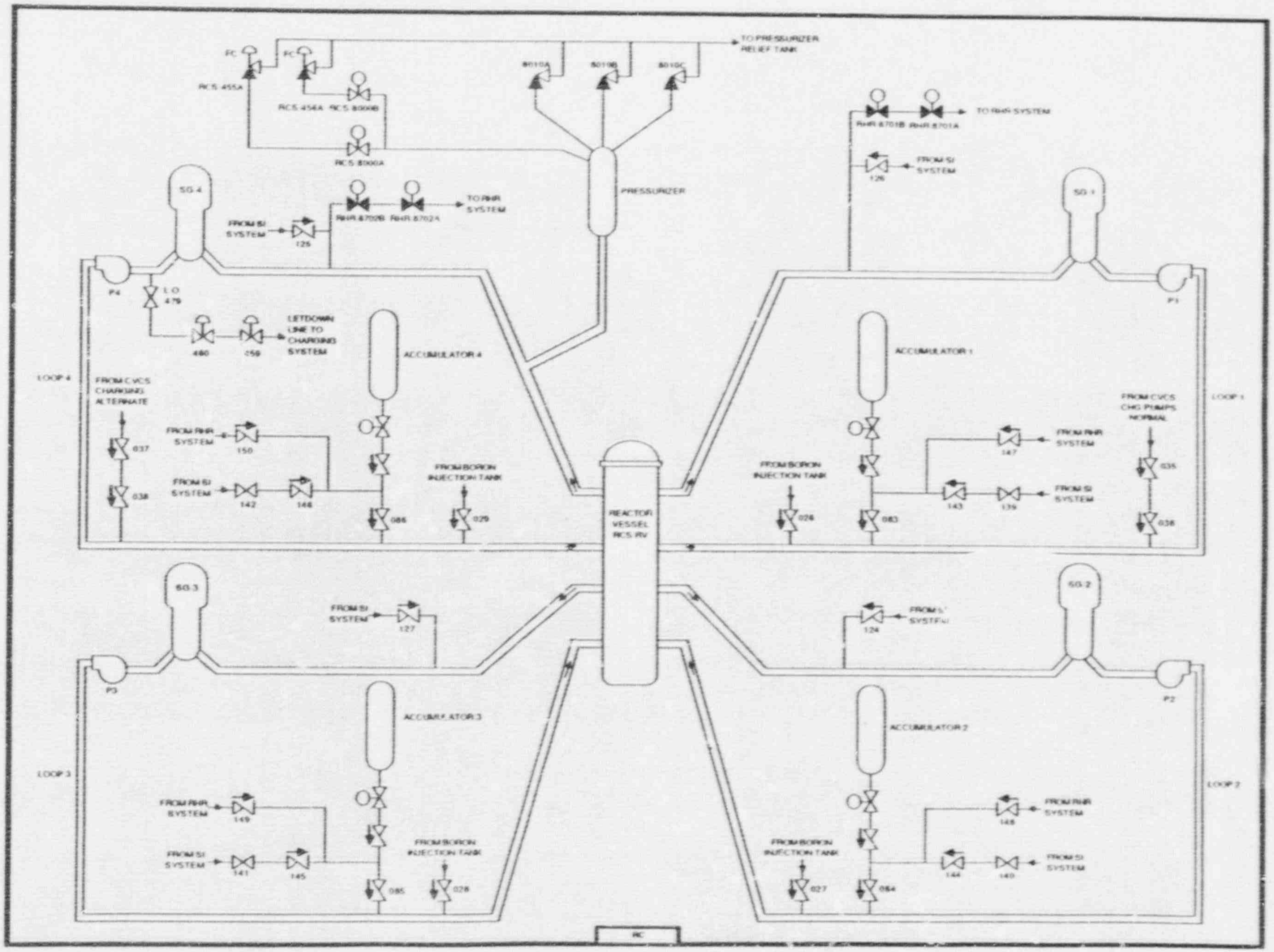


Figure 3.1-3. Vogtle 1 Reactor Coolant System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RCS-455A	NV	RC	EP-BS-1ABE	480	CBB	AC/A
RCS-456A	NV	RC	EP-BS-1BBE	480	CBB	AC/B
RCS-8000A	MOV	RC	EP-BS-1ABE	480	CBB	AC/A
RCS-8000B	MOV	RC	EP-BS-1BBE	480	CBA	AC/B
RCS-RV	RV	RC				
RHR-8701A	MOV	RC	EP-BS-1ABE	480	CBB	AC/A
RHR-8701B	MOV	RC	EP-BS-1CD1	125	1CD1RM	DC/C
RHR-8702A	MOV	RC	EP-BS-1BBE	480	CBA	AC/B
RHR-8702B	MOV	RC	EP-BS-1DD1	125	1DD1RM	DC/D

3.2 AUXILIARY FEEDWATER SYSTEM (AFWS) AND SECONDARY STEAM RELIEF SYSTEM (SSRS)

3.2.1 System Function

The AFWS provides a source of feedwater to the steam generators to remove heat from the reactor coolant system (RCS) when: (a) the main feedwater system is not available, and (b) RCS pressure is too high to permit heat removal by the residual heat removal (RHR) system. The Secondary Steam Relief System (SSRS) provides a steam vent path from the steam generators to the atmosphere, thereby completing the heat transfer path to an ultimate heat sink when the main steam and power conversion systems are not available. Together, the AFWS and SSRS constitute an open-loop fluid system that provides for heat transfer from the RCS following transients and small-break LOCAs.

3.2.2 System Definition

The AFWS is composed of three trains which serve the four steam generators. Train A consists of a motor-driven pump and provides more than 100% of the required auxiliary feedwater flow to steam generators 1 and 4. Train B consists of a motor-driven pump and provides more than 100% of the required flow to steam generators 2 and 3. The third train (C) consists of a steam turbine-driven pump and provides more than 200% of the required auxiliary feedwater flow to all four steam generators. The turbine-driven pump can be supplied with steam for motive power from either steam generator 1 or 2 (Ref. 1).

Water supply for the pumps is taken from two redundant safety-class condensate storage tanks (CSTs) each having sufficient capacity for an extended cooldown. Transfer to the standby tank must be performed manually (Ref. 2).

The SSRS consists of five safety valves and one hydraulically operated atmospheric dump valve on each of the four main steam lines.

Simplified drawings of the AFWS and the SSRS are shown in Figures 3.2-1 and 3.2-2. A summary of data on selected AFWS components is presented in Table 3.2-1.

3.2.3 System Operation

During normal operation the AFWS is in standby. The motor-driven pumps are started on either a low-low level in any steam generator, a safety injection signal, a trip of both main feedwater pumps, or a complete loss of electrical power. The turbine-driven pump will start on either a low-low level in any two steam generators or a complete loss of electrical power. The AFWS can also be started manually from the control room, the shutdown panels, and the auxiliary feedwater panel.

Coolant is supplied to the pumps by condensate storage tank CST1, with CST2 as a back-up. The capacity of each CST is 480,000 gallons, and a minimum of 340,000 gallons are reserved for AFWS use. The capacity of the CST provides for 9 hours of AFWS operation prior to transitioning to the shutdown cooling system: 4 hours at hot standby, followed by a 5 hour cooldown of the primary system at an average rate of 50° per hour to a temperature of 350°F. It should be noted that for a single motor-driven pump to maintain full flow (630 gpm) over the 8 hour extended hot shutdown period, 302,400 gallons of water from the CST are required.

The motor-operated isolation/flow control valves in the branch lines from each auxiliary feedwater pump can be controlled from either the control room or local panels to modulate the auxiliary feedwater flow to maintain the required steam generator water level. They can be manually closed to isolate the flow to a faulted steam generator and thus minimize coolant loss.

3.2.4 System Success Criteria

For the decay heat removal function to be successful, both the AFWS and the SSRS must operate successfully. The AFWS success criteria are the following:

- Makeup to any one of four steam generators provides adequate decay heat removal from the Reactor Coolant System (Ref. 2).
- The turbine-driven pump or either of the motor driven pumps can provide adequate flow. If only the turbine-driven pump is used, it must receive steam from either steam generator 1 or 2, and it must feed the same steam generator that is supplying steam to the turbine.
- Either condensate storage tank provides an adequate source of water for the AFWS pumps.

3.2.5 Component Information

A. Motor-driven AFWS pumps 1A, 1B
   1. Rated flow: 630 gpm @ 3500 ft. head (1517 psig)
   2. Rated capacity: 100%
   3. Type: Horizontal, centrifugal, multistage

B. Turbine-driven AFWS pump 1C
   1. Rated flow: 1175 gpm @ 3500 ft. head (1517 psig)
   2. Rated capacity: 200%
   3. Type: Horizontal, centrifugal, multistage

C. Condensate Storage Tanks CST1, CST2
   1. Capacity: 480,000 gallons each

D. Safety Valves (20 total, 5 per main steam line)
   1. Set pressure: 1185 to 1235 psig
   2. Relief capacity: 930,000 lb/hr (per valve)

E. Atmospheric Dump Valves (4 total, 1 per main steam line)
   1. Set pressure: 1120 psig
   2. Relief capacity: 596,000 lb/hr (each) @1107 psia

3.2.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The AFW motor-driven pumps are automatically actuated on either a low-low level in any steam generator, a safety injection signal, a trip of both main feedwater pumps, or a complete loss of electrical power. The AFW turbine-driven pump is automatically actuated on either a low-low level in any two steam generators or a complete loss of electrical power.
   2. Remote manual
      The AFWS can be operated from the control room, the shutdown panels, and the auxiliary feedwater panel.

B. Motive Power
   1. The motor-driven AFWS pumps and motor-operated valves are Class 1E loads that can be supplied from the standby diesel generators as described in Section 3.6.
   2. The turbine-driven AFWS pump is supplied with steam from the main steam lines of either steam generator 1 or 2 upstream of the main steam line isolation valves. The power and controls for the steam supply valves are supplied from the train C, Class 1E DC system.

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

3.2.7 Section 3.2 References

1. Vogtle 1 and 2 Final Safety Analysis Report, Section 10.4.9.
2. NUREG/CR-4228, "Review of the Vogtle Units 1 and 2 Auxiliary Feedwater System Reliability Analysis," Brookhaven National Laboratory, August 1985.

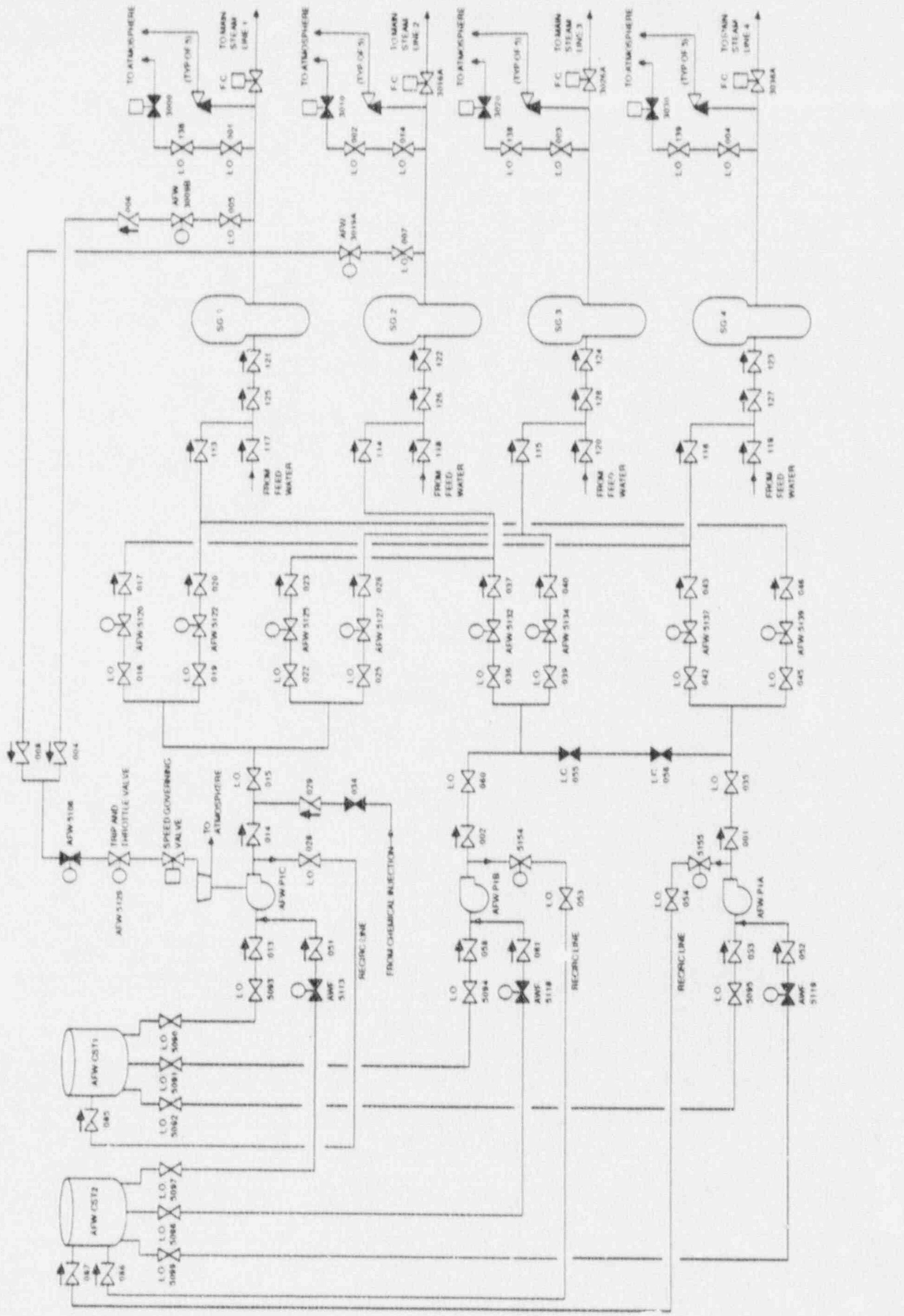


Figure 3.2-1. Vogtle 1 Auxiliary Feedwater System

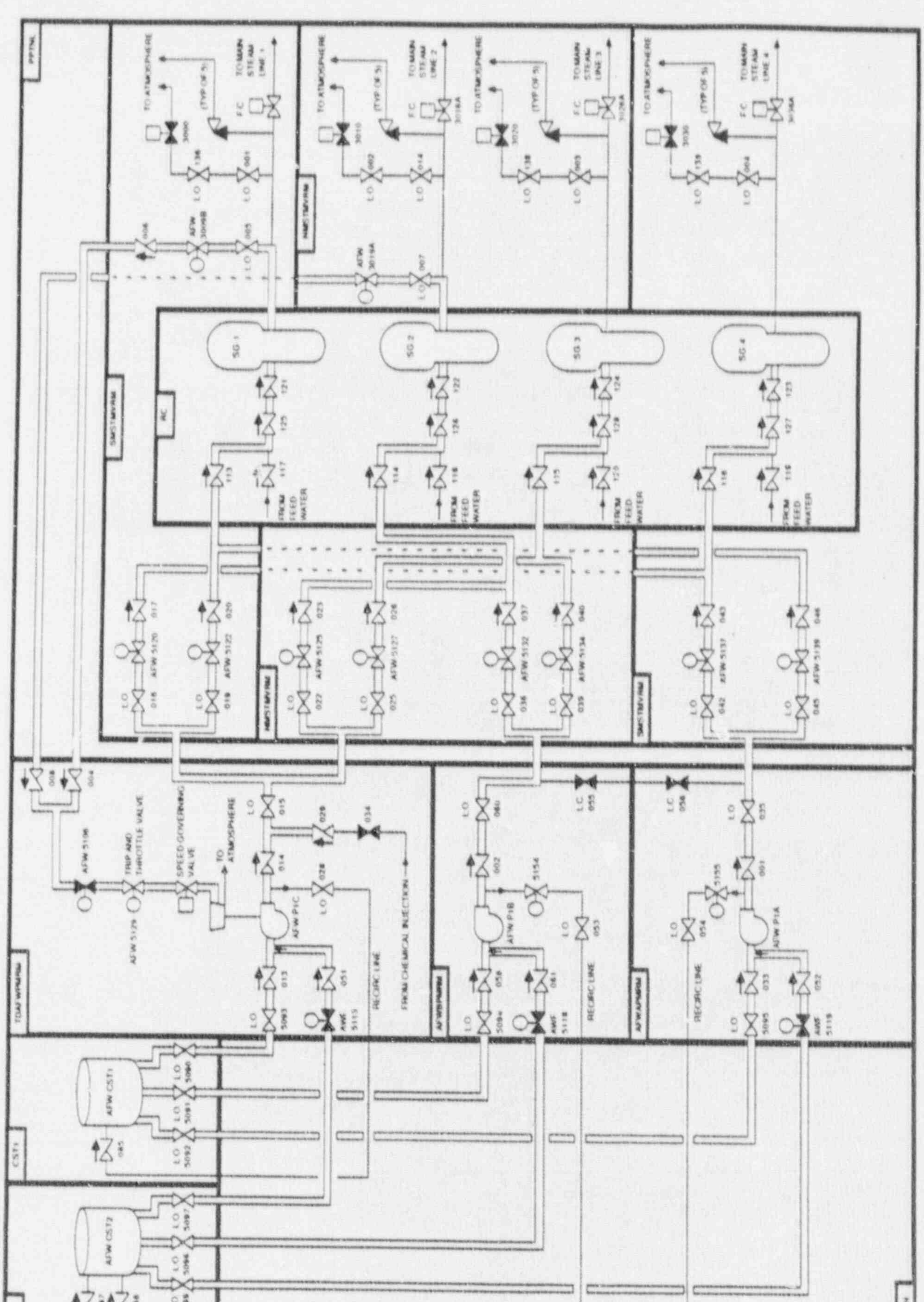


Figure 3.2-2 Vogtle 1 Auxiliary Feedwater System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
AFW-3009B	MOV	SMSTMVRM	EP-BS-1BD1	125	1BD1RM	DC/B
AFW-3019A	MOV	NMSTMVRM	EP-BS-1AD1	125	1AD1RM	DC/A
AFW-5106	MOV	TDAFWPMRM	EP-BS-1CD1	125	1CD1RM	DC/C
AFW-5113	MOV	TDAFWPMRM	EP-BS-1CD1	125	1CD1RM	DC/C
AFW-5118	MOV	AFWBPMRM	EP-BS-1B[illegible]	480	DG1BRM	AC/B
AFW-5119	MOV	AFWAPMRM	EP-BS-1ABF	480	DG1ARM	AC/A
AFW-5122	MOV	SMSTMVRM	EP-BS-1CD1	125	1CD1RM	DC/C
AFW-5125	MOV	NMSTMVRM	EP-BS-1CD1	125	1CD1RM	DC/C
AFW-5129	MOV	TDAFWPMRM	EP-BS-1CD1	125	1CD1RM	DC/C
AFW-5132	MOV	NMSTMVRM	EP-BS-1BBB	480	AB1	AC/B
AFW-5134	MOV	NMSTMVRM	EP-BS-1BBB	480	AB1	AC/B
AFW-5137	MOV	SMSTMVRM	EP-BS-1ABF	480	DG1ARM	AC/A
AFW-5139	MOV	SMSTMVRM	EP-BS-1ABF	480	DG1ARM	AC/A
AFW-CST1	TK	CST1				
AFW-CST2	TK	CST2				
AFW-P1A	MDP	AFWAPMRM	EP-BS-1AA02	4160	CBA	AC/A
AFW-P1B	MDP	AFWBPMRM	EP-BS-1BA03	4160	CBA	AC/B
AFW-P1C	TDP	TDAFWPMRM				

3.3 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.3.1 System Function

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

3.3.2 System Definition

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

- Accumulators
- Charging System (CVCS, see Section 3.4)
- Safety Injection System
- Residual Heat Removal System

There are four accumulators, one attached to each cold leg, that discharge their contents when RCS pressure drops below the tank pressure. The charging system's two centrifugal charging pumps pump through the boron injection tank to deliver borated water to the RCS. The safety injection system consists of two motor-driven pumps that deliver water to three injection headers. One header directs flow to the four cold legs, while the other two headers each direct flow to two different legs. The RHR system consists of two motor-driven pumps that deliver water to the four cold legs. During the recirculation phase, the RHR pumps can also deliver water to the suction of the charging and safety injection pumps. The RHR pumps also provide the shutdown cooling function. The Refueling Water Storage Tank (RWST) is the water source for the ECCS pumps during the injection phase. During recirculation, the RHR pumps take suction on the containment sump and can inject directly into the RCS at low pressure, or provide flow to the suctions of the SI and centrifugal charging pumps to establish a high pressure recirculation flow path.

Simplified drawings of the safety injection system are shown in Figures 3.3-1 and 3.3-2. The RHR system is shown in Figures 3.3-3 and 3.3-4. The charging system (CVCS) is discussed in Section 3.4. 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. The ECCS pumps are automatically actuated by a Safety Injection Signal, which is generated on any of the following conditions:

- Low pressurizer pressure
- High containment pressure
- High differential pressure between any two steam lines outside containment
- High steam flow in two of four lines in coincidence with either low T_{avg} or low steam line pressure
- Manual actuation

The accumulators constitute a passive injection system, discharging their contents automatically when RCS pressure drops below the tank pressure. Sufficient borated water is supplied in the four tanks to rapidly fill the volume outside of the core barrel below the nozzles, the bottom plenum, and a portion of the core with the contents of one tank assumed to be lost through the break. During injection, the charging, safety injection, and RHR pumps take suction on the RWST and deliver borated water to the four cold legs. The relative importance of the charging and safety injection pumps is increased for small breaks when the RCS is still at high pressure, while the RHR pumps are important in responding to large breaks.

When the RWST reaches a low-low level alarm setpoint, the recirculation phase is initiated. This phase of operation has two modes, cold leg recirculation and hot leg recirculation. In both modes the RHR pumps take suction on the containment sump and deliver water through the RHR heat exchangers directly to the RCS or to the suction of the charging and safety injection pumps. Initially, the discharge of these three sets of pumps is aligned to flow to the same cold leg injection points used during the injection phase. Later, the safety injection and RHR pumps are realigned to deliver to two separate hot leg injection points.

3.3.4 System Success Criteria

The success criteria for the ECCS is not clearly defined in the Vogtle 1 and 2 FSAR (Ref. 1). LOCA mitigation requires both the emergency coolant injection (ECI) and emergency coolant recirculation (ECR) functions. The four accumulators, two centrifugal charging pumps, two safety injection pumps, and two residual heat removal pumps are all utilized to respond to both large and small LOCAs, with the accumulators and RHR pumps more important for large LOCAs and the charging and safety injection pumps more important for small LOCAs. The ECCS is designed to be successful with a single active failure and one RCS loop assumed to be out of service due to the break.

The RWST is required for system success during the injection phase. The containment sumps and one of two RHR pumps are required for system success during the low pressure recirculation phase. High pressure recirculation requires the successful establishment of at least one tandem pumping path from a containment sump to an RHR pump, to either an SI or centrifugal charging pump, and finally to the RCS.

For small LOCAs that do not result in RCS depressurization below the safety injection pump shutoff head, the charging pumps are required. The RCS must be depressurized by other means if the safety injection pumps are to provide makeup. Options for depressurizing the RCS may include:

- RCS cooldown (i.e. using auxiliary feedwater system, see Section 3.2)
- Opening power-operated relief valves on the pressurizer (two PORVs are available, see Section 3.1)

3.3.5 Component Information

A. Safety Injection pumps 1A, 1B
   1. Rated flow: 425 gpm @ 2680 ft. head (1162 psid)
   2. Maximum flow: 650 gpm @ 1650 ft. head (715 psid)
   3. Shutoff head: 3455 ft. head (1498 psid)
   4. Type: Horizontal, multistage, centrifugal

B. Residual Heat Removal pumps 1A, 1B
   1. Rated flow: 3000 gpm @ 375 ft. head (163 psid)
   2. Maximum flow: 4500 gpm @ 325 ft. head (141 psid)
   3. Shutoff head: 450 ft. head (195 psid)
   4. Type: Vertical, single-stage, centrifugal

C. Centrifugal charging pumps 1A, 1B
   1. Rated flow: 150 gpm @ 5800 ft. head (2514 psid)
   2. Maximum flow: 550 gpm @ 1400 ft. head (607 psid)
   3. Type: Horizontal, multi-stage, centrifugal

D. Accumulators (4)
   1. Volume, Total: 1350 ft^3 each
   2. Nominal water volume: 900 ft^3 each
   3. Normal operating pressure: 650 psig

E. Refueling Water Storage Tank
   1. Capacity: 715,000 gallons
   2. Operating pressure: atmospheric

F. Boron Injection Tank
   1. Volume: 900 gallons
   2. Operating pressure: 2735 psig

G. RHR Heat Exchangers (2)
   1. Type: Vertical shell and U-tube
   2. Heat removal capacity: 32.8 x 10^6 Btu/hr

3.3.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. The ECCS subsystems are automatically actuated on any of the following safety injection signals:
         - Low pressurizer pressure
         - High containment pressure
         - High differential pressure between any two steam lines outside of containment
         - High steam flow in two of four lines in coincidence with either low T_{avg} or low steam line pressure
         - Manual actuation

      b. The SIAS automatically initiates the following actions:
         - reactor trip
         - starts the diesel generators
         - starts the charging, safety injection, and RHR pumps
         - opens the boron injection tank isolation valves and charging pump RWST suction valves

      c. Switchover from the injection/mode to recirculation is initiated on two out of four RWST low level signals in conjunction with a safety injection signal. This causes the suction valves from the containment sump to open and the RWST isolation valves to close.

   2. Remote manual
      A safety injection signal can be initiated by remote manual means from the control room. ECCS operation can be initiated by remote manual means.

B. Motive Power

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

C. Other

1. Cooling for the charging, safety injection, and RHR pumps is provided by the Nuclear Service Cooling Water System (see Section 3.9).
2. Pump lubrication is assumed to be provided locally.
3. The RHR heat exchangers and the RHR pump seal coolers are cooled by the Component Cooling Water System (see Section 3.8).
4. Systems for ECCS pump room cooling have not been identified.

3.3.7 Section 3.3 References

1. Vogtle 1 and 2 Final Safety Analysis Report, Section 6.3.

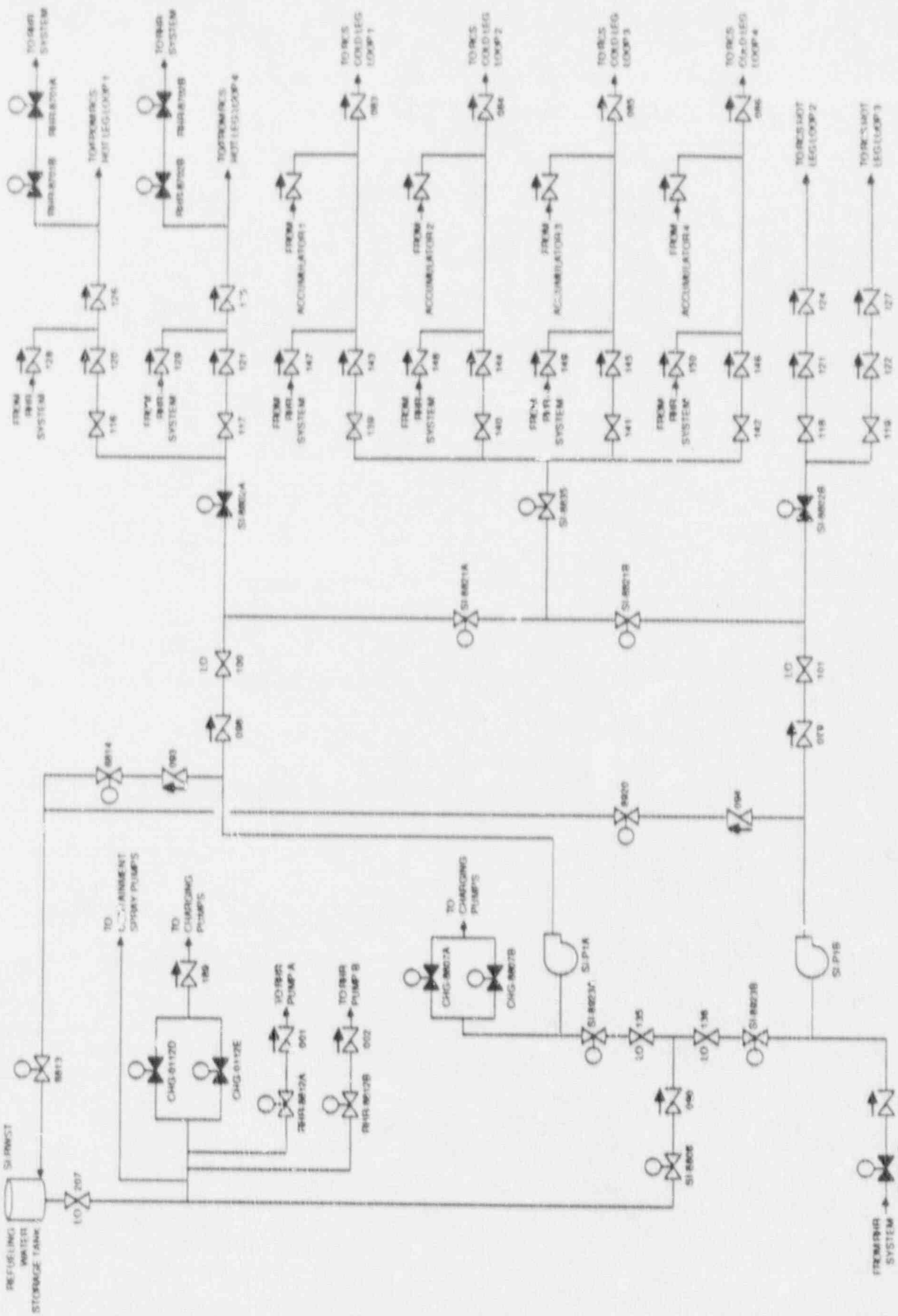


Figure 3.3-1. Vogtle 1 Safety Injection System

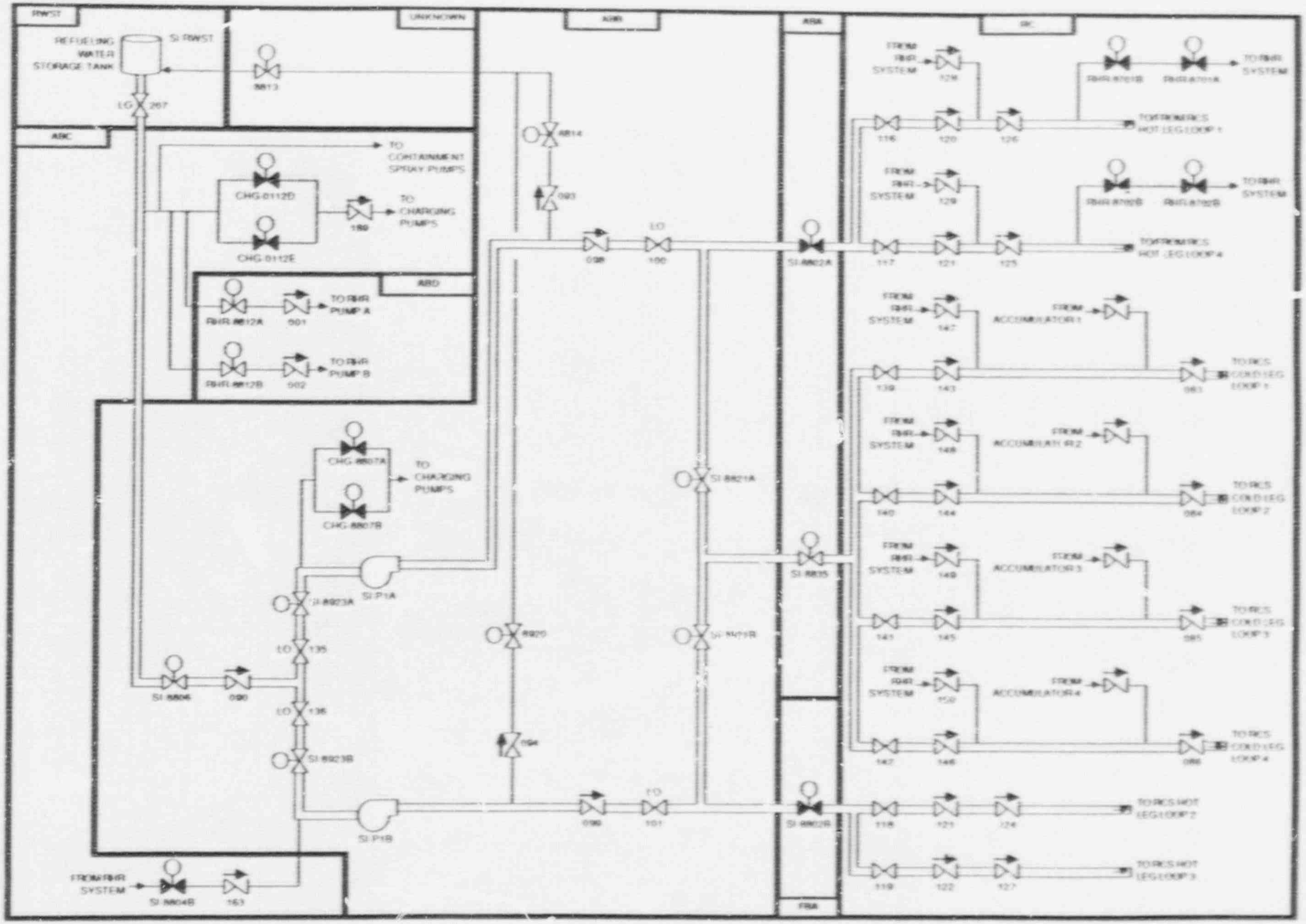


Figure 3.3-2. Vogtle 1 Safety Injection System Showing Component Locations

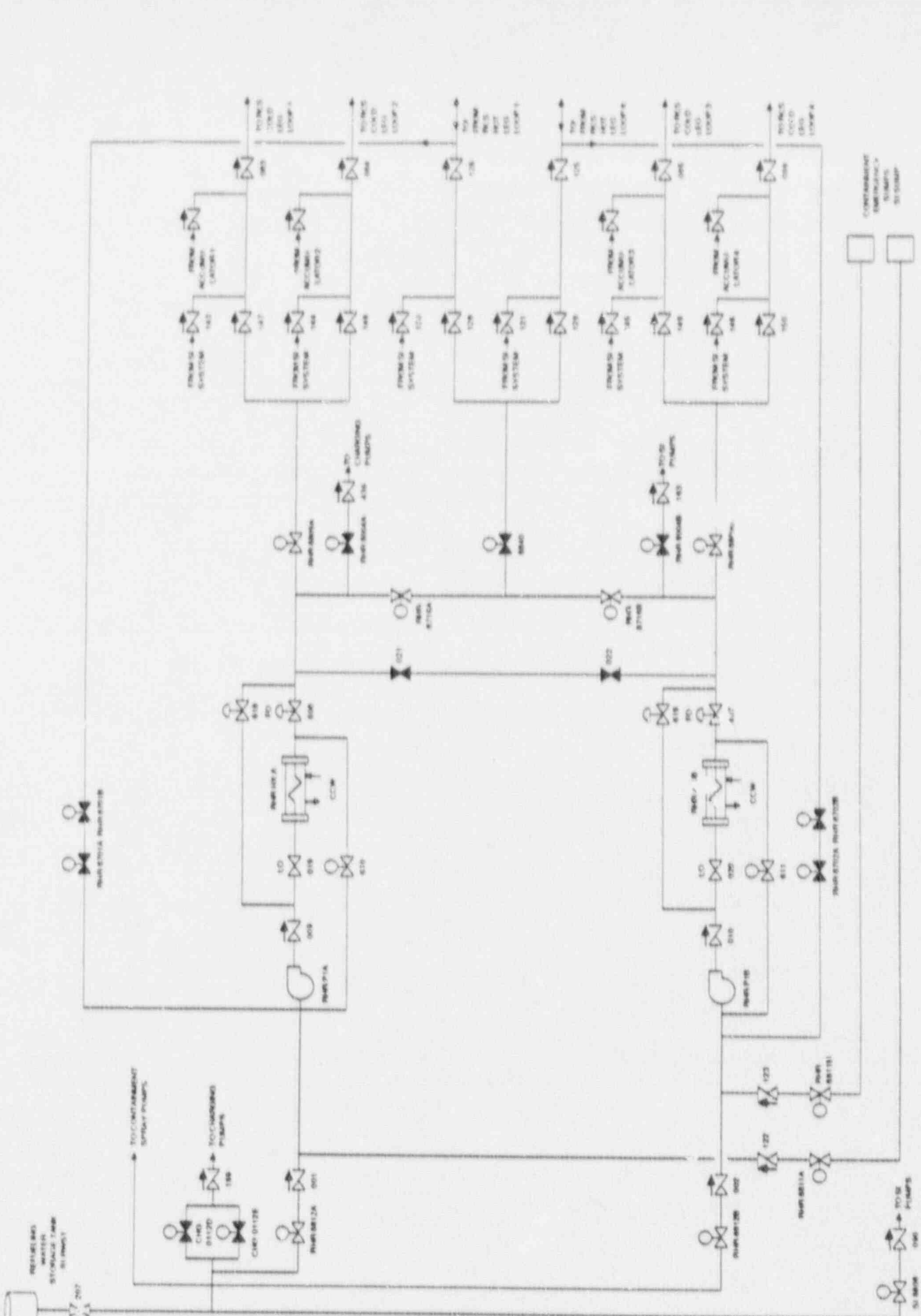


Figure 3.3-3. Vogtle 1 Residual Heat Removal System

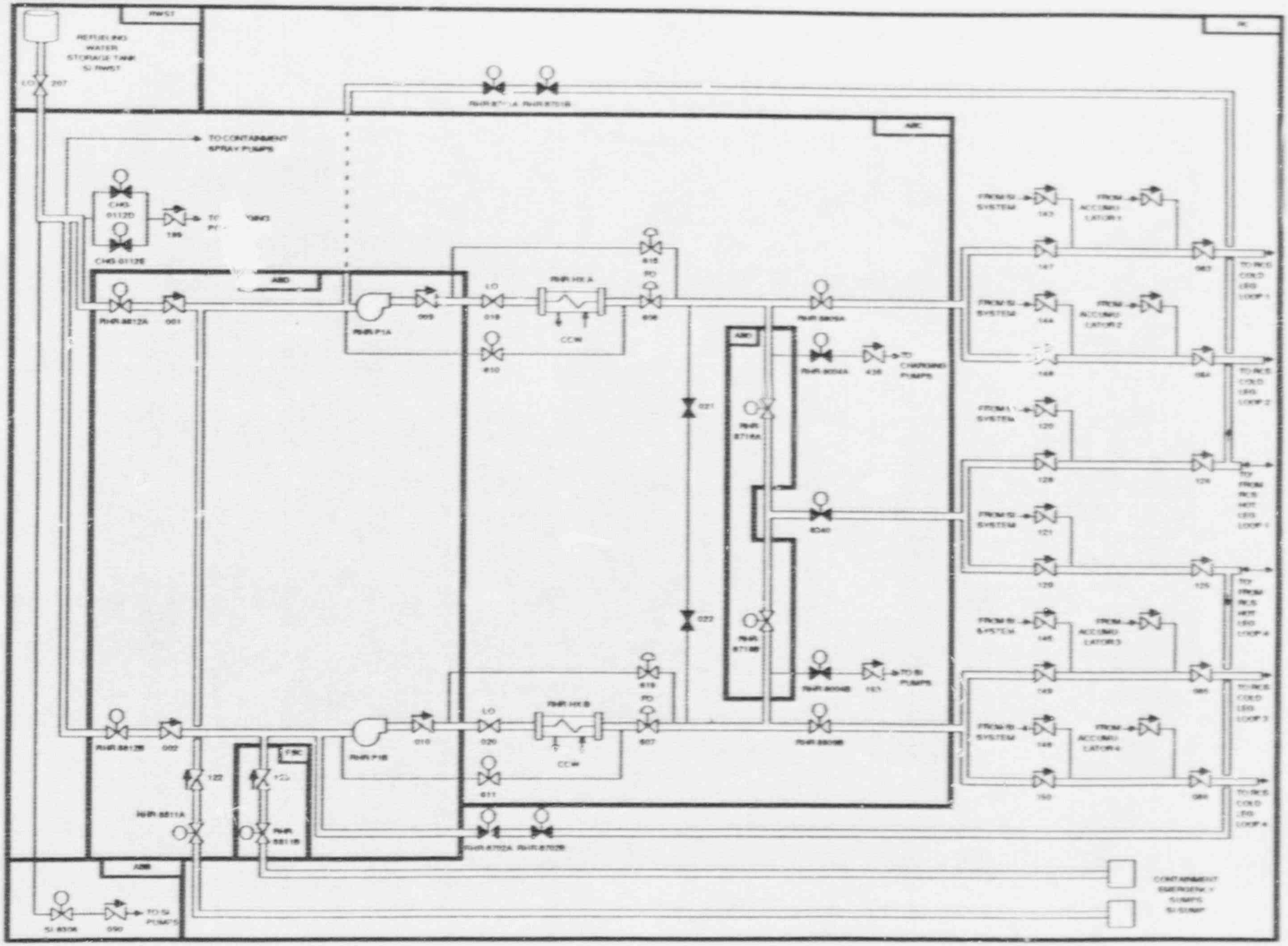


Figure 3.3-4. Vogtle 1 Residual Heat Removal System Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
RHR-8716A	MOV	ABD	EP-BS-1ABD	480	ABC	AC/A
RHR-8716B	MOV	ABD	EP-BS-1BBD	480	ABB	AC/B
RHR-8804A	MOV	ABC	EP-BS-1ABB	480	AB1	AC/A
RHR-8804B	MOV	ABC	EP-BS-1BBB	480	AB1	AC/B
RHR-8811A	MOV	ABD	EP-BS-1ABD	480	ABC	AC/A
RHR-8811B	MOV	FBC	EP-BS-1BBD	480	ABB	AC/B
RHR-HXA	HX	ABB				
RHR-HXA	HX	ABC				
RHR-HXB	HX	ABB				
RHR-HXB	HX	ABC				
RHR-P1A	MDP	ABD	EP-BS-1AA02	4160	CBA	AC/A
RHR-P1B	MDP	ABD	EP-BS-1BA03	4160	CBA	AC/B
SI-8802A	MOV	ABA	EP-BS-1ABD	480	ABC	AC/A
SI-8802B	MOV	FBA	EP-BS-1BBD	480	ABB	AC/B
SI-8806	MOV	ABB	EP-BS-1BBD	480	ABB	AC/B
SI-8821A	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
SI-8821B	MOV	ABB	EP-BS-1BBD	480	ABB	AC/B
SI-8835	MOV	ABA	EP-BS-1ABB	480	AB1	AC/A
SI-8923A	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
SI-8923B	MOV	ABB	EP-BS-1BBD	480	ABB	AC/B
SI-P1A	MDP	ABB	EP-BS-1AA02	4160	CBA	AC/A
SI-P1B	MDP	ABB	EP-BS-1BA03	4160	CBA	AC/B
SI-RWST	TK	RWST				

3.4 CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS)

3.4.1 System Function

The CVCS is responsible for maintaining the proper water inventory in the Reactor Coolant System, providing required seal water flow to the reactor coolant pump seals, and maintaining water purity and the proper concentration of neutron absorbing and corrosion inhibiting chemicals in the reactor coolant. The centrifugal charging pumps perform as part of the emergency core cooling system (ECCS, see Section 3.3) and provide injection flow to the RCS following a LOCA. The makeup function of the CVCS (charging system) is required to maintain the plant in an extended hot shutdown condition following a transient.

3.4.2 System Definition

The CVCS consists of several subsystems that perform the functions of maintaining RCS coolant inventory control, coolant chemistry and purity control, and reactivity control. The charging system consists of two centrifugal and one positive displacement charging pumps that, during normal operation, take a suction on the volume control tank (VCT) and return the purified reactor coolant to the RCS. The normal charging path is through the regenerative heat exchanger. The charging pumps also provide the high pressure safety injection function, as described in Section 3.3. In this mode the charging pumps are aligned to take a suction on the refueling water storage tank (RWST) and inject through the boron injection tank into the RCS.

Simplified drawings of the CVCS, focusing on the charging function, are shown in Figures 3.4-1 and 3.4-2. A summary of data on selected CVCS components is presented in Table 3.4-1.

3.4.3 System Operation

During normal operation, a side-stream of reactor coolant flows through the letdown line to the purification system and is returned to the RCS by a single normally-operating charging pump. Letdown flow from reactor coolant loop 4 cold leg is discharged to the CVCS; it then flows through the shell side of the regenerative heat exchanger for an initial temperature reduction. The coolant then experiences a large pressure reduction as it passes through the letdown orifice. The cooled, low pressure water then undergoes a second temperature reduction in the tube side of the letdown heat exchanger, followed by a second pressure reduction by the low pressure letdown valve. Flow is then directed through various filters and ion exchangers before being sprayed into the volume control tank where it is returned to the RCS by the charging pumps.

Normal charging flow is handled by the positive displacement pump. This charging flow splits into two paths. The bulk of the charging flow is pumped back to the RCS cold leg through the regenerative heat exchanger. A portion of the charging flow is filtered and injected into the reactor coolant pump seals (nominally 8 gpm per pump).

The centrifugal charging pumps serve as high-head safety injection pumps in the ECCS following a LOCA. Other than the charging pumps and associated piping and valves, the CVCS is not required to operate during a LOCA. In the event of a LOCA, charging pump suction is switched from the VCT to the RWST.

3.4.4 System Success Criteria

The following success criterion is given in the FSAR (Ref. 1) for CVCS makeup following a transient:

- 1 of 3 charging pumps taking suction on the RWST is required for adequate post-transient makeup to the RCS.

The charging pump success criteria for LOCA mitigation is discussed with the ECCS in Section 3.3.

3.4.5 Component Information

A. Centrifugal charging pumps P1A, P1B
   1. Rated flow: 150 gpm @ 5800 ft. head (2514 psid)
   2. Maximum flow: 550 gpm @ 1400 ft. head (607 psid)
   3. Type: Horizontal centrifugal

B. Positive displacement charging pump P1C
   1. Rated flow: 98 gpm @ 5800 ft. head (2514 psid)
   2. Type: Positive displacement

C. Refueling Water Storage Tank
   1. Capacity: 715,000 gallons
   2. Operating pressure: atmospheric

D. Boron Injection Tank
   1. Volume: 900 gallons
   2. Design pressure: 2735 psig

E. Volume Control Tank
   1. Volume: 400 ft^3
   2. Design pressure: 75 psig

3.4.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. During normal operation, CVCS letdown flow and RCS makeup flow are modulated by the pressurizer level control system.
      b. A safety injection signal automatically starts the two centrifugal charging pumps, closes the normal charging path valves, causes pump suction to change from the VCT to the RWST, and opens the boron injection tank isolation valves.
   2. Remote manual
      The charging pumps and associated motor operated valves can be actuated by remote means from the control room.

B. Motive Power
   1. The centrifugal charging pumps and associated motor-operated valves of the CVCS are Class 1E AC loads that can be supplied from the standby diesel generators as described in Section 3.6.
   2. The positive displacement charging pump is a Non-class 1E load.

C. Other
   1. Cooling water for the centrifugal charging pumps is provided by the nuclear service cooling water system (see Section 3.9), and cooling water for the positive displacement charging pump is provided by the auxiliary component cooling water system.
   2. Charging pump lubrication is assumed to be provided locally.
   3. Charging pump room cooling systems have not been identified.

3.4.7 Section 3.4 References

1. Vogtle 1 and 2 Final Safety Analysis Report, Section 9.3.4.

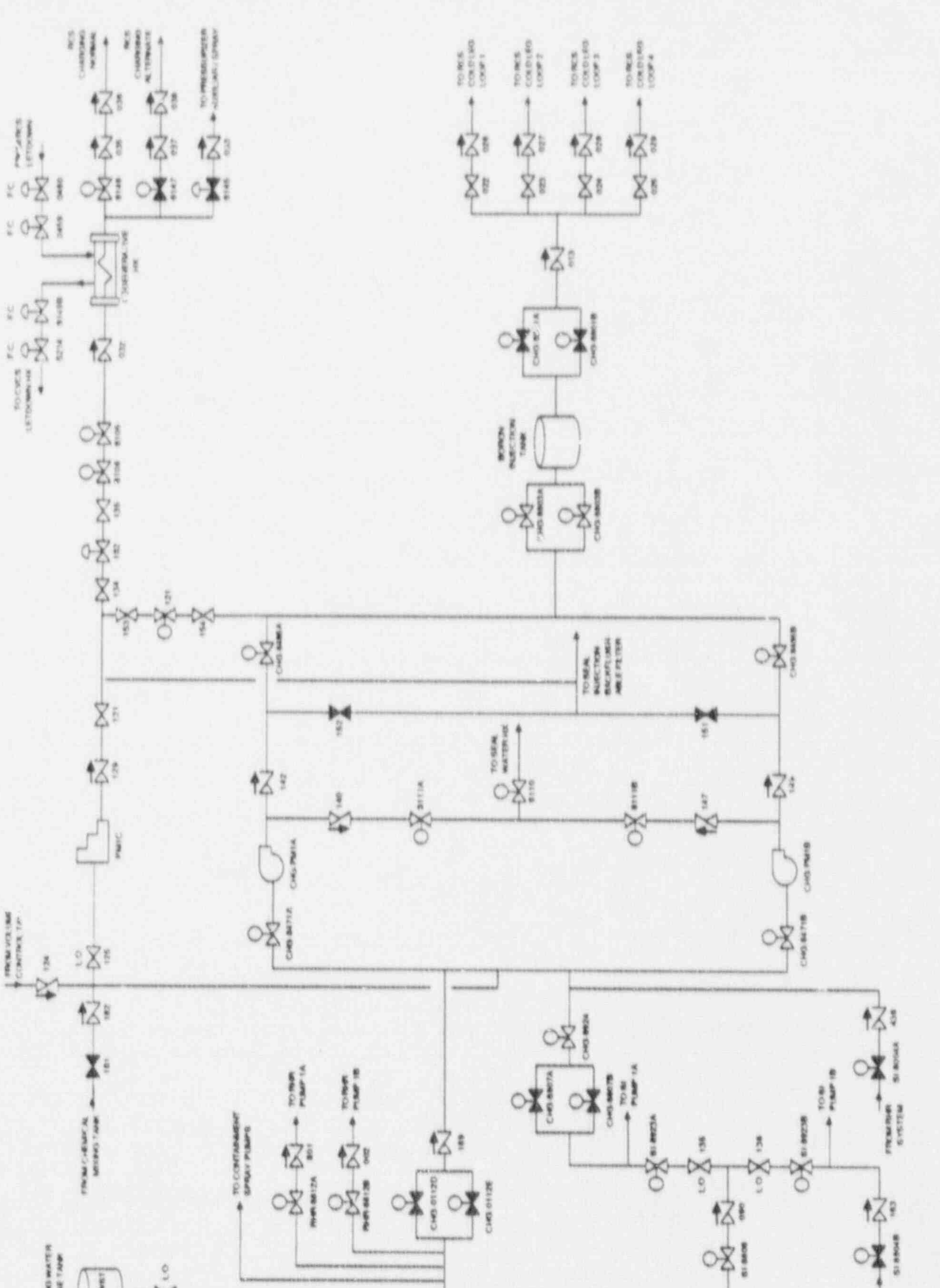


Figure 3.4-1. Vogtle 1 Charging System (CVCS)

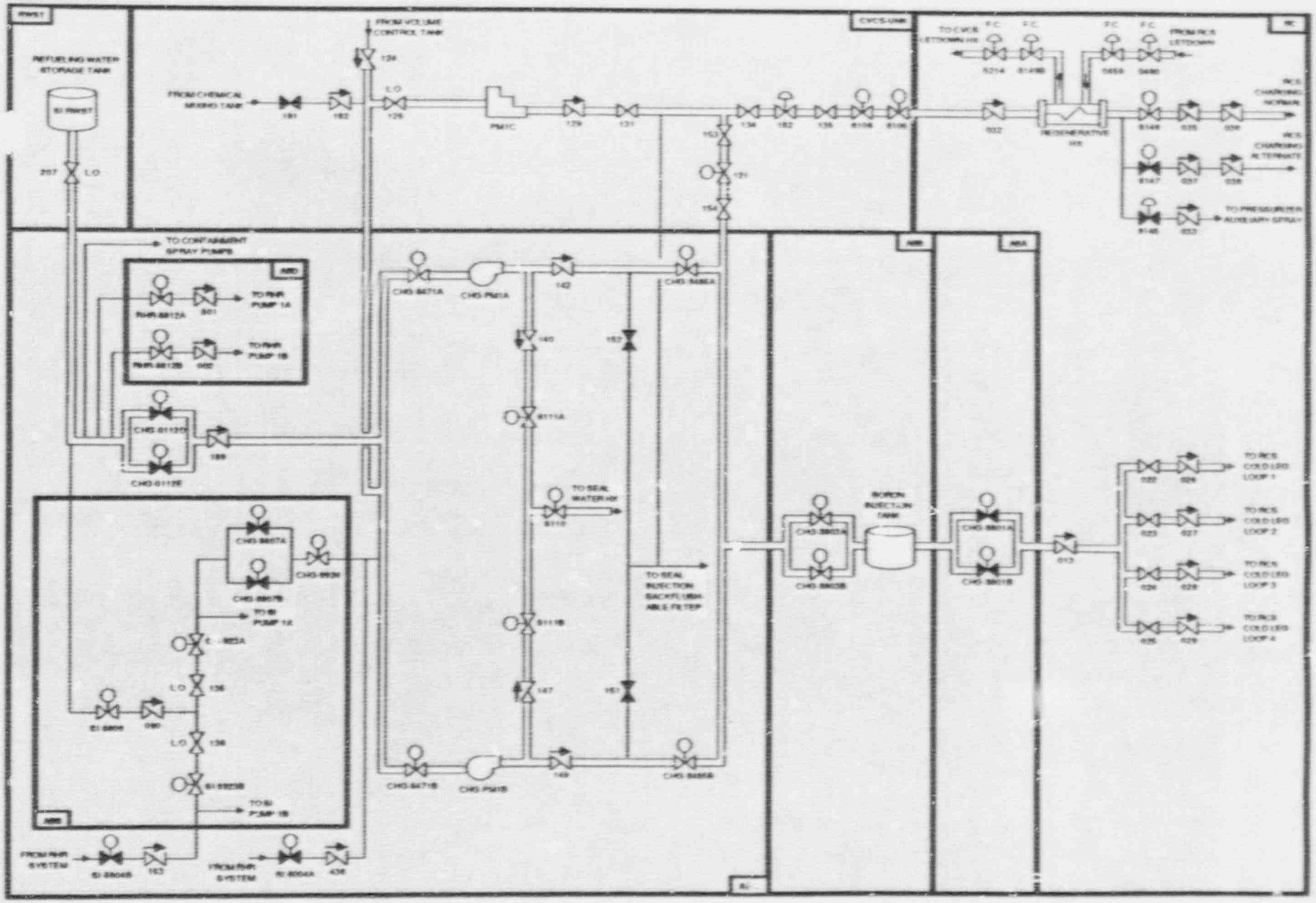


Figure 3.4-2. Vogtle 1 Charging System (CVCS) Showing Component Locations

Table 3.4-1. Vogtle 1 Chemical and Volume Control System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CHG-0112D	MOV	ABC	EP-BS-1ABD	480	ABC	AC/A
CHG-0112E	MOV	ABC	EP-BS-1BBD	480	ABB	AC/B
CHG-8471A	MOV	ABC	EP-BS-1ABD	480	ABC	AC/A
CHG-8471B	MOV	ABC	EP-BS-1BBD	480	ABB	AC/B
CHG-8485A	MOV	ABC	EP-BS-1ABD	480	ABC	AC/A
CHG-8485B	MOV	ABC	EP-BS-1BBD	480	ABB	AC/B
CHG-8801A	MOV	ABA	EP-BS-1ABD	480	ABC	AC/A
CHG-8801B	MOV	ABA	EP-BS-1BBD	480	ABB	AC/B
CHG-8803A	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
CHG-8803B	MOV	ABB	EP-BS-1BBD	480	ABB	AC/B
CHG-8807A	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
CHG-8807B	MOV	ABB	EP-BS-1BBD	480	ABB	AC/B
CHG-8924	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
CHG-PM1A	MDP	ABC	EP-BS-1AA02	4160	CBA	AC/A
CHG-PM1B	MDP	ABC	EP-BS-1BA03	4160	CBA	AC/B

3.5 INSTRUMENTATION AND CONTROL (I & C) SYSTEMS

3.5.1 System Function

The instrumentation and control systems consist of the Reactor Trip System (also known as the Reactor Protection System, RPS), the Engineered Safety Features (ESF) actuation systems, and systems for the display of plant information to the operators. The RPS and the ESF actuation systems monitor the reactor plant and alert the operator to take corrective action before specified limits are exceeded. The RPS will initiate an automatic reactor trip (scram) to rapidly shutdown the reactor when plant conditions exceed one or more specified limits. The ESF actuation systems will automatically actuate selected safety systems based on the specific limits or combinations of limits that are exceeded. A remote shutdown capability is provided to ensure that the reactor can be placed in a safe condition in the event that the main control room must be evacuated.

3.5.2 System Definition

The RPS includes sensor and transmitter units, logic units, and output trip relays that generate a reactor trip signal. The reactor trip signal deenergizes the control rod magnetic latch mechanisms, allowing all control rod assemblies to drop into the core. The ESF actuation systems include independent sensor and transmitter units, logic units and relays that interface with the control circuits for the many different sets of engineered safety features components that can be actuated. Operator instrumentation display systems consist of display panels in the control room and local control stations that are powered by the 120 VAC electric power system (see Section 3.6).

3.5.3 System Operation

A. RPS

The RPS has two to four redundant input instrument channels for each sensed parameter. Two reactor trip breakers are actuated by two separate RPS logic matrices. When either of the trip breakers opens, power is interrupted to the rod drive power supply, and the control and shutdown rods fall into the core. Certain reactor trip channels are automatically bypassed at power levels where they are not required for safety. The following conditions result in reactor trip (Ref. 1):

- High neutron flux
- High neutron flux rate
- Negative neutron flux rate
- Overtemperature delta T
- Overpower delta T
- Low pressurizer pressure
- High pressurizer pressure
- High pressurizer water level
- Low reactor coolant flow
- Reactor coolant pump undervoltage
- Reactor coolant pump underfrequency
- Safety injection system actuation
- Turbine trip
- Low-low steam generator water level
- Manual

B. ESF Systems

The ESF systems each consists of two discrete portions of circuitry: (1) an analog portion consisting of three to four redundant channels per parameter, and (2) a digital portion consisting of two redundant logic trains which receive inputs from the analog protection channels and perform the logic needed to actuate the ESF equipment, motor starters, and valve operators. The following vital functions are actuated (Ref. 2):

- Safety injection system actuation
- Containment isolation
- Main steam line isolation
- Feedwater isolation
- Auxiliary feedwater actuation
- Containment spray system actuation
- Containment ventilation isolation
- Control room ventilation isolation

The actuation systems provide an actuation signal to each individual component in the required engineered safety features system.

C. Remote Shutdown

If temporary evacuation of the control room is required, the operator can establish and maintain the reactor in a safe shutdown condition from outside the control room through the use of controls located at the shutdown panels. The prime intent of the shutdown panels is to enable the operators to achieve and maintain a hot standby condition.

Two shutdown panels (train A and B) are provided for each unit (Ref. 3). Each panel contains the control switches for the associated train's safety-grade equipment required to accomplish hot standby. Each control switch and controller on the shutdown panel is accompanied by a transfer switch. When a transfer switch is turned to the local position, the following occur:

- Alarm in the control room is actuated.
- Control from the control room is defeated.
- Manual control from shutdown panel is possible.
- Automatic features in control circuits originating from the control room are defeated.

The shutdown panels contain controls and/or indicators for equipment in the following systems required for safe shutdown:

- Reactor Coolant System
- Main Steam System
- Auxiliary Feedwater System
- Safety Injection System
- Residual Heat Removal System
- Chemical and Volume Control System
- Nuclear Service Cooling Water System
- Electrical System

3.5.4 System Success Criteria

A. RPS

The RPS uses hindrance logic (normal = 1, trip = 0) in both the input and output logic. Therefore, a channel will be in a trip state when input signals are lost, when control power is lost, or when the channel is temporarily removed from service for testing or maintenance (i.e. the channel has a fail-safe failure mode). A reactor scram will occur upon loss of control power to the RPS. A reactor scram usually is implemented by the scram circuit breakers which must open in response to a scram signal. Typically, there are two series scram circuit breakers in the power path to the scram rods. In this case, one of two circuit breakers must open. Details of the scram system for Vogtle 1 and 2 have not been determined.

B. ESF Systems

In general, the loss of instrument power to the sensors, instruments, or logic devices places that channel in the trip mode. Details of the ESF actuation systems for Vogtle 1 and 2 have not been determined.

C. Manually-Initiated Protective Actions

When reasonable time is available, certain protective actions may be performed manually by plant personnel. The control room operators are capable of operating individual components using normal control circuitry, or operating groups of components by manually tripping the RPS or an ESF subsystem. The control room operators also may send qualified persons into the plant to operate components locally or from some other remote control location (i.e., the remote shutdown panel or a motor control center). To make these judgments, data on key plant parameters must be available to the operators.

3.5.5 Support Systems and Interfaces

A. Control Power

Operator instrumentation displays are powered from the 120 VAC instrument buses (see Section 3.6).

3.5.6 Section 3.5 References

1. Vogtle 1 and 2 Final Safety Analysis Report, Section 7.2
2. Vogtle 1 and 2 Final Safety Analysis Report, Section 7.3
3. Vogtle 1 and 2 Final Safety Analysis Report, Section 7.4.3

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 Class 1E system is divided into two redundant trains per unit (trains A and B), with either one of the trains capable of providing power to support systems needed to establish and maintain a safe shutdown condition. The engineered safety features for Unit 1 receive power from two 4160 VAC buses, designated 1AA02 (train A) and 1BA03 (train B). The emergency source of power for these buses are two diesel generators; diesel generator 1A feeds bus 1AA02, and diesel generator 1B feeds bus 1BA03. Each 4160 VAC bus feeds four emergency 480 VAC load centers through transformers, and the 480 VAC load centers in turn supply power to various motor control centers.

The 125 VDC system provides power for control and instrumentation and other loads. There are four 125 VDC systems (identified A, B, C, and D) per unit, each consisting of a dedicated battery, switchgear, two redundant battery chargers, and 125 VDC distribution panels.

Four independent Class 1E 120 VAC vital instrument power supplies are provided to supply the four channels of the protection systems and reactor control systems. Each vital instrument power supply consists of an inverter, transformer, and a distribution panel. Trains A and B are provided with two inverters and two distribution panels.

Simplified one-line diagrams of the station electric power system are shown in Figures 3.6-1 and 3.6-2. The Unit 1 4160 and 480 VAC systems are shown in Figures 3.6-3 to 3.6-6, and the 125 VDC and 120 VAC systems are shown in Figures 3.6-7 to 3.6-10. A summary of data on selected electric power system components is presented in Table 3.6-1. Selected loads and components supplied by the Unit 1 Class 1E electric power system are listed in Table 3.6-2.

3.6.3 System Operation

During normal operation, the Class 1E electric power system is supplied from the 230 kV switchyard through the two reserve auxiliary transformers, 1NXRA and 1NXRB. The emergency sources of AC power are the diesel generators. The transfer from the preferred power source to the diesel generators is accomplished automatically by opening the normal source circuit breakers and then reenergizing the Class 1E portion of the electric power system from the diesel generators.

The DC power system normally is supplied through the battery chargers, with the batteries "floating" on the system, maintaining a full charge. Upon loss of AC power, the entire DC load draws from the batteries. The batteries are rated for approximately 2.75 hours of operation without assistance from the battery chargers, based on the length of time they can supply the inverters following loss of AC power (Ref. 1, Section 8.3.2.1.1).

Each 120 VAC instrumentation bus receives power from an inverter/rectifier, which normally is supplied from its associated 125 VDC battery (through its 125 VDC Bus). If the inverter is taken out of service, the 120 VAC bus can be supplied via its respective 480/120 volt transformer.

Redundant safeguards equipment such as motor-driven pumps and motor-operated valves are supplied by different VAC buses. For the purpose of discussion, this equipment has been grouped into "load groups". Load group AC/A contains components powered either directly or indirectly from 4160 VAC bus 1AA02. Load group AC/B contains components powered either directly or indirectly by 4160 VAC bus 1BA03.

Components receiving DC power are assigned to load groups DC/A, DC/B, DC/C, or DC/D, based on the battery power source.

3.6.4 System Success Criteria

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

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

3.6.5 Component Information

A. Standby diesel generators 1A, 1B
   1. Rated load: 7000 kW
   2. Rated voltage: 4160 VAC
   3. Manufacturer: Unknown

B. Batteries 1A, 1B, 1C, 1D
   1. Rated voltage: 125 VDC
   2. Rated capacity: approximately 2.75 hours with design loads

3.6.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The standby diesel generators are automatically started on loss of voltage to the respective 4160 VAC bus or receipt of a safety injection signal.
   2. Remote manual
      The diesel generators can be started, and many distribution circuit breakers can be operated, from the control room.

B. Diesel Generator Auxiliary Systems
   1. Diesel Cooling Water System
      Each diesel generator can be cooled by the nuclear service cooling water system (see Section 3.9).
   2. Diesel Starting System
      Each diesel generator is equipped with two independent and redundant starting air systems.
   3. Diesel Fuel Oil Transfer and Storage System
      A "day tank" supplies the short-term fuel needs of each diesel. The capacity of each day tank is 1250 gallons, providing at least 2.6 hr of operation. Each day tank can be replenished from a separate 80,000 gallon fuel oil storage tank located underground in the yard.
   4. Diesel Lubrication System
      Each diesel generator has an independent oil lubrication system.
   5. Diesel Room Ventilation System
      This system consists of exhaust fans which maintain the environmental conditions in the diesel room within limits for which the diesel generator

and switchgear have been qualified. This system may be needed for long-term operation of the diesel generator.

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

3.6.7 <u>Section 3.6 References</u>

1. Vogtle 1 and 2 Final Safety Analysis Report, Section 8

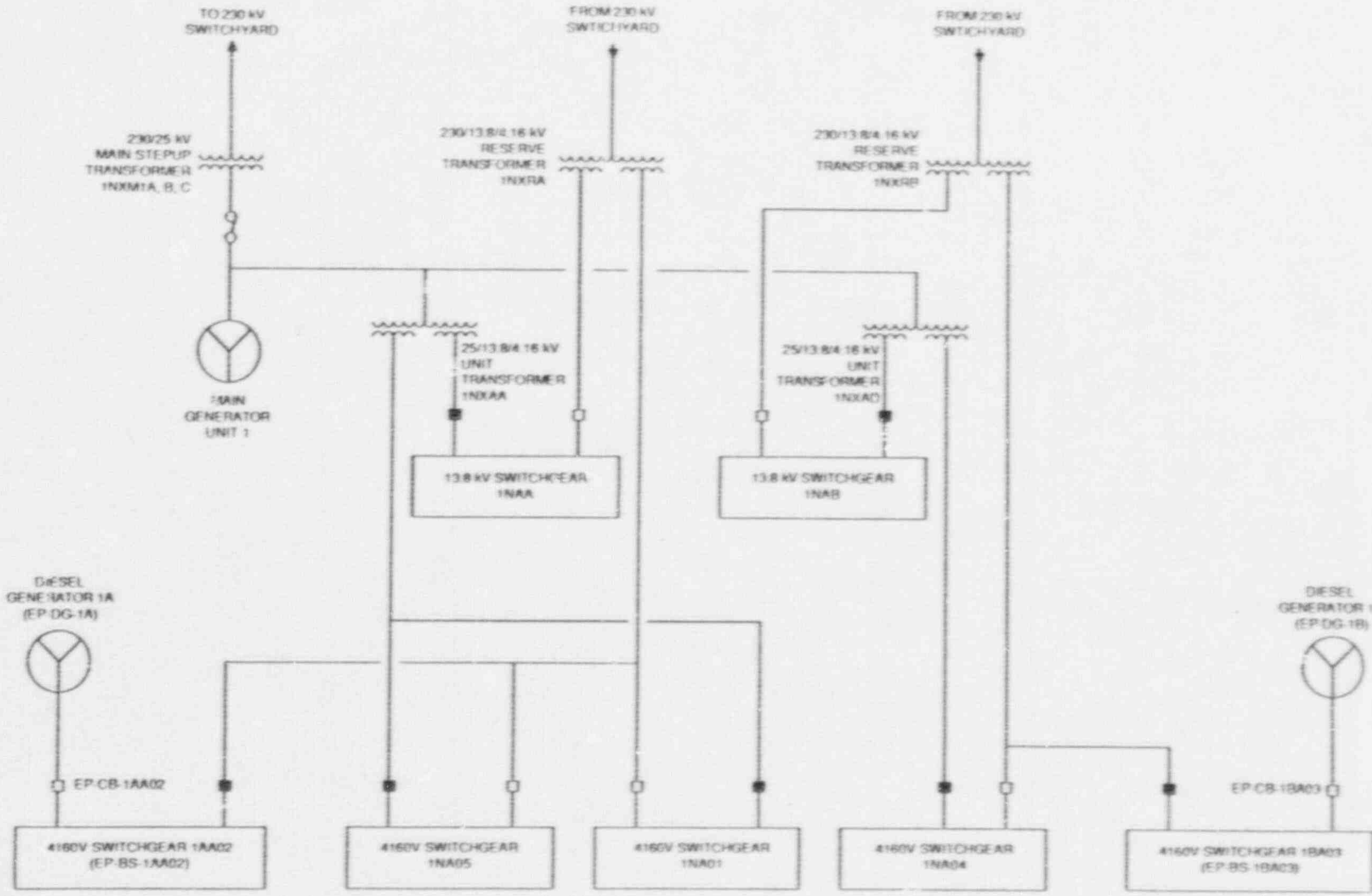
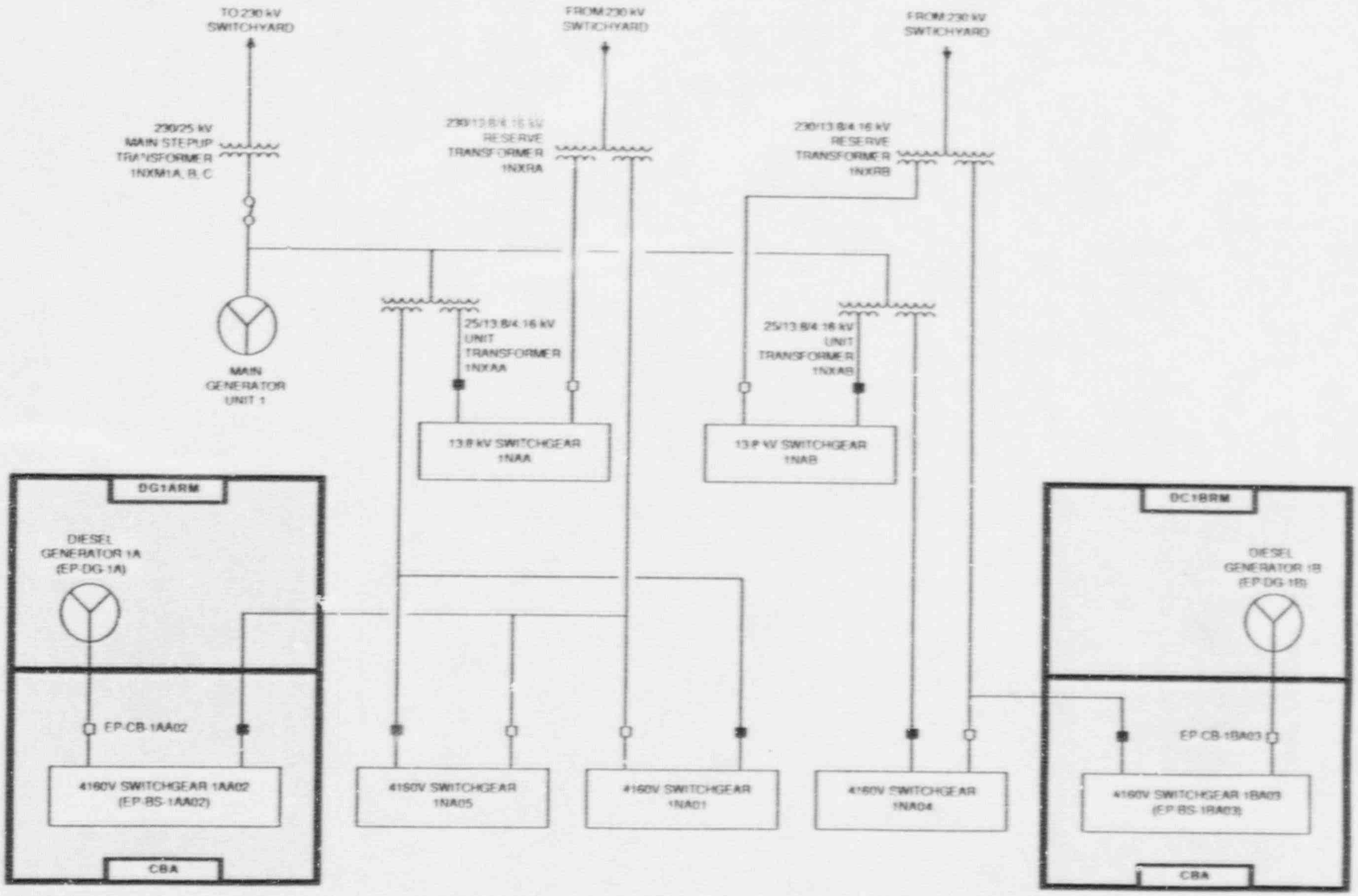


Figure 3.6-1. Vogtle 1 Station Electric Power System



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS

Figure 3.6-2. Vogtle 1 Station Electric Power System Showing Component Locations

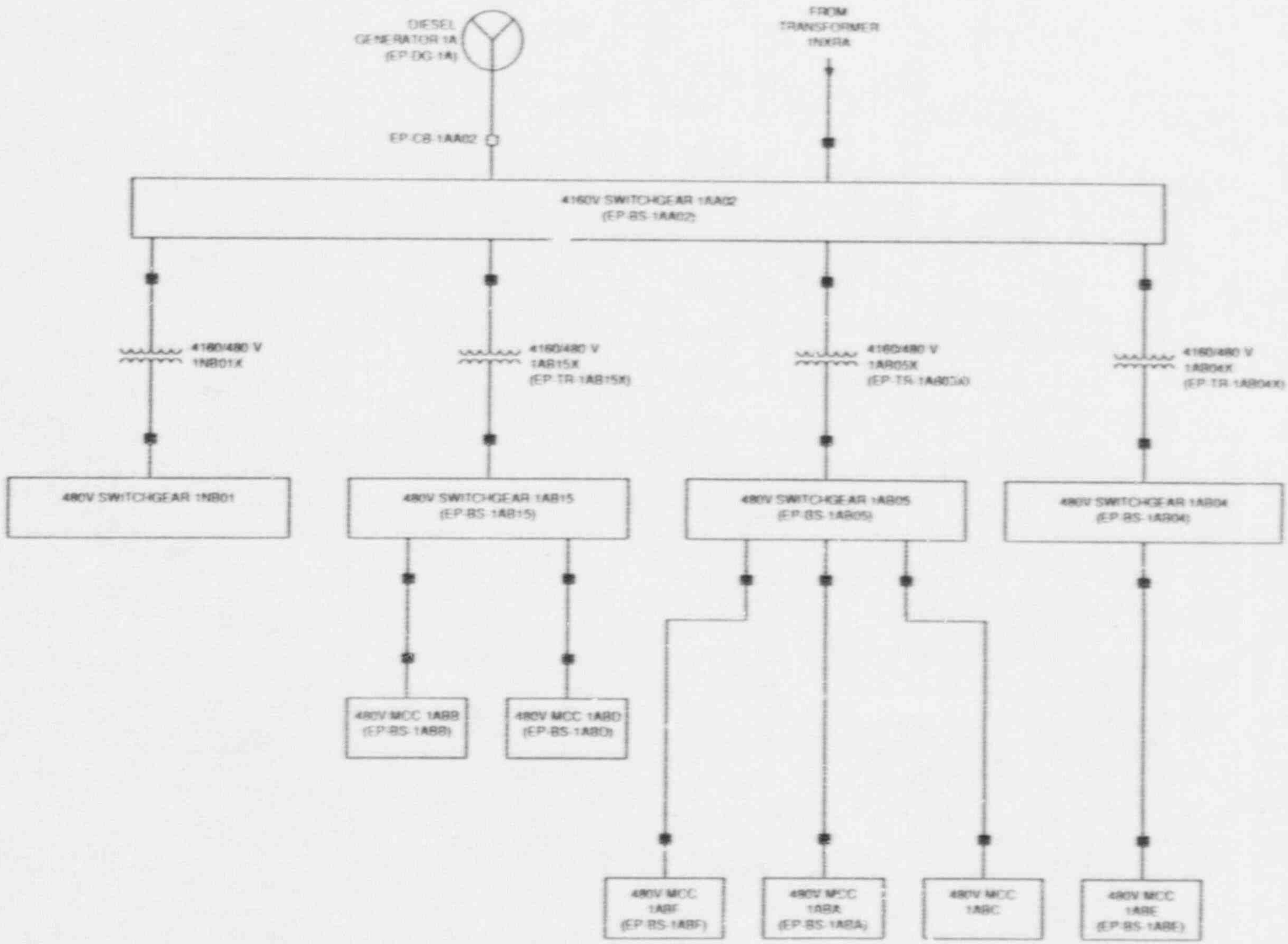
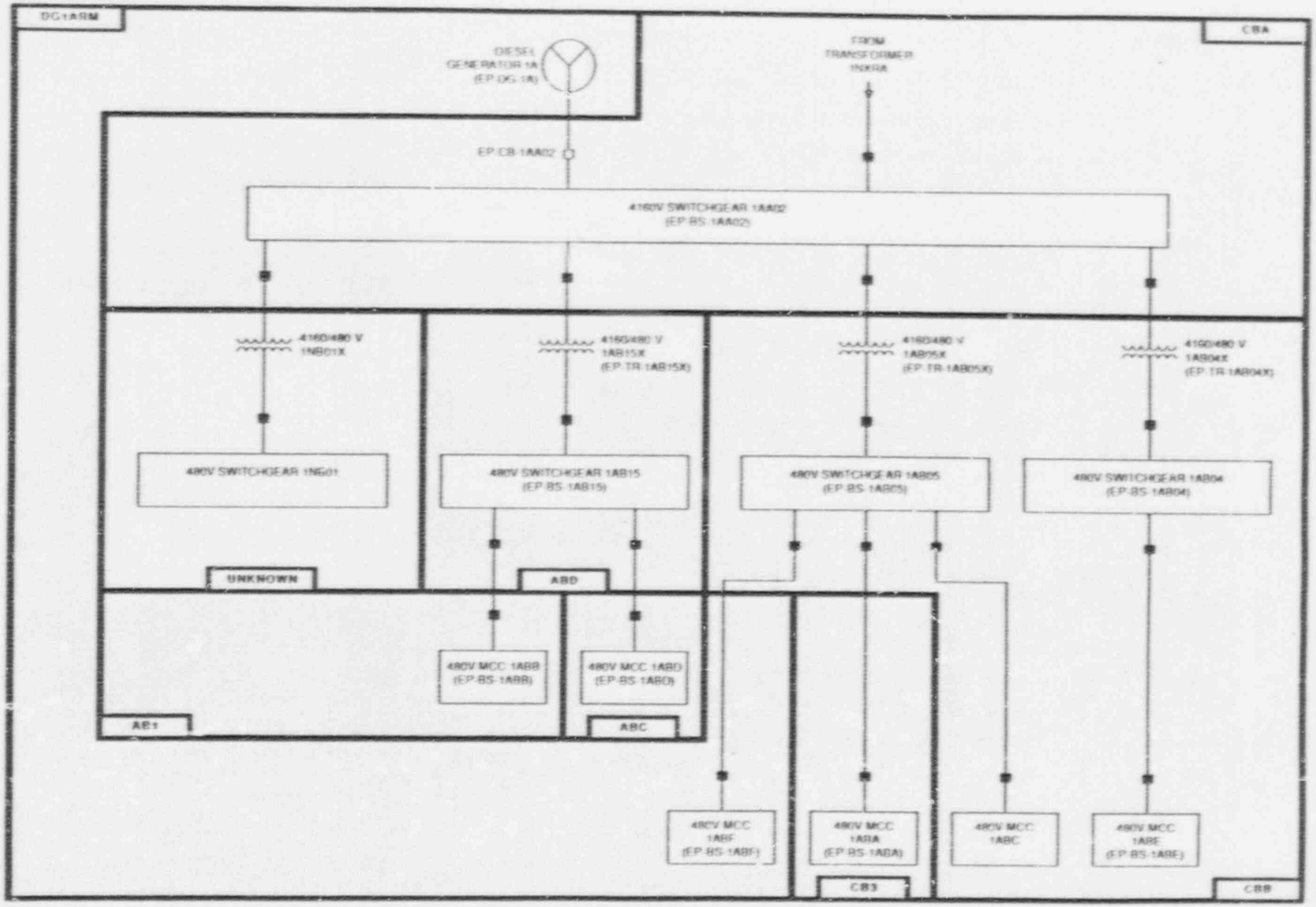


Figure 3.6-3. Vogtle 1 4160 and 480 VAC Electric Power Systems (Train A)



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS

Figure 3.6-4. Vogtle 1 4160 and 480 VAC Electric Power Systems (Train A) Showing Component Locations

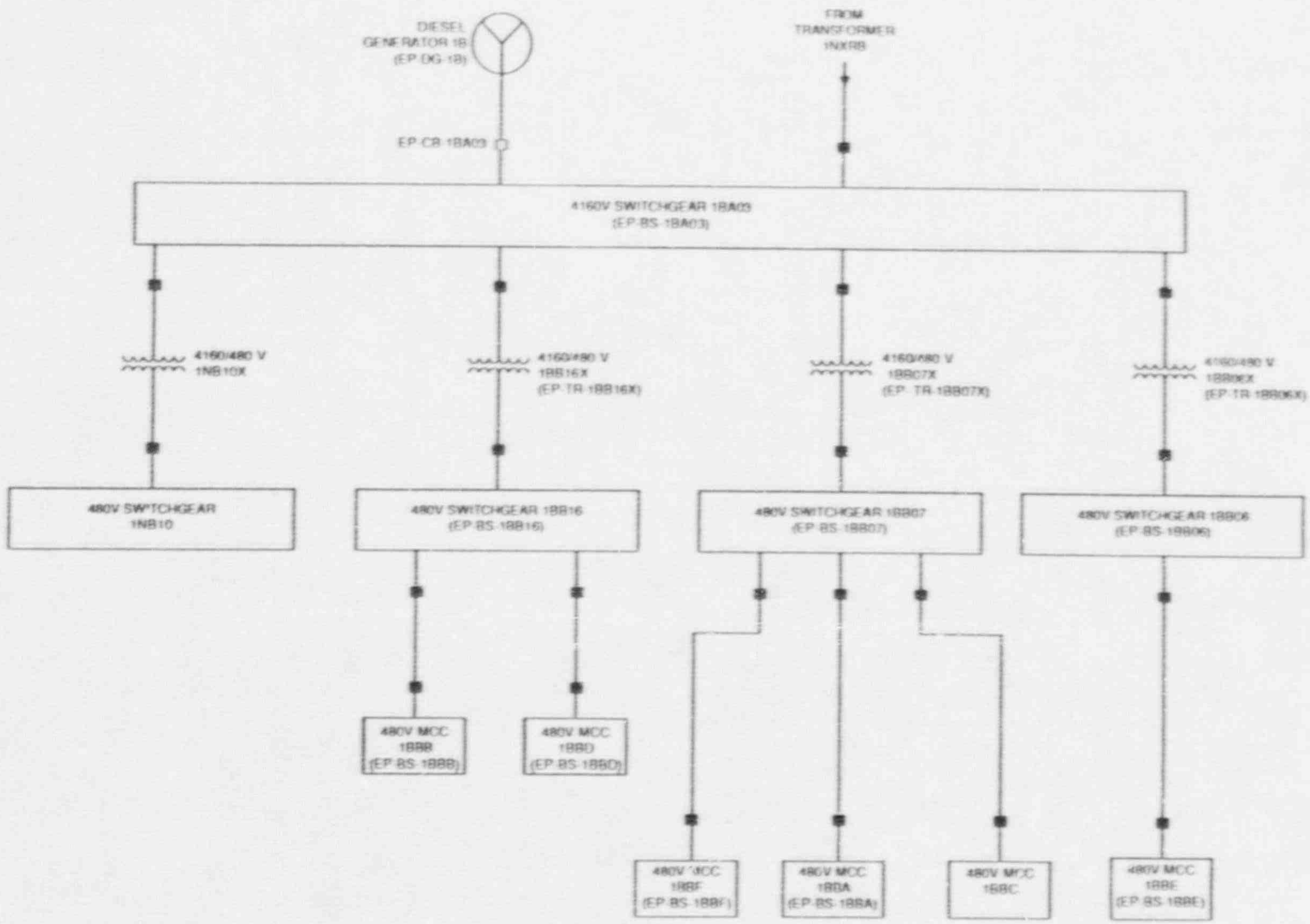
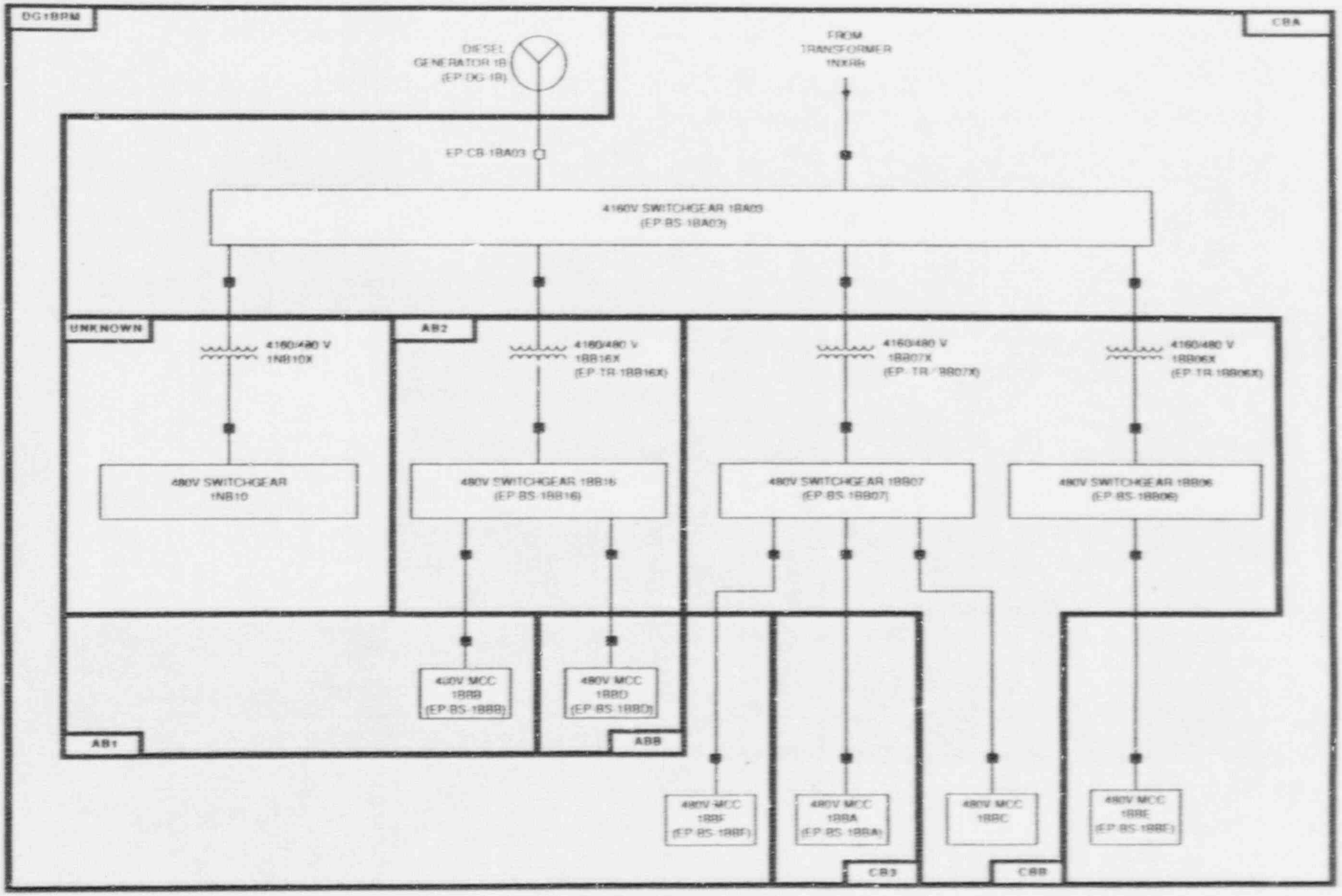


Figure 3.6-5. Vogtle 1 4160 and 480 VAC Electric Power Systems (Train B)



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS

Figure 3.6-6. Vogtle 1 4160 and 480 VAC Electric Power Systems (Train B) Showing Component Locations

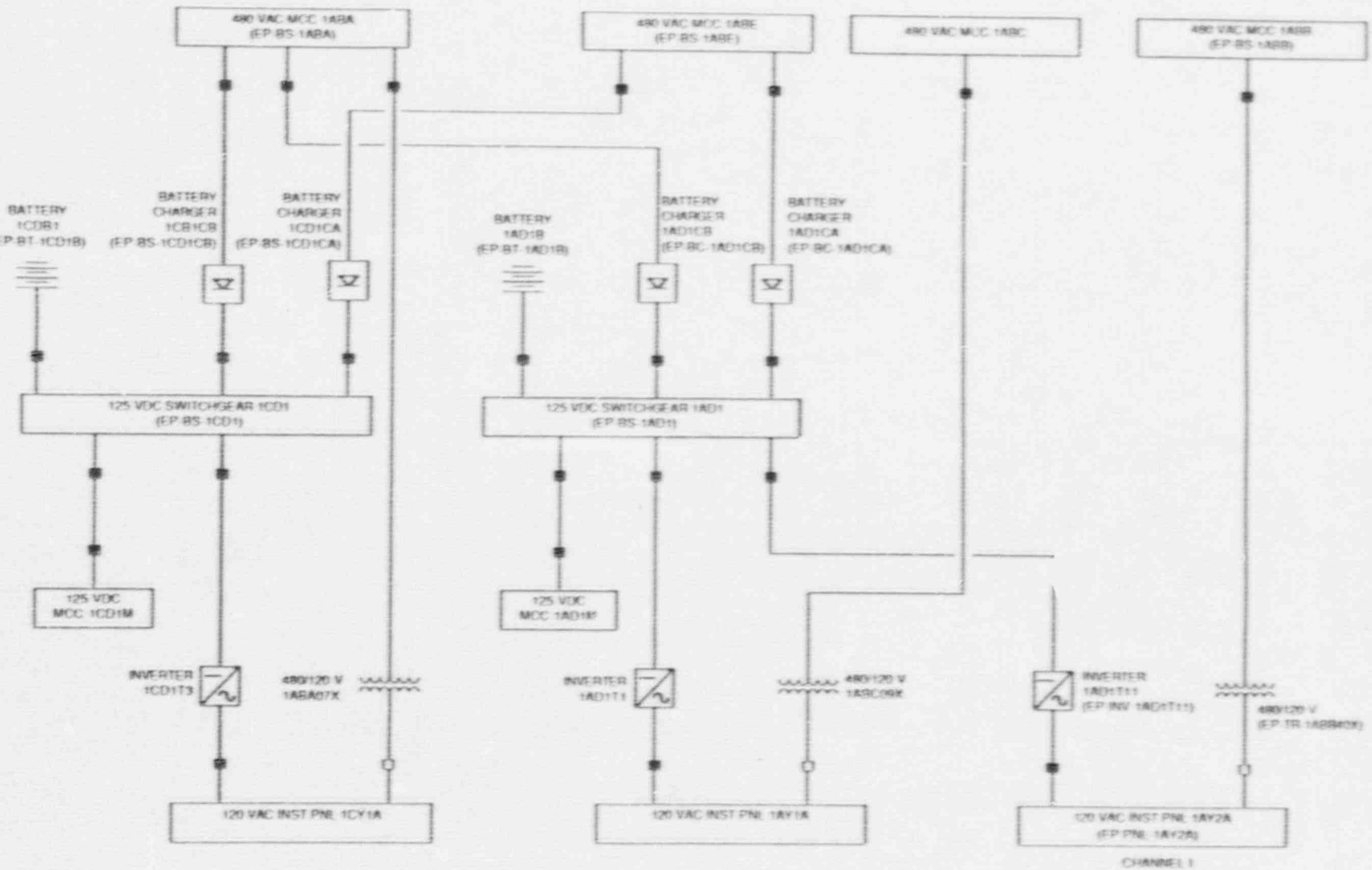
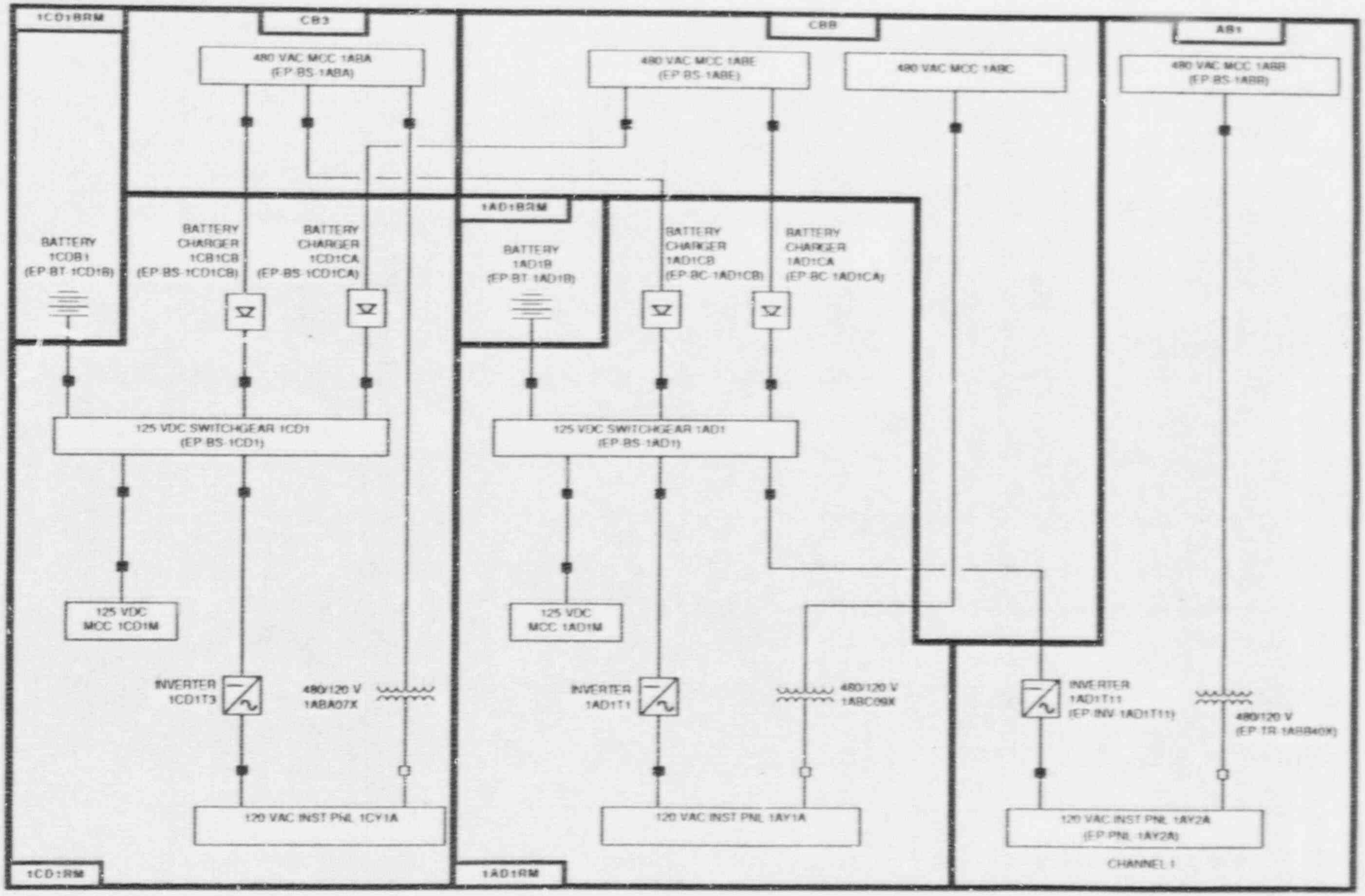


Figure 3.6-7. Vogtle 1 125 VDC and 120 VAC Electric Power Systems (Train A)



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS

Figure 3.6-8. Vogtle 1 125 VDC and 120 VAC Electric Power Systems (Train A) Showing Component Locations

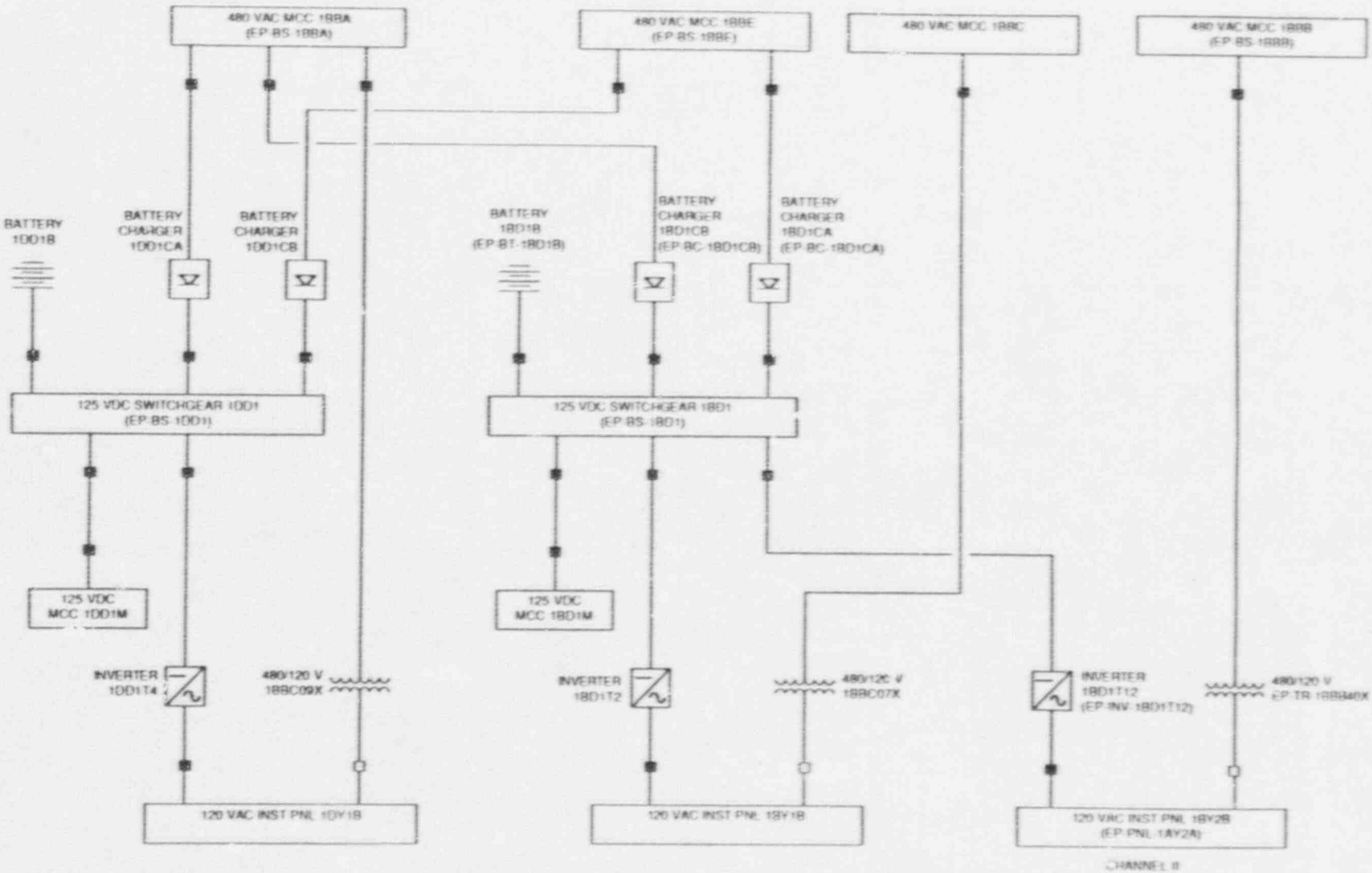
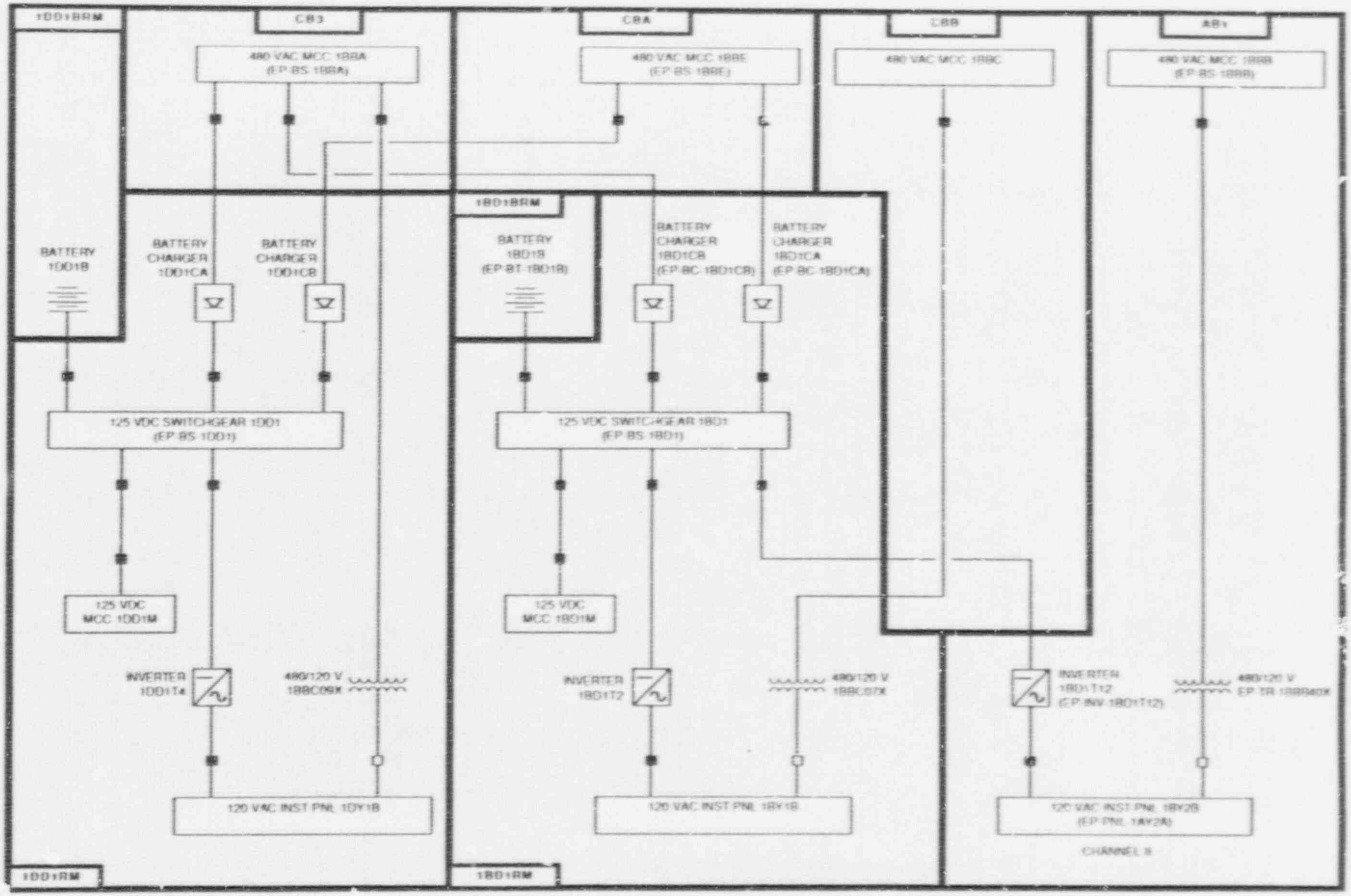


Figure 3.6-9. Vogtle 1 125 VDC and 120 VAC Electric Power Systems (Train B)



NOTE: LINES MAY NOT REPRESENT TRUE CABLE ROUTING BETWEEN ROOMS

Figure 3.6-10. Vogtle 1 125 VDC and 120 VAC Electric Power Systems (Train B) Showing Component Locations

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
EP-BC-1AD1CA	BC	1AD1RM	EP-BS-1ABE	480	CBB	AC/A
EP-BC-1AD1CB	BC	1AD1RM	EP-BS-1ABA	480	CB3	AC/A
EP-BC-1BD1CA	BC	1BD1RM	EP-BS-1BBE	480	CBA	AC/B
EP-BC-1BD1CB	BC	1BD1RM	EP-BS-1BBA	480	CB3	AC/B
EP-BC-1CD1CA	BC	1CD1RM	EP-BS-1ABE	480	CBB	AC/A
EP-BC-1CD1CB	BC	1CD1RM	EP-BS-1ABA	480	CB3	AC/A
EP-BS-1AA02	BUS	CBA	EP-DG-1A	4160	DG1ARM	AC/A
EP-BS-1AB04	BUS	CBB	EP-TR-1AB04X	480	CBB	AC/A
EP-BS-1AB05	BUS	CBB	EP-TR-1AB05X	480	CBB	AC/A
EP-BS-1AB15	BUS	ABD	EP-TR-1AB15X	480	CBB	AC/A
EP-BS-1ABA	MCC	CB3	EP-BS-1AB05	480	CBB	AC/A
EP-BS-1ABB	MCC	AB1	EP-BS-1AB15	480	ABD	AC/A
EP-BS-1ABD	MCC	ABC	EP-BS-1AB15	480	ABD	AC/A
EP-BS-1ABE	MCC	CBB	EP-BS-1AB04	480	CBB	AC/A
EP-BS-1ABF	MCC	DG1ARM	EP-BS-1AB05	480	CBB	AC/A
EP-BS-1AD1	BUS	1AD1RM	EP-BC-1AD1CA	125	1AD1RM	DC/A
EP-BS-1BA03	BUS	CBA	EP-DG-1B	4160	DG1BRM	AC/B
EP-BS-1BB06	BUS	CB[illegible]	EP-TR-1BB06X	480	ABD	AC/A
EP-BS-1BB07	BUS	[illegible]	EP-TR-1BB07X	480	CBB	AC/B
EP-BS-1BB16	BUS	AB2	EP-TR-1BB16X	480	AB1	AC/B
EP-BS-1BBA	MCC	CB3	EP-BS-1BB07	480	CBB	AC/B
EP-BS-1BBB	MCC	AB1	EP-BS-1BB16	480	AB2	AC/B
EP-BS-1BBB	MCC	AB1	EP-BS-1BB16	480	AB2	AC/B
EP-BS-1BBD	MCC	ABB	EP-BS-1BB16	480	ABB	AC/B
EP-BS-1BBE	MCC	CBA	EP-BS-1BB06	480	CBB	AC/B
EP-BS-1BBF	MCC	DG1BRM	EP-BS-1BB07	480	CBB	AC/B

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

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
EP-BS-1BD1	BUS	1BD1RM	EP-BC-1BD1CA	125	1BD1RM	DC/B
EP-BS-1CD1	BUS	1CD1RM	EP-BC-1CD1CA	125	1CD1RM	DC/C
EP-BT-1AD1B	BATT	1AD1BRM	EP-BS-1AD1	125	1AD1RM	DC/A
EP-BT-1BD1B	BATT	1BD1BRM	EP-BS-1BD1	125	1BD1RM	DC/B
EP-BT-1CD1B	BATT	1CD1BRM	EP-BS-1CD1	125	1CD1RM	DC/C
EP-CB-1AA02	CB	CBA	EP-DG-1A	4160	DG1ARM	AC/A
EP-CB-1BA03	CB	CBA	EP-DG-1B	4160	DG1BRM	AC/B
EP-DG-1A	DG	DG1ARM				AC/A
EP-DG-1B	DG	[illegible]RM				AC/B
EP-INV-1AD1T11	INV	[illegible]	EP-BS-1AD1	125	1AD1RM	DC/A
EP-INV-1BD1T12	INV	[illegible]	EP-BS-1BD1	125	1BD1RM	DC/B
EP-TR-1AB04X	TR	CBB	EP-BS-1AA02	4160	CBA	AC/A
EP-TR-1AB05X	TR	CBB	EP-BS-1AA02	4160	CBA	AC/A
EP-TR-1AB15X	TR	ABD	EP-BS-1AA02	4160	CBA	AC/A
EP-TR-1ABB40X	TR	AB1	EP-BS-1ABB	480	AB1	AC/A
EP-TR-1BB06X	TR	CBA	EP-BS-1BA03	4160	CBA	AC/B
EP-TR-1BB07X	TR	CBB	EP-BS-1BA03	4160	CBA	AC/B
EP-TR-1BB16X	TR	AB2	EP-BS-1BA03	4160	CBA	AC/B
EP-TR-1BBB40X	TR	AB1	EP-BS-1BBB	480	AB1	AC/B

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BC-1AD1CA	125	DC/A	1A[illegible]1RM	EP	EP-BS-1AD1	BUS	1AD1RM
EP-BC-1AD1CA	125	DC/A	1AD1RM	EP	EP-BS-1AD1	BUS	1AD1RM
EP-BC-1BD1CA	125	DC/B	1BD1RM	EP	EP-BS-1BD1	BUS	1BD1RM
EP-BC-1B[illegible]	125	DC/B	1BD1RM	EP	EP-BS-1BD1	BUS	1BD1RM
EP-BC-1CD1CA	125	DC/C	1CD1RM	EP	EP-BS-1CD1	BUS	1CD1RM
EP-BS-1AA02	4160	[illegible]C/A	CBA	AFWS	AFW-P1A	MDP	AFWAPMRM
EP-BS-1AA02	4160	[illegible]C/A	CBA	CCWS	CCW-P1A	MDP	ABA
EP-BC-1AA02	4160	AC/A	CBA	CCWS	CCW-P3A	MDP	ABA
EP-BS-1AA02	4160	AC/A	CBA	CCWS	CCW-P5A	MDP	ABA
EP-BS-1AA02	[illegible]160	AC/A	CBA	CHRS	CSA-P1A	MDP	ABD
EF[illegible]AA02	4160	AC/A	CBA	CVCS	CHG-PM1A	MDP	ABC
[illegible]2	4160	AC/A	CBA	ECCS	RHR-P1A	MDP	ABD
[illegible]	4160	AC/A	CBA	ECCS	SI-P1A	MDP	ABB
[illegible]	4160	AC/A	CBA	EP	EP-TR-1AB04X	TR	CBB
EP-B[illegible]A02	4160	AC/A	CBA	EP	EP-TR-1AB05X	TR	CBB
EP-BS[illegible]A02	4160	AC/A	CBA	EP	EP-TR-1AB15X	TR	ABD
EP-BS-1AA02	4160	AC/A	C[illegible]A	NSCWS	NSCW-1A	MDP	NSCWA
EP-BS-1AA02	4160	AC/A	CBA	NSCWS	NSCW-3A	MDP	NSCWA
EP-BS-1AA02	4160	AC/A	CBA	NSCWS	NSCW-5A	MDP	NSCWA
EP-BS-1AB04	480	AC/A	CBB	EP	EP-BS-1ABE	MCC	CBB
EP-BS-1AB05	480	AC/A	CBB	EP	EP-BS-1ABA	MCC	CB3
EP-BS-1AB05	480	AC/A	CBB	EP	EP-BS-1ABF	MCC	DG1ARM
EP-BS-1AB15	480	AC/A	ABD	EP	EP-BS-1ABB	MCC	AB1
EP-BS-1AB15	480	AC/A	ABD	EP	EP-BS-1ABD	MCC	ABC
EP-BS-1ABA	480	AC/A	CB3	EP	EP-BC-1AD1CB	BC	1AD1RM
EP-BS-1ABA	480	AC/A	CB3	EP	EP-BC-1CD1CB	BC	1CD1RM
EP-BS-1ABB	480	AC[illegible]A	AB1	ECCS	RHR-8804A	MOV	ABC
EP-BS-1ABB	480	AC/A	AB1	ECCS	SI-8835	MOV	ABA
EP-BS-1ABB	48[illegible]	AC/A	AB1	EP	EP-TR-1ABB40X	TR	AB1
EP-BS-1ABB	480	AC/A	AB1	NSCWS	NSCW-1600	MOV	NSCWA
EP-BS-1ABB	480	AC/A	AB1	NSCWS	NSCW-1605	MOV	NSCWA

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BS-1ABB	480	AC/A	AB1	NSCWS	NSCW-1606	MOV	NSCWA
EP-BS-1ABB	480	AC/A	AB1	NSCWS	NSCW-1658A	MOV	NSCWA
EP-BS-1ABB	480	AC/A	AB1	NSCWS	NSCW-1658B	MOV	NSCWA
EP-BS-1ABD	480	AC/A	ABC	CHRS	1806	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	CHRS	1808	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	CHRS	1822	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	CHRS	1830	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	CHRS	CSA-9001A	MOV	ABA
EP-BS-1ABD	480	AC/A	ABC	CHRS	CSA-9002A	MOV	ABC
EP-BS-1ABD	480	AC/A	ABC	CHRS	CSA-9003A	MOV	ABC
EP-BS-1ABD	480	AC/A	[illegible]	CVCS	CHG-0112D	MOV	ABC
EP-BS-1ABD	480	AC/A	ABC	CVCS	CHG-8471A	MOV	ABC
EP-BS-1ABD	480	AC/A	ABC	CVCS	CHG-8485A	MOV	ABC
EP-BS-1ABD	480	AC/A	ABC	CVCS	CHG-8801A	MOV	ABA
EP-BS-1ABD	480	AC/A	ABC	CVCS	CHG-8803A	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	CVCS	CHG-8807A	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	CVCS	CHG-8924	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	ECCS	RHR-8716A	MOV	ABD
EP-BS-1ABD	480	AC/A	[illegible]	ECCS	RHR-8811A	MOV	ABD
EP-BS-1ABD	480	AC/A	[illegible]	ECCS	SI-8802A	MOV	ABA
EP-BS-1ABD	480	AC/A	ABC	ECCS	SI-8821A	MOV	ABB
EP-BS-1ABD	480	AC/A	ABC	ECCS	SI-892[illegible]A	MOV	ABB
EP-BS-1ABE	480	AC/A	CBB	EP	EP-BC-1AD1CA	BC	1AD1RM
EP-BS-1ABE	480	AC/A	CBB	EP	EP-BC-1CD1CA	BC	1CD1RM
EP-BS-1ABE	480	AC/A	CBB	RCS	RCS-455A	NV	RC
EP-BS-1ABE	480	AC/A	CBB	RCS	RCS-8000A	MOV	RC
EP-BS-1ABE	480	AC/A	CBB	RCS	RHR-8701A	MOV	RC
EP-BS-1ABF	480	AC/A	DG1ARM	AFWS	AFW-5119	MOV	AFWAPMRM
EP-BS-1ABF	480	AC/A	DG1ARM	AFWS	AFW-5137	MOV	SMSTMVRM
EP-BS-1ABF	480	AC/A	DG1ARM	AFWS	AFW-5139	MOV	SMSTMVRM
EP-BS-1AD1	125	DC/A	1AD1RM	AFWS	AFW-3019A	MOV	NMSTMVRM

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BS-1AD1	125	DC/A	1AD1RM	EP	EP-BT-1AD1B	BATT	1AD1BRM
EP-BS-1AD1	125	DC/A	1AD1RM	EP	EP-INV-1AD1T11	INV	AB1
EP-BS-1BA03	4160	AC/B	CBA	AFWS	AFW-P1B	MDP	AFWBPMRM
EP-BS-1BA03	4160	AC/B	CBA	CCWS	CCW-P2B	MDP	ABA
EP-BS-1BA03	4160	AC/B	CBA	CCWS	CCW-P4B	MDP	ABA
EP-BS-1BA03	4160	AC/B	CBA	CCWS	CCW-P6B	MDP	ABA
EP-BS-1BA03	4160	AC/B	CBA	CHRS	CSB-P1B	MDP	ABD
EP-BS-1BA03	4160	AC/B	CBA	CVCS	CHG-PM1B	MDP	ABC
EP-BS-1BA03	4160	AC/B	CBA	ECCS	RHR-P1B	MDP	ABD
EP-BS-1BA03	4160	AC/B	CBA	ECCS	SI-P1B	MDP	ABB
EP-BS-1BA03	4160	AC/B	CBA	EP	EP-TR-1BB06X	TR	CBA
EP-BS-1BA03	4160	AC/B	CBA	EP	EP-TR-1BB07X	TR	CBB
EP-BS-1BA03	4160	AC/B	CBA	EP	EP-TR-1BB16X	TR	AB2
EP-BS-1BA03	4160	AC/B	CBA	NSCWS	NSCW-2B	MDP	NSCWB
EP-BS-1BA03	4160	AC/B	CBA	NSCWS	NSCW-4B	MDP	NSCWB
EP-BS-1BA03	4160	AC/B	CBA	NSCWS	NSCW-6B	MDP	NSCWB
EP-BS-1BB06	480	AC/B	CBB	EP	EP-BS-1BBE	MCC	CBA
EP-BS-1BB07	480	AC/B	CBB	EP	EP-BS-1BBA	MCC	CB3
EP-BS-1BB07	480	AC/B	CBB	EP	EP-BS-1BBF	MCC	DG1BRM
EP-BS-1BB16	480	AC/B	AB2	EP	EP-BS-1BBB	MCC	AB1
EP-BS-1BB16	480	AC/B	AB2	EP	EP-BS-1BBB	MCC	AB1
EP-BS-1BB16	480	AC/B	ABB	EP	EP-BS-1BBD	MCC	ABB
EP-BS-1BBA	480	AC/B	CB3	EP	EP-BC-1BD1CB	BC	1BD1RM
EP-BS-1BBB	480	AC/B	AB1	AFWS	AFW-5132	MOV	NMSTMVRM
EP-BS-1BBB	480	AC/B	AB1	AFWS	AFW-5134	MOV	NMSTMVRM
EP-BS-1BBB	480	AC/B	AB1	ECCS	RHR-8804B	MOV	ABC
EP-BS-1BBB	480	AC/B	AB1	EP	EP-TR-1BBB40X	TR	AB1
EP-BS-1BBB	480	AC/B	AB1	NSCWS	NSCW-1607	MOV	NSCWB
EP-BS-1BBB	480	AC/B	AB1	NSCWS	NSCW-1612	MOV	NSCWB
EP-BS-1BBB	480	AC/B	AB1	NSCWS	NSCW-1613	MOV	NSCWB
EP-BS-1BBB	480	AC/B	AB1	NSCWS	NSCW-1669A	MOV	NSCWB

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BS-1BBB	480	AC/B	AB1	NSCWS	NSCW-1669B	MOV	NSCWB
EP-BS-1BBB	480	AC/B	AB1	NSCWS	NSCW-1669B	MOV	NSCWB
EP-BS-1BBD	480	AC/B	ABB	CHRS	1807	MOV	FBB
EP-BS-1BBD	480	AC/B	ABB	CHRS	1809	MOV	FBB
EP-BS-1BBD	480	AC/B	ABB	CHRS	1823	MOV	FBB
EP-BS-1BBD	480	AC/B	ABB	CHRS	1831	MOV	FBB
EP-BS-1BBD	480	AC/B	ABB	CHRS	CSB-9001B	MOV	FBA
EP-BS-1BBD	480	AC/B	ABB	CHRS	CSB-9002B	MOV	FBC
EP-BS-1BBD	480	AC/B	ABB	CHRS	CSB-9003B	MOV	FBC
EP-BS-1BBD	480	AC/B	[illegible]	CVCS	CHG-0112E	MOV	ABC
EP-BS-1BBD	480	AC/B	ABB	CVCS	CHG-8471B	MOV	ABC
EP-BS-1BBD	480	AC/B	ABB	CVCS	CHG-8485B	MOV	ABC
EP-BS-1BBD	480	AC/B	ABB	CVCS	CHG-8801B	MOV	ABA
EP-BS-1BBD	480	AC/B	ABB	CVCS	CHG-8803B	MOV	ABB
EP-BS-1BBD	480	AC/B	ABB	CVCS	CHG-8807B	MOV	ABB
EP-BS-1BBD	480	AC/B	ABB	ECCS	RHR-8716B	MOV	ABD
EP-BS-1BBD	480	AC/B	ABB	ECCS	RHR-8811B	MOV	FBC
EP-BS-1BBD	480	AC/B	ABB	ECCS	SI-8802B	MOV	FBA
EP-BS-1BBD	480	AC/B	ABB	ECCS	SI-8806	MOV	ABB
EP-BS-1BBD	480	AC/B	ABB	ECCS	SI-8821B	MOV	ABB
EP-BS-1BBD	480	AC/B	ABB	ECCS	SI-8923B	MOV	ABB
EP-BS-1BBE	480	AC/B	CBA	EP	EP-BC-1BD1CA	BC	1BD1RM
EP-BS-1BBE	480	AC/B	CBB	RCS	RCS-456A	NV	RC
EP-BS-1BBE	480	AC/B	CBA	RCS	RCS-8000B	MOV	RC
EP-BS-1BBE	480	AC/B	CBA	RCS	RHR-8702A	MOV	RC
EP-BS-1BBF	480	AC/B	DG1BRM	AFWS	AFW-5118	MOV	AFWBPMRM
EP-BS-1BD1	125	DC/B	1BD1RM	AFWS	AFW-3009B	MOV	SMSTMVRM
EP-BS-1BD1	125	DC/B	1BD1RM	EP	EP-BT-1BD1B	BATT	1BD1BRM
EP-BS-1BD1	125	DC/B	1BD1RM	EP	EP-INV-1BD1T12	INV	AB1
EP-BS-1CD1	125	DC/C	1CD1RM	AFWS	AFW-5106	MOV	TDAFWPMRM
EP-BS-1CD1	125	DC/C	1CD1RM	AFWS	AFW-5113	MOV	TDAFWPMRM

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

POWER SOURCE	VOLTAGE	EMERG LOAD GRP	POWER SOURCE LOCATION	LOAD SYSTEM	LOAD COMPONENT ID	COMP TYPE	COMPONENT LOCATION
EP-BS-1CD1	125	DC/C	1CD1RM	AFWS	AFW-5122	MOV	SMSTMVRM
EP-BS-1CD1	125	DC/C	1CD1RM	AFWS	AFW-5125	MOV	NMSTMVRM
EP-BS-1CD1	125	DC/C	1CD1RM	AFWS	AFW-5129	MOV	TDAFWPMRM
EP-BS-1CD1	125	DC/C	1CD1RM	EP	EP-BT-1CD1B	BATT	1CD1BRM
EP-BS-1CD1	125	DC/C	1CD1RM	RCS	RHR-8701B	MOV	RC
EP-BS-1DD1	125	DC/D	1DD1RM	RCS	RHR-8702B	MOV	RC
EP-DG-1A	4160	AC/A	DG1ARM	EP	EP-BS-1AA02	BUS	CBA
EP-DG-1A	4160	AC/A	DG1ARM	EP	EP-CB-1AA02	CB	CBA
EP-DG-1B	4160	AC/B	DG1BRM	EP	EP-BS-1BA03	BUS	CBA
EP-DG-1B	4160	AC/B	DG1BRM	EP	EP-CB-1BA03	CB	CBA
EP-TR-1AB04X	480	AC/A	CBB	EP	EP-BS-1AB04	BUS	CBB
EP-TR-1AB05X	480	AC/A	CBB	EP	EP-BS-1AB05	BUS	CBB
EP-TR-1AB15X	480	AC/A	CBB	EP	EP-BS-1AB15	BUS	ABD
EP-TR-1BB06X	480	AC/A	ABD	EP	EP-BS-1BB06	BUS	CBB
EP-TR-1BB07X	480	AC/B	CBB	EP	EP-BS-1BB07	BUS	CBB
EP-TR-1BB16X	480	AC/B	AB1	EP	EP-BS-1BB16	BUS	AB2

3.7 CONTAINMENT HEAT REMOVAL SYSTEMS

3.7.1 System Function

The containment heat removal systems consist of an integrated set of subsystems that provide the functions of containment heat removal and containment pressure control following a loss of coolant accident. In conjunction with the ECCS, the containment heat removal systems complete the post-LOCA heat transfer path from the reactor core to the ultimate heat sink.

3.7.2 System Definition

The containment heat removal systems consists of two separate subsystems:

- Containment Cooling (CC) System
- Containment Spray (CS) System

The containment cooling system consists of eight separate 25-percent fan cooler units inside the containment which reject heat to the nuclear service cooling water system (NSCWS). For purposes of heat removal from the containment atmosphere, any combination of four fans in slow speed (versus high speed) is sufficient. Each fan cooling unit consists of a fan, drive motor, cooling coils, duct distribution system, and instrumentation and controls.

The containment spray system consists of two pumps, spray ring headers and spray nozzles, valves, and connecting piping. There are no heat exchangers in the containment spray system. Water from the refueling water storage tank (RWST) is initially used for the containment spray and later followed by water recirculated from the containment emergency sump.

The containment cooling system is separated into two trains consisting of four fan cooler units each. The two trains are supplied cooling water and electrical power from the corresponding train of the NSCWS and the Class 1E electrical power system. Likewise, the containment spray system is separated into two trains each supplied electrical power from the corresponding train of the Class 1E electrical power system.

Simplified drawings of the Containment Spray System are shown in Figures 3.5-1 and 3.5-2. The interface between the containment fan coolers and the nuclear service cooling water system is shown on the NSCWS drawings in Section 3.9. A summary of data on selected containment heat removal system components is presented in Table 3.7-1.

3.7.3 System Operation

The containment cooling system is an engineered safety feature (ESF) system that is in use during normal plant operation with four fans operating at high speed. The containment cooling system removes heat by continuously recirculating the containment atmosphere through cooling coils that transfer heat to the nuclear service cooling water system. System ESF operation is initiated automatically upon receipt of an SI signal, upon which all fans are restarted at low speed. The containment air cooling units can be stopped and started from the control room and from the shutdown panels.

The containment spray system is normally in standby. It is actuated by a signal initiated manually from the control room or automatically on coincidence of two of four containment pressure (high-3) signals. These signals start the containment spray pumps and open the discharge valves to the spray headers. During all modes of operation except refueling, the suction of the pumps is normally aligned to the RWST. The spray pumps continue to draw suction on the RWST until the later stages of the injection phase. After the ECCS is realigned from injection to recirculation, and when the RWST level reaches a low-level setpoint, the spray pump suction is remote-manually shifted to the containment emergency sumps.

3.7.4 System Success Criteria

The success criteria for the containment heat removal function is not clearly defined in the FSAR (Ref. 1), but it appears that this function can be accomplished by the combined operation of one train of containment coolers and one train of containment spray.

3.7.5 Component Information

A. Containment Spray Pumps 1A, 1B
   1. Rated flow: 2600 gpm @ 450 ft. head (195 psid)
   2. Rated capacity: 100%
   3. Type: horizontal centrifugal

B. Containment Fan Cooler Units (8)
   1. Design duty: 56.3×10^6 Btu/h (each)
   2. Design temperature: 270° F
   3. Design pressure: 60 psia

C. Spray Additive Tank
   1. Internal volume: 4000 gal
   2. Internal design pressure: 10 psig

D. Refueling Water Storage Tank
   1. Nominal volume: 715,000 gal
   2. Design pressure: atmospheric

3.7.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      a. The CS system is automatically actuated on coincidence of two of four containment pressure (high-3) signals.
      b. An SI signal automatically restarts all fans at low speed.
   2. Remote manual
      The CS system and containment fan cooler units can be actuated by remote manual means from the control room and from the remote shutdown panels.

B. Motive Power
   The CS pumps, containment fan cooler units, and related motor-operated valves are Class 1E AC loads that can be supplied from the standby diesel generators, as described in Section 3.6. Redundant loads are supplied from separate load groups.

C. Cooling Water
   1. The CS pumps are cooled by the nuclear service cooling water system (see Section 3.9).
   2. The containment fan cooler units are cooled by the nuclear service cooling water system (see Section 3.9).

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

3.7.7 Section 3.7 References

1. Vogtle Final Safety Analysis Report, Section 6.2.2

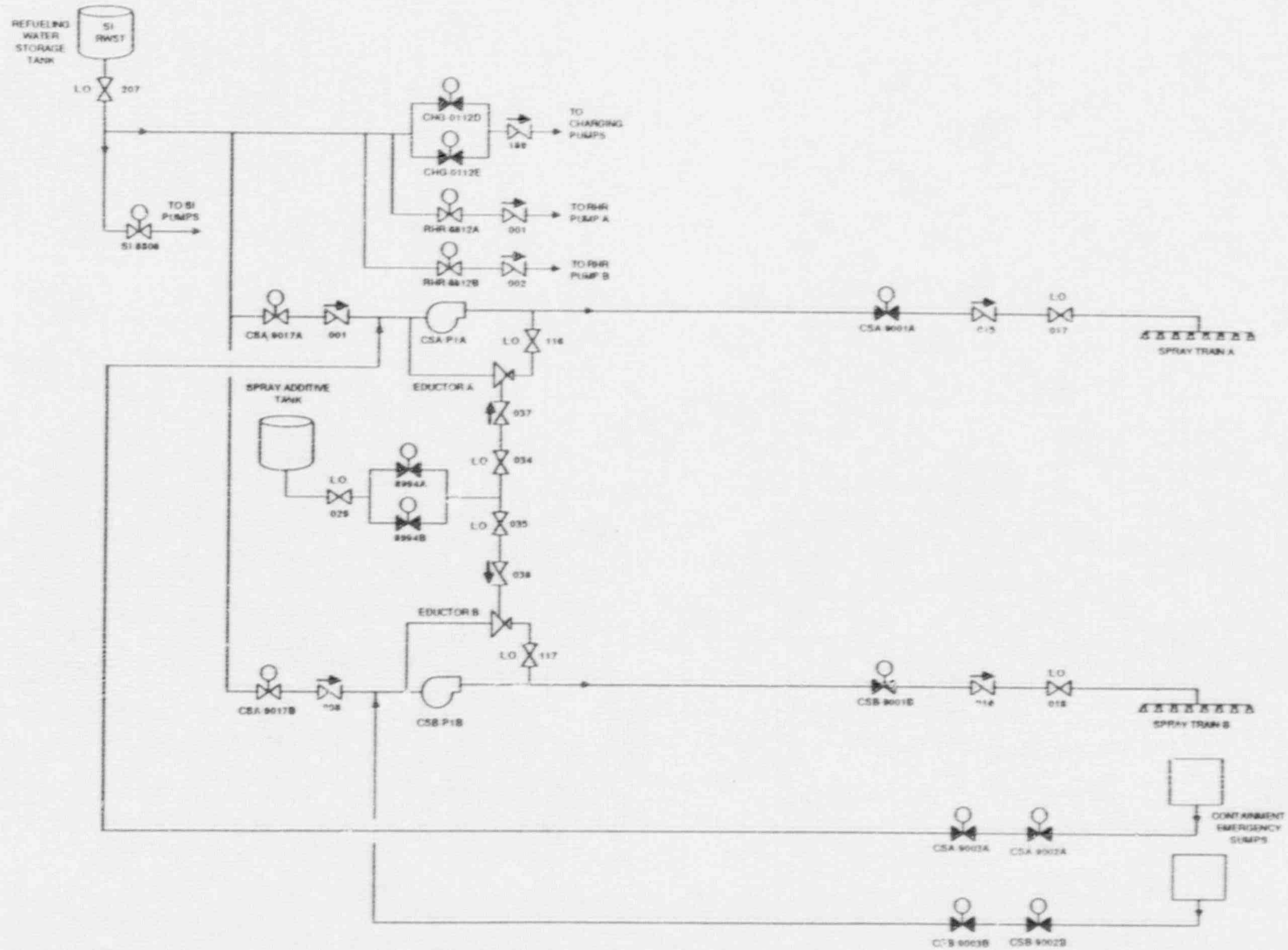


Figure 3.7-1. Vogtle 1 Containment Spray System

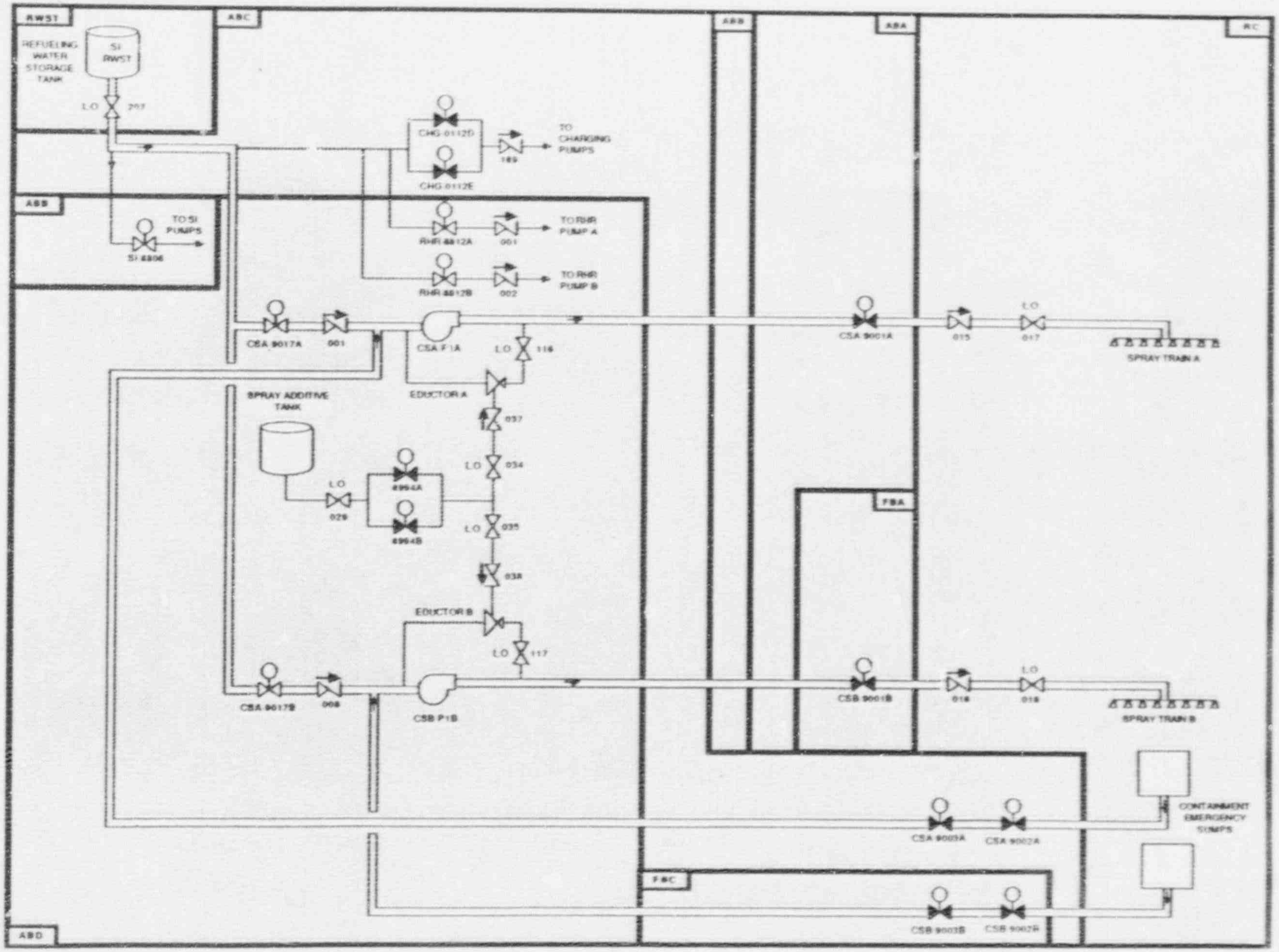


Figure 3.7-2. Vogtle 1 Containment Spray System Showing Component Location

Table 3.7-1. Vogtle 1 Containment Heat Removal System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
1806	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
1807	MOV	FBB	EP-BS-1BBD	480	ABB	AC/B
1808	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
1809	MOV	FBB	EP-BS-1BBD	480	ABB	AC/B
1822	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
1823	MOV	FBB	EP-BS-1BBD	480	ABB	AC/B
1830	MOV	ABB	EP-BS-1ABD	480	ABC	AC/A
1831	MOV	FBB	EP-BS-1BBD	480	ABB	AC/B
CSA-9001A	MOV	ABA	EP-BS-1ABD	480	ABC	AC/A
CSA-9002A	MOV	ABC	EP-BS-1ABD	480	ABC	AC/A
CSA-9003A	MOV	ABC	EP-BS-1ABD	480	ABC	AC/A
CSA-P1A	MDP	ABD	EP-BS-1AA02	4160	CBA	AC/A
CSB-9001B	MOV	FBA	EP-BS-1BBD	480	ABB	AC/B
CSB-9002B	MOV	FBC	EP-BS-1BBD	480	ABB	AC/B
CSB-9003B	MOV	FBC	EP-BS-1BBD	480	ABB	AC/B
CSB-P1B	MDP	ABD	EP-BS-1BA03	4160	CBA	AC/B
SI-SUMPS	TK	RC				

3.8 COMPONENT COOLING WATER SYSTEM (CCWS)

3.8.1 System Function

The component cooling water system (CCWS) provides cooling for the spent fuel pool during all plant operating modes and for the residual heat removal system during normal shutdown and emergency conditions. It transfers reactor heat energy to the NSCWS for rejection to the ultimate heat sink. The CCWS serves as an intermediate system between the RCS and NSCWS, thereby reducing the probability of leakage of potentially radioactive coolant.

3.8.2 System Definition

The component cooling water system (CCWS) is a closed loop cooling water system consisting of two separate 100 percent capacity redundant trains. Each train is designed to supply cooling water to one spent fuel pool heat exchanger, one RHR heat exchanger, and the seal cooler of the RHR pump aligned with that heat exchanger. Each CCW train consists of one heat exchanger, three 50-percent capacity pumps, one CCW surge tank, and associated piping, valves, and instrumentation. Heat is transferred by the CCW heat exchangers to the nuclear service cooling water system.

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

3.8.3 System Operation

One CCWS train is operating during normal power generation, while both trains are automatically started by an ESF signal. The CCW pumps take suction from the shell side of the CCW heat exchangers and circulate the component cooling water through the components to be cooled, and then back to the shell side of the CCW heat exchanger. There, the heat is transferred to the NSCWS which in turn transfers the heat to the ultimate heat sink. There are three 50-percent capacity pumps in each train; the third pump serves as standby and allows maintenance to be performed on one pump.

The surge tank is connected to the main CCW line on the suction side of the pumps and functions to ensure that the system is kept filled and pump suction head requirements are maintained.

3.8.4 System Success Criteria

One CCW train utilizing two pumps is capable of fulfilling system requirements (Ref. 1). The Nuclear Service Cooling Water System is required to remove heat from the CCWS (see Section 3.9).

3.8.5 Component Information

A. Component Cooling Water pumps 1A, 2B, 3A, 4B, 5A, 6B
   1. Rated flow: 5000 gpm @ 160 ft. head (69 psid)
   2. Rated capacity: 50%
   3. Type: Horizontal centrifugal

B. Component Cooling Water heat exchangers A, B
   1. Heat transferred: 129×10^6 Btu/hr each
   2. Rate capacity: 100%
   3. Type: Horizontal shell and straight tube

C. Surge tanks (2)
   1. Total volume: 2000 gallons each
   2. Operating pressure: atmospheric

3.8.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      Both CCWS trains are automatically started by an engineered safety feature (ESF) signal.
   2. Remote manual
      The CCWS can be operated from the control room.

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

C. Other
   1. Heat is transferred from the CCW heat exchangers to the nuclear service cooling water system (see Section 3.9).
   2. CCW pump cooling is provided by the nuclear service cooling water system (see Section 3.9).
   3. Lubrication is assumed to be provided locally for the CCWS pumps.
   4. CCWS pump room cooling systems have not been identified.

3.8.7 Section 3.8 References

1. Vogtle 1 and 2 Final Safety Analysis Report, Section 9.2.2

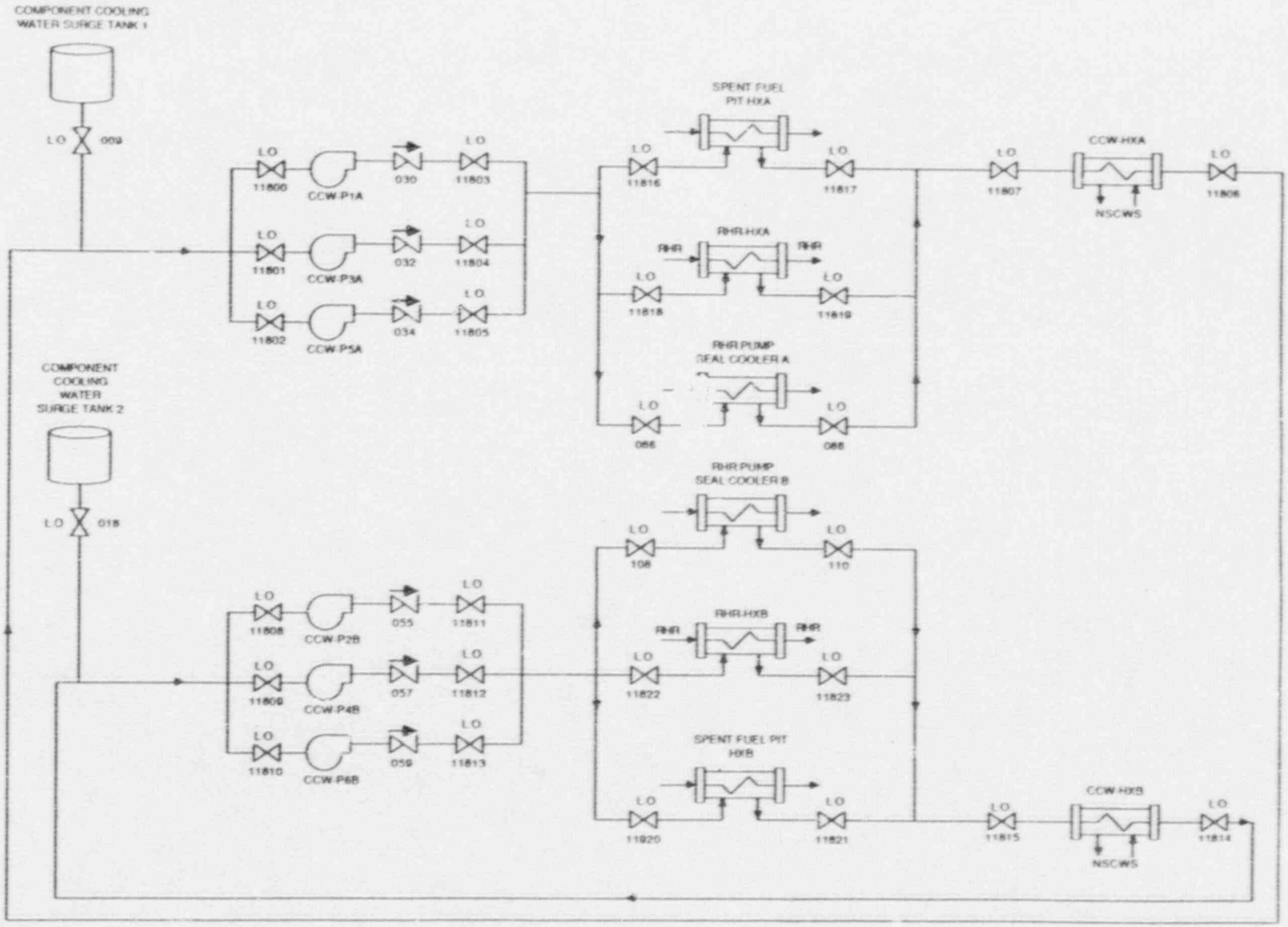


Figure 3.8-1. Vogtle 1 Component Cooling Water System

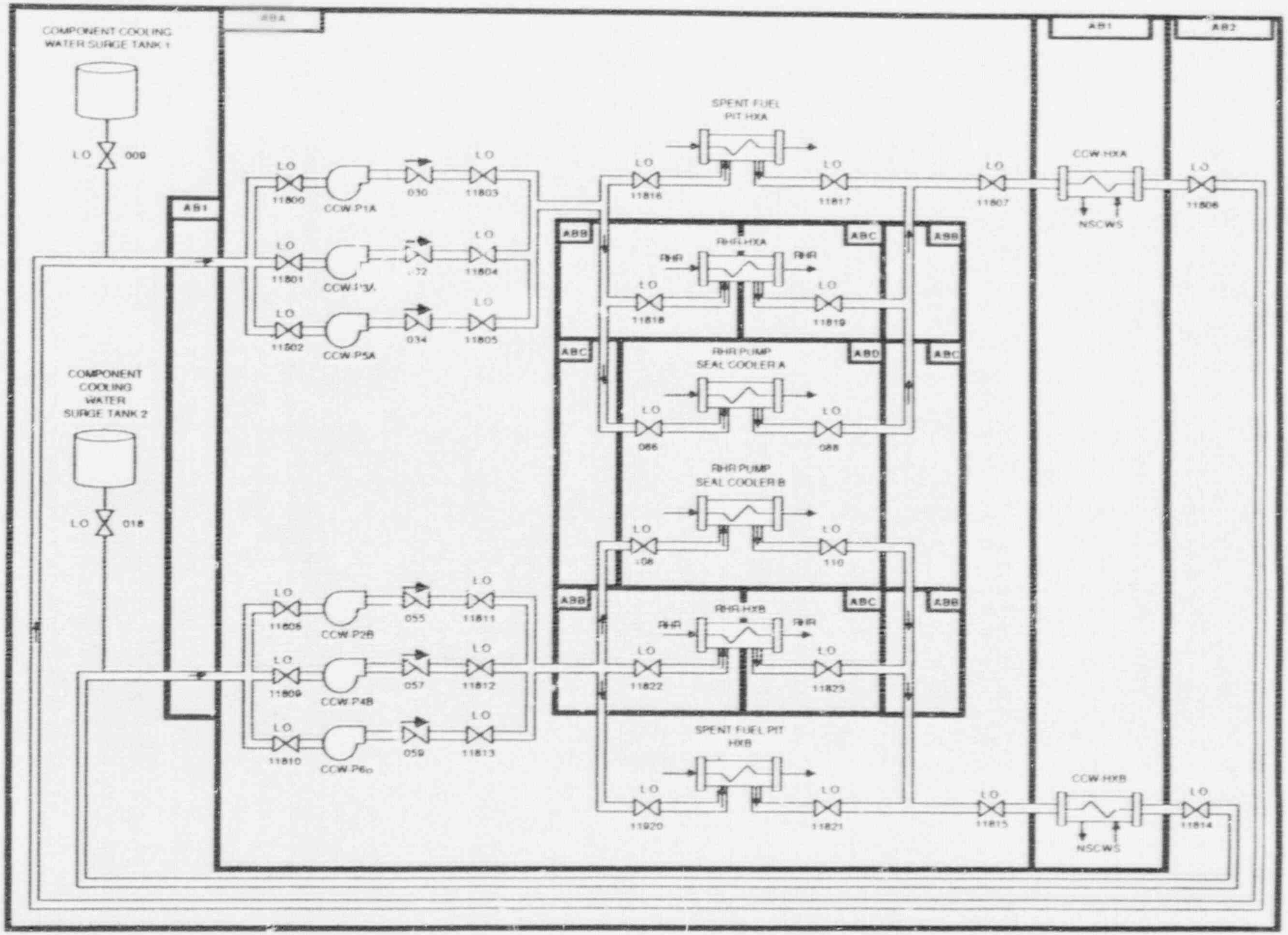


Figure 3.8-2. Vogtle 1 Component Cooling Water System Showing Component Locations

Table 3.8-1. Vogtle 1 Component Cooling Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
CCW-HXA	HX	AB1				
CCW-HXB	HX	AB2				
CCW-P1A	MDP	ABA	EP-BS-1AA02	4160	CBA	AC/A
CCW-P2B	MDP	ABA	EP-BS-1BA03	4160	CBA	AC/B
CCW-P3A	MDP	ABA	EP-BS-1AA02	4160	CBA	AC/A
CCW-P4B	MDP	ABA	EP-BS-1BA03	4160	CBA	AC/B
CCW-P5A	MDP	ABA	EP-BS-1AA02	4160	CBA	AC/A
CCW-P6B	MDP	ABA	EP-BS-1BA03	4160	CBA	AC/B

3.9 NUCLEAR SERVICE COOLING WATER SYSTEM (NSCWS)

3.9.1 System Function

The nuclear service cooling water system (NSCWS) provides cooling water for the containment coolers, control building ESF chiller condensers, various engineered safety features (ESF) pump coolers, standby diesel generator jacket water coolers, and the component cooling water (CCW) and auxiliary component cooling water (ACCW) heat exchangers and transfers the heat removed from these systems to the ultimate heat sink.

3.9.2 System Definition

The NSCWS consists of two separate, redundant, 100 percent capacity trains (train A and train B) comprised of cooling towers, pumps, valves and distribution piping. Cooling water for each unit is normally supplied from the cooling tower basins, by two of three NSCW pumps in each train. After removing heat from the components, coolant is piped back to the cooling towers where the heat is rejected through direct contact with ambient air. Each tower basin is provided with a transfer pump to effect water transfer between the two basins to permit full utilization of the water inventory in the two basins. It should be noted that the heat removal requirement is greater for Unit 2 than for Unit 1 due to the larger spent fuel storage capacity of the Unit 2 pool.

Simplified drawings of the NSCWS are shown in Figures 3.9-1 and 3.9-2 (train A) and in Figures 3.9-3 and 3.9-4 (train B). A summary of data on selected NSCWS components is presented in Table 3.9-1.

3.9.3 System Operation

During power generation, at least one NSCW train is in operation. During the other plant operating modes including post-accident coincident with a loss of offsite power, both NSCW trains may be operating, although one train is sufficient to reject 100 percent of the heat loads associated with bringing the plant to and holding the plant at a safe shutdown condition.

The NSCW pumps each provide 50 percent of the cooling water requirements for each train. Two pumps are operated, with the third pump on standby. The third pump is automatically started on low pressure in the pump discharge manifold.

The NSCWS supplies water at a higher pressure than the fluid in the cooled safety-related component. Therefore, if leakage occurs, it will be into the system being cooled.

3.9.4 System Success Criteria

Under emergency shutdown and accident conditions, system success can be achieved by one nuclear service cooling water train utilizing two of the three available pumps (Ref. 1).

3.9.5 Component Information

A. Nuclear Service Cooling Water pumps 1A, 3A, 5A, 2B, 4B, 6B
   1. Rated flow: 8,600 gpm @ 230 ft head (100 psid)
   2. Rated capacity: 50% (each)
   3. Type: Vertical centrifugal

3.9.6 Support Systems and Interfaces

A. Control Signals
   1. Automatic
      The NSCW pumps will be started automatically on low pressure in the pump discharge manifold or on a safety injection signal.
   2. Remote Manual
      The NSCWS pumps can be operated from the control room or from the shutdown panels.

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

C. Other
   1. Lubrication and cooling are assumed to be ; rovided locally for the NSCWS pumps.
   2. NSCWS pump room ventilation systems have not been identified.

3.9.7 Section 3.9 References

1. Vogtle 1 and 2 Final Safety Analysis Report, Section 9.2.1.

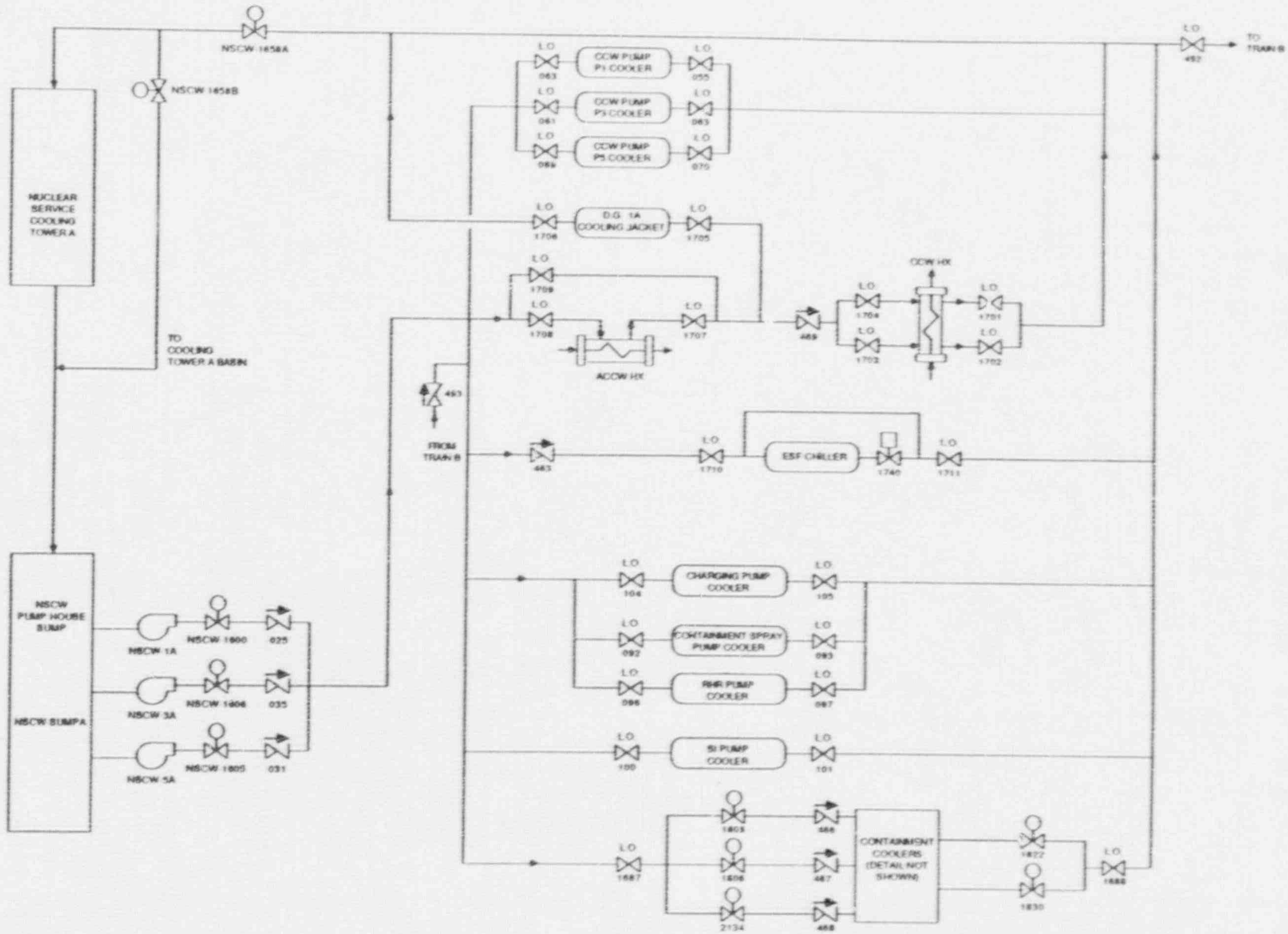


Figure 3.9-1. Vogtle 1 Nuclear Service Cooling Water System (Train A)

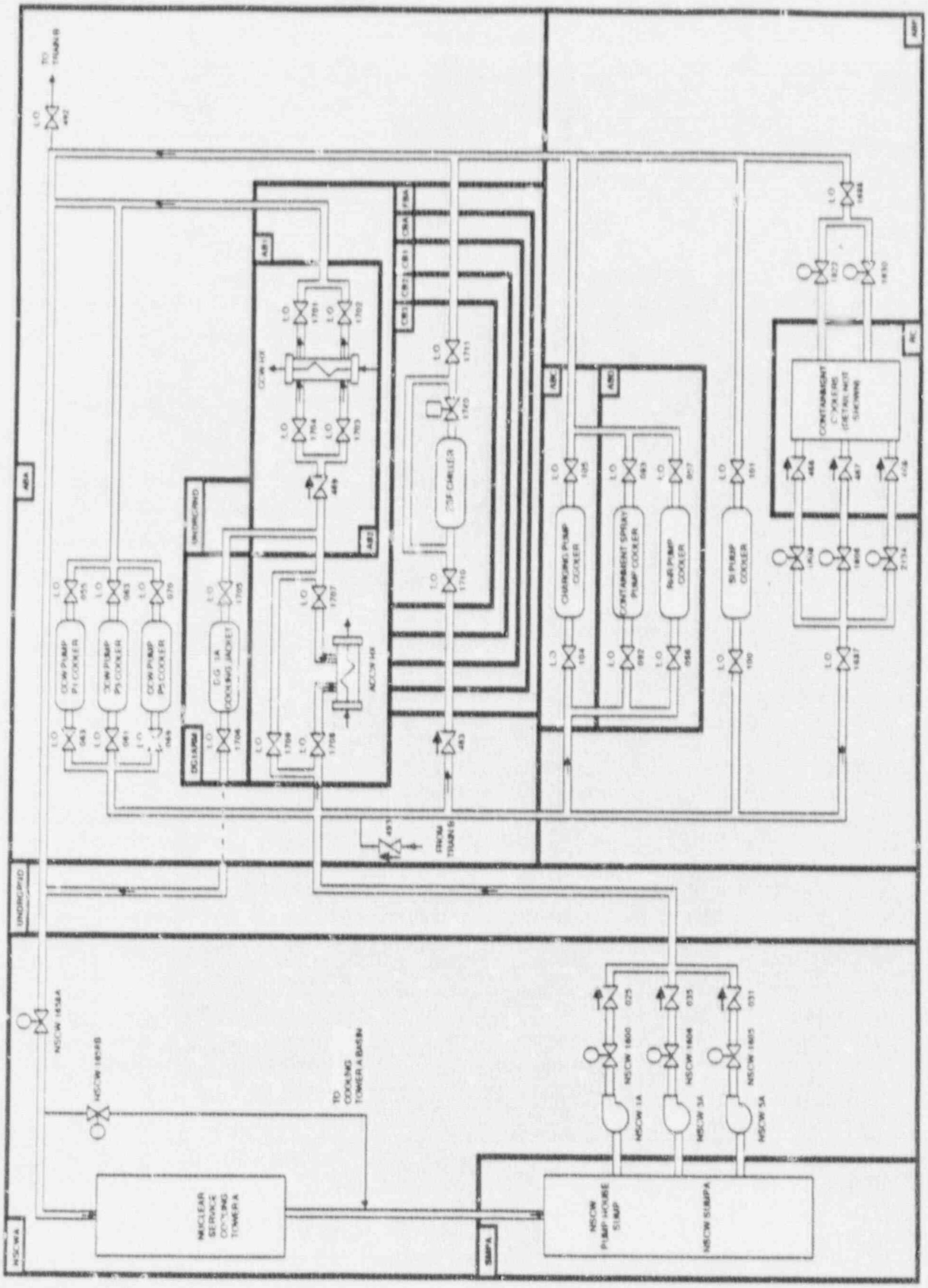


Figure 3.9-2. Vogtle 1 Nuclear Service Cooling Water System (Train A) Showing Component Locations

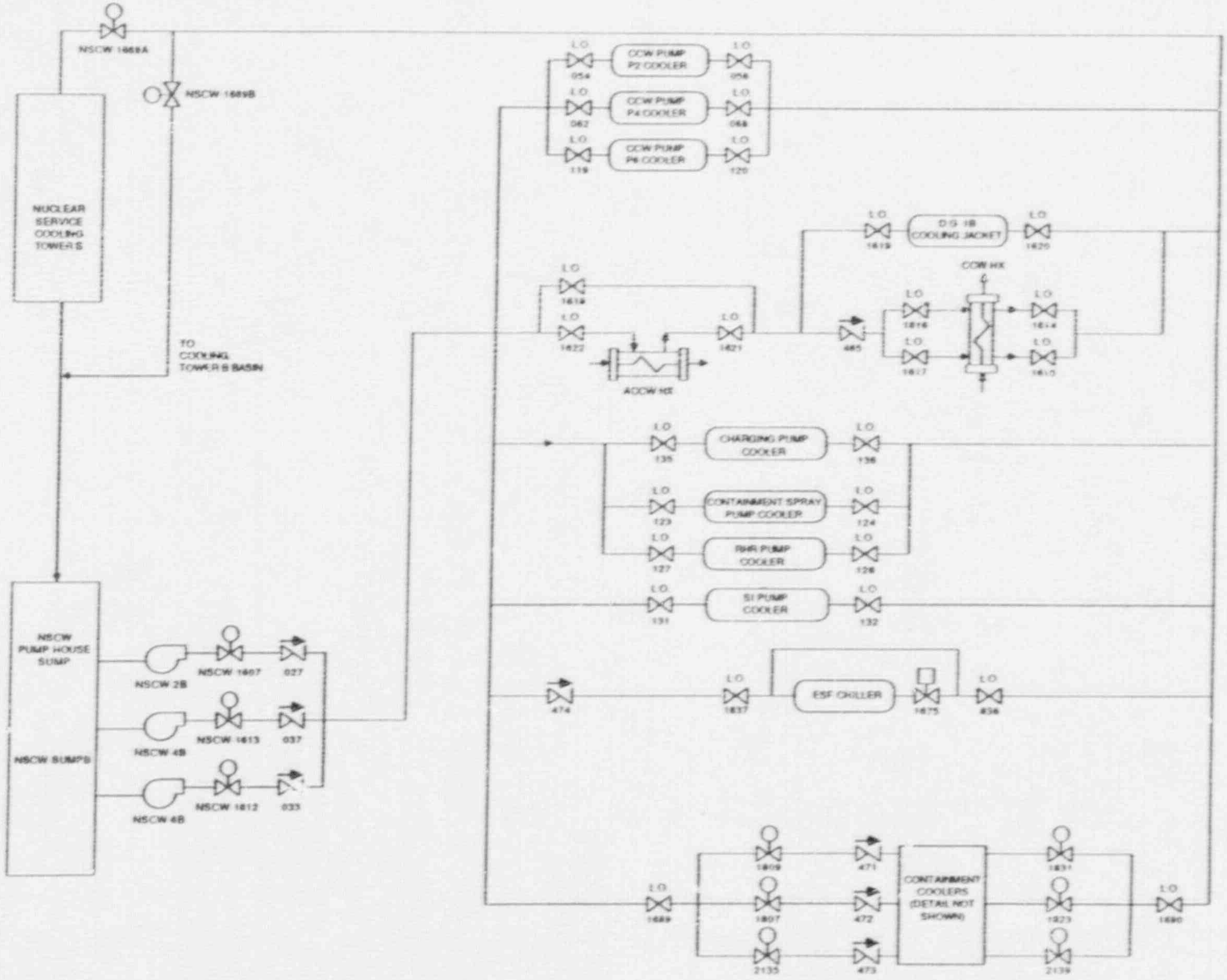


Figure 3.9-3. Vogtle 1 Nuclear Service Cooling Water System (Train B)

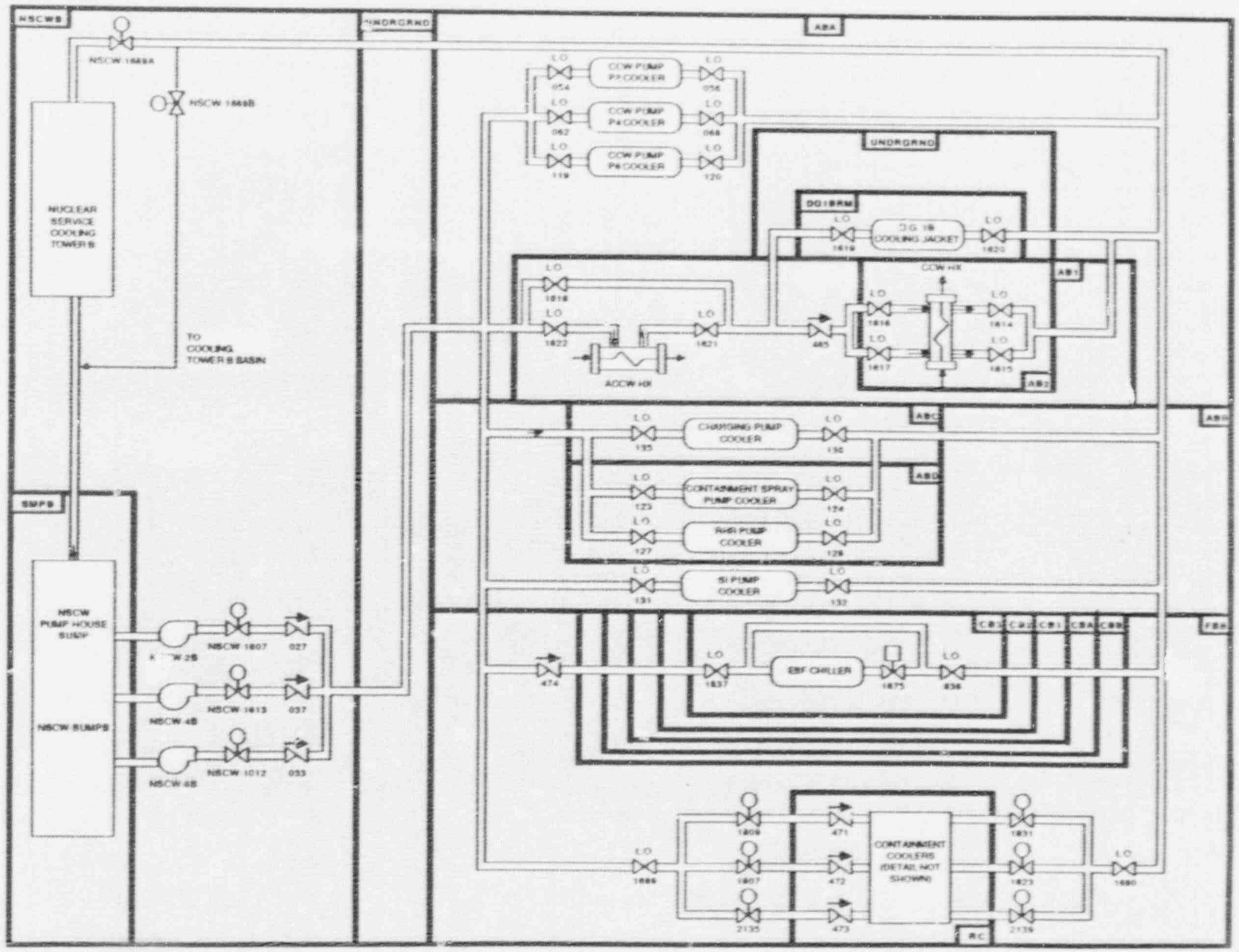


Figure 3.9-4. Vogtle 1 Nuclear Service Cooling Water System (Train B) Showing Component Locations

Table 3.9-1. Vogtle 1 Nuclear Service Cooling Water System Data Summary for Selected Components

COMPONENT ID	COMP. TYPE	LOCATION	POWER SOURCE	VOLTAGE	POWER SOURCE LOCATION	EMERG. LOAD GRP.
NSCW-1600	MOV	NSCWA	EP-BS-1ABB	480	AB1	AC/A
NSCW-1605	MOV	NSCWA	EP-BS-1ABB	480	AB1	AC/A
NSCW-1606	MOV	NSCWA	EP-BS-1ABB	480	AB1	AC/A
NSCW-1607	MOV	NSCWB	EP-BS-1BBB	480	AB1	AC/B
NSCW-1612	MOV	NSCWB	EP-BS-1BBB	480	AB1	AC/B
NSCW-1613	MOV	NSCWB	EP-BS-1BBB	480	AB1	AC/B
NSCW-1658A	MOV	NSCWA	EP-BS-1ABB	480	AB1	AC/A
NSCW-1658B	MOV	NSCWA	EP-BS-1ABB	480	AB1	AC/A
NSCW-1669A	MOV	NSCWB	EP-BS-1BBB	480	AB1	AC/B
NSCW-1669B	MOV	NSCWB	EP-BS-1BBB	480	AB1	AC/B
NSCW-1669B	MOV	NSCWB	EP-BS-1BBB	480	AB1	AC/B
NSCW-1A	MDP	NSCWA	EP-BS-1AA02	4160	CBA	AC/A
NSCW-2B	MDP	NSCWB	EP-BS-1BA03	4160	CBA	AC/B
NSCW-3A	MDP	NSCWA	EP-BS-1AA02	4160	CBA	AC/A
NSCW-4B	MDP	NSCWB	EP-BS-1BA03	4160	CBA	AC/B
NSCW-5A	MDP	NSCWA	EP-BS-1AA02	4160	CBA	AC/A
NSCW-6B	MDP	NSCWB	EP-BS-1BA03	4160	CBA	AC/B
NSCW-SUMPB	TK	SMPB				

4. PLANT INFORMATION

4.1 SITE AND BUILDING SUMMARY

The Vogtle 1 and 2 site is located in southeast Georgia on the west side of the Savannah River about 26 miles southeast of Augusta, Georgia, and 15 miles east-northeast of Waynesboro, Georgia. It is in Burke County, Georgia, just across the river from the Savannah River Plant. Figure 4-1 (from Ref. 1) shows a general view of the site, while Figure 4-2 shows a simplified plot plan.

The major structures include the containments, the equipment buildings, the turbine buildings, the auxiliary building, the control building, the diesel generator buildings, the auxiliary feedwater pumphouses, the fuel handling buildings, the nuclear service cooling water towers, and the circulating water cooling towers.

The containment encloses the RCS, the steam generators, some of the engineered safety features systems, and supporting systems. The containment is a prestressed, post-tensioned, reinforced concrete, right circular cylinder with a hemispherical dome. The auxiliary building, located south of the containments, contains the major engineered safety features systems and necessary auxiliary support systems. The control building, located north of the containments, contains many of the control and electrical systems.

The auxiliary feedwater pumphouse, located northeast of the containments, contains the train A and B motor-driven pumps as well as the train C turbine-driven pump. The condensate storage facility consists of two concrete condensate storage tanks.

The diesel generator building, located east of the containments, contains the two diesel generators, two fuel oil day tanks, and other auxiliaries. The nuclear service cooling water towers, located south of the containments, house the equipment required to cool the heated nuclear service cooling water.

4.2 FACILITY LAYOUT DRAWINGS

Figures 4-3 through 4-6 show various section views of the Vogtle 1 and 2 station. Figures 4-7 through 4-18 show simplified layout drawings for Vogtle 1. Comparable layout drawings for Vogtle 2 are shown in Figures 4-19 to 4-30. Major rooms, stairways, elevators, and doorways are shown in the simplified layout drawings, however, many interior walls have been omitted for clarity. Labels printed in uppercase correspond to the location codes listed in Table 4-1 and used in the component data listings and system drawings in Section 3. Some additional labels are included for information and are printed in lowercase type.

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

4.3 SECTION 4 REFERENCES

1. Heddleson, F.A., "Design Data and Safety Features of Commercial Nuclear Power Plants.", ORNL-NSIC-55, Volume 3, Oak Ridge National Laboratory, Nuclear Safety Information Center, April, 1974.

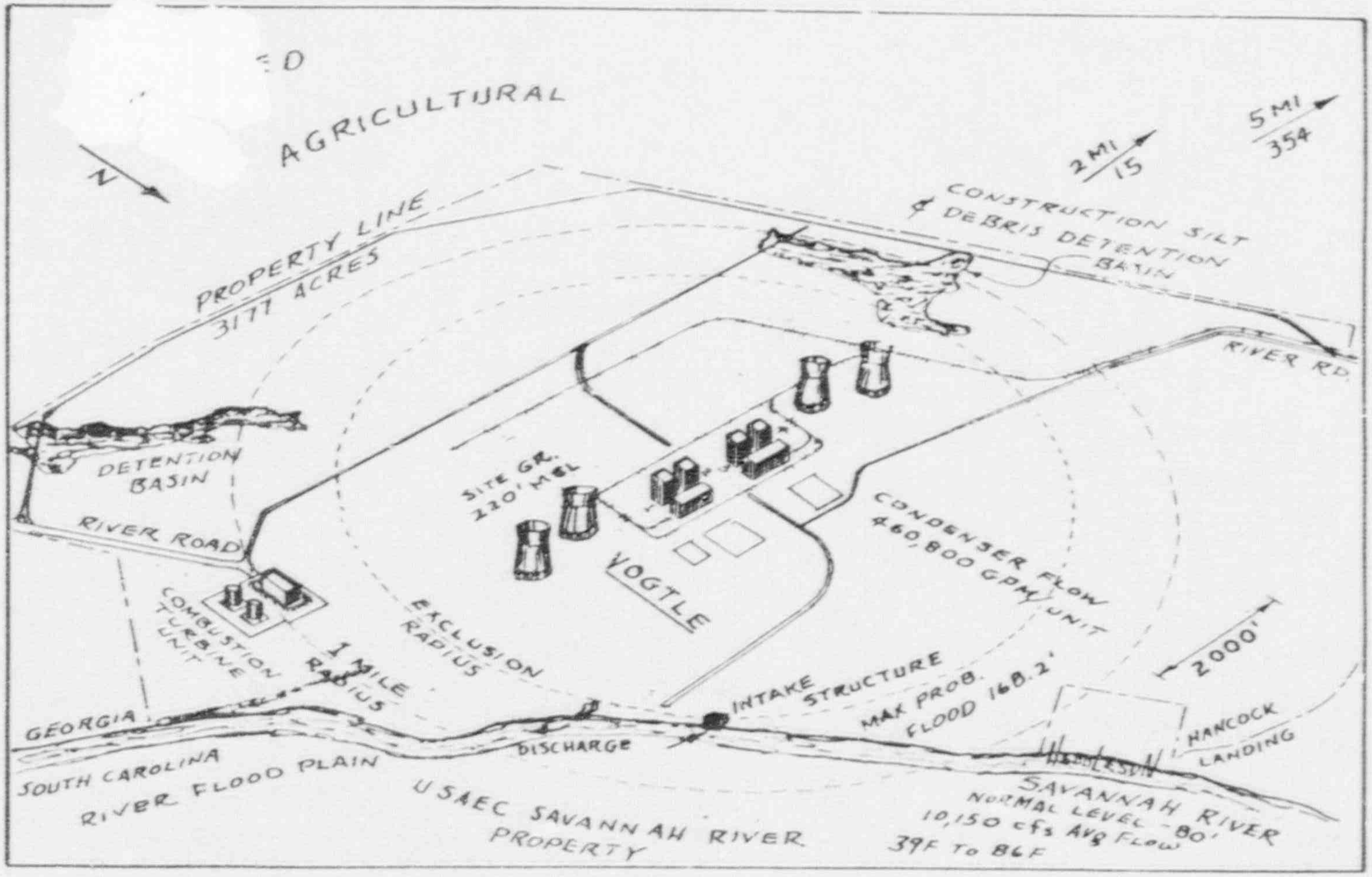


Figure 4-1. General View of Vogtle 1 and 2 Site and Vicinity

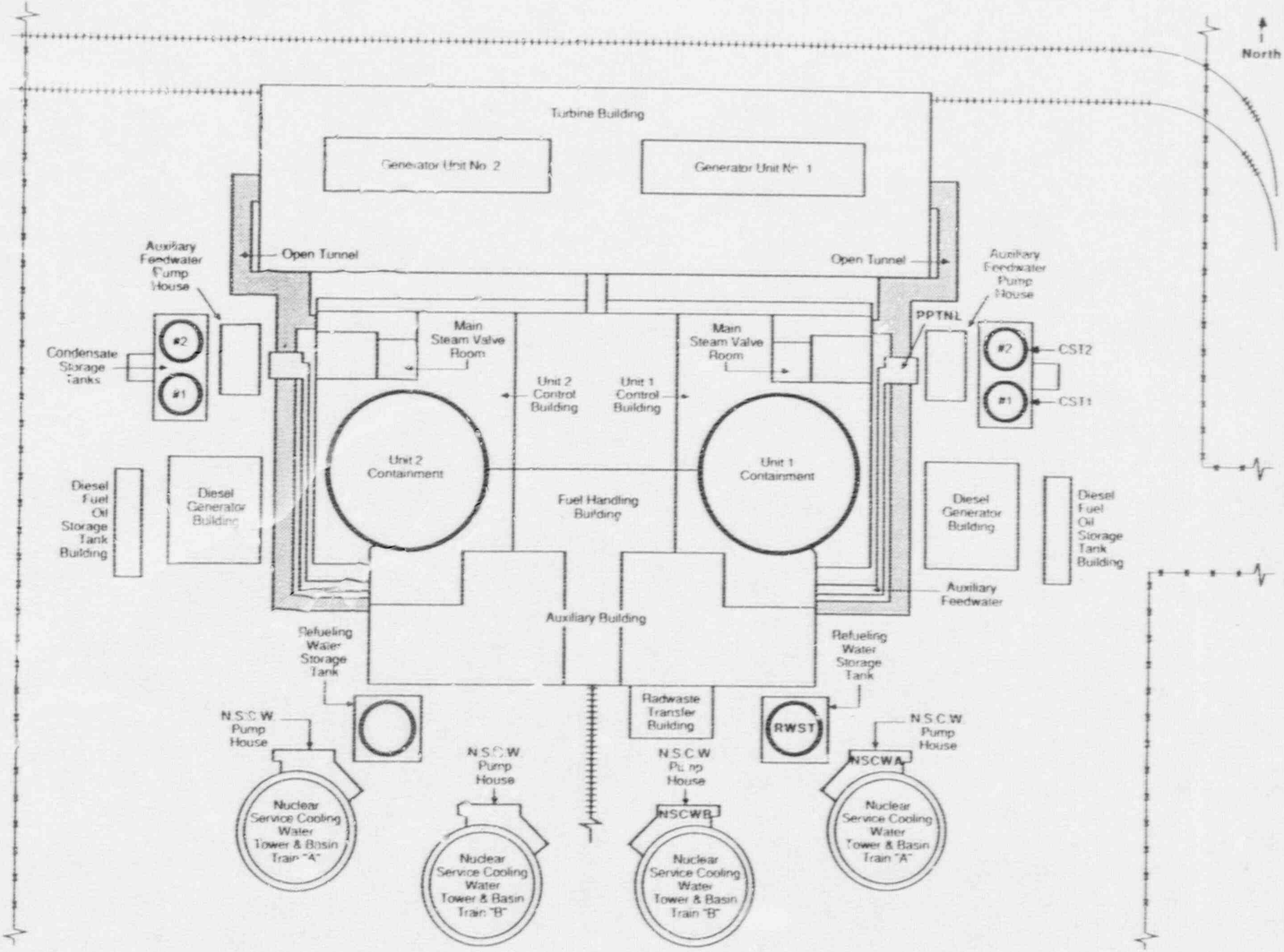


Figure 4-2. Vogtle 1 and 2 Simplified Site Plan

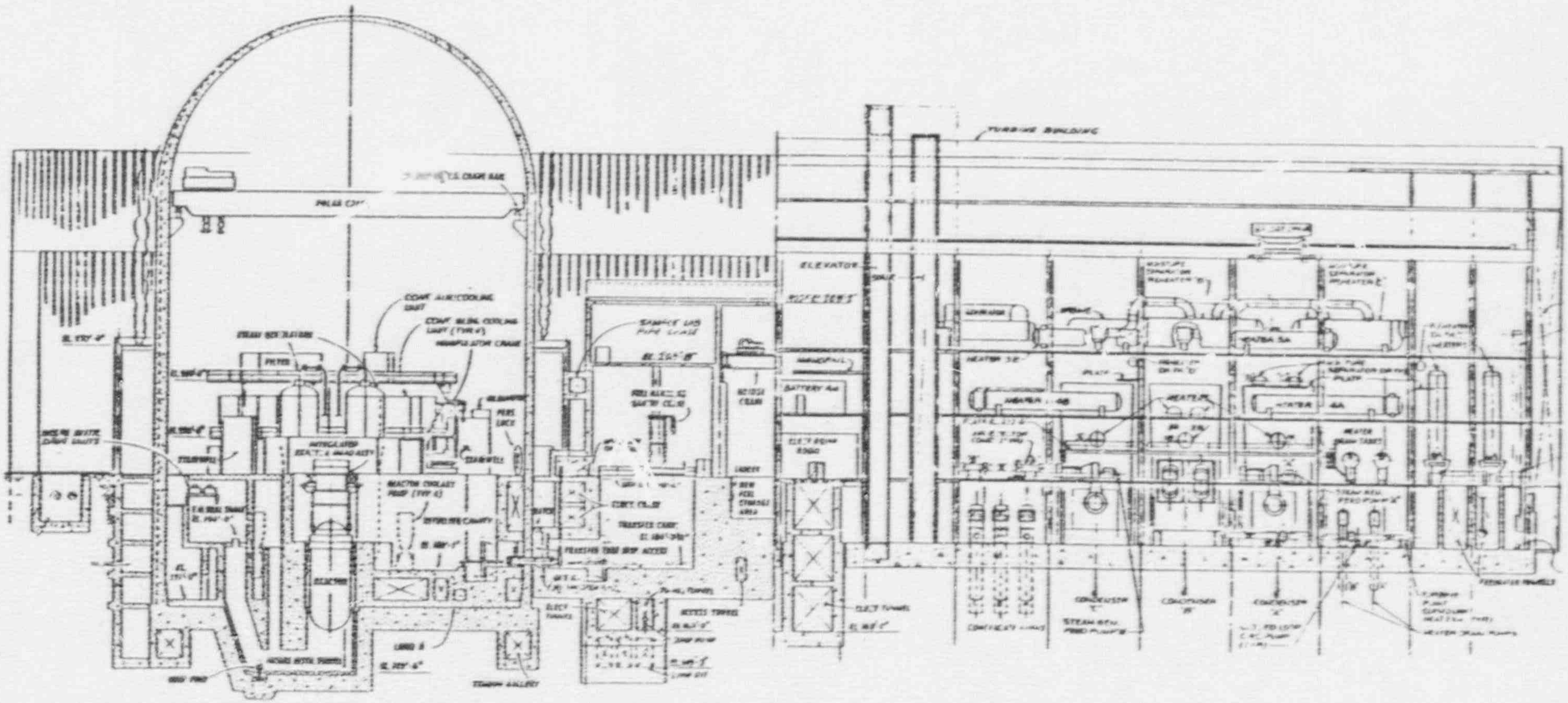


Figure 4-3. Vogtle 2 General Arrangement, Looking North (Section Through Unit 2 Containment Fuel Handling Building and Unit 1 Turbine Building)

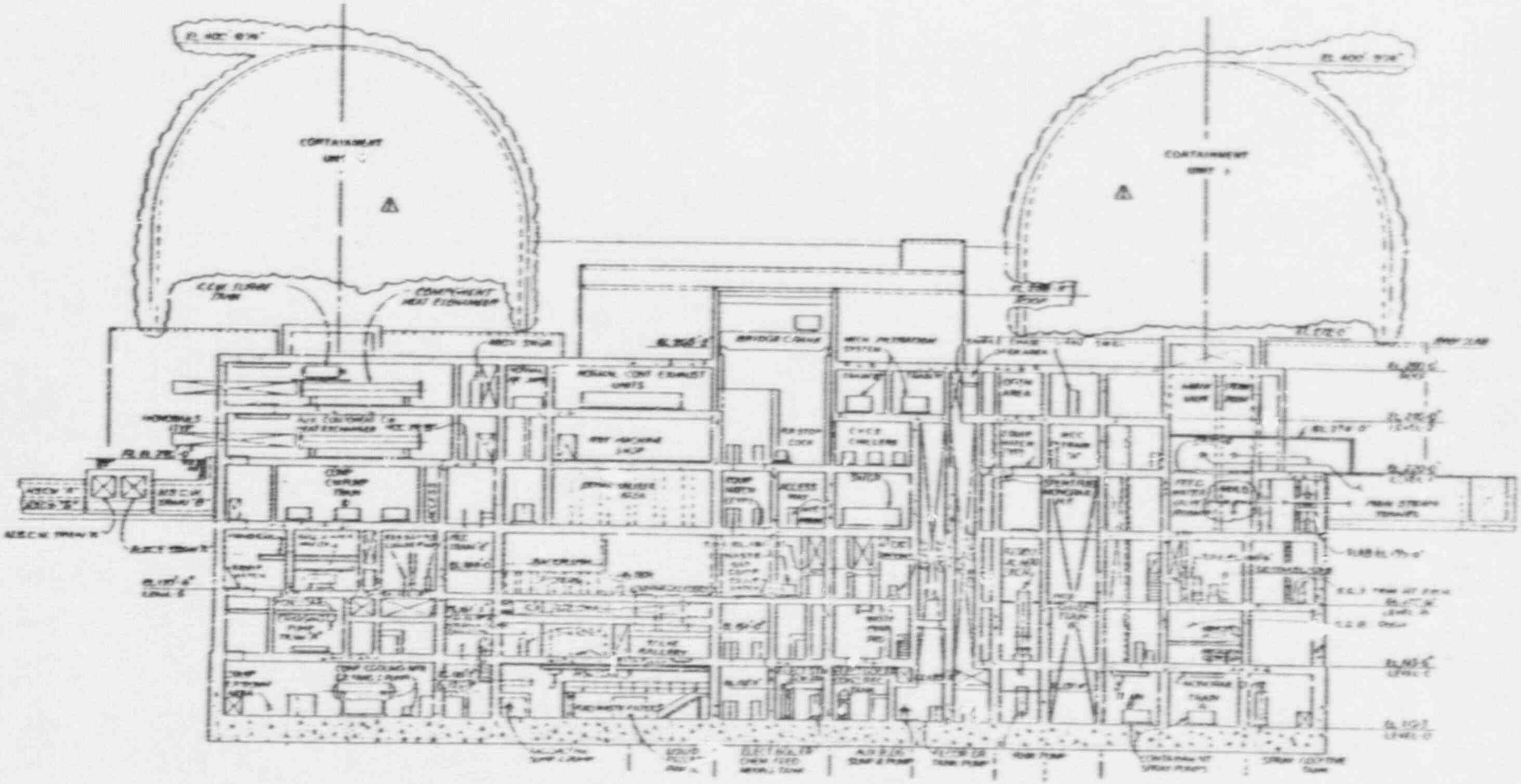


Figure 4-4. Vogtle 1 and 2 General Arrangement, Looking North (Section Through Auxiliary Building)

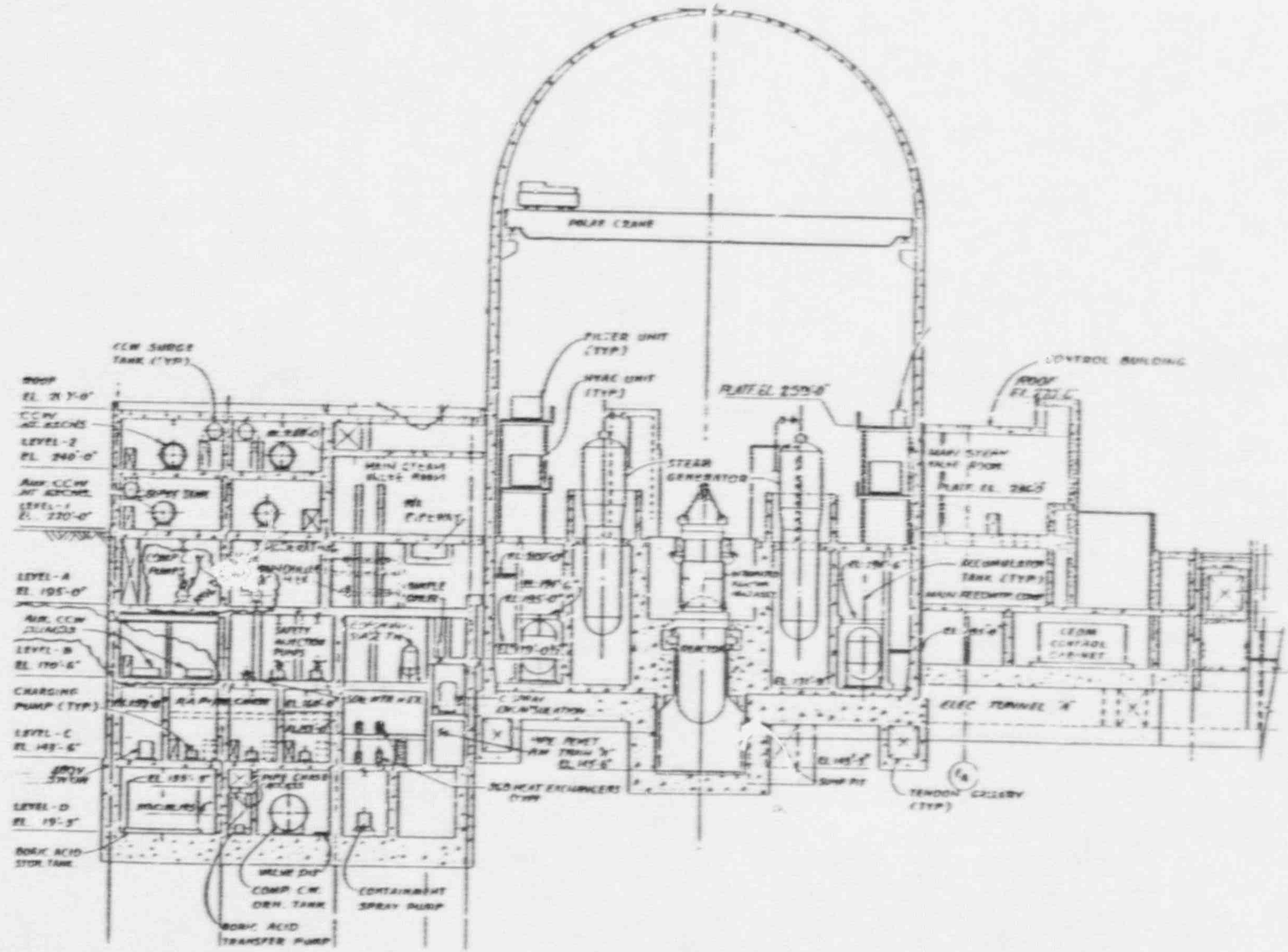


Figure 4-5. Vogtle 1 General Arrangement, Looking West (Section Through Unit 1 Containment)

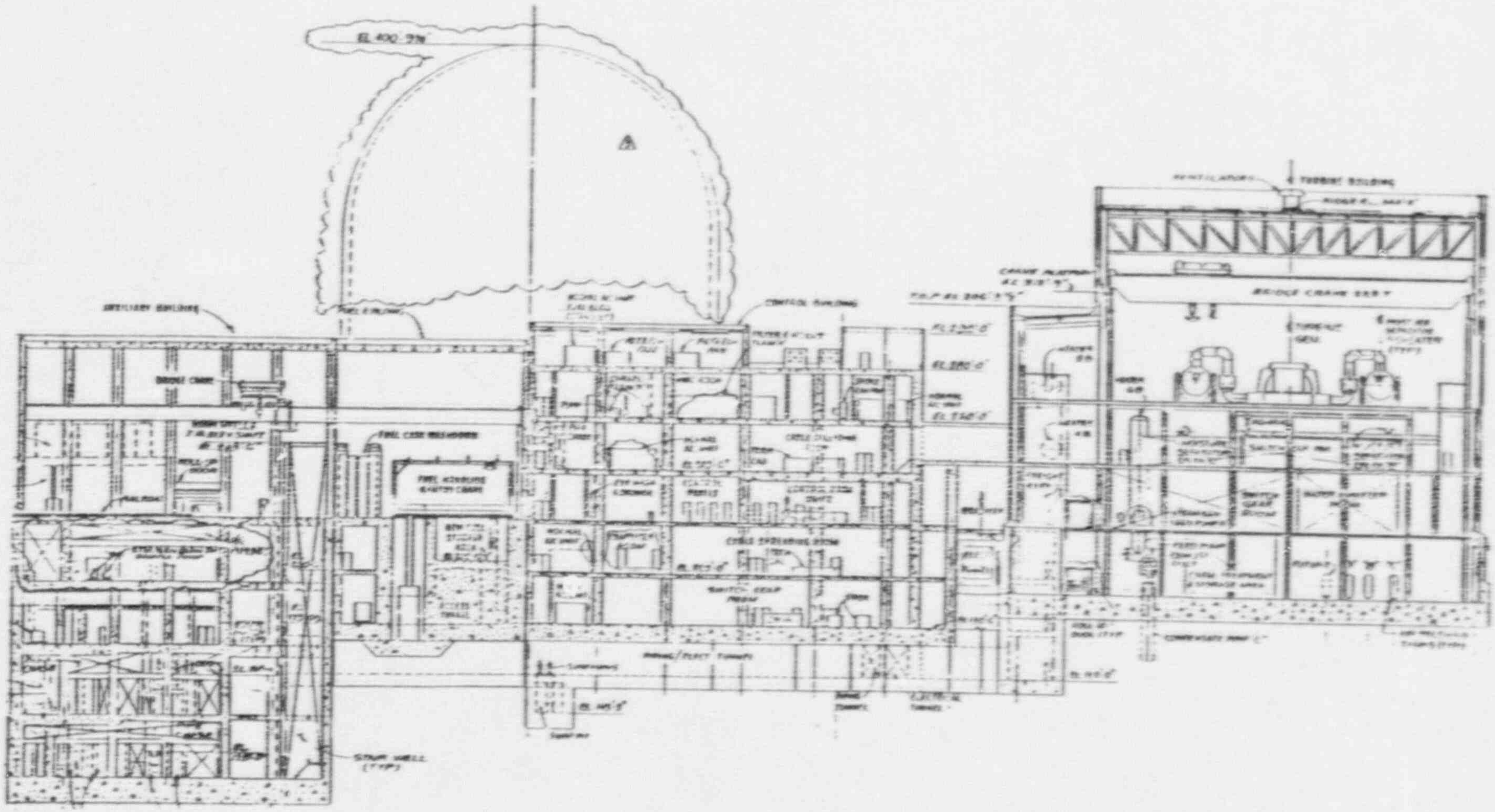


Figure 4-6. Vogtle 1 and 2 General Arrangement, Looking West
(Section Through Fuel Handling Building)

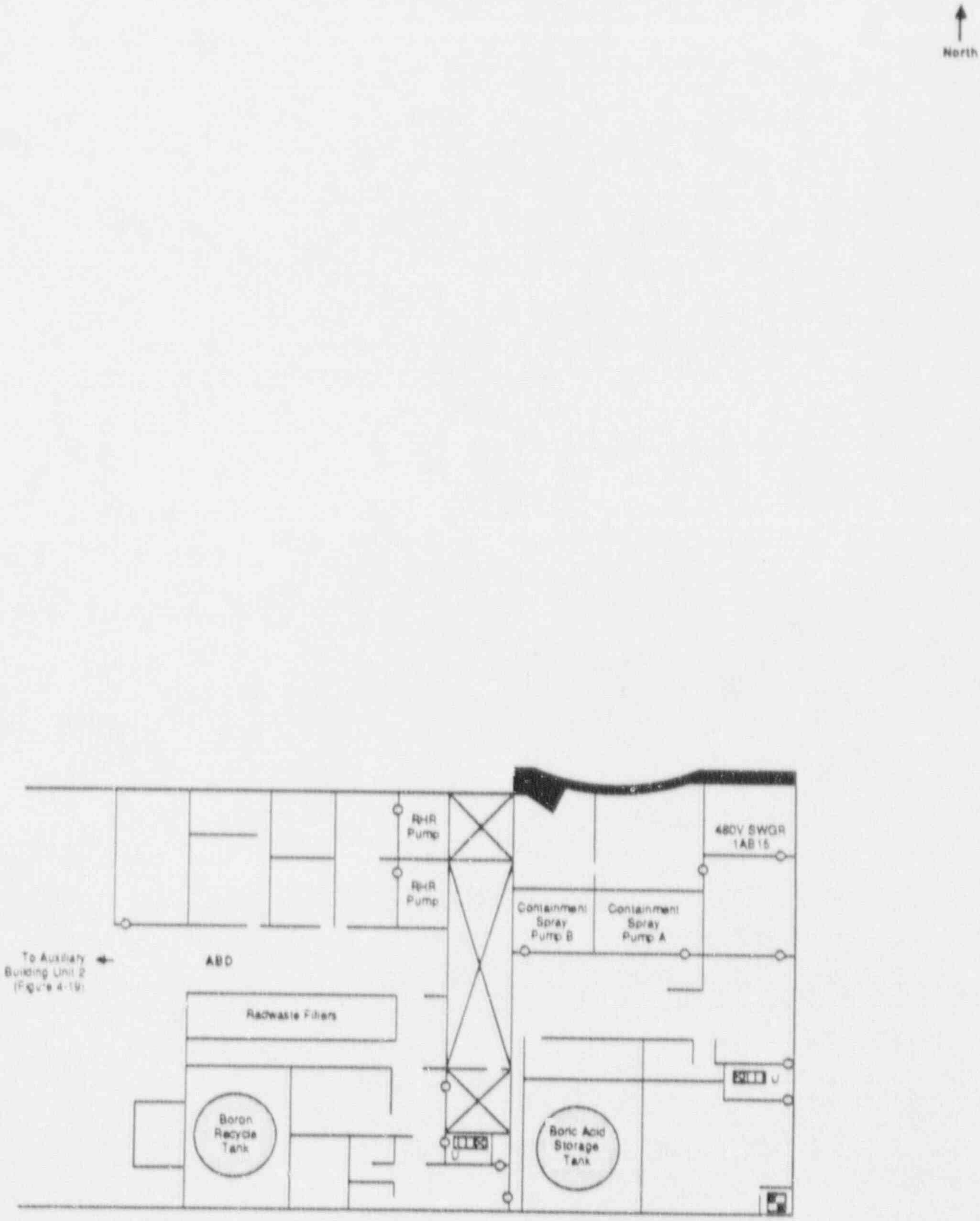


Figure 4-7. Vogtle 1 Auxiliary Building, Level D (Elevation 119'-3" to 143'-6")

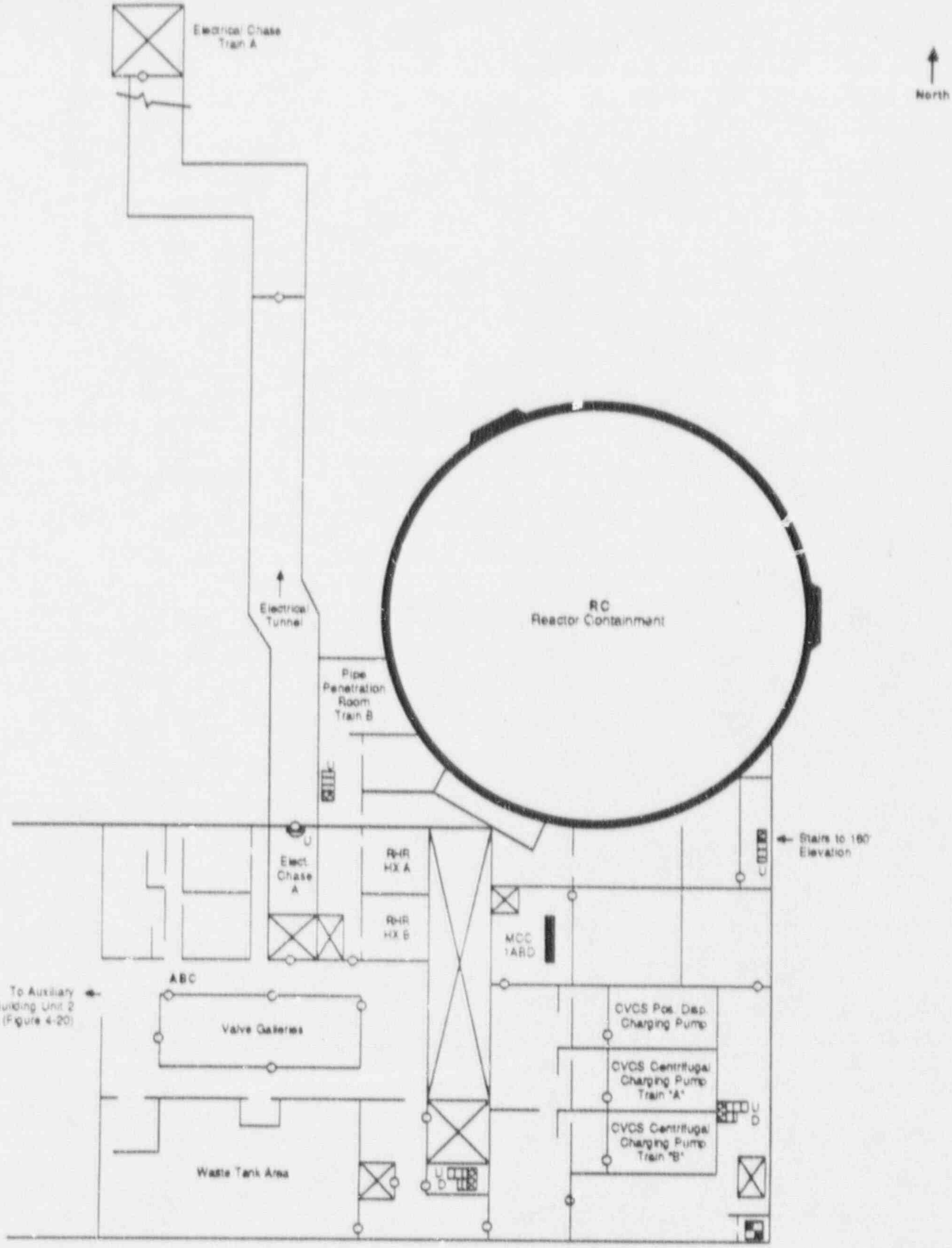


Figure 4-8. Vogtle 1 Auxiliary Building, Level C (Elevation 143'-6" to 170'-6")

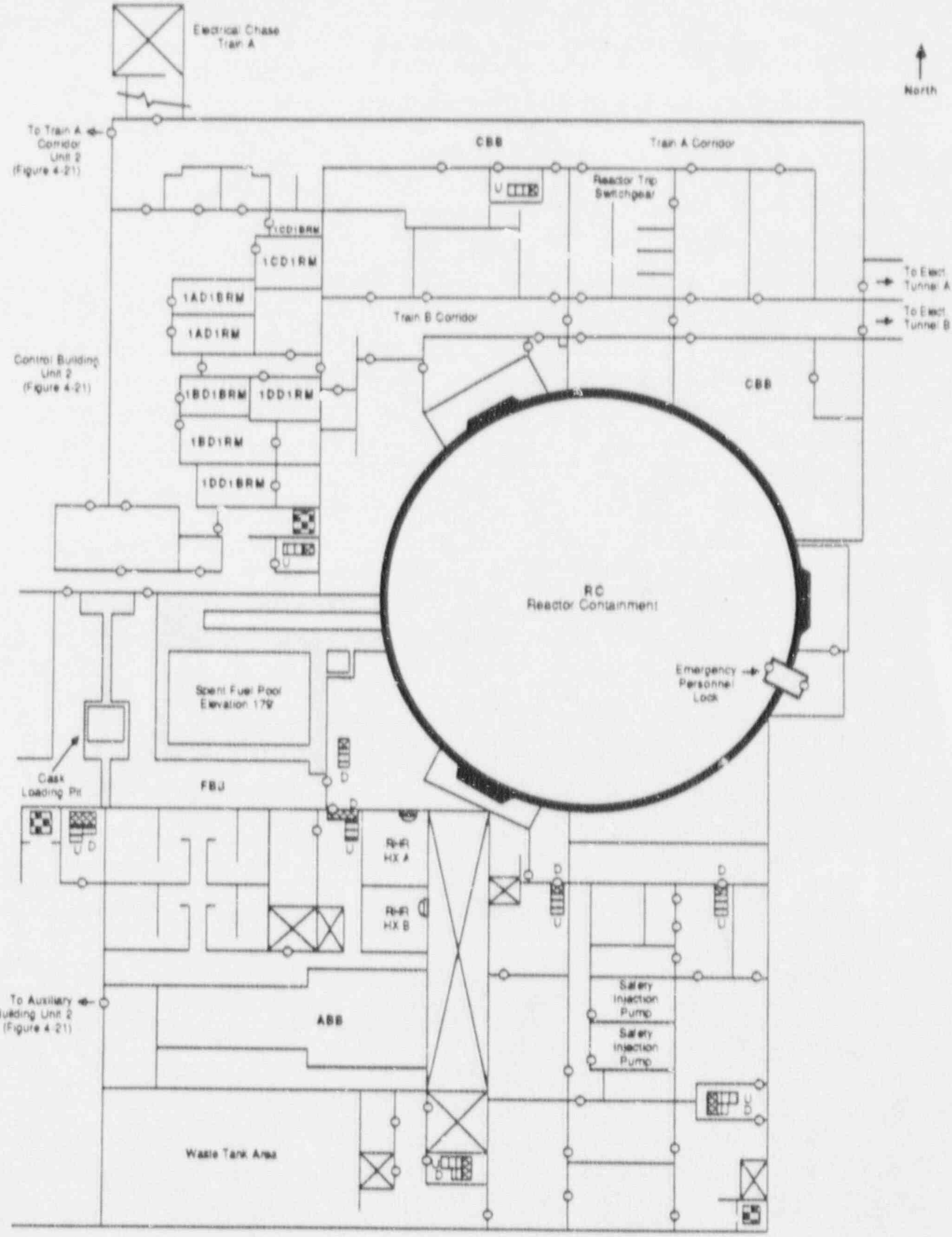


Figure 4-9. Vogtle 1 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level B (Elevation 180'-0")

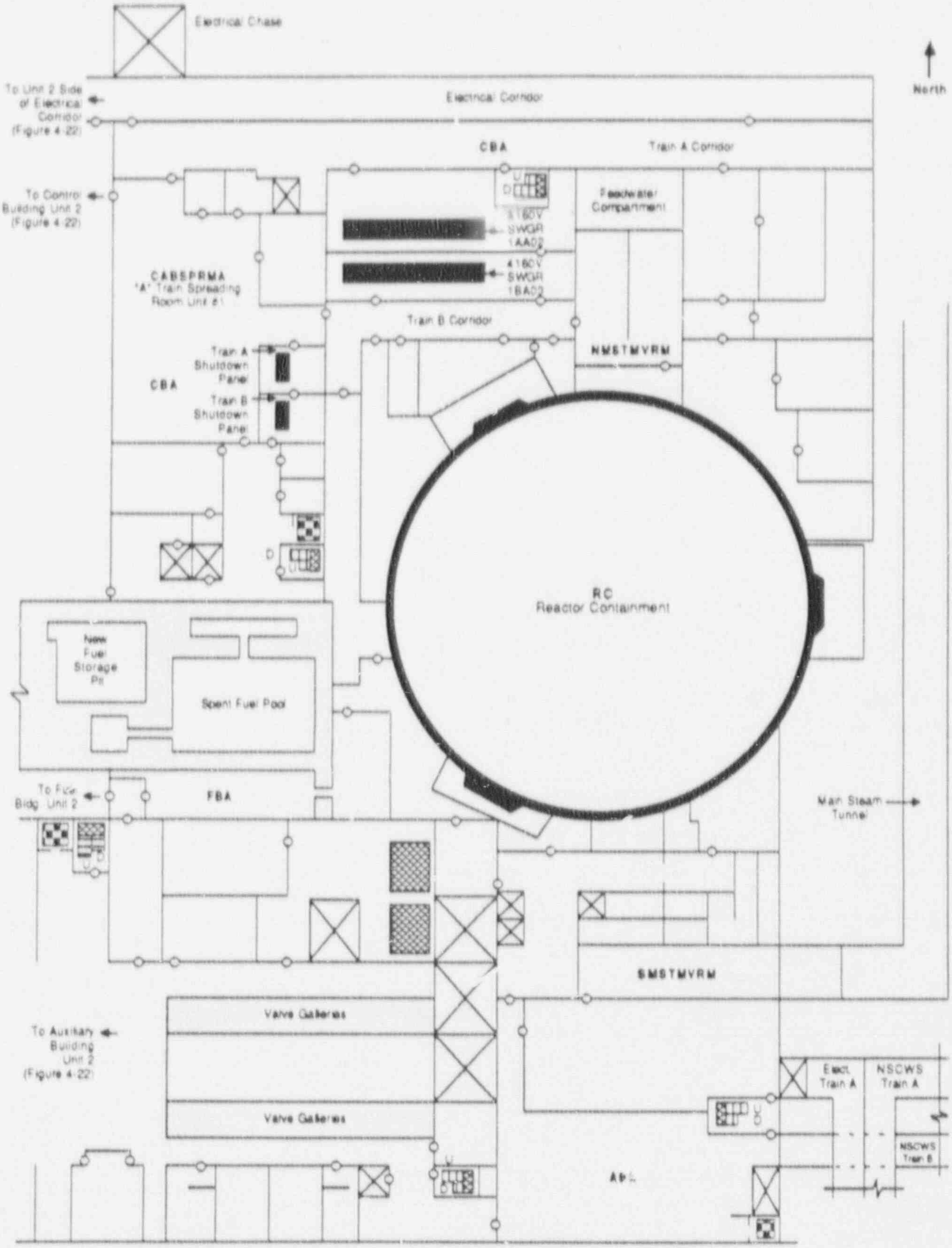


Figure 4-10. Vogtle 1 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level A (Elevation 200'-0")

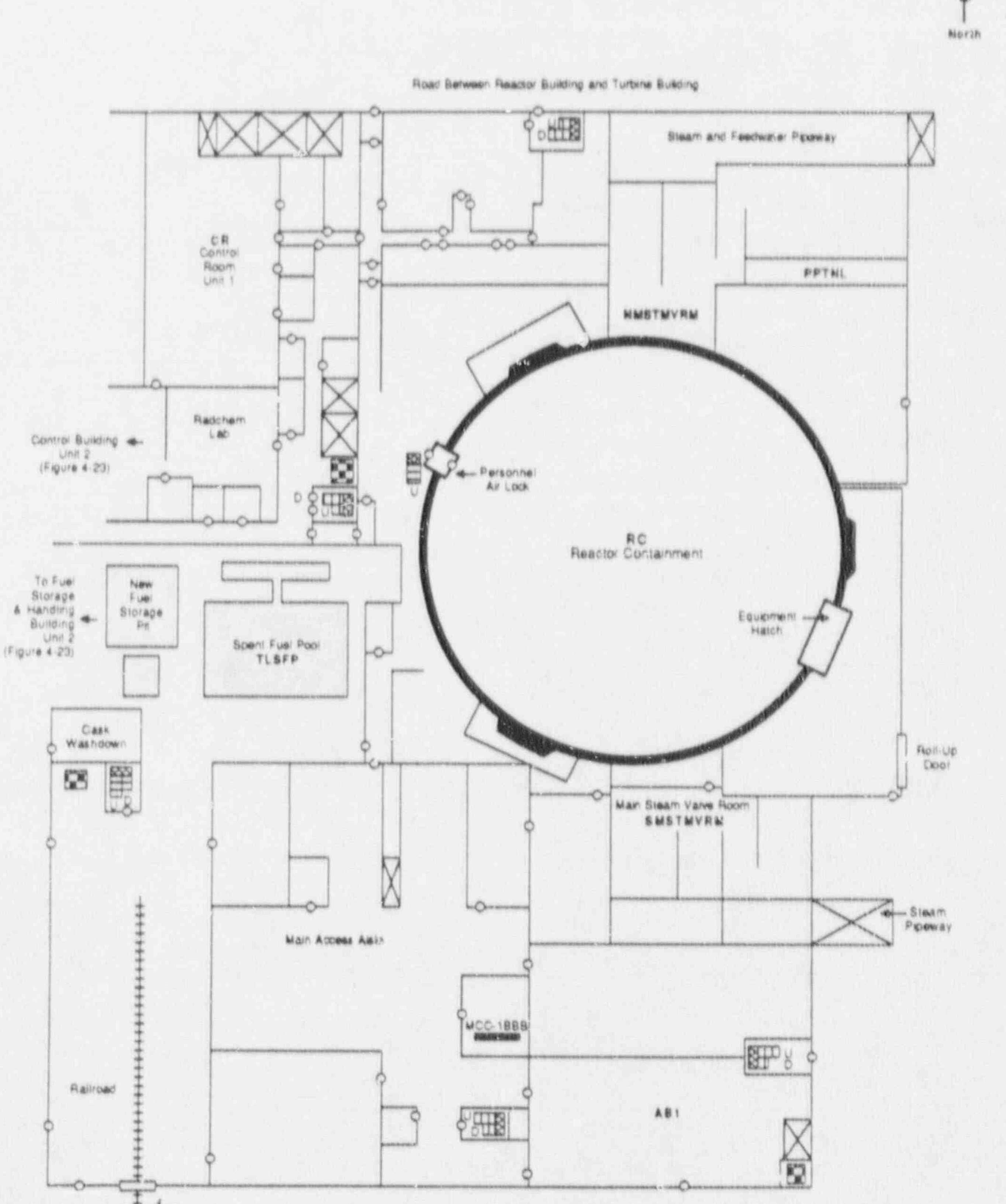


Figure 4-11. Vogtle 1 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level 1 (Elevation 220'-0")

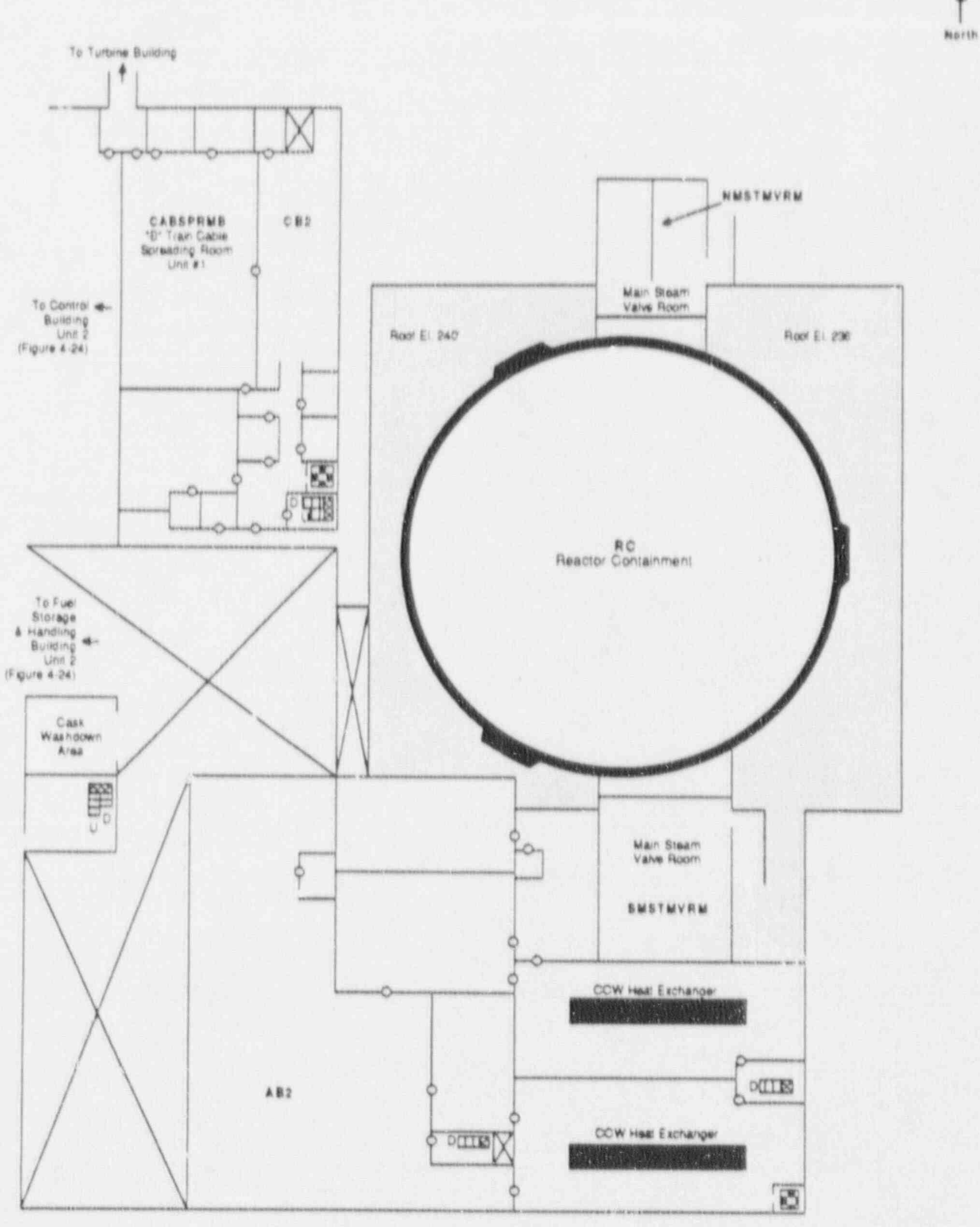


Figure 4-12. Vogtle 1 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level 2 (Elevation 240'-0")

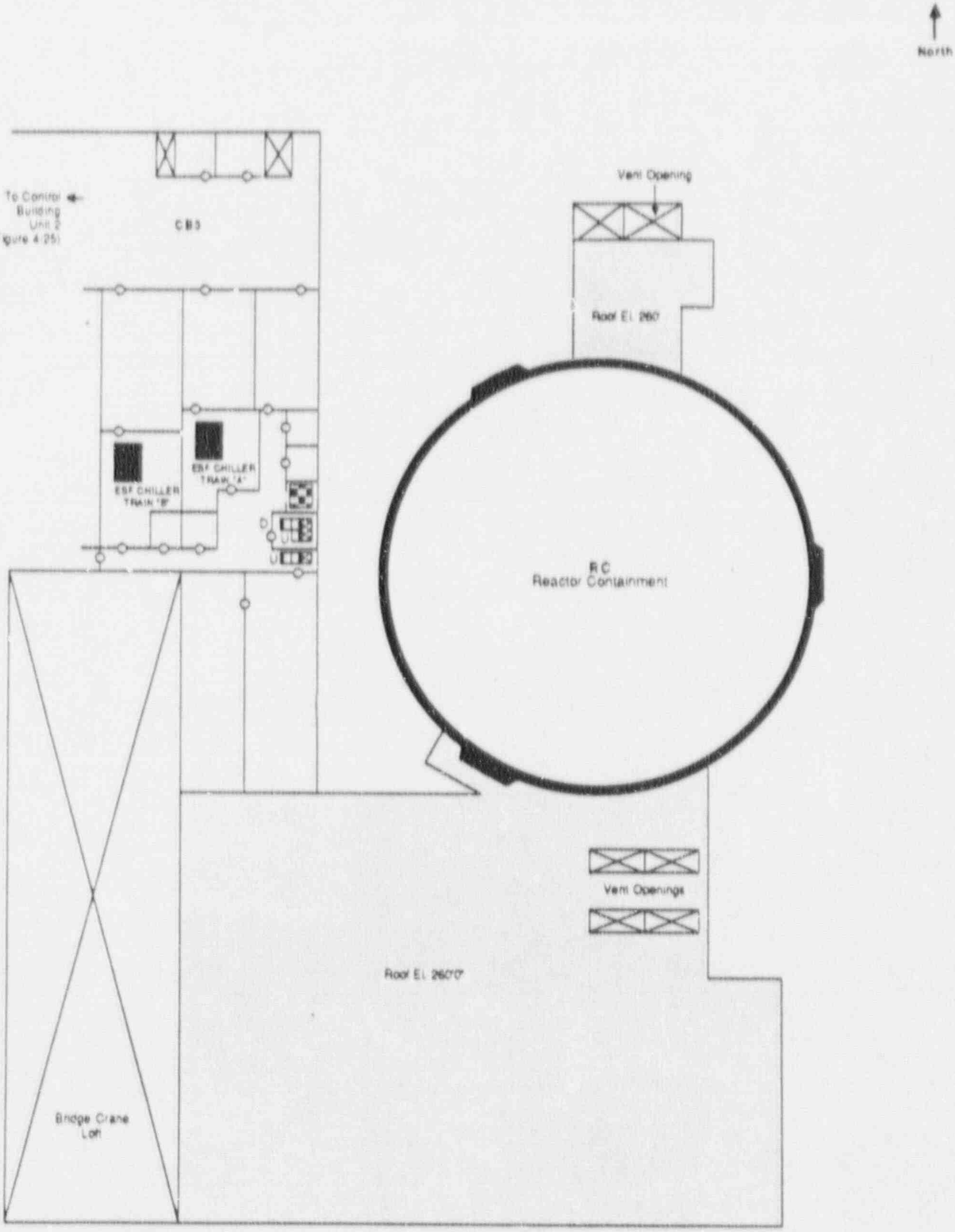


Figure 4-13. Vogtle 1 Reactor Containment, Control Building, and Fuel Handling Building, Level 3 (Elevation 260'-0")

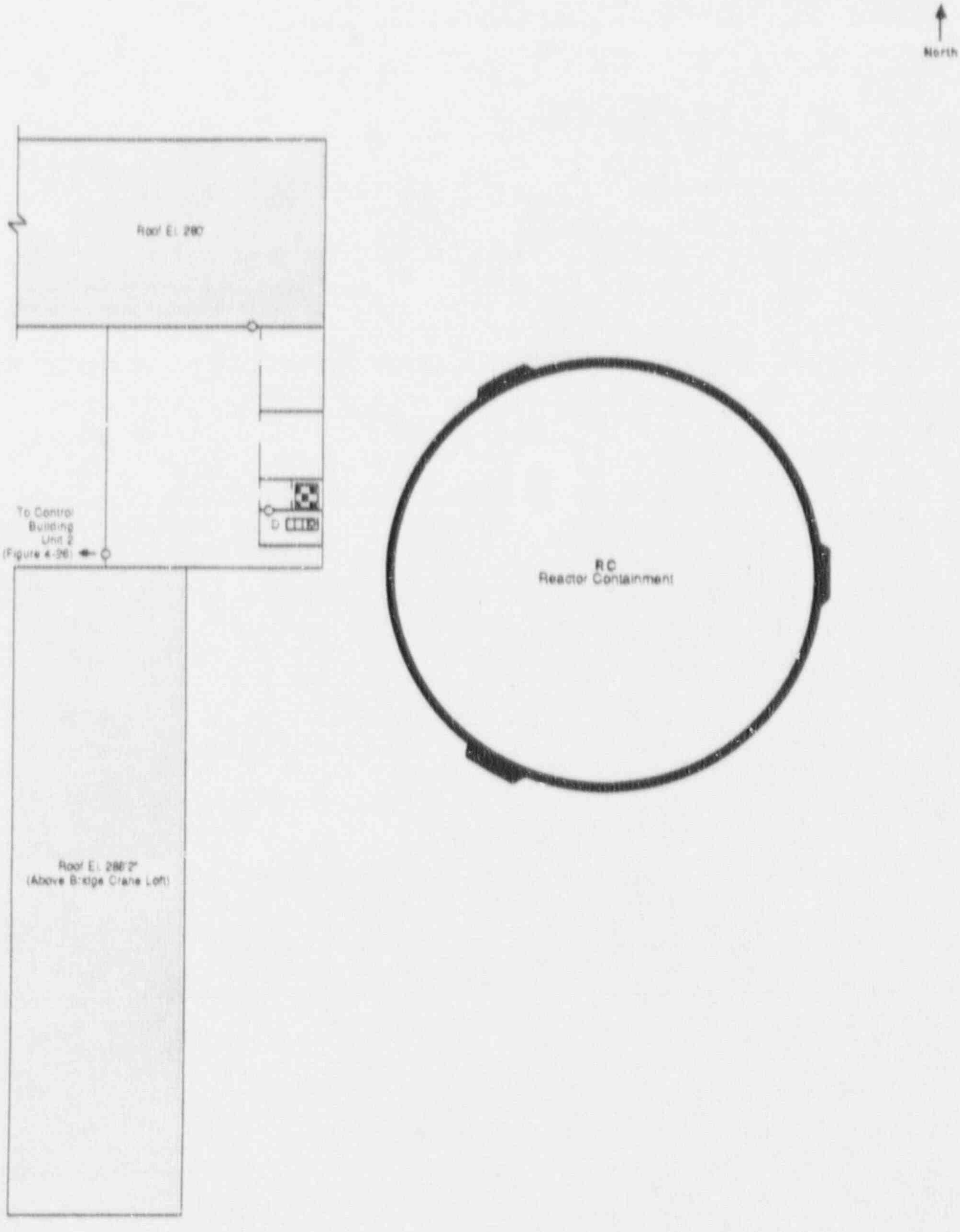


Figure 4-14. Vogtle 1 Reactor Containment, Control Building, and Fuel Handling Building, Level 4 (Elevation 280'-0")

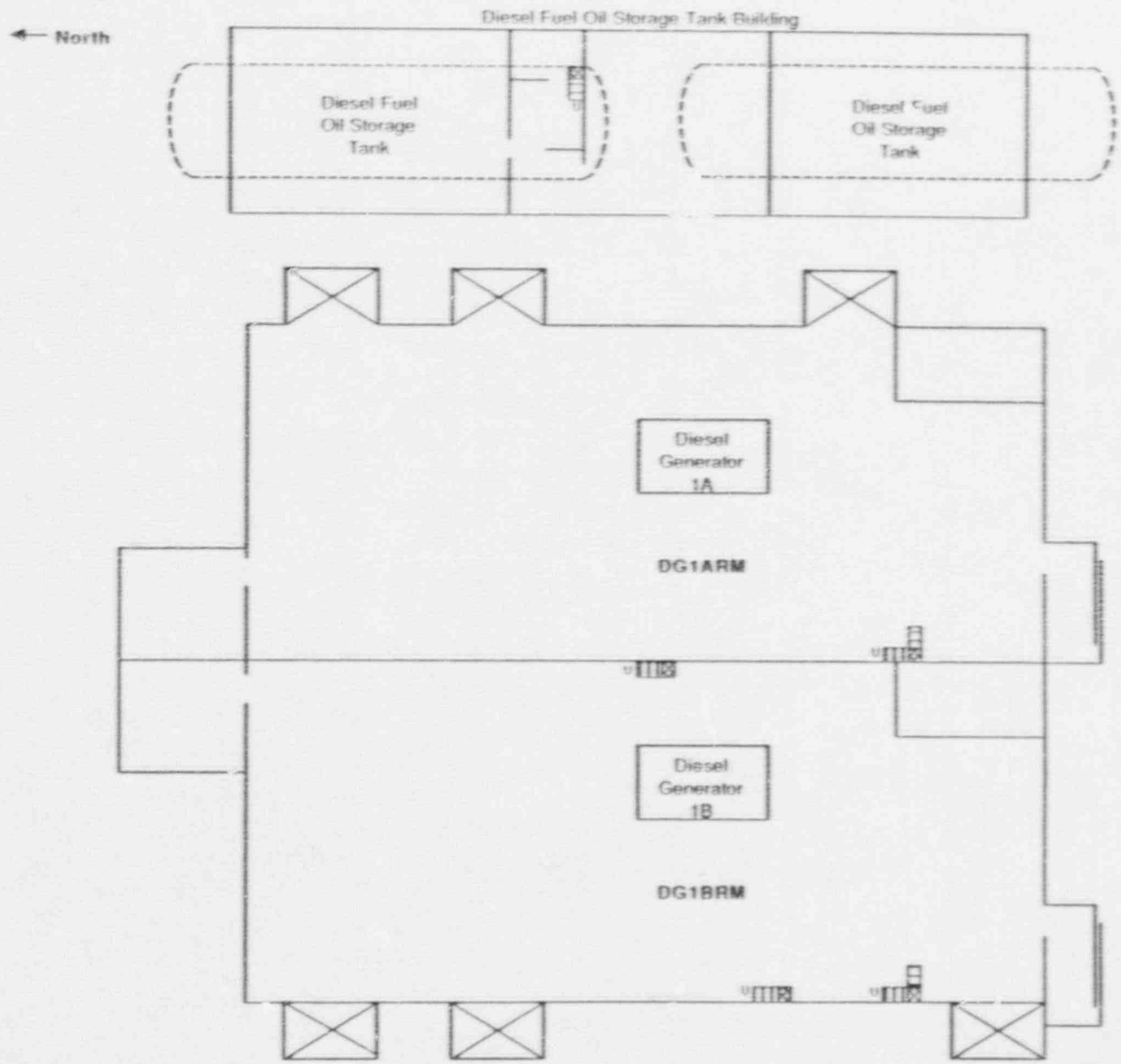


Figure 4-15. Vogtle 1 Diesel Generator Building (Elevation 220'-0")

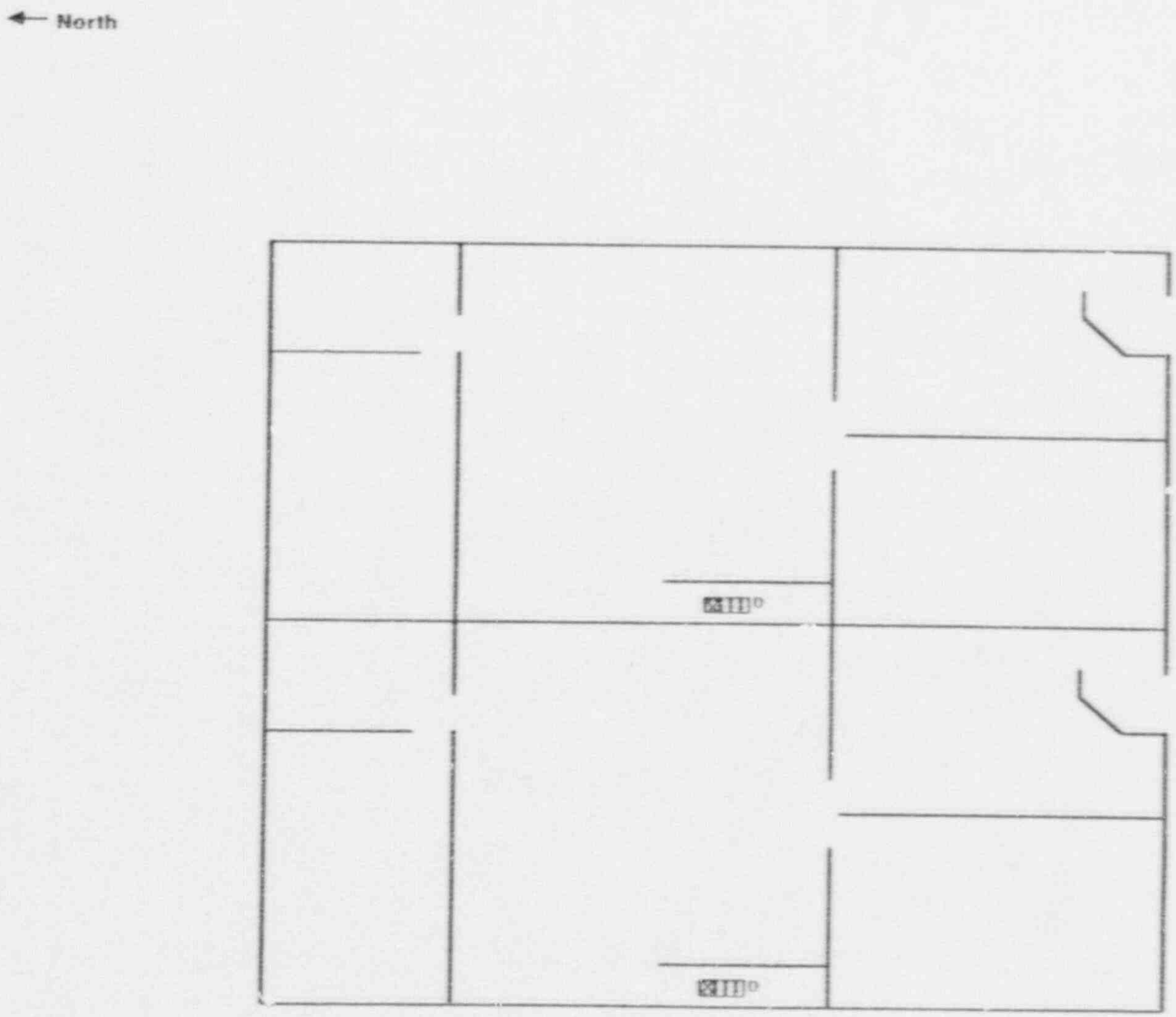


Figure 4-16. Vogtle 1 Diesel Generator Building (Elevation 255'-0")

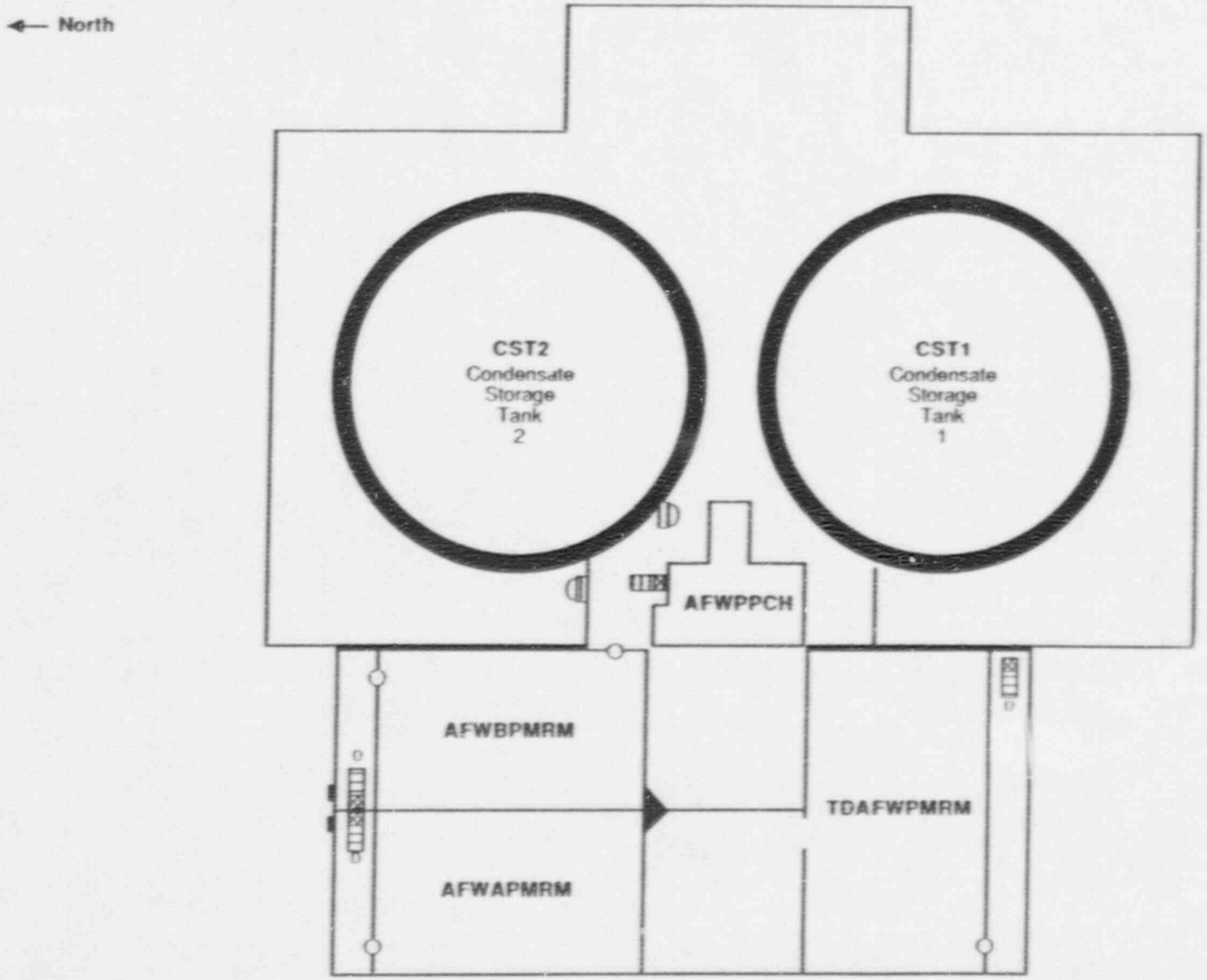
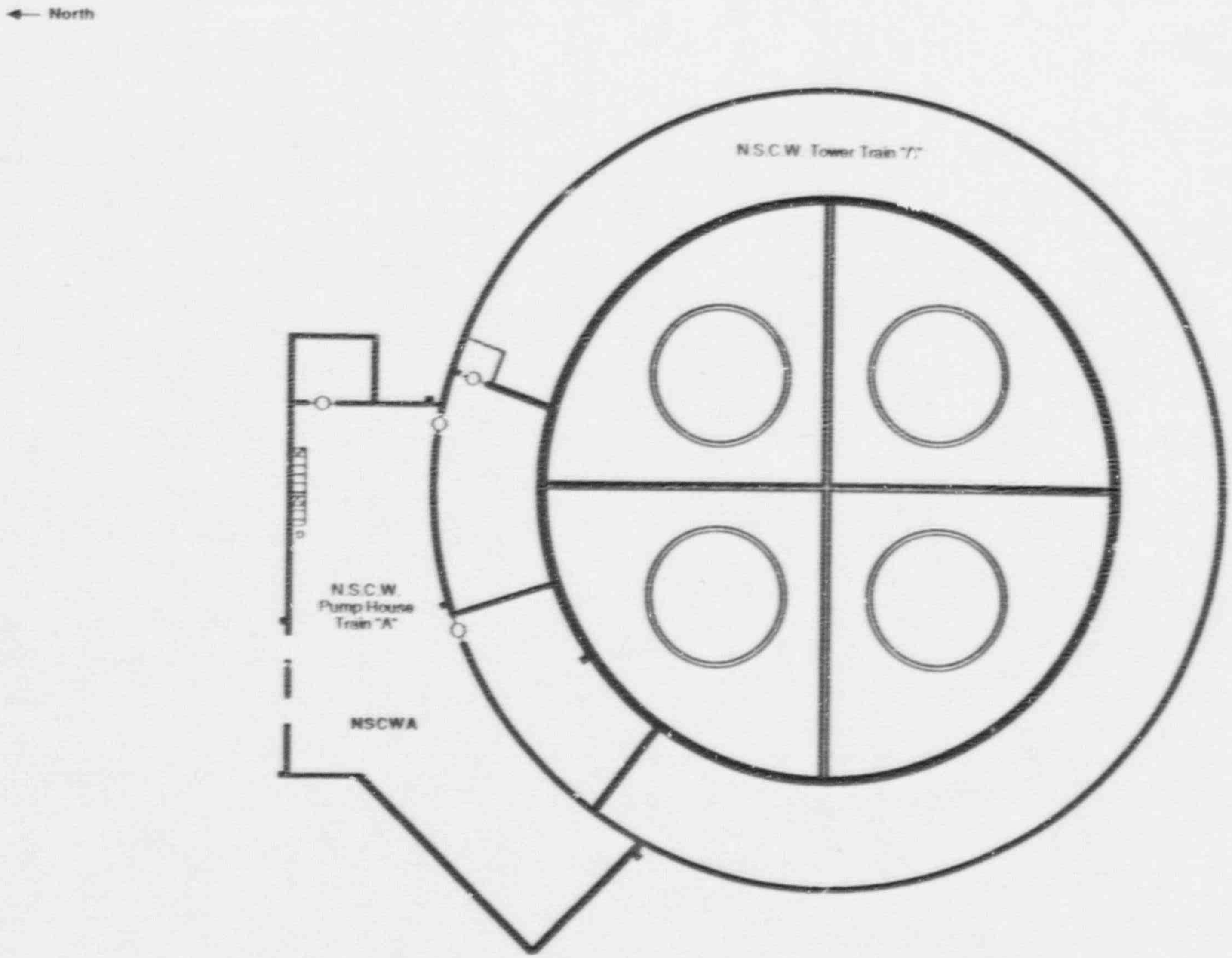


Figure 4-17. Vogtle 1 Auxiliary Feedwater Pump House and Condensate Storage Tank (Elevation 231'-0")



Note: NSCWS Cooling Tower for Train B is similar.

Figure 4-18. Vogtle 1 Nuclear Service Cooling Water Tower Train A (Elevation 220'-0")

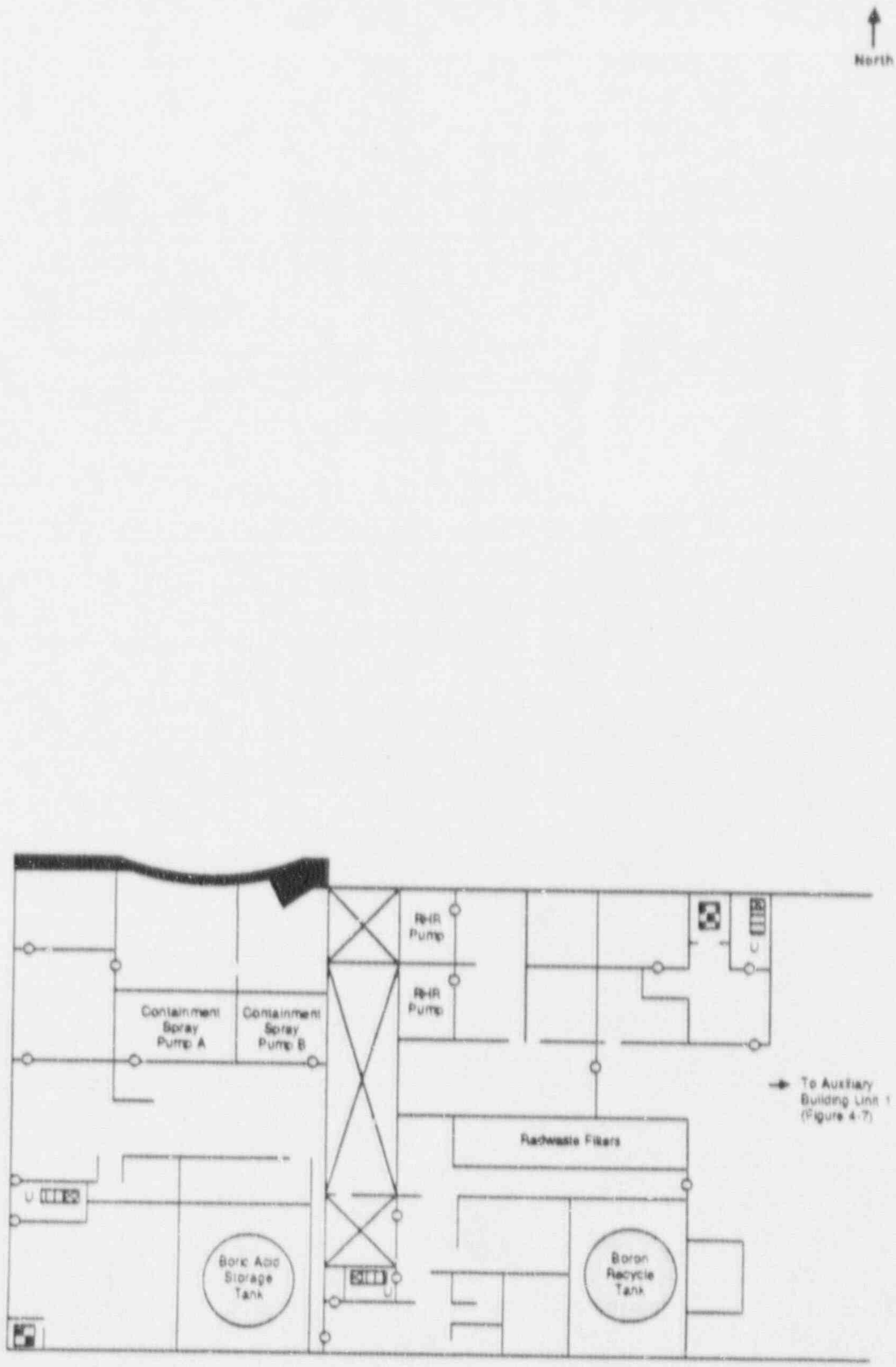


Figure 4-19. Vogtle 2 Auxiliary Building, Level D (Elevation 119'-3" to 143'-6")

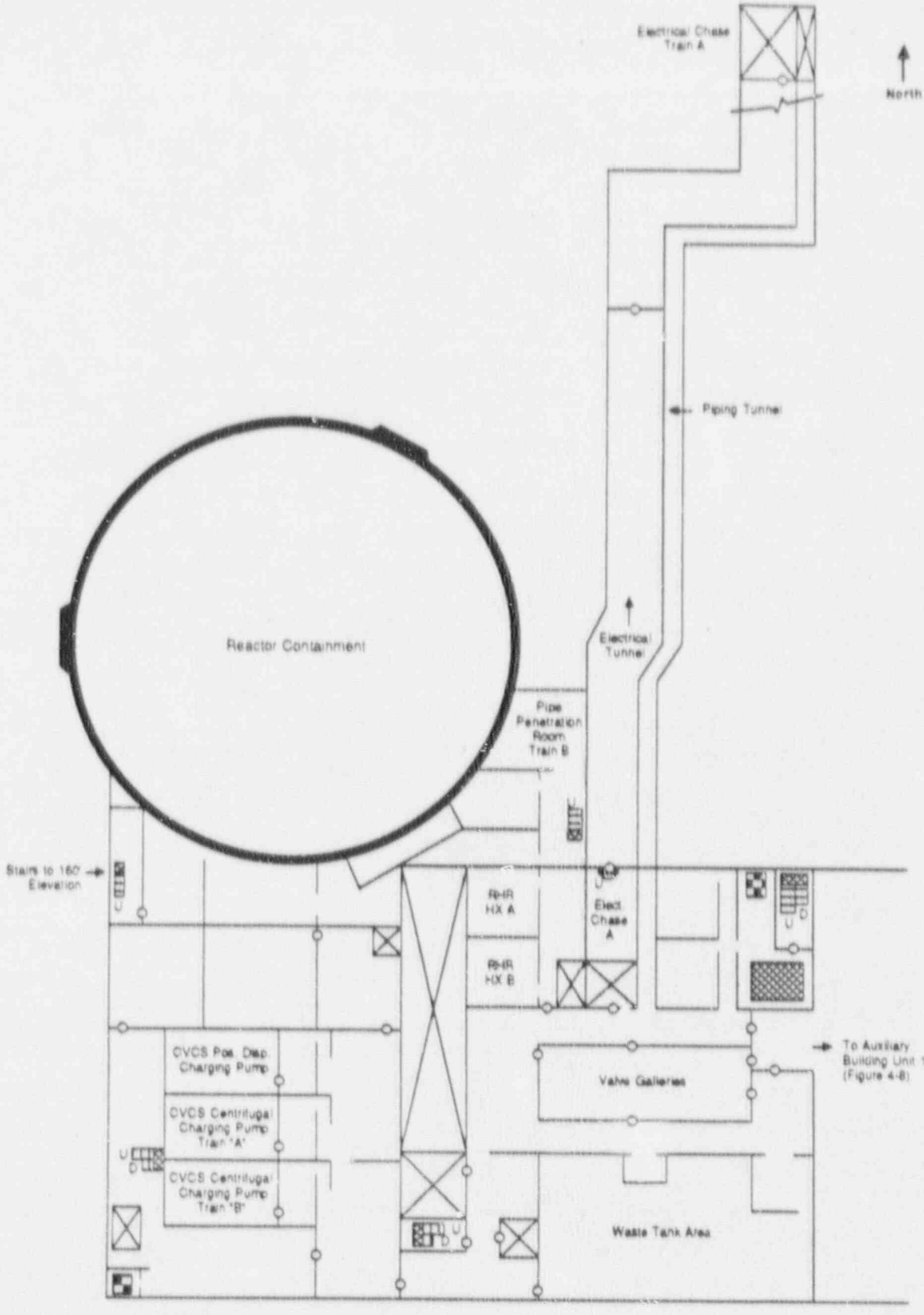


Figure 4-20. Vogtle 2 Auxiliary Building, Level C (Elevation 143'-6" to 170'-6")

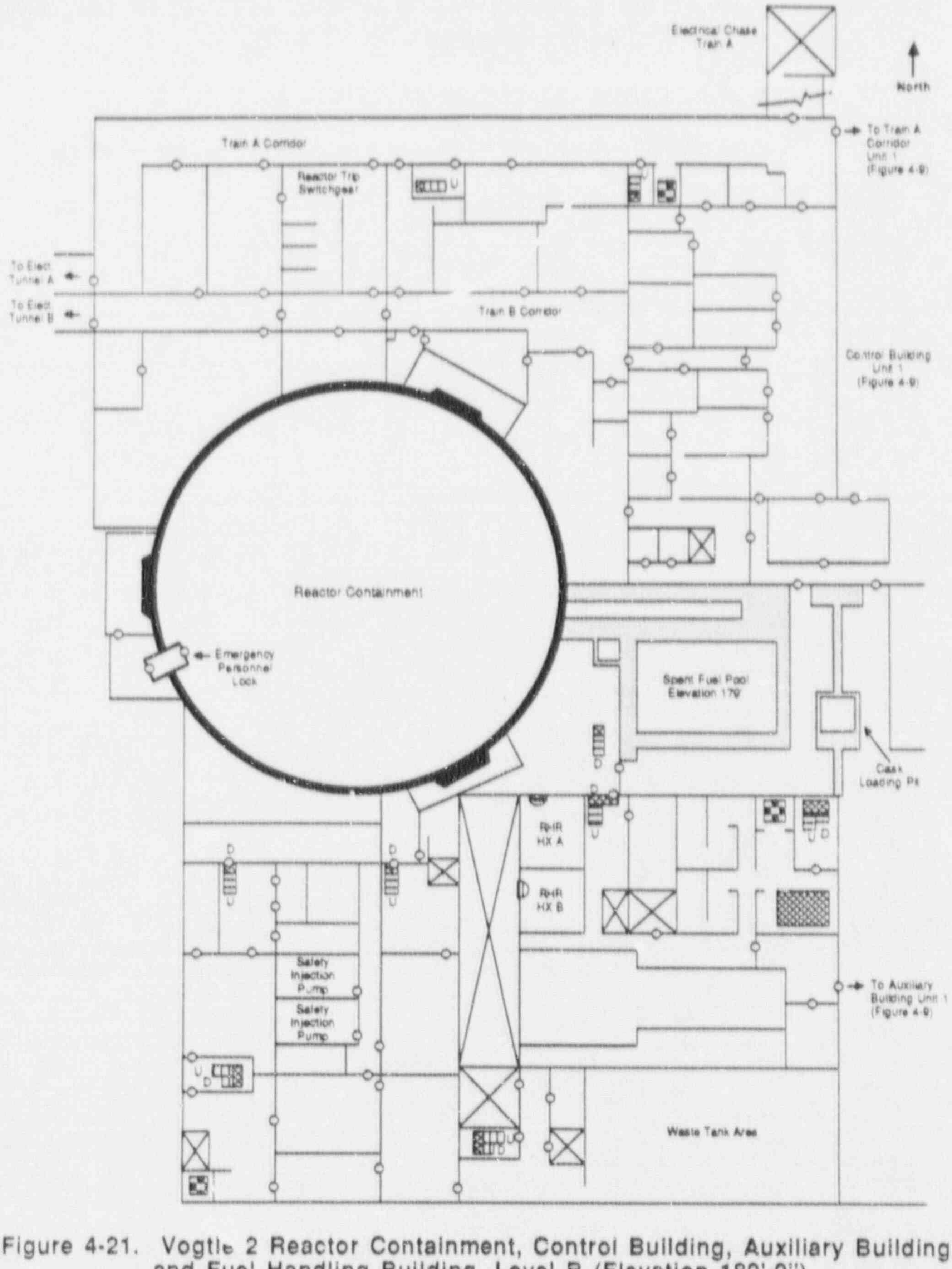


Figure 4-21. Vogtle 2 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level B (Elevation 180'-0")

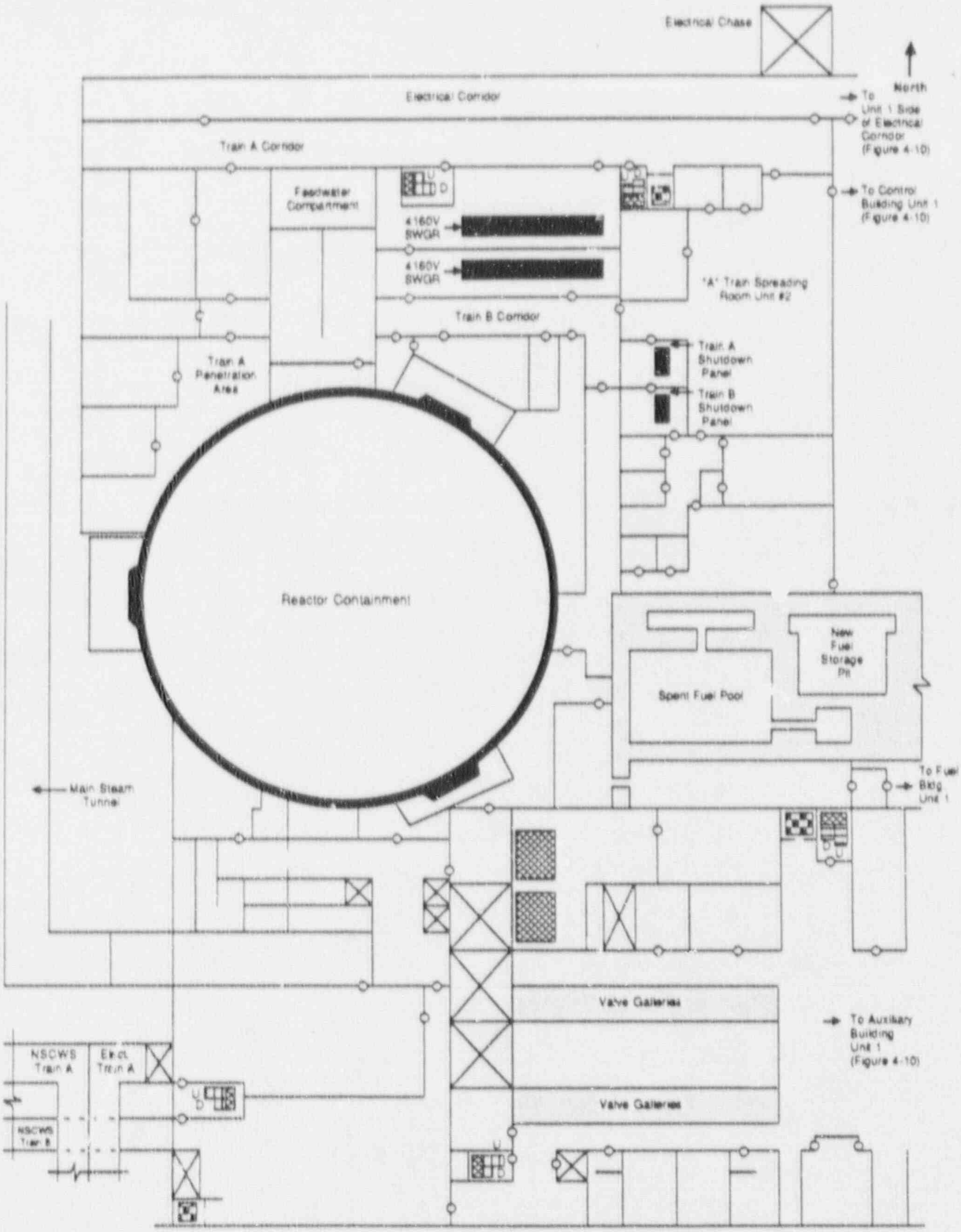


Figure 4-22. Vogtle 2 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level A (Elevation 200'-0")

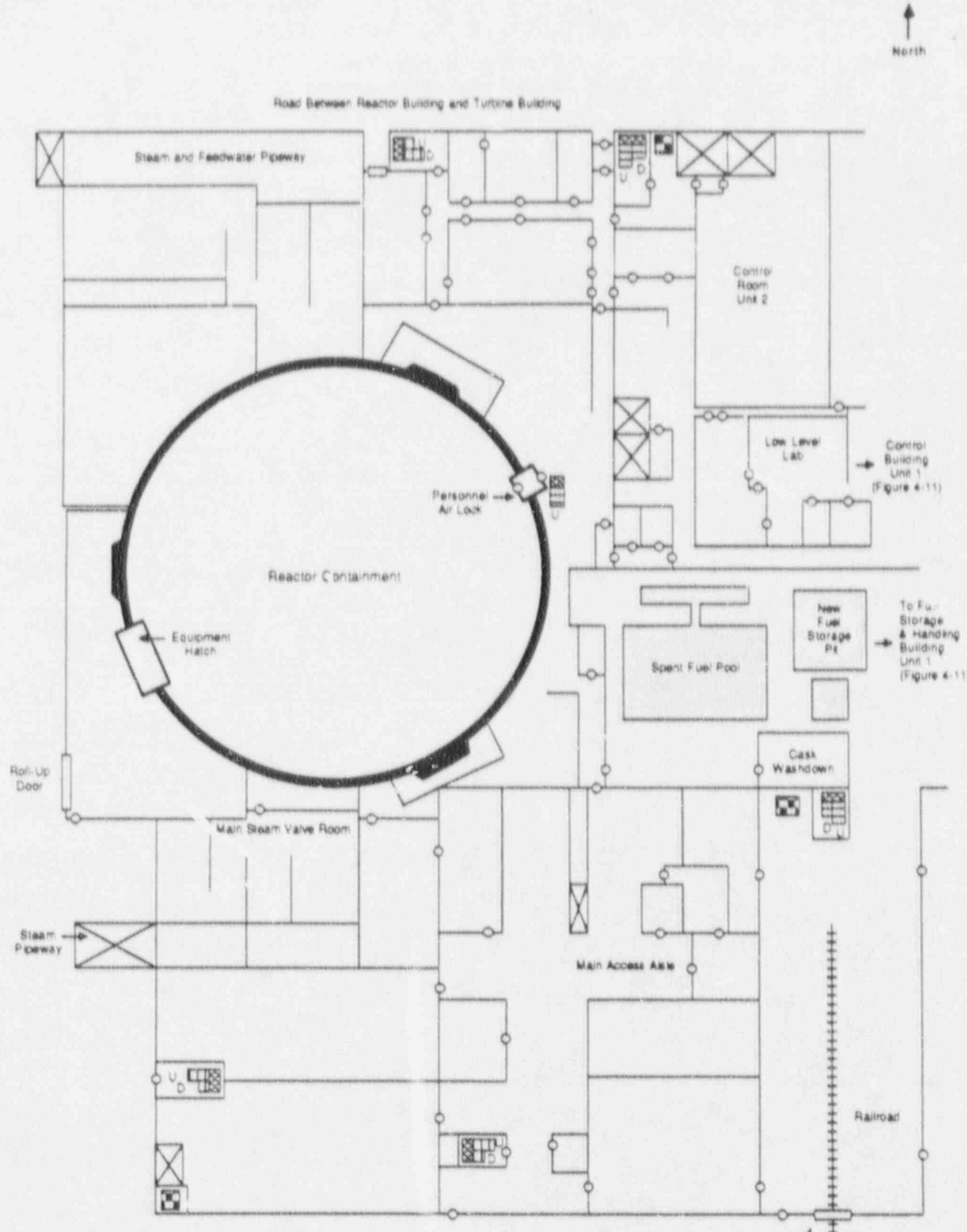


Figure 4-23. Vogtle 2 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level 1 (Elevation 220'-0")

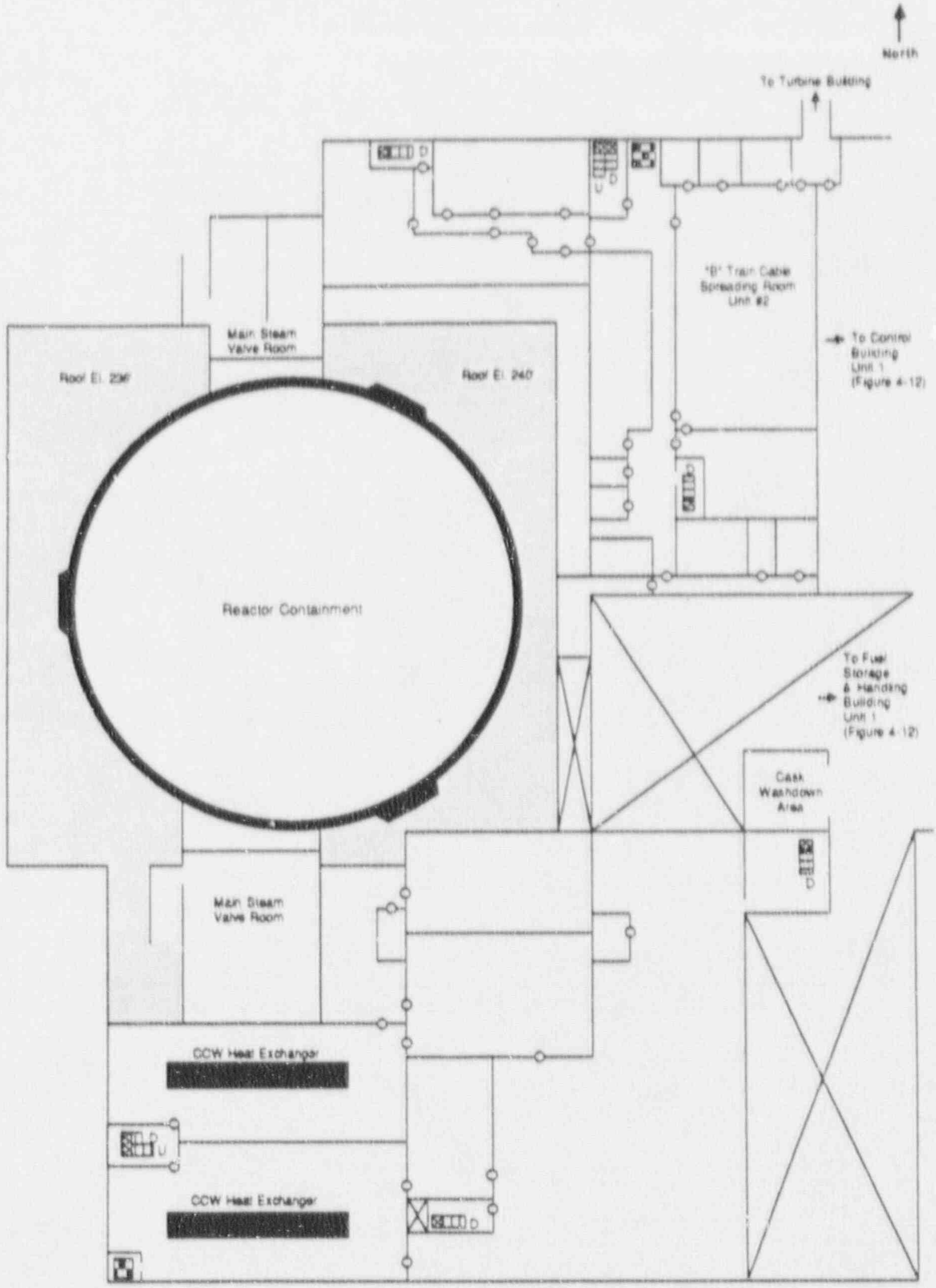


Figure 4-24. Vogtle 2 Reactor Containment, Control Building, Auxiliary Building, and Fuel Handling Building, Level 2 (Elevation 240'-0")

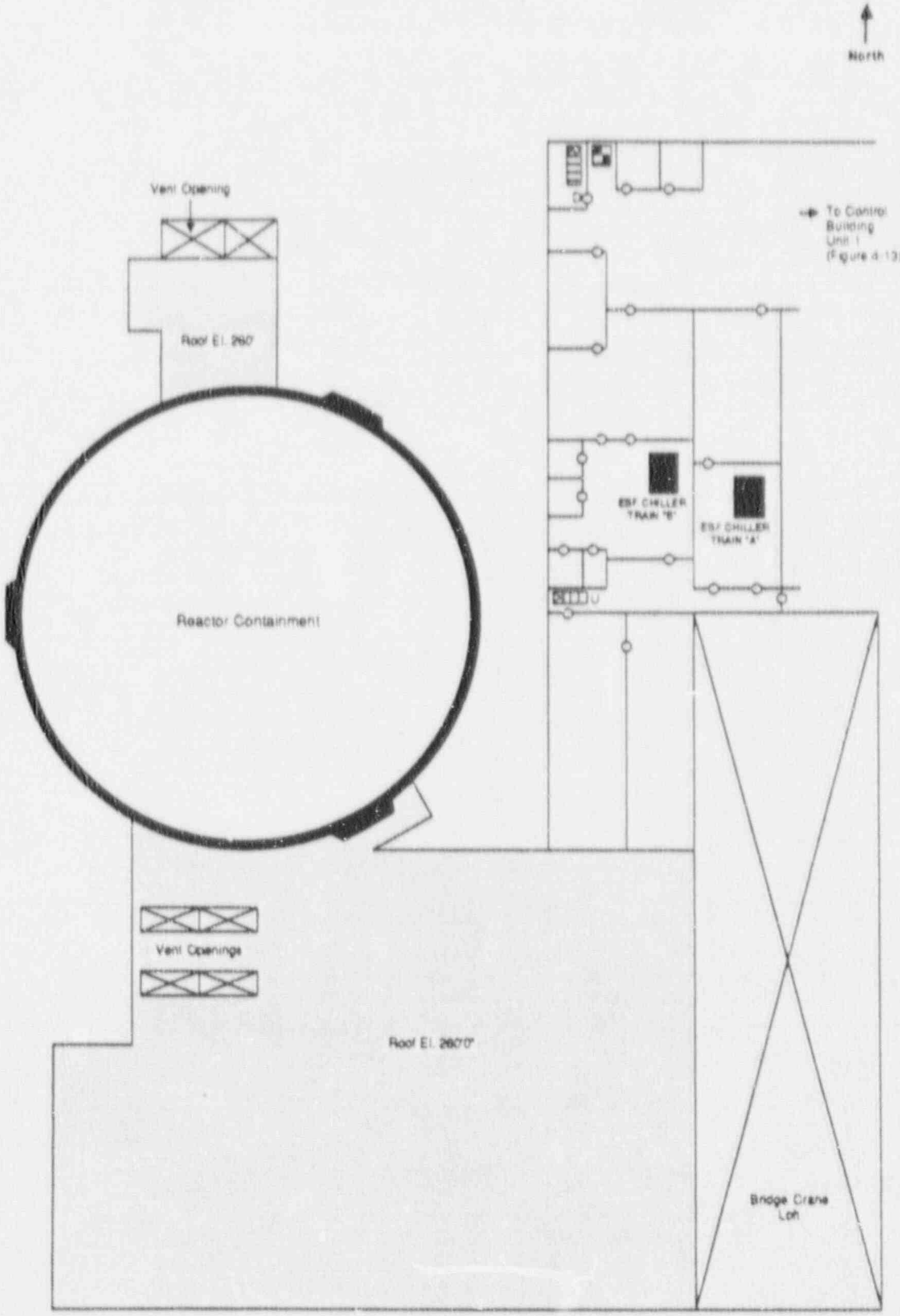


Figure 4-25. Vogtle 2 Reactor Containment, Control Building, and Fuel Handling Building, Level 3 (Elevation 260'-0")

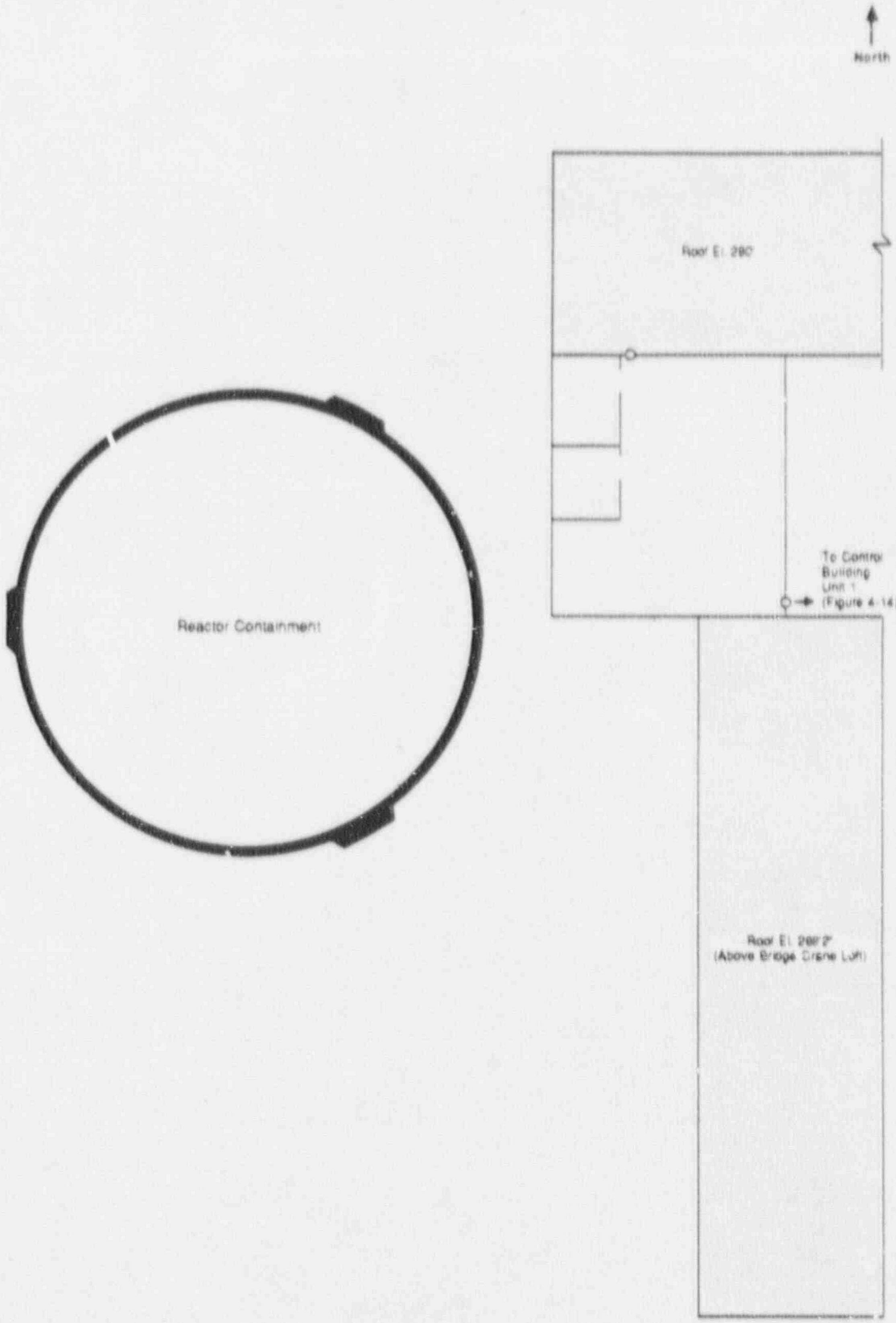


Figure 4-26. Vogtle 2 Reactor Containment, Control Building, and Fuel Handling Building, Level 4 (Elevation 280'-0")

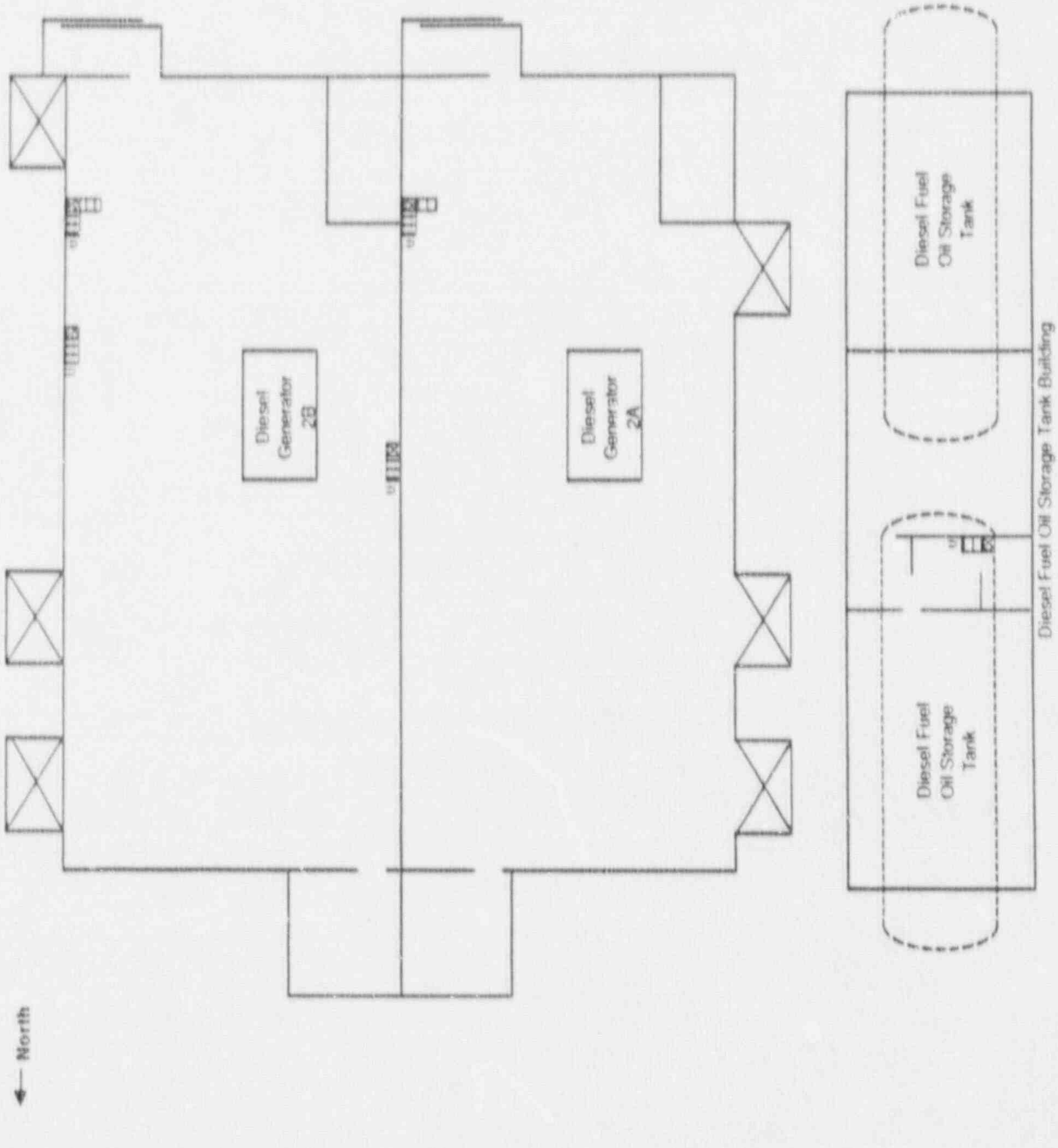


Figure 4-27. Vogtle 2 Diesel Generator Building (Elevation 220'-0")

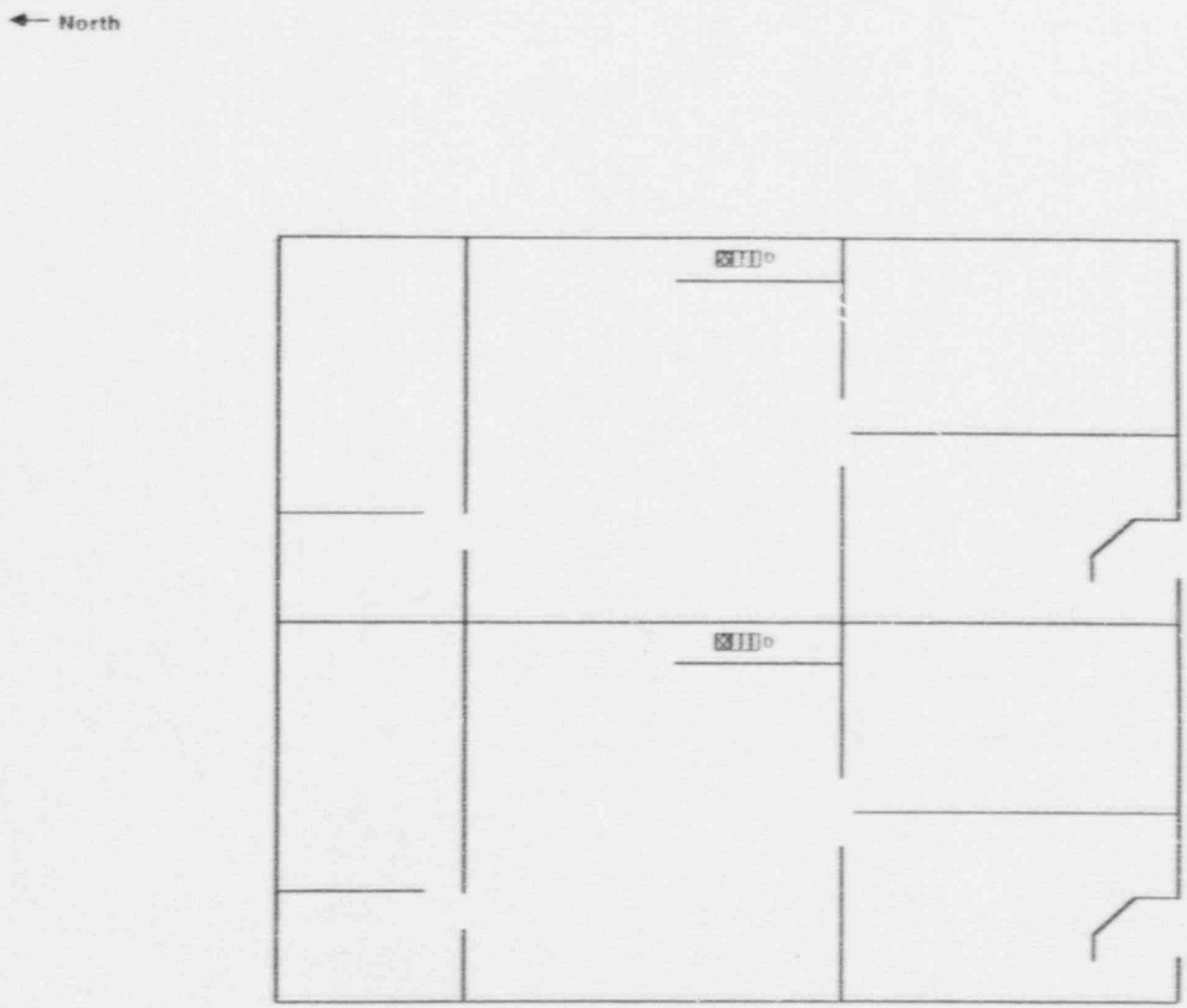


Figure 4-28. Vogtle 2 Diesel Generator Building (Elevation 255'-0")

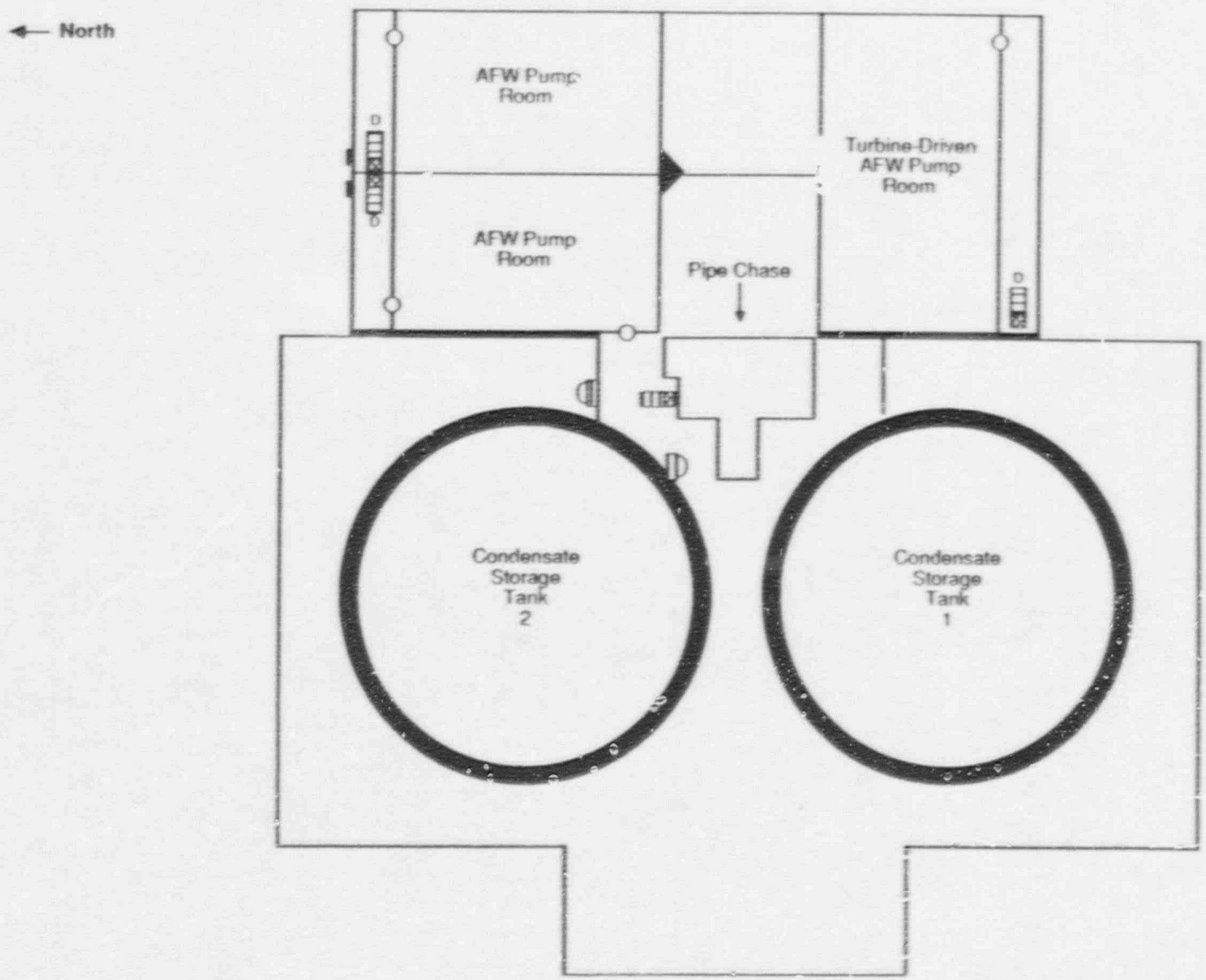
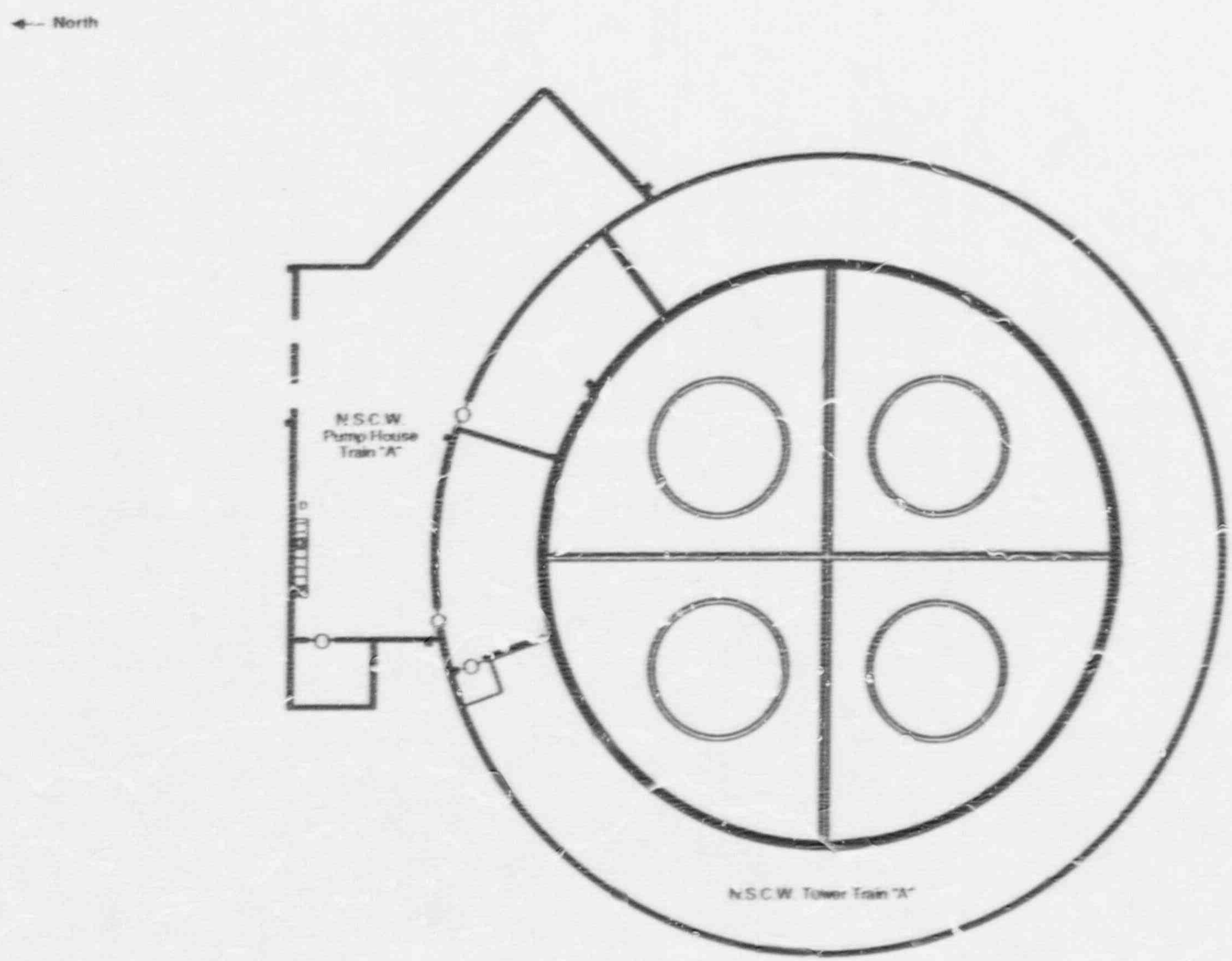


Figure 4-29. Vogtle 2 Auxiliary Feedwater Pump House and Condensate Storage Tank (Elevation 231'-0")



Note: NSCWS Cooling Tower for Train B is similar.

Figure 4-30. Vogtle 2 Nuclear Service Cooling Water Tower Train A (Elevation 220'-0")

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

Abbreviation	Description
1. 1AD1BRM	Room containing battery 1AD1B located on level B of the control building.
2. 1AD1RM	Room containing DC switchgear 1AD1 located on level B of the control building.
3. 1BD1BRM	Room containing battery 1BD1B located on level B of the control building.
4. 1B[illegible]	Room containing DC switchgear 1BD1 located on level B of the control building.
5. 1CD1BRM	Room containing battery 1CD1B located on level B of the control building.
6. 1CD1RM	Room containing DC switchgear 1CD1 located on level B of the control building.
7. 1DD1RM	Room containing DC switchgear 1DD1 located on level B of the control building.
8. ABA	Level A (elevation 200') of the auxiliary building.
9. ABB	Level B (elevation 180' of the auxiliary building.
10. ABC	Level C (elevation 160') of the auxiliary building.
11. ABD	Level D (elevation 140') of the auxiliary building.
12. AB1	Level 1 (elevation 220') of the auxiliary building.
13. AB2	Level 2 (elevation 240') of the auxiliary building.
14. AFWAPMRM	"A" train auxiliary feedwater pump room located in the southwest corner of the auxiliary feedwater pump house.
15. AFWBPMRM	"B" train auxiliary feedwater pump room located in the northwest corner of the auxiliary feedwater pump house.
16. AFWPPCH	Pipe chase between the condensate storage tanks and the auxiliary feedwater pump house.
17. CABSPRMA	"A" train cable spreading room located at level A of the control building (CBA).
18. CABSPRMB	"B" train cable spreading room located at level 2 of the control building (CB2).

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

Abbreviation	Description
19. CBA	Level A (elevation 200') of the control building.
20. CBB	Level B (elevation 180') of the control building.
21. CB1	Level 1 (elevation 220') of the control building.
22. CB2	Level 2 (elevation 240') of the control building.
23. CB3	Level 3 (elevation 260') of the control building.
24. CR	Control room located at level 1 of the control building.
25. CST1	Condensate storage tank No. 1 located outdoors east of the auxiliary feedwater pump house.
26. CST2	Condensate storage tank No. 2 located outdoors east of the auxiliary feedwater pump house.
27. CVCS-UNK	Room(s) containing CVCS piping downstream of the discharge of the positive displacement charging pump (specific plant location(s) not determined).
28. DG1ARM	Room containing emergency diesel generator 1A located in the diesel generator building.
29. DG1BRM	Room containing emergency diesel generator 1B located in the diesel generator building.
30. FBA	Level A (elevation 200') of the fuel building.
31. FBB	Level B (elevation 180') of the fuel building.
32. FBC	Level C (elevation 160') of the fuel building.
33. FB3	Level 3 (elevation 260') of the fuel building.
34. NMSTMVRM	North main steam valve room located at level 1 of the control building, north of the reactor containment.
35. NSCWA	"A" train nuclear service cooling water pump house attached to the cooling tower/basin.
36. NSCWB	"B" train nuclear service cooling water pump house attached to the cooling tower/basin.

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

Abbreviation	Description
37. PPTNL	The underground concrete pipe chase between the auxiliary feedwater pump house and the auxiliary building and the control building.
38. RC	Reactor containment.
39. RWST	Refueling water storage tank located outdoors at ground level south of the auxiliary building.
40. SMPA	"A" train nuclear service cooling water tower basin located south of the auxiliary building.
41. SMPB	"B" train nuclear service cooling water tower basin located south of the auxiliary building.
42. SMSTMVRM	South main steam valve room located at level 1 of the auxiliary building, south of the reactor containment.
43. TDAFWPMRM	Room containing the turbine-driven auxiliary feedwater pump located on the east side of the auxiliary feedwater pump house.
44. TLSFP	Spent fuel operating floor located at level 1 of the fuel building.

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
1AD1BRM	EP	EP-BT-1AD1B	BATT
1AD1RM	EP	EP-BC-1AD1CB	BC
1AD1RM	EP	EP-BS-1AD1	BUS
1AD1RM	EP	EP-BS-1AD1	BUS
1AD1RM	EP	EP-BC-1AD1CA	BC
1BD1BRM	EP	EP-BT-1BD1B	BATT
1BD1RM	EP	EP-BC-1BD1CB	BC
1BD1RM	EP	EP-BS-1BD1	BUS
1BD1RM	EP	EP-BS-1BD1	BUS
1BD1RM	EP	EP-BC-1BD1CA	BC
1CD1BRM	EP	EP-BT-1CD1B	BATT
1CD1RM	EP	EP-BS-1CD1	BUS
1CD1RM	EP	EP-BC-1CD1CB	BC
1CD1RM	EP	EP-BC-1CD1CA	BC
AB1	CCWS	CCW-HXA	HX
AB1	EP	EP-INV-1AD1T11	INV
AB1	EP	EP-INV-1BD1T12	INV
AB1	EP	EP-BS-1ABB	MCC
AB1	EP	EP-BS-1BBB	MCC
AB1	EP	EP-TR-1ABB40X	TR
AB1	EP	EP-TR-1BBB40X	TR
AB1	EP	EP-BS-1BBB	MCC
AB2	CCWS	CCW-HXB	HX
AB2	EP	EP-BS-1BB16	BUS
AB2	EP	EP-TR-1BB16X	TR
ABA	CCWS	CCW-P1A	MDP
ABA	CCWS	CCW-P3A	MDP
ABA	CCWS	CCW-P5A	MDP
ABA	CCWS	CCW-P2B	MDP
ABA	CCWS	CCW-P4B	MDP
ABA	CCWS	CCW-P6B	MDP

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
ABA	CHRS	CSA-9001A	MOV
ABA	CVCS	CHG-8801A	MOV
ABA	CVCS	CHG-8801B	MOV
ABA	ECCS	SI-8835	MOV
ABA	ECCS	SI-8802A	MOV
ABB	CCWS	RHR-HXA	HX
ABB	CCWS	RHR-HXB	HX
ABB	CHRS	1806	MOV
ABB	CHRS	1808	MOV
ABB	CHRS	1822	MOV
ABB	CHRS	1830	MOV
ABB	CVCS	CHG-8807A	MOV
ABB	CVCS	CHG-8807B	MOV
ABB	CVCS	CHG-8924	MOV
ABB	CVCS	CHG-8803A	MOV
ABB	CVCS	CHG-8803B	MOV
ABB	ECCS	SI-8806	MOV
ABB	ECCS	RHR-HXA	HX
ABB	ECCS	RHR-HXB	HX
ABB	ECCS	SI-P1A	MDP
ABB	ECCS	SI-8821A	MOV
ABB	ECCS	SI-8923A	MOV
ABB	ECCS	SI-P1B	MDP
ABB	ECCS	SI-8821B	MOV
ABB	ECCS	SI-8923B	MOV
ABB	EP	EP-BS-1BBD	MCC
ABC	CCWS	RHR-HXA	HX
ABC	CCWS	RHR-HXB	HX
ABC	CHRS	CSA-9002A	MOV
ABC	CHRS	CSA-9003A	MOV
ABC	CVCS	CHG-0112D	MOV

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
ABC	CVCS	CHG-0112E	MOV
ABC	CVCS	CHG-PM1A	MDP
ABC	CVCS	CHG-8471A	MOV
ABC	CVCS	CHG-8485A	MOV
ABC	CVCS	CHG-PM1B	MDP
ABC	CVCS	CHG-8471B	MOV
ABC	CVCS	CHG-8485B	MOV
ABC	ECCS	RHR-8804A	MOV
ABC	ECCS	RHR-HXA	HX
ABC	ECCS	RHR-8804B	MOV
ABC	ECCS	RHR-HXB	HX
ABC	EP	EP-BS-1ABD	MCC
ABD	CHRS	CSA-P1A	MDP
ABD	CHRS	CSB-P1B	MDP
ABD	ECCS	RHR-8716A	MOV
ABD	ECCS	RHR-8716B	MOV
ABD	ECCS	RHR-P1A	MDP
ABD	ECCS	RHR-P1B	MDP
ABD	ECCS	RHR-8811A	MOV
ABD	EP	EP-BS-1AB15	BUS
ABD	EP	EP-TR-1AB15X	TR
AFWAPMRM	AFWS	AFW-P1A	MDP
AFWAPMRM	AFWS	AFW-5119	MOV
AFWBPMRM	AFWS	AFW-P1B	MDP
AFWBPMRM	AFWS	AFW-5118	MOV
CB3	EP	EP-BS-1ABA	MCC
CB3	EP	EP-BS-1BBA	MCC
CBA	EP	EP-CB-1AA02	CB
CBA	EP	EP-CB-1BA03	CB
CBA	EP	EP-BS-1AA02	BUS
CBA	EP	EP-BS-1BA03	BUS

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
CBA	EP	EP-TR-1BB06X	TR
CBA	EP	EP-BS-1BBE	MCC
CBB	EP	EP-BS-1AB04	BUS
CBB	EP	EP-BS-1BB06	BUS
CBB	EP	EP-TR-1AB04X	TR
CBB	EP	EP-BS-1AB05	BUS
CBB	EP	EP-TR-1AB05X	TR
CBB	EP	EP-BS-1BB07	BUS
CBB	EP	EP-TR-1BB07X	TR
CBB	EP	EP-BS-1ABE	MCC
CST1	AFWS	AFW-CST1	TK
CST1	AFWS	AFW-CST1	TK
CST1	AFWS	AFW-CST1	TK
CST2	AFWS	AFW-CST2	TK
CST2	AFWS	AFW-CST2	TK
CST2	AFWS	AFW-CST2	TK
DG1ARM	EP	EP-DG-1A	DG
DG1ARM	EP	EP-BS-1ABF	MCC
DG1BRM	EP	EP-DG-1B	DG
DG1BRM	EP	EP-BS-1BBF	MCC
FBA	CHRS	CSB-9001B	MOV
FBA	ECCS	SI-8802B	MOV
FBB	CHRS	1807	MOV
FBB	CHRS	1809	MOV
FBB	CHRS	1823	MOV
FBB	CHRS	1831	MOV
FBC	CHRS	CSB-9002B	MOV
FBC	CHRS	CSB-9003B	MOV
FBC	ECCS	RHR-8811B	MOV
NMSTMVRM	AFWS	AFW-5125	MOV
NMSTMVRM	AFWS	AFW-5132	MOV

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
NMSTMVRM	AFWS	AFW-5134	MOV
NMSTMVRM	AFWS	AFW-3019A	MOV
NSCWA	NSCWS	NSCW-1600	MOV
NSCWA	NSCWS	NSCW-1605	MOV
NSCWA	NSCWS	NSCW-1606	MOV
NSCWA	NSCWS	NSCW-1658A	MOV
NSCWA	NSCWS	NSCW-1658B	MOV
NSCWA	NSCWS	NSCW-1A	MDP
NSCWA	NSCWS	NSCW-3A	MDP
NSCWA	NSCWS	NSCW-5A	MDP
NSCWB	NSCWS	NSCW-1669B	MOV
NSCWB	NSCWS	NSCW-1607	MOV
NSCWB	NSCWS	NSCW-1612	MOV
NSCWB	NSCWS	NSCW-1613	MOV
NSCWB	NSCWS	NSCW-1669A	MOV
NSCWB	NSCWS	NSCW-2B	MDP
NSCWB	NSCWS	NSCW-4B	MDP
NSCWB	NSCWS	NSCW-6B	MDP
NSCWB	NSCWS	NSCW-1669B	MOV
RC	CHRS	SI-SUMPS	TK
RC	ECCS	SI-SUMPS	TK
RC	ECCS	SI-SUMPS	TK
RC	RCS	RCS-455A	NV
RC	RCS	RCS-456A	NV
RC	RCS	RCS-8000A	MOV
RC	RCS	RCS-8000B	MOV
RC	RCS	RCS-RV	RV
RC	RCS	RHR-8701A	MOV
RC	RCS	RHR-8701B	MOV
RC	RCS	RHR-8702A	MOV
RC	RCS	RHR-8702B	MOV

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

LOCATION	SYSTEM	COMPONENT ID	COMP TYPE
RWST	CVCS	SI-RWST	TK
RWST	CVCS	SI-RWST	TK
RWST	ECCS	SI-RWST	TK
RWST	ECCS	SI-RWST	TK
SMPA	NSCSW	NSCW-SUMPA	TK
SMPB	NSCWS	NSCW-SUMPB	TK
SMSTMVRM	AFWS	AFW-5137	MOV
SMSTMVRM	AFWS	AFW-5139	MOV
SMSTMVRM	AFWS	AFW-3009B	MOV
SMSTMVRM	AFWS	AFW-5122	MOV
TDAFWPMRM	AFWS	AFW-5106	MOV
TDAFWPMRM	AFWS	AFW-5113	MOV
TDAFWPMRM	AFWS	AFW-P1C	TDP
TDAFWPMRM	AFWS	AFW-5129	MOV

5. BIBLIOGRAPHY FOR VOGTLE 1 AND 2

1. NUREG-1087, "Final Environmental Statement Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2," USNRC Division of Licensing, March 1985.

2. NUREG-1137, "Safety Evaluation Report Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2," USNRC Division of Licensing, June 1985.

3. NUREG-1237, "Technical Specifications for Vogtle Electric Generating Plant, Unit 1," USNRC Division of Pressurized Water Reactor Licensing, January 1987.

4. NUREG-1247, "Technical Specifications for Vogtle Electric Generating Plant, Unit 1," USNRC Division of Pressurized Water Reactor Licensing, March 1987.

5. NUREG-1278, "Vogtle Unit 1 Readiness Review; Assessment of Georgia Power Company Readiness Review Pilot Program," USNRC Division of Licensee Performance & Quality Evaluation, September 1987.

6. NUREG-1343, "Technical Specifications for Vogtle Electric Generating Plant, Units 1 and 2," USNRC Division of Reactor Projects, February 1989.

7. NUREG-1359, "Technical Specifications for Vogtle Electric Generating Plant, Units 1 and 2," USNRC Division of Reactor Projects, March 1989.

8. NUREG/CR-4228, "Review of the Vogtle Units 1 and 2 Auxiliary Feedwater System Reliability Analysis," Brookhaven National Laboratory, October 1985.

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

A1. SYSTEM DRAWINGS

A1.1 Fluid System Drawings

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

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

- Component symbols used in the fluid system drawings are defined in Figure A-1.
  - Most valve and pump symbols are designed to allow the reader to distinguish among similar components based on their support system requirements (i.e., electric power for a motor or solenoid, steam to drive a turbine, pneumatic or hydraulic source for valve operation, etc.)
  - Valve symbols allow the reader to distinguish among valves that allow flow in either direction, [illegible] (non-return) valves, and valves that perform an overpressure protec[illegible]unction. No attempt has been made to define the specific type of val[illegible], 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)

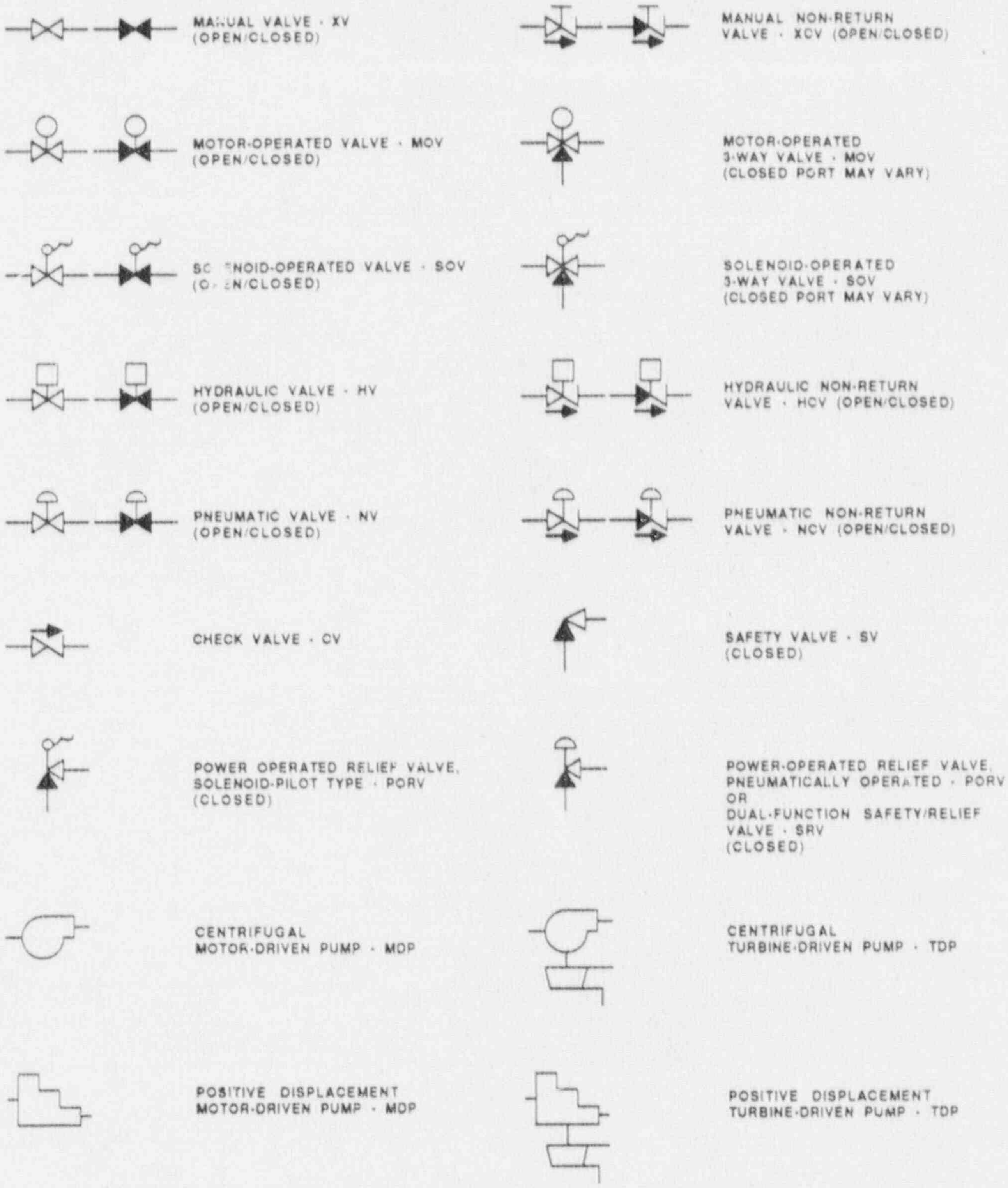


Figure A-1. Key To Symbols In Fluid System Drawings

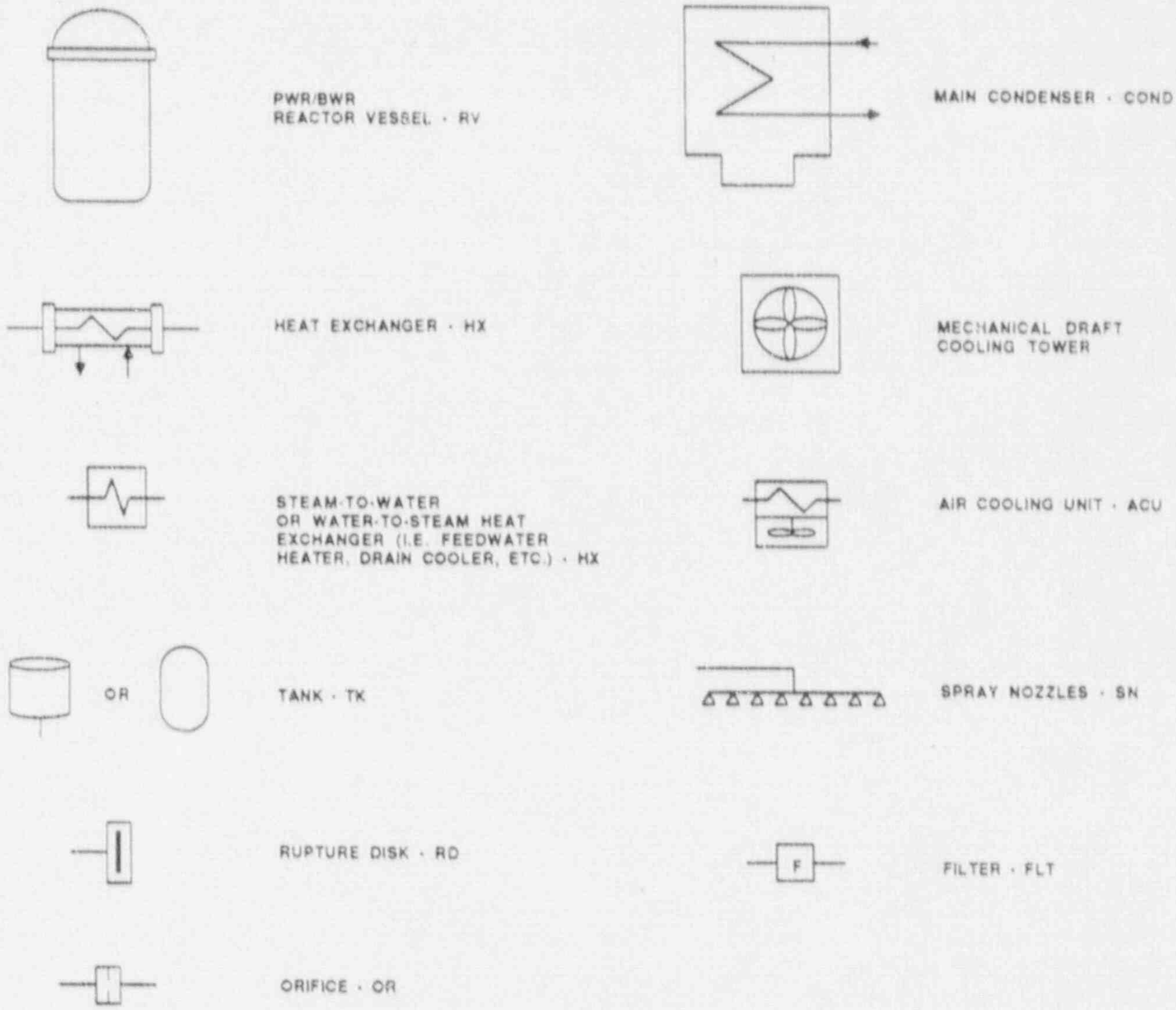


Figure A-1. Key To Symbols In Fluid System Drawings (Continued)

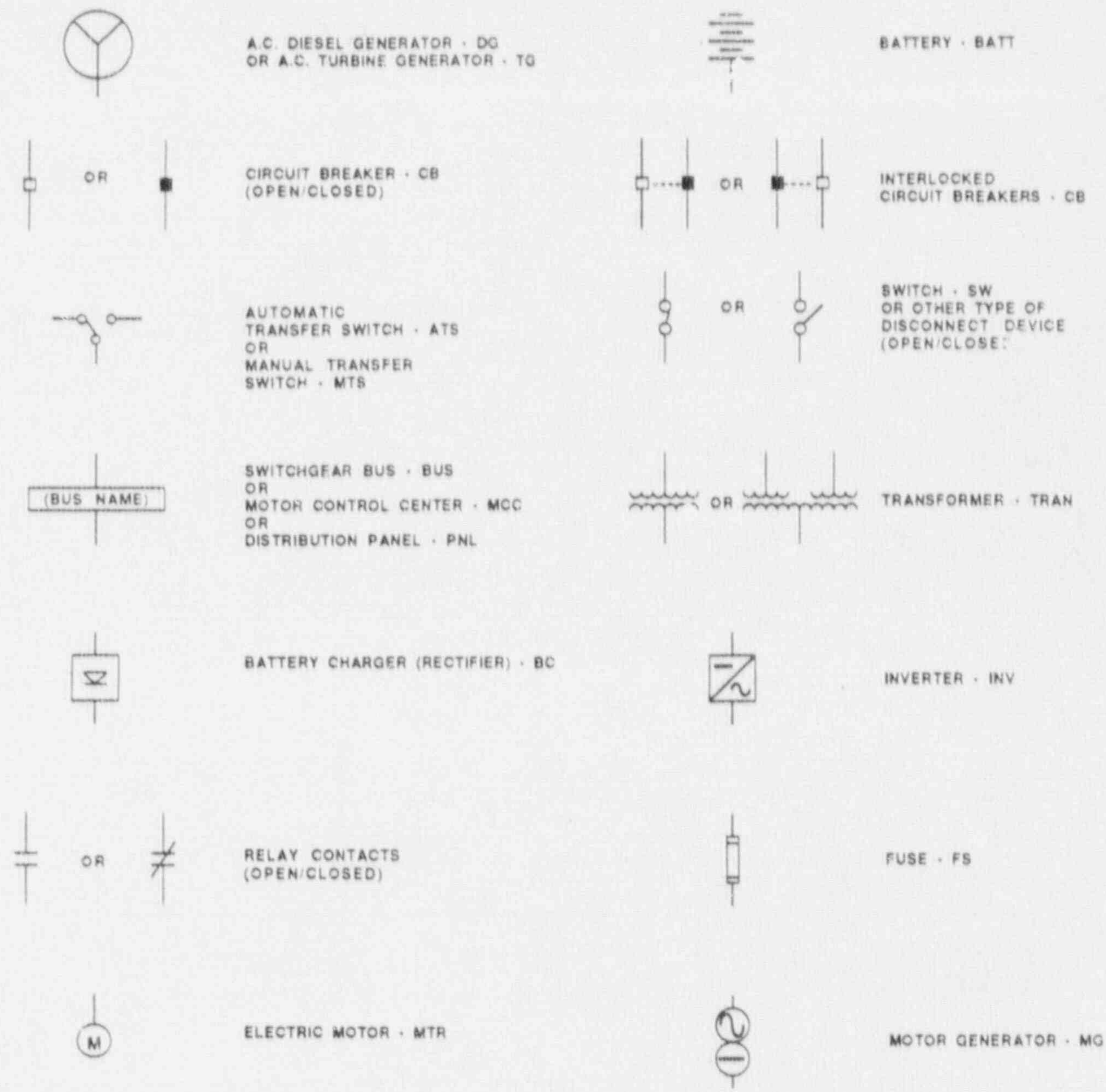


Figure A-2. Key To Symbols In Electrical System Drawings

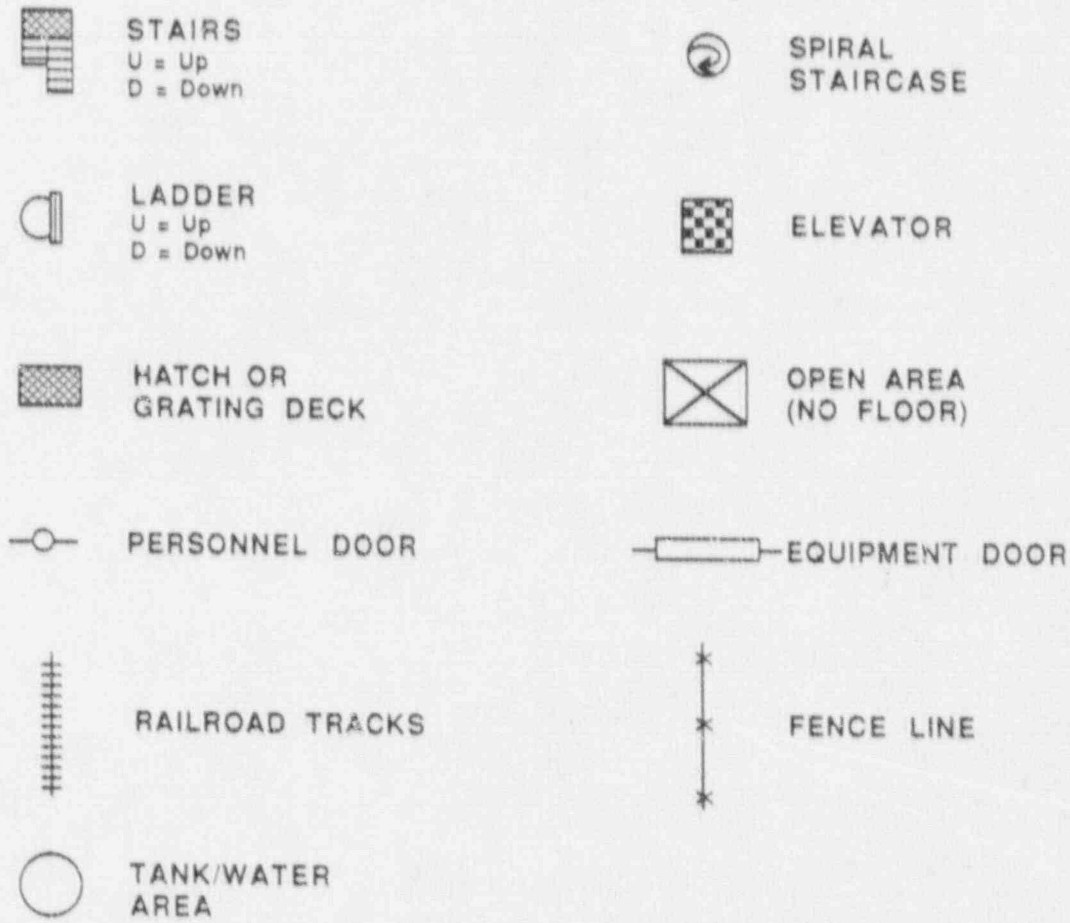


Figure A-3. Key To Symbols In Facility Layout Drawings

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
AFWS	Auxiliary Feedwater System
ECCS	Emergency Core Cooling System (including HPSI and LPSI)
CVCS	Chemical and Volume Control System (Charging System)
CHRS	Containment Heat Removal System (including spray and fan cooler systems)
EP	Electric Power System
CCWS	Component Cooling Water System
NSCWS	Nuclear Service Cooling 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

TABLE B-1. COMPONENT TYPE CODES

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

TABLE B-1. COMPONENT TYPE CODES (Continued)

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