BALTIMORE GAS AND ELECTRIC COMPANY

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March 19, 1981

ARTHUR E. LUNDVALL, JR.
VICE PRESIDENT
SUPPLY

Mr. D. G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Calvert Cliffs Nuclear Power Plant
Units Nos. 1 & 2, Dockets Nos. 50-317 & 50-318
Fire Protection Modifications

Dear Mr. Eisenhut:

10CFR 50.48 requires submittal of certain information within 30 days of the effective date of that Section. Information required consists of:

a) Plans and schedules for meeting requirements of Appendix R;

b) Design description of modifications to meet Appendix R Section III.G.3 concerning automatic shutdown capabilities;

c) Requests for exemption from Appendix R requirements.

Plans and Schedules

Plans and schedules for open Appendix R items were discussed in our letter of 12/29/80, written in response to your letter of 11/24/80. Enclosure 2 to your 11/24 letter listed all remaining items required to meet Appendix R. The discussions in our 12/29 letter remain valid, except as discussed under "Exemption Requests" below, and except that our previous responses to SER item 3.3.7, Quality Assurance Program, have since been found acceptable by your staff; we were informed of this acceptance in a recent phone conversation with your Mr. Chang Li. Though engineering, procurement, and installation schedules are tight, our intent is still to complete these items by the required completion dates listed in that letter, except for specific changes to plant systems required to meet certain aspects of the Safe Shutdown Study. Though these changes have not yet been specifically defined, they are likely to be limited by delivery of equipment. We will inform you, of course, of any changes in these schedules as plans become more firm.

POOR ORIGINAL

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Your letter of 12/20/81 requested that as part of our submittal of plans and schedules we include an assessment of our compliance with Sections III.G, III.J, and III.O of Appendix R, as required by 50.48(b). Plans for Section III.G (Fire Protection of Safe Shutdown Capability) are referred to above and are discussed in detail below under "Alternate Safe Shutdown". We have concluded that we comply with Section III.J (Emergency Lighting). We also comply with Section III.O (RCP Lube Oil Collection), and this is further discussed below under "Exemption Requests".

Alternate Shutdown

Our "Report on Alternate Safe Shutdown" is attached. The systems approach to safe shutdown detailed in this report was developed to provide the alternative shutdown capability specified in Section III.G.3 of Appendix R for all areas in the plant where safe shutdown cannot be assured due to equipment or cable damage caused by a fire, or from fire suppression activities.

The report replaces pages FHA-6 through FHA-10 previously supplied to you as part of our 12/21/79 submittal which addressed Section 3.2.1 of the Fire Protection SEP dated 9/14/79. Equipment lists and operating descriptions originally presented were intended to provide safe shutdown capability when combined with fire protection measures. Credit for automatic suppression to protect unique devices, or redundant devices in close proximity, was subsequently not allowed by Appendix R, and therefore our previous approach has been replaced by a detailed systems analysis in order to identify alternate devices or methods of operation available to achieve a safe and orderly shutdown.

General system descriptions are supplied to provide an overall understanding of plant operation after a postulated fire, as well as detailed descriptions including device numbers. To better visualize interrelations, logic diagrams are included as attachments to the report. A separate diagram is included for each system function and all diagrams are designed to stand alone. Equipment required for more than one function is included on each applicable diagram. The diagrams are constructed of parallel and series paths representing the logical "or" and the logical "and". They are not flow diagrams. No specific operation of a device is implied by its presence on a diagram; the intent is only to show the various combinations of equipment which the operator may use to achieve the required system function.

In addition to all cables related to a particular device, analysis is being performed for all cables which are associated with the safe shutdown circuit either electrically or physically (i.e. where separation in accordance with Regulatory Guide 1.75 is not provided). It should be noted that although previous submittal information addressed redundant channel raceways in each room, the analysis presently underway will supply the specific consequences to system operation of each postulated fire, since individual circuits rather than entire raceways are being studied.

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This process is being applied to all areas of the plant which contain safe shutdown equipment or associated circuits. Though we do not intend to provide further details for all areas, the results of the application of this process to the Unit 1 and 2 containments are attached to the report as examples. For those areas, relocation of three pressurizer instrument loop transmitters, rerouting of their cables, and rerouting of cables to each PORV were identified as necessary to insure safe shutdown capability. Additionally, cable trays were identified which compromised the clear horizontal air space between redundant devices. Enclosing these trays provides the required separation.

The modifications listed in the report are those required to provide alternate shutdown capability independent of damage to cabling and equipment in the plant areas addressed specifically in the SER. Where the requirements of Sections III.G.1 and III.G.2 are not met, modifications will be made to insure conformance to Section III.L, except for the requirements to achieve cold shutdown within 72 hours. For this criteria we intend to follow the guidelines of Section I and Section III.G.1. Obviously, modifications will be done in accordance with 10 CFR 50.59.

Detailed analysis of all remaining plant areas is continuing. Unit 1 analysis will be completed by 7/15/81, and Unit 2 analysis by 12/1/81. It should be clear that the additional information requested by your letter of 2/20/81 is an integral part of the results of this study. As such, it will be generated on a continuing basis in order to meet these schedules and will not be available by 5/19/81. We believe the attached study, with detailed results for the two example areas, will provide the information you require for evaluation.

Exemption Requests

1. Hose Tests

Appendix R Section III.E, Hydrostatic Hose Tests, specifies periodic tests at the greater of 300 psi or 50 psi above maximum fire main operating pressure. NFPA 196 specifies that the initial hose test be at 300 psi, with subsequent periodic tests at 50 psi greater than maximum operating pressure. The intent specified in your Technical Basis was to invoke requirements of NFPA 196; the intent specified in your "Comment Resolution" was that "all hose would be tested at a pressure greater than the maximum pressure found in the fire protection water distribution systems". Though this was not listed by you as an open item, we bring to your attention that our interpretation of this section is for periodic tests at 50 psi greater than maximum operating pressure. If an exemption is required for this interpretation, we hereby request one.

2. Lube Oil Collection

Appendix R Section III.O requires that the RCP lube oil collection system shall be "so designed, engineered, and installed... that there is reasonable assurance that the system will withstand a Safe Shutdown Earthquake".

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This criteria is met completely by the system just installed in both Calvert Cliffs units. The collection tanks themselves, located on containment floor, are not ASME Code and are not seismically qualified. They are, however, supported and restrained to prevent movement in any direction during a Design Basis Earthquake, providing assurance that they will perform their function during or following a Safe Shutdown Earthquake. If an exemption is required for this design, we hereby request one.

3. Fire Barriers

Appendix R Section III.G discusses requirements for separation of safe shutdown equipment into separate fire areas. It is silent regarding exactly how the criteria can be met, though in Section III.N criteria are provided for fire doors when they are used to separate fire areas. In previous responses, we proposed and provided justification for selective use of water curtains for certain openings in fire barriers, in lieu of fire doors. This would appear to be allowed by Appendix R provided water curtains could be shown to provide a fire barrier meeting the applicable three-hour or one-hour criteria. Your disapproval of our proposals to meet SER Item 3.2.1 was based on two general points:

(a) The contention that the automatic water suppression system which provides the water curtain will not always be actuated; and

(b) Lack of evidence demonstrating effectiveness of such a barrier.

Regarding point (a), it would appear that the actuation mechanism for the water curtain (fusible links) is similar to the mechanism permitted by Section III.N.3 for closure of doors. This slim potential for failure of actuation would therefore appear to be acceptable in Appendix R. Regarding point (b), we are proposing performance of a test by an independent laboratory to demonstrate the equivalence of a water curtain to three-hour and/or one-hour barriers. We therefore request an exemption from the previous staff interpretation which allows no credit for water curtains, pending successful completion of the proposed test. We will finalize plans for the test upon receipt of firm indication from you that such an approach will be acceptable.

4. General

All commitments made as a result of Appendix R assume its status remains the same. However, it should be closely understood that the matters discussed herein are subject to the outcome of litigation currently pending in the United States Court of Appeals for the District of Columbia, of which our Company is a party, being: Connecticut Light and Power Co., et.al. v NRC (No. 81-1090). No waiver of rights, express or implied, is intended as the result of any commitment or obligation, contained in this letter, which may later be inconsistent with the results of said litigation.

Very truly yours,

A. E. Lundvall, Jr.

POOR ORIGINAL

cc: J. A. Biddison, Esquire
G. F. Trowbridge, Esquire
Messrs. F. L. Conner, Jr. - NRC
E. Architzel - NRC

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Report On

Alternate Safe Shutdown

At

Calvert Cliffs Nuclear Power Plant

Units 1 and 2

7/25/80

Revised 2/19/81

Alternate Safe Shutdown Requirements
SEP Item 3.2.1

Purpose

This report addresses the systems and equipment necessary to reach hot and cold shutdown at Calvert Cliffs Nuclear Power Plant in accordance with U. S. Nuclear Regulatory Commission 10CFR Part 50 Appendix R. Modifications are proposed to provide alternate safe shutdown in the event of a postulated fire.

Definitions

Hot Standby - That condition which exists after CEA's have been inserted into the core, per cent rated thermal power is 0, K_{eff} is less than 0.99 and the average coolant temperature is greater than or equal to 300°F.

Hot Shutdown - That condition which exists when per cent rated power is 0, K_{eff} is less than 0.99 and the average coolant temperature is greater than 200°F but less than 300°F.

Cold Shutdown - That condition which exists when per cent rated power is 0, K_{eff} is less than 0.99 and the average coolant temperature is less than or equal to 200°F.

Reactivity Control Function - That process required to place and maintain the reactor in a subcritical condition.

Reactor Coolant Make-up Function - That process required to maintain primary coolant within the range of pressurizer level indication.

Reactor Heat Removal Function - That process required to carry decay heat from the primary system during the cool down process.

Process Monitoring Function - Instrumentation required to monitor process variables related to the above functions.

Support - Diesel generators, service water, communications, etc. required to perform the above functions.

Assumptions

1. Single failure criteria are not applicable.
2. No other plant accidents are assumed to occur except as precipitated by the postulated fire.
3. Equipment used prior to 72 hours after the postulated fire shall be capable of being powered by onsite and offsite power sources or by onsite power systems that are independent of the offsite power systems.
4. Equipment used after 72 hours after the postulated fire can be powered by offsite power sources.
5. If a fire causes electrical shorts or overloads, protective devices are assumed to function properly except as effected by the postulated fire.
6. After detection of a fire it is assumed that reactor trip can be accomplished from the control room. In the event of a fire which necessitates evacuation of the control room, it is assumed that reactor trip can be accomplished prior to this evacuation followed by local trip of the 480 volt power to the rod control motor generator sets.
7. A defense in depth approach was taken as dictated in Appendix R. In the consideration of alternate safe shutdown, it was assumed that the postulated fire started and was not promptly extinguished by the combination of automatic suppression and detection systems or manual suppression.
8. It was further assumed that all equipment and cables in a specific area, except where separation is provided by over 20' of clear horizontal air space, are disabled by the postulated fire, but that valves remain functional and manual operators can be operated after the fire is extinguished. Pipes and heat exchangers in systems normally carrying water are assumed to be undamaged by the fire.
9. Local operation of cold shutdown equipment where available is assumed possible since the postulated fire is assumed to be extinguished prior to commencement of cold shutdown procedures.
10. Turbine trip can be accomplished manually in the turbine hall.

Description of Shutdown Systems

Unless noted all descriptions are applicable to both units. Unit 1 room numbers will be referenced.

Systems Required for Hot Standby

Reactivity control required to place an operating unit in hot standby is accomplished by insertion of CEA's into the core. Interruption of 240VAC from motor-generator sets located in the switchgear rooms, #430 and #317, will cause the rods to drop. Rod insertion is normally initiated from the control room, however 240 VAC can be removed locally in the cable spreading room, #306, or the 480 VAC supply to the motor-generator sets can be removed locally in the switchgear rooms.

Reactor coolant inventory is maintained during cooldown by keeping both pressurizer PORV's or their motor operated block valves closed. All are located in the containment. Additionally, one of two redundant reactor coolant pump seal leak-off header valves, one of two redundant reactor vessel vent valves, one of two redundant pressurizer vessel vent valves, one of two redundant shut down cooling return isolation valves, and all sample header valves or the combined sample header valve must be maintained shut. In each case, redundant valves are both inside and outside the containment structure. Primary coolant system make-up can be supplied by one of three charging pumps from the concentrated boric acid tanks or the refueling water tank.

Auxiliary feedwater can be supplied to the steam generators by one of two redundant steam driven AFW pumps located in room #603. Either pump can be supplied with steam from a common header which is in turn supplied by either steam generator. Both AFW pumps can draw water from three condensate storage tanks, however for the purpose of this report, credit is taken only for condensate storage tank #12 which is covered in the Technical Specifications for Calvert Cliffs. AFW pump feedwater discharge is supplied to a common header

and then to either (or both) steam generator through flow control valves located in room #316. Both flow control valves open on loss of power or control air. Heat is removed from each steam generator through an atmospheric dump valve or eight steam generator safety valves. Both dump valves are located in room #428. One steam generator and associated valves is sufficient to reach hot shut down.

Reactor coolant system pressure can be maintained during cooldown using the pressurizer heaters (electric). Redundant banks of heaters are fed from the switchgear rooms, #430 and #317. If pressurizer heaters are inoperable due to a fire, reactor coolant system pressure can be maintained through use of the charging pumps. The pressurizer can be pumped solid by one of three charging pumps located in room #115. Charging pump suction is provided from one of two concentrated boric acid tanks, located in room #217, by gravity feed. Boric acid from these tanks can also be supplied to the charging pumps by one of two redundant boric acid pumps. Suction can also be provided from the refueling water tank. Charging pump discharge is delivered to the primary coolant system through one of two redundant charging line isolation valves or one of four redundant safety injection header valves. Reactor coolant system pressure regulation can be achieved through use of the letdown system. All equipment which would be used in this process is located remotely from the pressurizer heaters. Adding further redundancy, if the letdown system is inoperable, pressure can be maintained at 1200 psi with the high pressure safety injection pumps. Suction is provided to the high pressure safety injection pumps from the refueling water tank and pump discharge is supplied to the reactor coolant system by opening one of four redundant high pressure safety injection header valves. Equipment required to operate the high pressure safety injection pumps is located in rooms #118 and #119 and is separated from equipment required for the letdown system.

Residual heat can also be removed by providing water to the primary system with the high pressure safety injection pumps and removing water to the quench tank through the pressurizer PORV's. This method, feed and bleed, is considered inappropriate since appendix R prohibits violating a primary system boundary.

Additional redundancy to pressurizer heater failure is provided by the use of reflux boiling. No credit is taken for this alternate since reactor coolant level would drop below the pressurizer. This condition is also in violation of appendix R.

Reactor cold leg temperature, reactor hot leg temperature, pressurizer pressure and pressurizer level indications are needed to monitor natural circulation within the Reactor Coolant System.

Cold leg temperature is normally provided by TE-115 and TE-125. However, TE-111Y and TE-121Y plus four safety grade Tc signals for each loop are available in the Control Room.

Hot leg temperature is normally provided by TE-111X and TE-121X. However, two additional safety grade Th signals for each loop are available in the Control Room.

Pressurizer pressure is normally provided by either PT-100X or PT-100Y. However, four additional safety grade pressure signals are available in the Control Room. PT-103 or PT-103-1 provide low range pressure signals.

Pressurizer level is normally provided by LT-110X and LT-110Y. However, LT-103 which is calibrated for cold conditions is also available.

Steam generator level, steam generator pressure, and auxiliary feedwater pump discharge pressure indications are needed to maintain adequate steam generator water inventory.

Steam generator level is normally provided by LT-1105 and LT-1106 on the main control board and in the auxiliary feedwater pump room. However,

LT-1121 and LT-1111 plus four safety grade level indications for each steam generator are also available in the Control Room.

Steam generator pressure is normally provided by PT-3991 and PT-4008 on the main control board and in the auxiliary feedwater pump room. However, these pressures can also be read locally from gauges in each auxiliary feedwater pump room. Additionally, four safety grade pressure indications for each steam generator are available in the Control Room.

Auxiliary feedwater pump discharge pressure is normally provided by PT-4507 on the main control board. This pressure can also be read locally in each auxiliary feedwater pump room.

Cold Shutdown

Reactivity control required to reach cold shutdown is provided by increasing primary coolant boration using one of three charging pumps located in room #115. Charging pump suction is provided from one of two concentrated boric acid tanks by gravity feed or from the refueling water tank. Boric acid can also be provided from concentrated boric acid tanks by one of two boric acid pumps. Pump discharge is introduced into the reactor coolant system through one of two charging line isolation valves or one of four safety injection header valves. All safety injection header valves can be operated manually. One of two redundant boric acid heat trace systems must be operable.

Residual heat is removed by the shutdown cooling system after primary coolant temperature is reduced to below 300°F. One of two redundant low pressure safety injection pumps, located in rooms #118 and #119 is required to circulate primary coolant through the shutdown cooling heat exchangers, also located in rooms #118 and #119. Heat is transfered from the shutdown cooling heat exchangers to one of two component cooling heat exchangers by one of three redundant component cooling pumps. Component cooling heat exchangers and pumps are located in room #228. Component cooling heat exchangers are cooled by the circulating salt water system. One of three saltwater pumps must be operable. All saltwater pumps are located at the intake structure and are separated by 61 feet horizontally. All valves required for residual heat removal can be placed in their shutdown positions either by the removal of power or control air or can be manually operated.

If a fire in the component cooling room disables all component cooling equipment, component cooling water from the unaffected unit can be supplied for shutdown cooling through existing piping. Unit 1 and Unit 2 component cooling and saltwater systems are in different areas and are therefore not affected by a common fire outside the control room or cable spreading rooms. In the case

of a control room or cable spreading room fire, normal shutdown cooling will be employed.

Support Systems

Equipment required to reach hot and cold shutdown is powered from redundant trains consisting of 4KV unit buses, 480V unit buses, 480V motor control centers, 120VAC instrument buses, 120VAC inverter buses and 125VDC battery buses. No single bus failure will impair the ability to reach cold shutdown.

Each switchgear room is cooled by one of two redundant air conditioning units and one of two redundant control room air conditioners is required to insure control room habitability.

On loss of offsite power, output of two of three installed diesel generators is required to effect cold shutdown on both units. The diesel fuel oil transfer pump and room ventilation systems must also be operable. All diesels can be supplied with cooling water from either Unit 1 or Unit 2 service water subsystems. All valves in the service water system can be placed in their required positions by removal of air or power.

Plant communications is provided by a page system and two sound powered phone systems. The page and one sound powered phone system are routed in common conduits. The second sound powered phone system is routed independently of any other communication system and does not pass through the cable spreading room.

Fire Analysis

Control Room

A control room fire which necessitates evacuation of the control room results in loss of centralized control and process monitoring. As previously stated in assumption 6, it is assumed that reactor scram will be attempted from the control room followed by local trip of the 480VAC supply to the CEA system in the switchgear rooms. Isolation and local control will be provided as outlined below:

1. Reactor Heat Removal Function:
   a. Provide electrical isolation from the control room and cable spreading room for CV-3938 and CV-3939. Both valves can be operated manually if required.
   b. Provide electrical isolation from the control room and cable spreading room and local operation for the pressurizer heaters.
   c. Provide electrical isolation from the control room and cable spreading room and local operation in the switchgear rooms for the saltwater pumps, component cooling pumps, low pressure safety injection pumps and service water pumps.
   d. Provide electrical isolation from the control room and cable spreading room for MOV-652 and local operation at its motor control center.
   e. Auxiliary feedwater system (MOV-4070, MOV-4071, AFW Pump 11, AFW Pump 12, CV-4511, CV-4512) modifications to provide independence from Control Room fires is being coordinated with Auxiliary Feedwater Modifications Project.
2. Reactivity Control Function:
   a. Provide electrical isolation from the cable spreading room and control room and local control for each charging pump.

3. Reactor Coolant Make-Up Function:

   a Provide electrical isolation from the control room and cable spreading room and local control at their motor control centers for the PORV's. PORV's close on loss of power.

   b. Provide facilities to remove power from C.-5464, CV-505, CV-507 and CV-516 independent of the control room and cable spreading room. These valves close on loss of power.

4. Process Monitoring Function:

   a. For each reactor coolant system loop, indication independent of the cable spreading room and the control room will be provided for one cold leg temperature, one hot leg temperature, one steam generator pressure, one steam generator level. Additionally, one pressurizer level and one pressurizer pressure will be provided.

5. Support:

   a. Diesel generator control cables will be isolated from the control room and cable spreading room to assure local operation of each machine. Isolation will be provided as necessary to place service water system valves in the positions required to supply cooling water to the diesels.

   b. As covered in previous fire hazards modifications submittals, an independent sound powered phone system was installed. Additional jacks will be installed in the ZA and ZB switchgear rooms and in the vicinity of CV-3839 and CV-3939 to provide communications between all areas where local control is to take place.

Cable Spreading Room

In addition to loss of control and process monitoring, a cable spreading room fire can cause loss of all DC power to the affected unit. Alternate 125VDC supply will be provided to Unit 1 4KV switchgear, to Unit 2 4KV

switchgear and to the diesel generators as required to assure two of three plant diesels will be available at all times.

Cable Chases (1A, 1B, 2A, 2B, U1 and U2)

Electrical isolation of control cables will be provided as noted previously to afford local equipment operation. Additionally, isolation will be provided for equipment whose inadvertent operation could impair the ability to reach hot standby or cold shutdown. Isolation will be situated to provide equipment operation independent of cable failure in these chases, or cables will be rerouted outside chases where fire damage can impair the ability to reach hot standby or cold shutdown.

Auxiliary Feedwater Pump Room

A cross connect pipe between Unit #1 and Unit #2 AFW Pump feedwater outlets will be added. This will provide auxiliary feedwater from the unaffected unit in the event of a fire that disables both AFW Pumps or both steam supply valves. Manual valves at both ends of the pipe will normally be locked closed. Design and installation of the cross connect pipe will be evaluated in conjunction with the Auxiliary Feedwater Modifications Project (additional AFW pumps-Electric).

Charging Pump Rooms

Fire barriers will be constructed so that no more than one pump is damaged in a single fire. Cables to the charging pumps will be afforded separation either by rerouting or wrapping.

Component Cooling Pump Rooms

As noted previously, sufficient redundancy exists such that equipment loss in a component cooling pump room can be compensated for with equipment outside that room through existing systems. Cables to redundant equipment running through this room will be afforded separation either by rerouting or wrapping.

Service Water Pump Rooms

Diesel generators can obtain service water from either unit. Cables to redundant equipment running through these rooms will be afforded separation either by rerouting or wrapping.

Other Auxiliary Building Areas

Auxiliary building corridors and other areas containing cables from redundant equipment will be compensated for as follows:

1. Cables to redundant pumps and valves will be provided separation as necessary to prevent loss of any function due to a single postulated fire. This separation will be afforded either by rerouting or wrapping.
2. Cables for redundant auxiliary safe shutdown instrumentation will be afforded separation either by rerouting or wrapping.
3. Isolation will be provided as required for equipment whose inadvertent operation could impair the ability to reach hot standby or cold shutdown.

Outdoor-Auxiliary Feedwater Supply

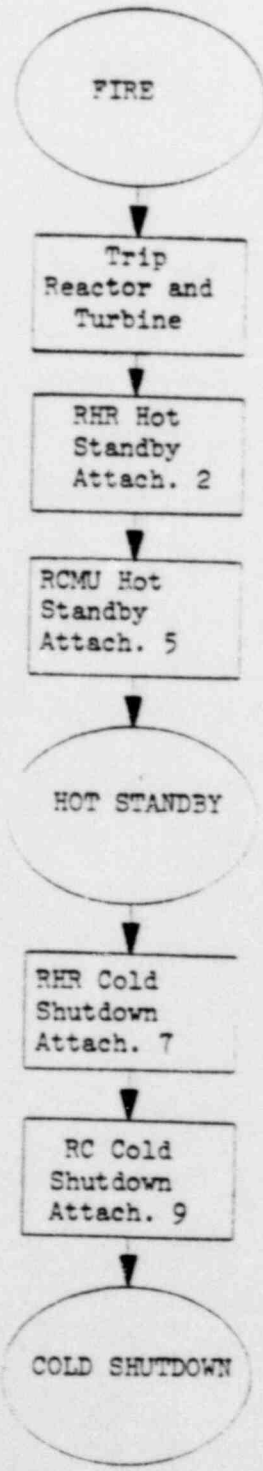
Two well water pumps will be repowered from diesel generators and facilities provided to pipe well water directly to condensate storage tank #12 to provide sufficient auxiliary feedwater to remain in hot stand-by for 72 hours.

Summary

The purpose of this report was to outline a plan of compliance with U.S. Nuclear Regulatory Commission 10CFR50 Appendix R. General descriptions are offered of the systems required to reach hot and cold shutdown. Where vulnerable to fire damage, alternate systems for reaching shutdown are included. This information is detailed in logic charts and the accompanying comprehensive equipment summaries. Modifications presently underway at Calvert Cliffs make it unlikely that a fire can start and reach proportions sufficient to cause widespread damage. However, the additional modifications detailed in this report provide a defense in depth approach to fire hazards and assure that cold shutdown can be reached regardless of any single postulated fire.

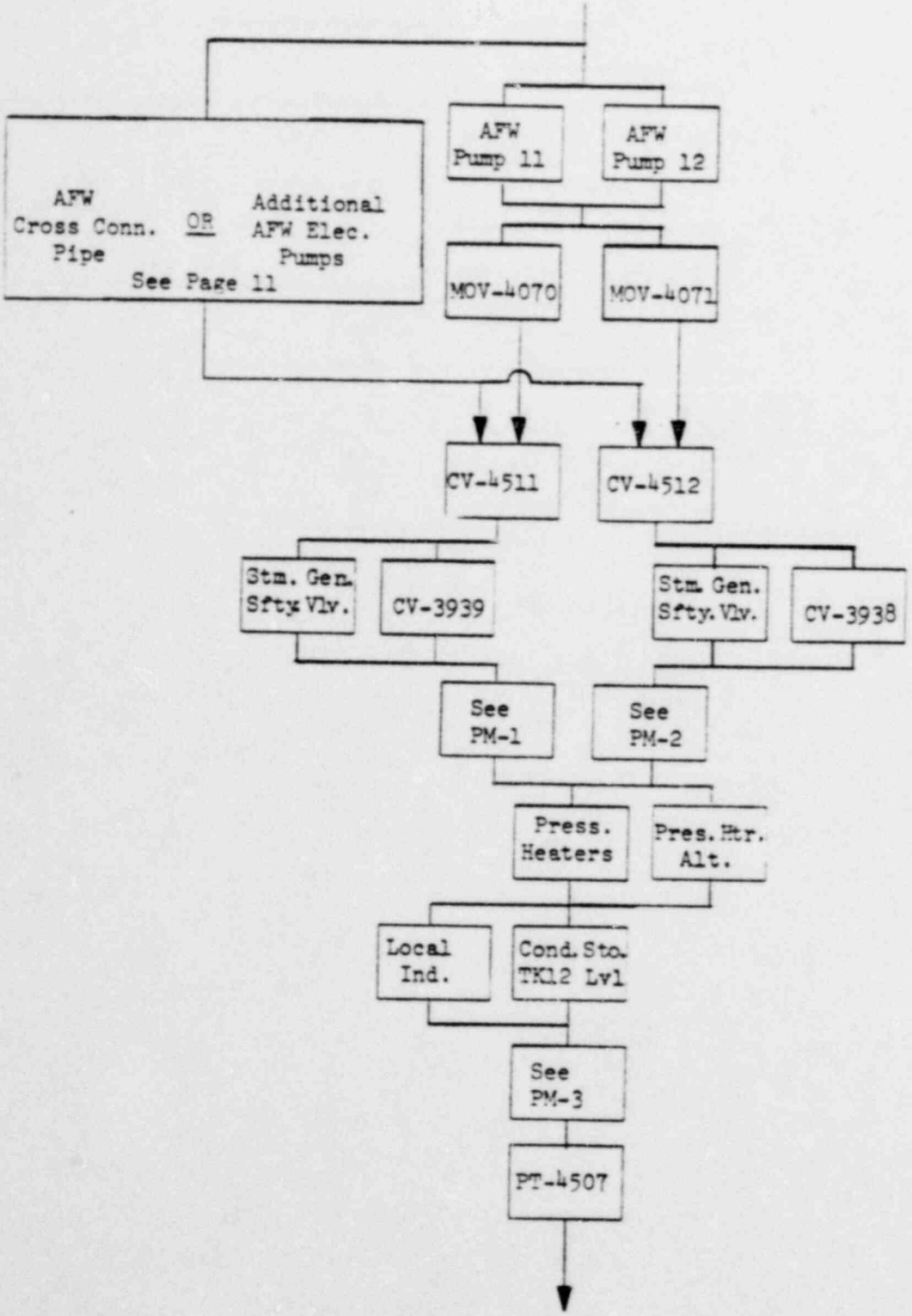
Index of Charts and Diagrams

ALTERNATE SAFE SHUTDOWN - FUNCTIONS REQUIRED

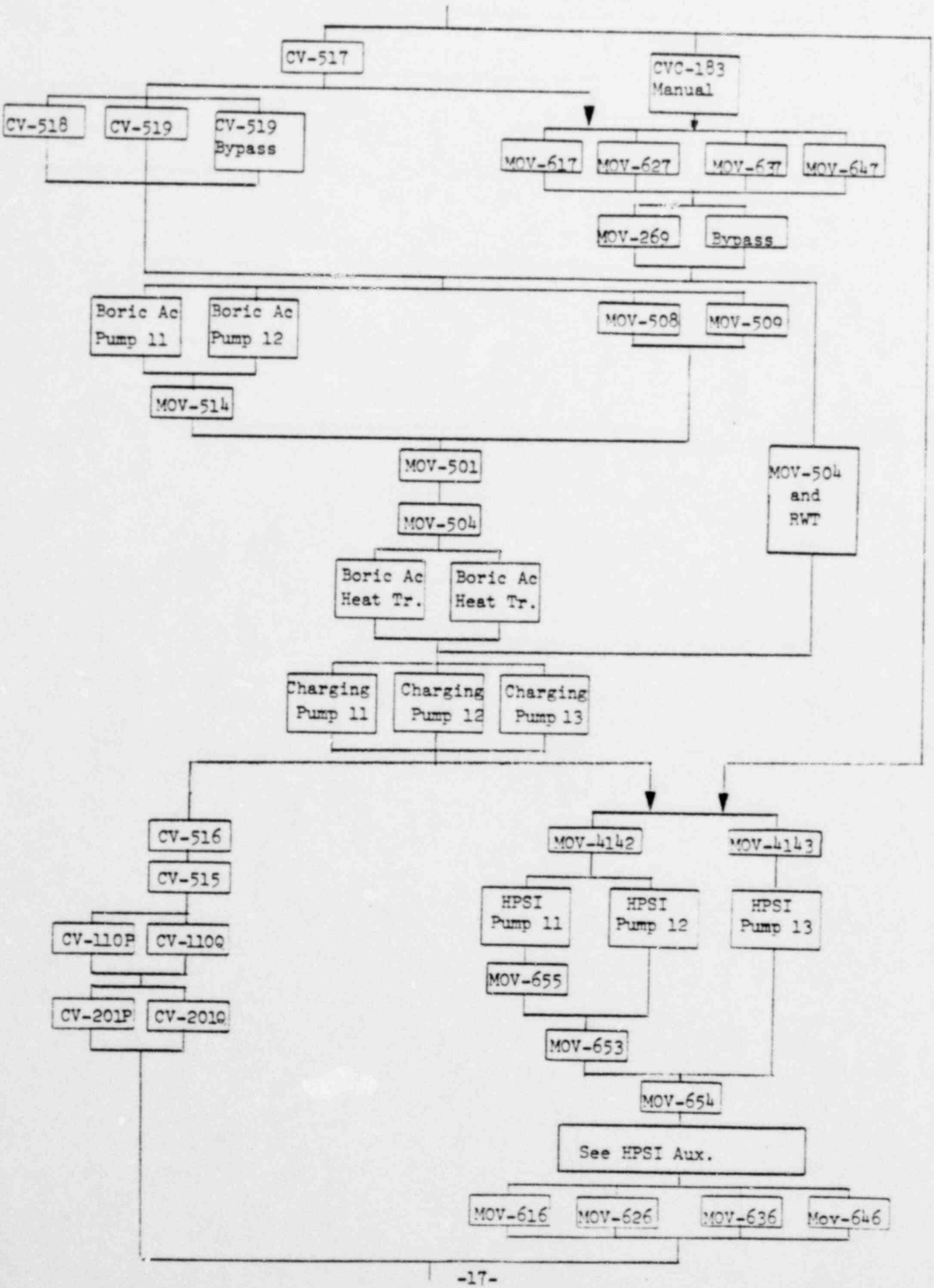


HOT STANDBY

REACTOR HEAT REMOVAL FUNCTION



PRESSURIZER HEATERS-ALTERNATE (PH-ALT)



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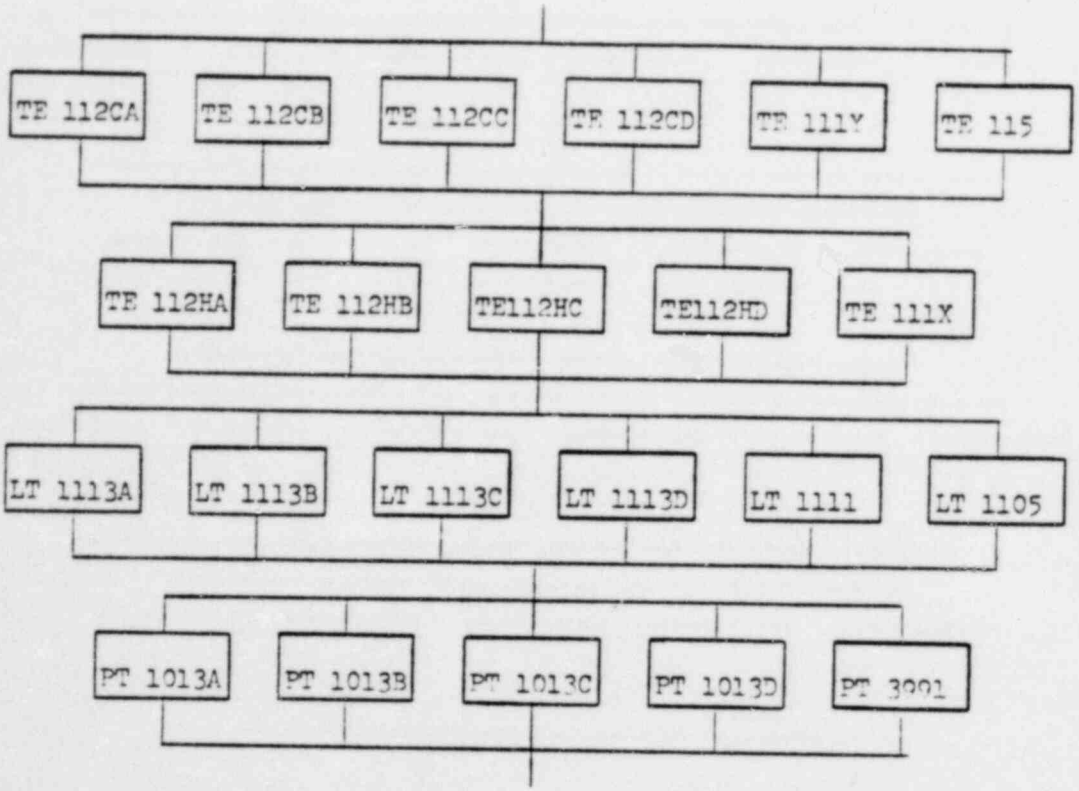

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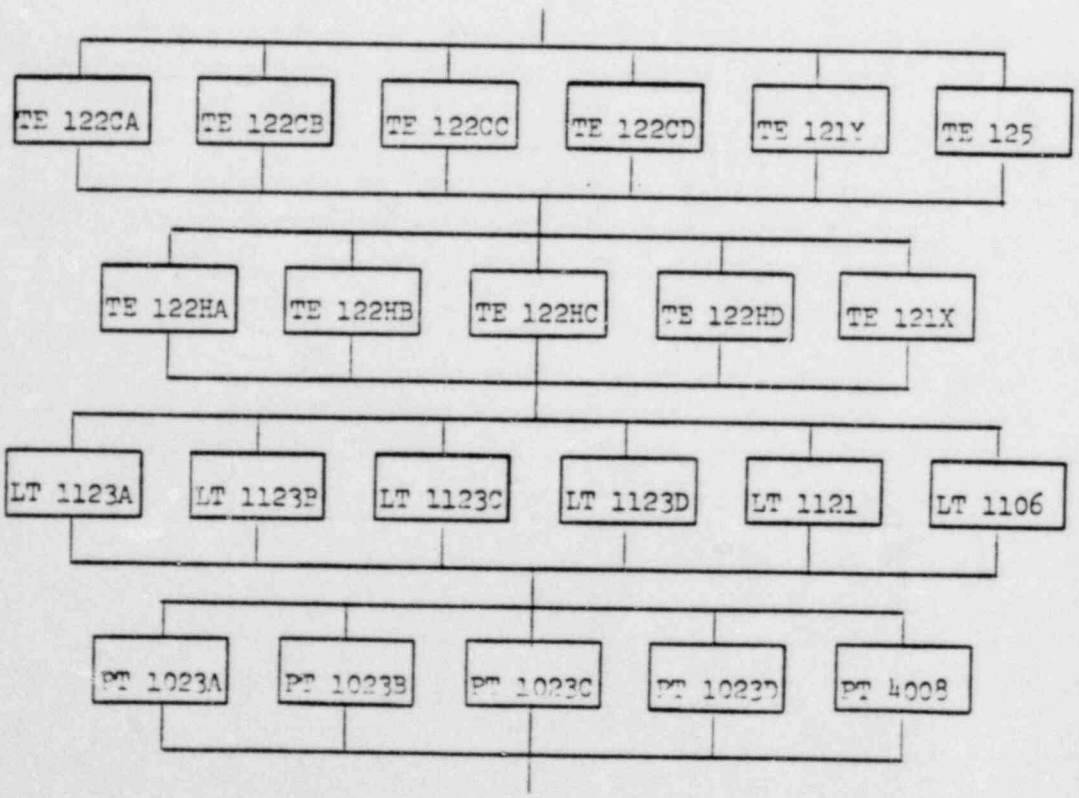

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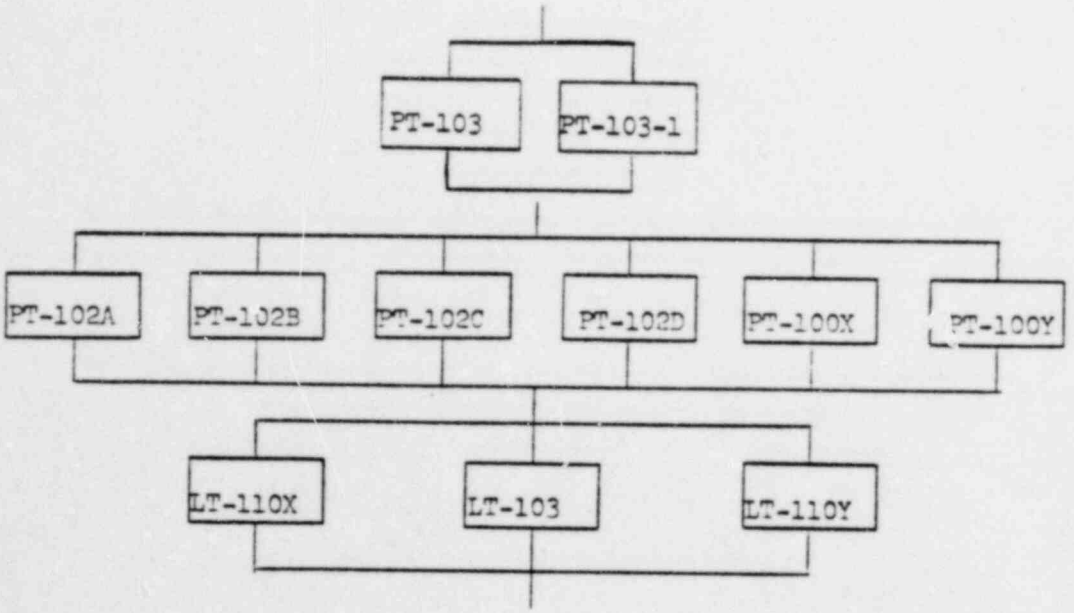
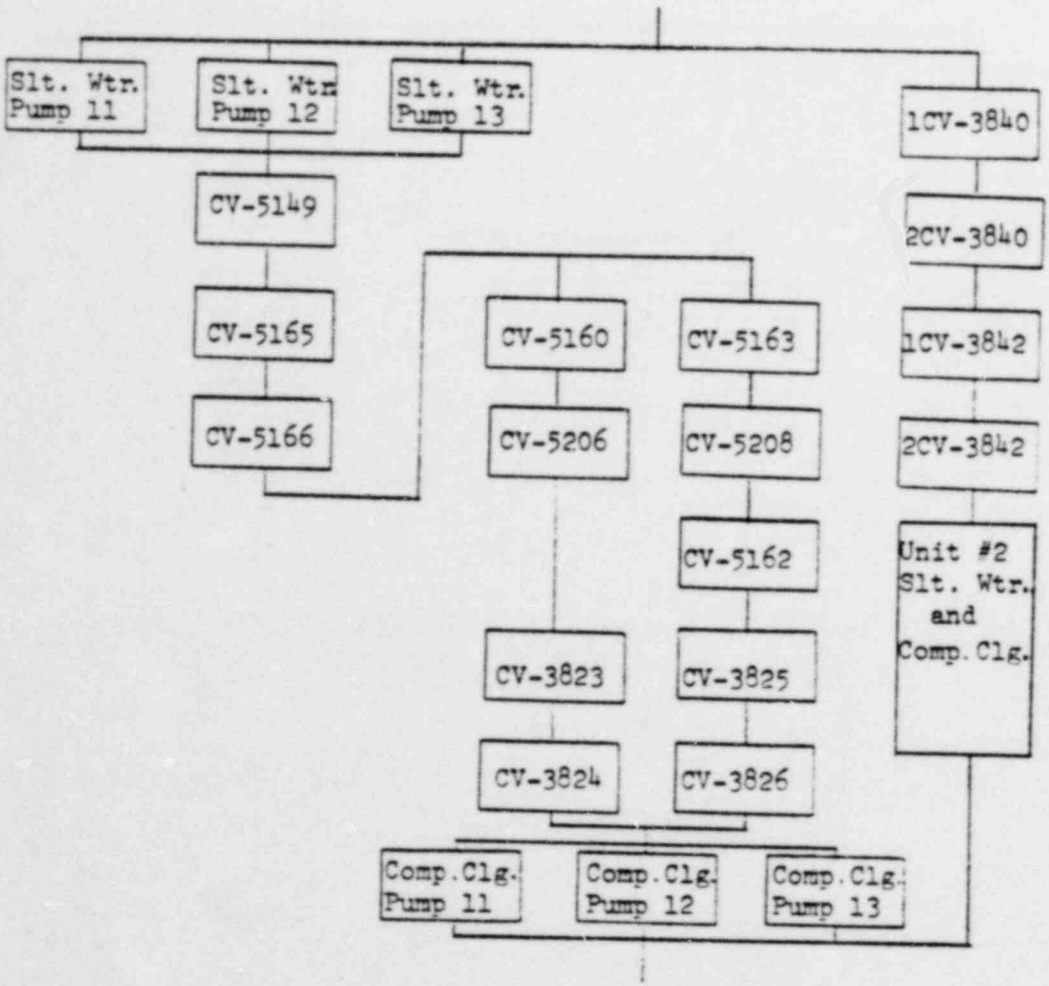


HPSI AUXILIARIES



Hot Standby

Reactor Heat Removal Function

1.	MOV-4070	AFW Pump Steam Supply Valve
2.	MOV-4071	AFW Pump Steam Supply Valve
3.	CV-4511	AFW Flow Control Valve
4.	CV-4512	AFW Flow Control Valve
5.	CV-3938	Atmospheric Dump Valve
6.	CV-3939	Atmospheric Dump Valve
7.	CV-518	Charging Line Isolation Valve
8.	CV-519	Charging Line Isolation Valve
9.	MOV-617	Safety Injection Auxiliary Header Valve
10.	MOV-627	Safety Injection Auxiliary Header Valve
11.	MOV-637	Safety Injection Auxiliary Header Valve
12.	MOV-647	Safety Injection Auxiliary Header Valve
13.	MOV-508	Boric Acid Gravity Feed Valve
14.	MOV-509	Boric Acid Gravity Feed Valve
15.	MOV-501	Volume Control Tank Outlet Valve
16.	MOV-504	Refueling Water Tank Outlet Valve
17.	CV-517	Auxiliary Spray Valve
18.	CV-516	RCS Letdown Stop Valve
19.	CV-515	RCS Letdown Stop Valve
20.	CV-1107	Letdown Flow Control Valve
21.	CV-1109	Letdown Flow Control Valve
22.	CV-2017	Letdown Back-pressure Control Valve
23.	CV-2019	Letdown Back-pressure Control Valve
24.	MOV-4142	Refueling Water Tank Outlet Valve
25.	MOV-4143	Refueling Water Tank Outlet Valve
26.	MOV-616	High Pressure Safety Injection Header Valve
27.	MOV-626	High Pressure Safety Injection Header Valve
28.	MOV-636	High Pressure Safety Injection Header Valve
29.	MOV-646	High Pressure Safety Injection Header Valve
30.	PT-4507	Steam Generator AFW Pump Discharge Header Pressure Transmitter
31.	MOV-656	Auxiliary High Pressure Safety Injection Header Isolation Valve
32.	MOV-514	Boric Acid Pump Outlet Valve
33.	MOV-653	High Pressure Safety Injection Header Cross Connect Valve
34.	MOV-654	High Pressure Safety Injection Header Isolation Valve
35.	MOV-655	High Pressure Safety Injection Header Cross Connect Valve
36.	MOV-269	Charging Header to HPSI Valve

Comprehensive Equipment Summary

Hot Standby

Reactor Heat Removal

Auxiliary feedwater can be supplied from condensate tank #12 by either steam driven auxiliary feedwater pump. Either steam supply valve, MOV-4070 or MOV-4071, must be open to provide steam to the auxiliary feedwater pump header. Either flow control valve CV-4511 or CV-4512 must be opened to provide auxiliary feedwater flow to a steam generator. Heat is removed from the steam generators via the steam dump valves, CV-3939 and CV-3938. If either valve is inoperable, heat is removed through steam generator safety valves.

Pressurizer pressure can be maintained during cooldown with pressurizer heaters. Reactor coolant system pressure can also be maintained by pumping the pressurizer solid with the charging pump and regulating pressure with either the let-down system or the high pressure safety injection pumps. One of two boric acid gravity feed valves, MOV-508 or MOV-509 must be open and volume control tank outlet valve MOV-501 and refueling water tank outlet valve MOV-504 must be closed to provide charging pump suction. Boric acid can also be supplied to the charging pumps with one of two boric acid pumps. In this case MOV-514 must be open. Either CV-518, CV-519, CV-519 bypass, or MOV-269 (or its manual bypass) and one of four safety injection auxiliary header valves, MOV-617, MOV-627, MOV-637 or MOV-647 must be open to permit charging into the reactor coolant system. Auxiliary spray valve CV-517 must be closed to permit charging through CV-518, CV-519 or CV-519 bypass, otherwise manual valve CVC-283 must be closed and the safety injection auxiliary header must be utilized. Let-down line isolation valves, CV-515 and CV-516 must be open. Either CV-110P or CV-110Q must be open. Either CV-201P or CV-201Q must be operable in order to provide pressure control via the let-down system. If the let-down system is inoperable, charging pumps will be secured and pressure

maintained by operating a high pressure safety injection pump. Either MOV 4142 or MOV-4143 must be open to provide suction from the refueling water tank. High pressure safety injection header valve MOV-654 and one high pressure safety injection header valve, MOV-616, MOV-626, MOV-636 or MOV-646 must be open. High pressure safety injection header cross connect valve MOV-653 must be open to utilize HPSI pump 12 and cross connect valve MOV-655 as well as MOV-653, must be open to utilize HPSI Pump 11. One of the redundant boric acid heat trace systems must be operable.

Reactor coolant system pressure regulation can also be achieved without charging pumps, using only the high pressure safety injection system as summarized previously.

Use of the high pressure safety injection pumps requires component cooling to provide cooling and seal water. To provide component cooling to the HPSI pumps, one of three salt water pumps must be operable to supply cooling for the component cooling system. Emergency discharge control valve CV-5149 must be maintained shut. Component cooling heat exchanger #11 (21) salt water inlet and outlet valves, CV-5160 and CV-5206, and component cooling inlet and outlet valves, CV-3823 and CV-3824, must be open, or component cooling heat exchanger #12 (22) salt water inlet valve, CV-5162, outlet valves CV-5208 and CV-5163, and component cooling inlet and outlet valves, CV-3825 and CV-3826 must be open. One of three component cooling pumps must be operable. Component cooling water from the unaffected unit can also be supplied through existing equipment.

Comprehensive Equipment Summary

Hot Standby

Process Monitoring

Reactor coolant system loop 11 (21) cold leg temperature is provided by TE-112CA, TE-112CB, TE-112CC, TE-112CD, TE-111Y and TE-115. Loop 12 (22) cold leg temperature is provided by TE-122CA, TE-122CB, TE-122CC, TE-122CD, TE-121Y and TE-125. Loop 11 (21) hot leg temperature is provided by TE-112HA, TE-112HB, TE-112HC, TE-112HD and TE-111X. Loop 12 (22) hot leg temperature is provided by TE-122HA, TE-122HB, TE-122HC, TE-122HD and TE-121X.

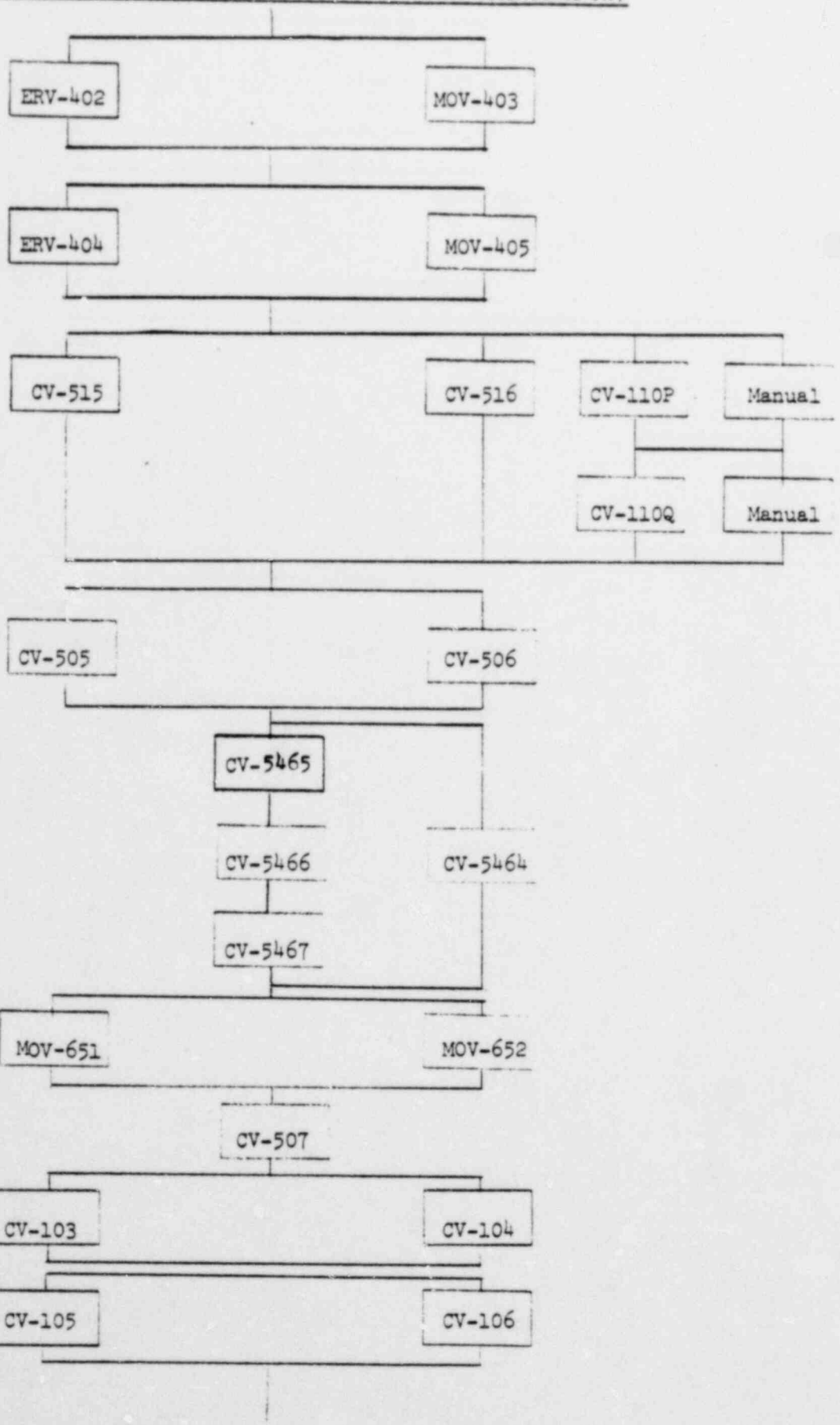
Steam generator #11 (21) level is provided by LT-1113A, LT-1113B, LT-1113C, LT-1113D, LT-1111 and LT-1105. Steam generator #12 (22) level is provided by LT-1123A, LT-1123B, LT-1123C, LT- 1123D, LT-1121 and LT-1106.

Steam generator #11 (21) pressure is provided by PT-1013A, PT-1013B, PT-1013C, PT-1013D and PT-3991. Steam generator #12 (22) pressure is provided by PT-1023A, PT-1023B, PT-1023C, PT-1023D and PT-4008.

High range pressurizer pressure is provided by PT-102A, PT-102B, PT-102C, PT-102D, PT-100X and PT-100Y. Low range pressure is provided by PT-103 and PT-103-1. Pressurizer level is provided by LT-110X, LT-103 and LT-110Y. Auxiliary feedwater pump discharge header pressure is provided by PT-4507. Condensate storage tank #12 level is available in the control room and locally at the tank.

HOT STANDBY

REACTOR COOLANT MAKE-UP FUNCTION (INVENTORY MAINTENANCE)



Hot Standby

Reactor Coolant Make-up Function

1.	ERV-402	RCS Power Oper. Relief Valve
2.	ERV-404	RCS Power Oper. Relief Valve
3.	MOV-403	RCS Motor Oper. Block Valve for ERV-402
4.	MOV-405	RCS Motor Oper. Block Valve for ERV-404
5.	CV-515	RCS Let-down Stop Valve
6.	CV-516	RCS Let-down Stop Valve
7.	CV-505	RCP Seal Leak Off Stop Valve
8.	CV-506	RCP Seal Leak Off Stop Valve
9.	CV-5465	Sample Valve
10.	CV-5466	Sample Valve
11.	CV-5467	Sample Valve
12.	CV-5464	Combined Sample Header Valve
13.	CV-507	RCP Bleed Relief Isolation Valve
14.	CV-110P	Let-down Flow Control Valve
15.	CV-110Q	Let-down Flow Control Valve
16.	CV-103	Reactor Vessel Vent Valve
17.	CV-104	Reactor Vessel Vent Valve
18.	CV-105	Pressurizer Vessel Vent Valve
19.	CV-106	Pressurizer Vessel Vent Valve
20.	MOV-651	Shut-down Cooling Return Isolation Valve
21.	MOV-652	Shut-down Cooling Return Isolation Valve

Comprehensive Equipment Summary

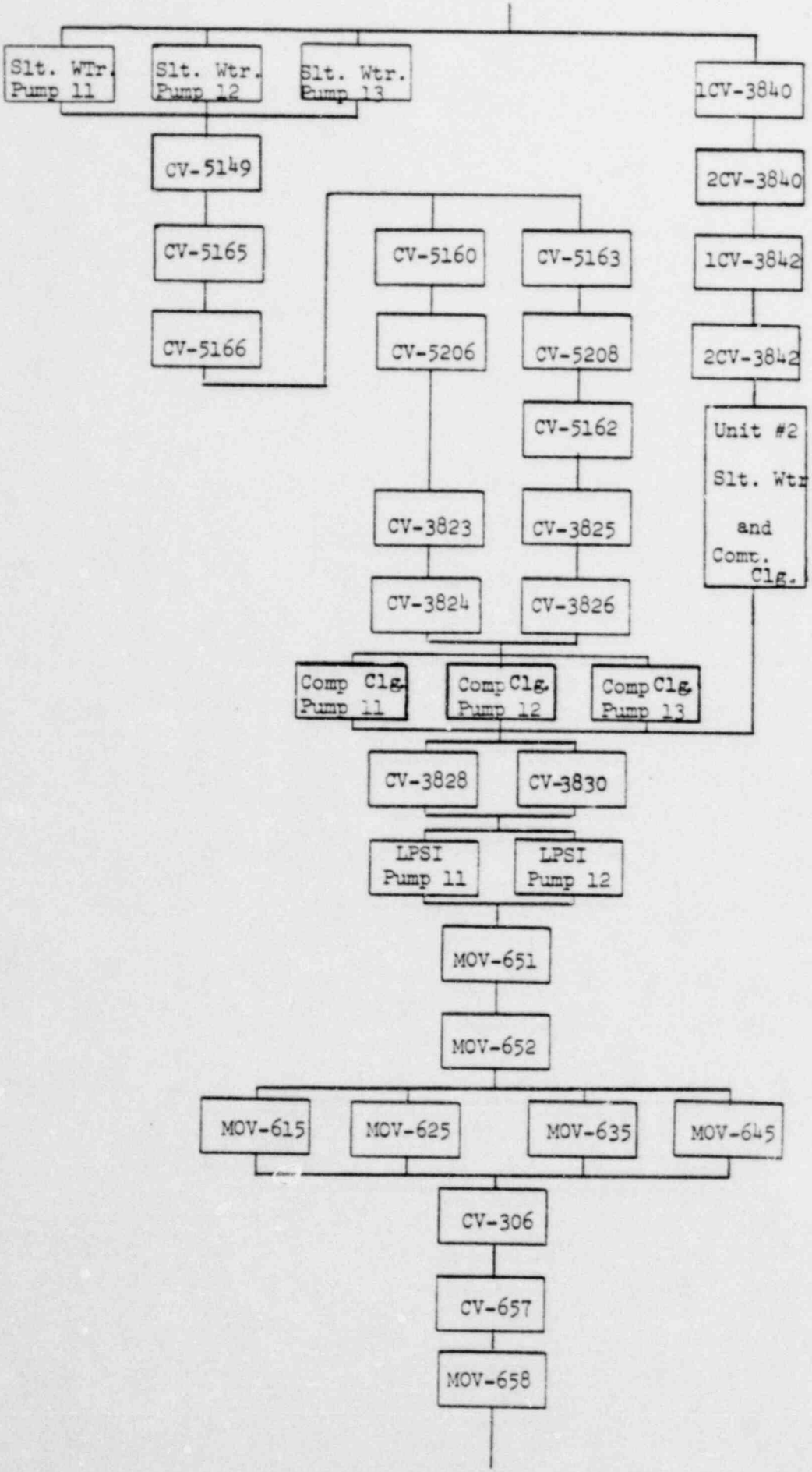
Hot Standby

Reactor Coolant Make-up

Reactor coolant inventory is maintained by: 1) Closing either power operated relief valve ERV-402 or its motor operated block valve MOV-403 and power operated relief valve ERV-404 or its motor operated relief valve MOV-405; 2) Closing one of two redundant leak-off header valves, CV-505 or CV-506; 3) Closing sample valves CV-5465, CV-5466 and CV-5467 or the combined sample header valve CV-5464; 4) Closing reactor coolant pump bleed relief isolation valve CV-507; 5) Maintaining one reactor vessel vent valve, CV-103 or CV-104, closed; 6) Maintaining one pressurizer vessel vent valve, CV-105 or CV-106, closed; 7) Closing either RCS letdown stop valve, CV-515 or CV-516, or both letdown flow control valves, CV-110P and CV-110Q or their manual block valves; and 8) Closing either shutdown cooling return isolation valve MOV-651 or MOV-652.

If for residual heat removal it was necessary to utilize a charging pump and the letdown system for pressure control (in the event of pressurizer heater loss), CV-515 and CV-516 will be held open. In this case, however, reactor coolant make-up is accomplished with the charging pump and water from the concentrated boric acid tanks.

COLD SHUTDOWN
REACTOR HEAT REMOVAL



Cold Shutdown

Reactor Heat Removal

1.	CV-5149	Emergency Discharge Control Valve
2.	CV-5165	Component Cooling #12 Hx. Auxiliary Outlet Valve
3.	CV-5166	Component Cooling #12 Hx. Bypass
4.	CV-5160	Component Cooling #11 Hx. Saltwater Inlet Valve
5.	CV-5206	Component Cooling #11 Hx. Saltwater Outlet Valve
6.	CV-3823	Component Cooling #11 Hx. Component Cooling Inlet Valve
7.	CV-3824	Component Cooling #11 Hx. Component Cooling Outlet Valve
8.	CV-5163	Component Cooling #12 Hx. Saltwater Outlet Valve
9.	CV-5208	Component Cooling #12 Hx. Saltwater Outlet Valve
10.	CV-5162	Component Cooling #12 Hx. Saltwater Inlet Valve
11.	CV-3825	Component Cooling #12 Hx. Component Cooling Inlet Valve
12.	CV-3826	Component Cooling #12 Hx. Component Cooling Outlet Valve
13.	CV-3828	Shut-down Cooling #11 Hx. Component Cooling Outlet Valve
14.	CV-3830	Shut-down Cooling #12 Hx. Component Cooling Outlet Valve
15.	MOV-651	Shut-down Cooling Return Isolation Valve
16.	MOV-652	Shut-down Cooling Return Isolation Valve
17.	MOV-615	Low Pressure Safety Injection Header Valve
18.	MOV-625	Low Pressure Safety Injection Header Valve
19.	MOV-635	Low Pressure Safety Injection Header Valve
20.	MOV-645	Low Pressure Safety Injection Header Valve
21.	CV-306	Safety Injection Flow Control Valve
22.	CV-657	Shut-down Cooling Temperature Control Valve
23.	MOV-658	Shut-down Cooling Hx. Isolation Valve

Comprehensive Equipment Summary

Cold Shutdown

Reactor Heat Removal

One of three saltwater pumps must be operable to supply cooling for the component cooling system. Emergency discharge control valve CV-5149 must be maintained shut. Component cooling heat exchanger #11 (21) saltwater inlet and outlet valves, CV-5160 and CV-5206, and component cooling inlet and outlet valves, CV-3823 and CV-3824 must be open or component cooling heat exchanger #12 (22) saltwater inlet valve, CV-5162, outlet valves CV-5208 and CV-5163, and component cooling inlet and outlet valves, CV-3825 and CV-3826 must be open to provide a flowpath to the shutdown cooling heat exchangers. One of three component cooling pumps must be operable and either shutdown cooling heat exchanger #11 (21) or #12 (22) component cooling outlet valve CV-3828 or CV-3830 must be open. One of two low pressure safety injection pumps must be operable. Cooling and seal water for these pumps is obtained from component cooling, outlined above. Both shutdown cooling return isolation valves, MOV-651 and MOV-652 must be open and one of four low pressure safety injection header valves, MOV-615, MOV-625, MOV-635 and MOV-645 must be open. Low pressure safety injection flow control valve CV-306 must be closed. Shutdown cooling heat exchanger isolation valve, MOV-658 and shutdown cooling temperature control valve CV-657 must be open.

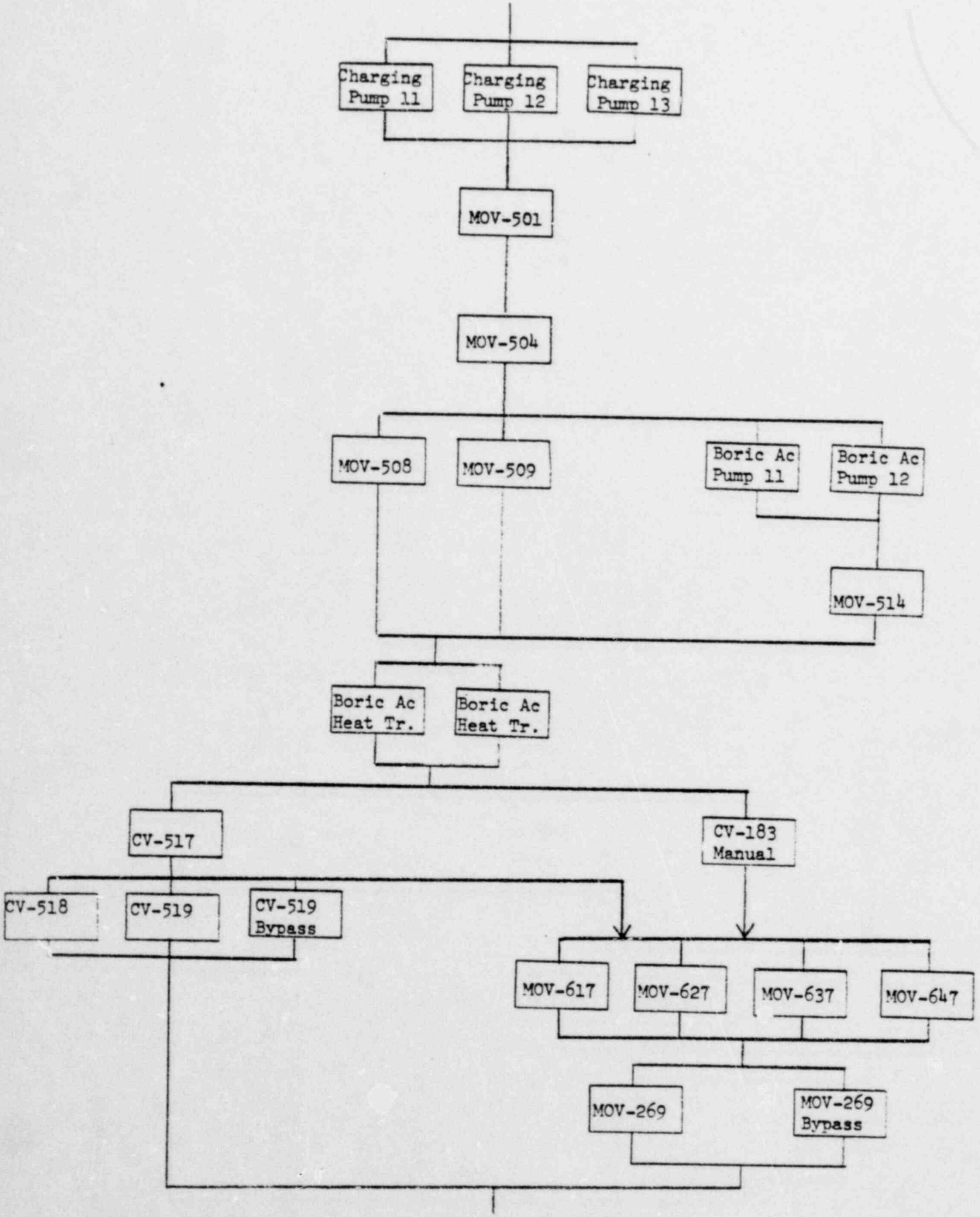
All CV's except CV-306 and CV-657 can be placed in their required shutdown position by removal of control air or power. CV-306, CV-657 and all MOV's can be manually operated.

If a fire in the component cooling room disables all component cooling pumps or both heat exchangers or their associated valves, component cooling water can also be supplied from the unaffected unit through existing piping to the shutdown cooling heat exchangers on the affected unit. Valves

1-CV-3840, 2-CV-3840, 1-CV-3842 and 2-CV-3842 must be open. Unit 1 and Unit 2 equipment for component cooling and saltwater systems are in different rooms and only a control room fire could effect both units. In this case, normal shutdown cooling will be employed with all valves placed in their required positions manually (MOV-652 will be operated locally at its MCC), and all pumps operated locally in the switchgear rooms.

COLD SHUTDOWN

REACTIVITY CONTROL FUNCTION



Cold Shutdown

Reactivity Control Function

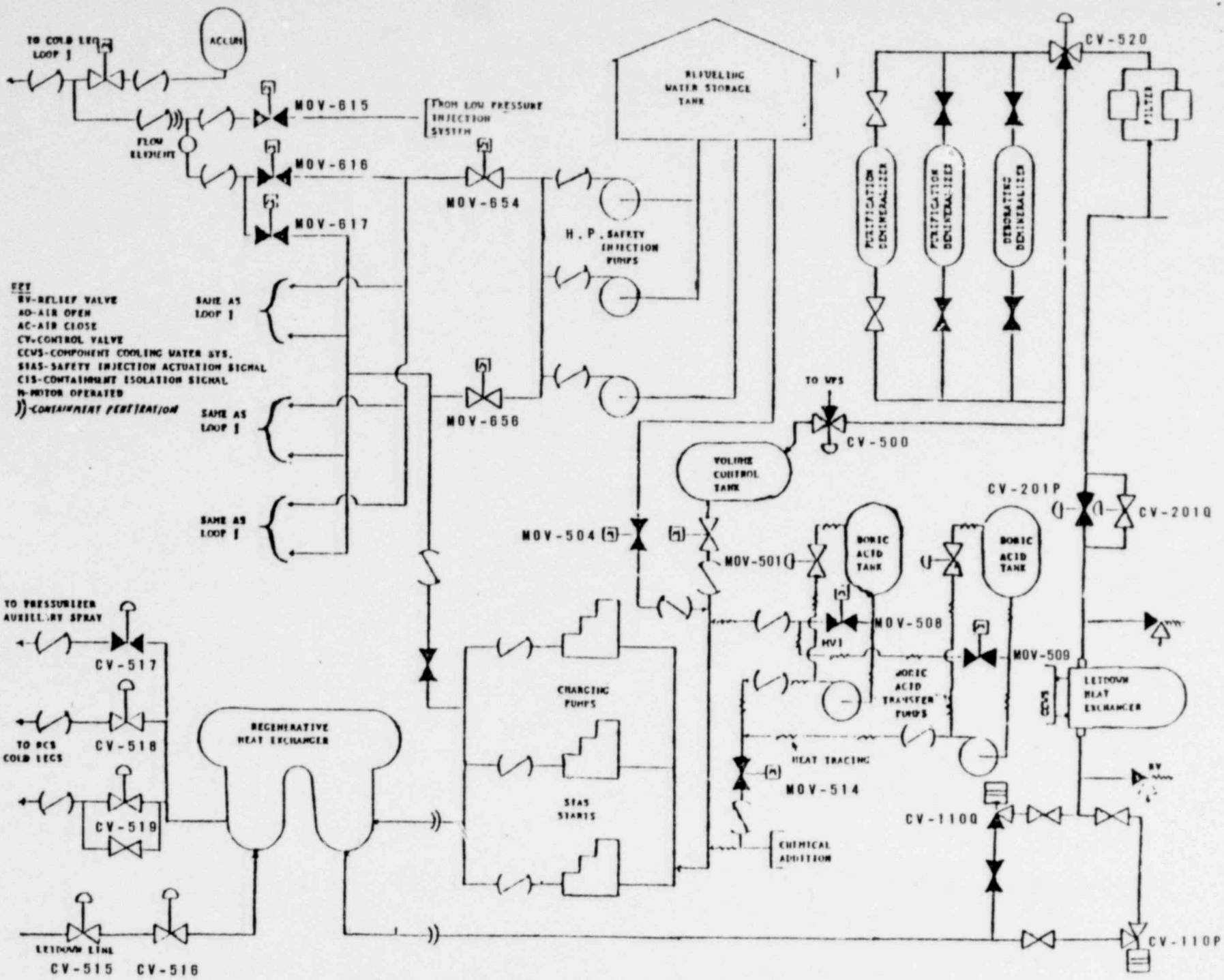
1.	MOV-501	Volume Control Tank Outlet Valve
2.	MOV-504	Refueling Water Tank Valve
3.	MOV-508	Boric Acid Gravity Feed Valve
4.	MOV-509	Boric Acid Gravity Feed Valve
5.	MOV-514	Boric Acid Pump Outlet Valve (To Charging Pumps)
6.	CV-518	Charging Line Isolation Valve
7.	CV-519	Charging Line Isolation Valve
8.	MOV-617	Safety Injection Header Valve
9.	MOV-627	Safety Injection Header Valve
10.	MOV-637	Safety Injection Header Valve
11.	MOV-647	Safety Injection Header Valve
12.	CV-517	Auxiliary Spray Valve
13.	MOV-269	Charging Header to HPSI Valve

Comprehensive Equipment Summary

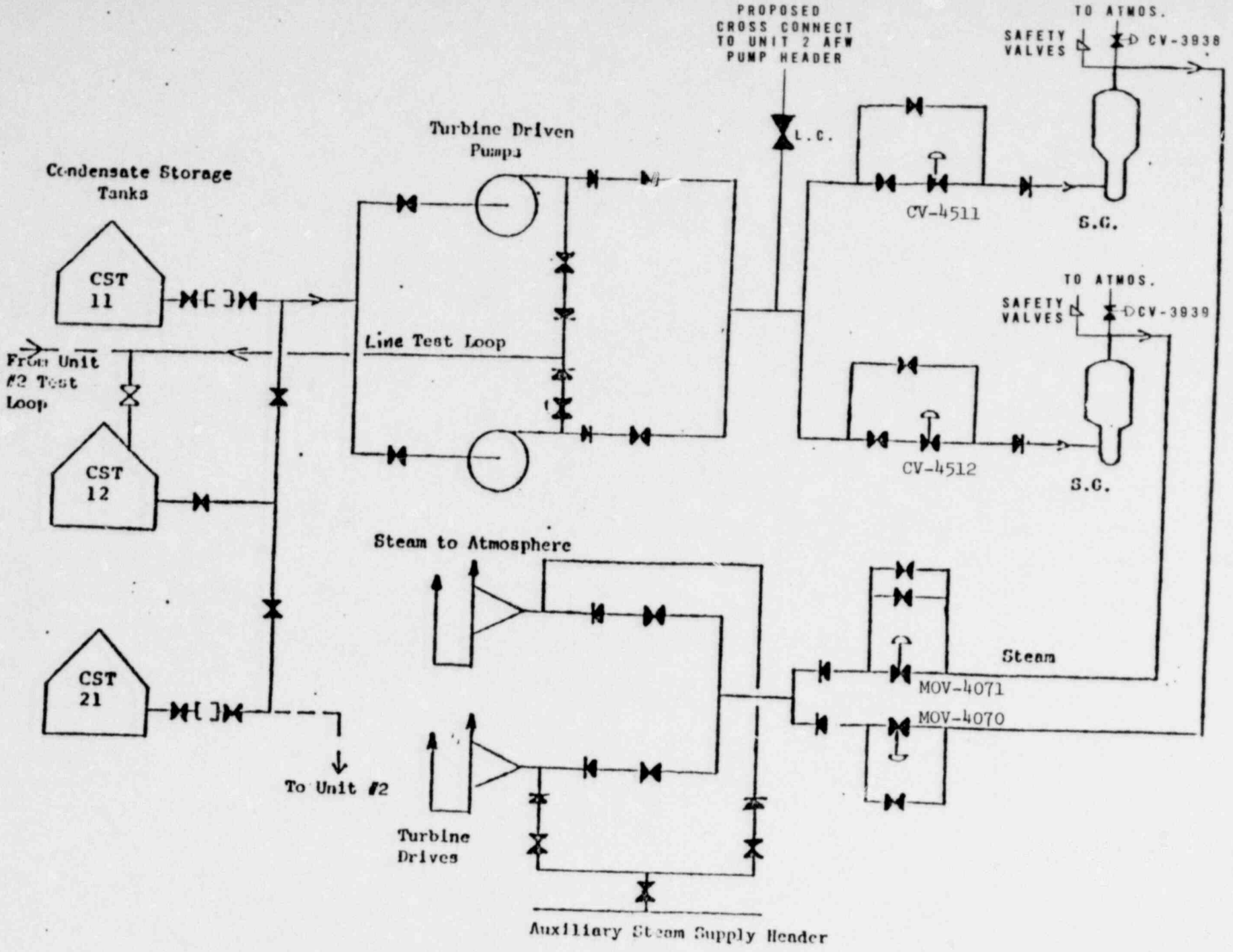
Cold Shutdown

Reactivity Control

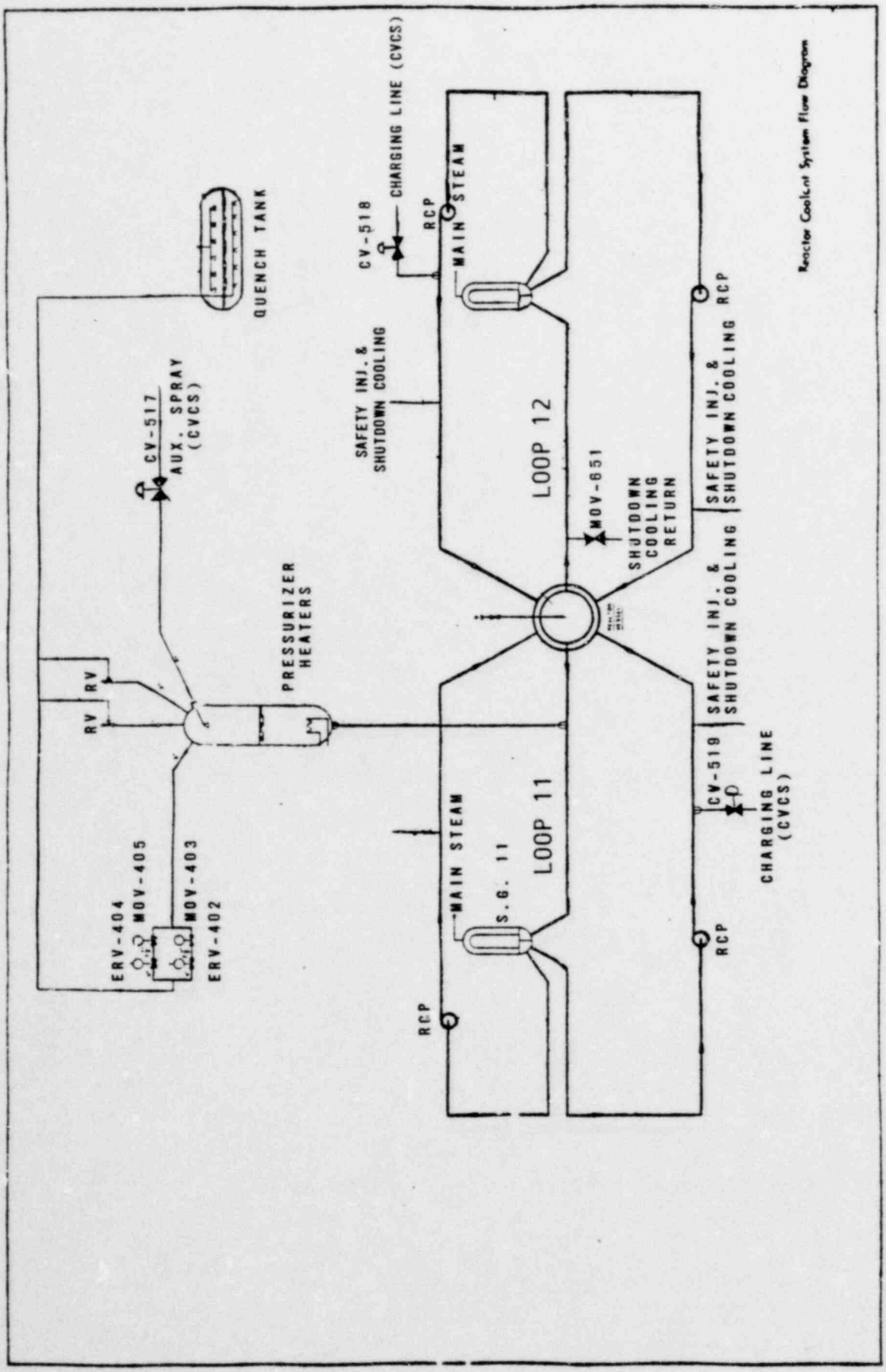
One of three charging pumps must be operable to provide boric acid to the reactor coolant system. Volume control tank outlet valve MOV-501 must be closed. Refueling water tank outlet valve MOV-504 must be closed. Either boric acid gravity feed valve MOV-508 or MOV-509 must be open. If neither valve can be opened, boric acid can be supplied to the charging pump suction with either boric acid pump. In this case MOV-514 must be open. One of two redundant boric acid heat trace systems must be operable. Either CV-518, CV-519 or the CV-519 bypass valve, or MOV-269 or its manual bypass and one of four safety injection auxiliary header valves, MOV-617, MOV-627, MOV-637 must be open to allow charging into the reactor coolant system. Auxiliary spray valve CV-517 must be closed to permit charging through CV-518 or CV-519, otherwise manual valve CVC-183 must be closed and the safety injection header isolation valve, MOV-656, must be closed in order to utilize the safety injection auxiliary header.



Calvert Cliffs Chemical And Volume Control System



Simplified Flow Diagram, Calvert Cliffs Auxiliary Feedwater System


Reactor Coolant System Flow Diagram
QUENCH TANK
CV-518
CHARGING LINE (CVCS)
RCP
MAIN STEAM
CV-517
AUX. SPRAY (CVCS)
SAFETY INJ. & SHUTDOWN COOLING
LOOP 12
MOV-651
SHUTDOWN COOLING RETURN
SAFETY INJ. & SHUTDOWN COOLING
RCP
PRESSURIZER HEATERS
RV
RV
ERV-404
MOV-405
MOV-403
ERV-402
MAIN STEAM
S.G. 11
LOOP 11
CV-519
SAFETY INJ. & SHUTDOWN COOLING
CHARGING LINE (CVCS)
RCP
RCP

Room 230 - Unit 1 Containment

Hot Standby

Reactor Heat Removal Function - See Attachments 2 & 2a

Equipment in Containment (non-instrumentation)

1. Pressurizer Heater

2. Pressurizer Heater Alternate Equipment:

   a) 1-CV-515 RCS Letdown Stop Valve
   b) 1-CV-516 RCS Letdown Stop Valve
   c) 1-CV-517 Auxiliary Spray Valve
   d) 1-CV-518 Charging Line Isolation Valve
   e) 1-CV-519 Charging Line Isolation Valve

Analysis:

1) Pressurizer heater cables enter the containment through the east electrical penetration room and are routed only on the east side of the containment. 1-CV-517 cables enter the containment through the west electrical penetration room. 1-CV-517 and 1-SV-517 are located in the southwest side of the containment at elevation 45'-0". Since separation of over 20 feet of clear horizontal air space is present, 1-CV-517, 1-SV-517 and their related cables are not subject to a fire common to the pressurizer heaters or their related cables. Therefore, either pressurizer heaters or an alternate path utilizing charging or HPSI pumps will be available to maintain RCS pressure.

2) A common fire can affect 1-CV-507 (see sheet 7) and 1-CV-517, however, charging pumps and pressurizer heaters will be unaffected allowing charging to compensate for RCP seal bleed-off, and pressurizer heaters to offset pressurizer spray. 1-CV-517 can be closed manually after the postulated fire to permit charging without a concurrent need for pressurizer heaters. Additionally, manual valve 1-CVC-183, located outside containment, can be closed eliminating pressurizer spray, and charging accomplished through the safety injection auxiliary header.

3) 1-CV-518 and 1-CV-519 are affected by a common fire. If neither valve can be opened, charging can be accomplished through safety injection auxiliary header valves which are all outside containment.

4) 1-CV-515 and 1-CV-516 can be affected by a common fire. If neither valve can be opended, RCS pressure can be maintained by HPSI pumps or pressurizer heaters. Pressurizer heater cables are separated from 1-CV-515, 1-SV-515, 1-CV-516, 1-SV-516 and related cables (all routed to the west electrical penetration room) by over 20 feet of clear horizontal air space and HPSI pumps and related valves are outside containment.

Modifications

1. General Containment Modification - see sheet 10

Room 230 - Unit 1 Containment

Hot Standby

Reactor Heat Removal Function

RCS Instrumentation - See Attachment 2b

Equipment in Containment:

1) RCS Loop 11 Hot Leg Temperature Transmitters 1-TE-112HA, 1-TE-112HB, 1-TE-112HC, 1-TE-112HD and 1-TE-111X.
2) RCS Loop 11 Cold Leg Temperature Transmitters 1-TE-112CA, 1-TE-112CB, 1-TE-112CC, 1-TE-112CD, 1-TE-111Y and 1-TE-115.
3) Steam Generator 11 Level Transmitters 1-LT-1113A, 1-LT-1113B, 1-LT-1113C, 1-LT-1113D, 1-LT-1111 and 1-LT-1105.
4) Steam Generator 11 Pressure Transmitters 1-PT-1013A, 1-PT-1013B, 1-PT-1013C and 1-PT-1013D.
5) RCS Loop 12 Hot Leg Temperature Transmitters 1-TE-122HA, 1-TE-122HB, 1-TE-122HC, 1-TE-122HD and 1-TE-121X.
6) RCS Loop 12 Cold Leg Temperature Transmitters 1-TE-122CA, 1-TE-122CB, 1-TE-122CC, 1-TE-122CD, 1-TE-121Y and 1-TE-125.
7) Steam Generator 12 Level Transmitters 1-LT-1123A, 1-LT-1123B, 1-LT-1123C, 1-LT-1123D, 1-LT-1121 and 1-LT-1106.
8) Steam Generator 12 Pressure Transmitters 1-PT-1023A, 1-PT-1023B, 1-PT-1023C and 1-PT-1023D.

Analysis:

Instrumentation is assured for at least one RCS Loop and associated Steam Generator since:

1) 1-TE-111Y, 1-TE-115, 1-TE-111X, 1-LT-1105 and 1-LT-1111 are located in RCP bay 11 and related cables routed directly to the east electrical penetration room.

2) 1-TE-121Y, 1-TE-125, 1-TE-121X, 1-LT-1121 and 1-LT-1106 are located in RCP bay 12 and related cables are routed directly to the west electrical penetration room.

3) Transmitters and related cables listed in 1) and 2) above are separated by over 20 feet of clear horizontal air space and therefore are not affected by a common fire.

4) Redundant Steam Generator 11 and 12 pressure transmitters, 1-PT-3991 and 1-PT-4008 respectively, are located outside containment.

Modifications

1) General Containment Modification - see sheet 10

Room 230 - Unit 1 Containment

Hot Standby

Reactor Heat Removal Function

Pressurizer Instrumentation - See Attachment 2c

Equipment in Containment:

1) Pressurizer pressure transmitters (high range) 1-PT-102A, 1-PT-102B, 1-PT-102C, 1-PT-102D, 1-PT-100X and 1-PT-100Y.
2) Pressurizer pressure transmitters (low range) 1-PT-103 and 1-PT-103-1.
3) Pressurizer level transmitters 1-LT-110X, 1-LT-110Y and 1-LT-103.

Analysis:

1) 1-LT-110X and 1-PT-100X are located together at elevation 45'-0" approximately 20 feet horizontally from 1-LT-110Y and 1-PT-100Y. This space, however, contains vertical cable trays and is not clear air space. All cables related to these devices are routed to the east electrical penetration room. Redundant devices and related cables are subject to damage from a common fire.
2) 1-PT-103 is located less than 20 feet horizontally from 1-PT-103-1. Both devices are at elevation 45'-0" and all related cables are routed to the east electrical penetration room. Both devices and related cables are subject to damage from a common fire.

Modifications:

1) 1-LT-110Y, 1-PT-100Y and 1-PT-103-1 will be relocated to provide 20 feet of clear horizontal air space between these devices and the vertical cable trays.

2) Cables related to 1-LT-110Y, 1-PT-100Y and 1-PT-103-1 will be rerouted to the west electrical penetration room in order to provide 20 feet of clear horizontal air space between these cables and those of 1-LT-110X, 1-PT-100X and 1-PT-103.

3) General Containment Modification - see sheet 10

Room 230 - Unit 1 Containment

Hot Standby

Reactor Coolant Make-Up Function - See Attachment 5

Equipment in Containment:

1)	1-ERV-402	RCS Power Operated Relief Valve
2)	1-MOV-403	PCS Motor Operated Block Valve
2)	1-ERV-404	RCS Power Operated Relief Valve
4)	1-MOV-405	RCS Motor Operated Block Valve
5)	1-CV-515	RCS Letdown Stop Valve
6)	1-CV-516	RCS Letdown Stop Valve
7)	1-CV-506	RCP Seal Leak Off Stop Valve
8)	1-CV-5465	Sample Valve
9)	1-CV-5466	Sample Valve
10)	1-CV-5467	Sample Valve
11)	1-CV-507	RCP Bleed Relief Isolation Valve
12)	1-MOV-652	Shutdown Cooling Return Isolation Valve
13)	1-CV-103	Reactor Vessel Vent Valve
14)	1-CV-104	Reactor Vessel Vent Valve
15)	1-CV-105	Pressurizer Vessel Vent Valve
16)	1-CV-106	Pressurizer Vessel Vent Valve

Analysis:

1) 1-ERV-402, 1-MOV-403, 1-ERV-404 and 1-MOV-405 are located in the pressurizer house and related cables are routed in close proximity to the east electrical penetration room. All cables are subject to damage from a common fire.

2) 1-CV-515, 1-SV-515, 1-CV-516 and 1-SV-516 are located less than 5 feet apart and are subject to damage from a common fire, however, redundant valves, 1-CV-110P and 1-CV-110Q are located outside the containment.

3) 1-CV-506 has a redundant valve, 1-CV-505, located outside the containment.

4) 1-CV-5465, 1-CV-5466 and 1-CV-5467 have a redundant valve, 1-CV-5464, located outside the containment.

5) 1-CV-507 opens on loss of power or air allowing RCP seal bleed-off. No redundant equipment is available. This valve, however, can be closed manually after the postulated fire is extinguished and RCP seal bleed-off (4gpm) can be tolerated until this time.

6) 1-MOV-652 has a redundant valve, 1-MOV-651 located outside the containment.

7) 1-CV-103, 1-CV-104, 1-CV-105 and 1-CV-106 are solenoid operated, 125VDC valves. All valves are controlled manually, close on loss of power, are normally closed (de-energized) and have both their positive and negative leads opened by control switches in the control room. Each valve is powered by a separate cable (i.e. no two valves utilize conductors in one common jacket). The series of four unique "hot shorts" required to open both valves on either the reactor or pressurizer vessel is not considered credible.

Modifications:

1) Cables to 1-ERV-402 and 1-ERV-404 will be rerouted in separate conduits with no other cables. These valves close on loss of power therefore inadvertent operation due to hot shorts will not be possible.

2) General Containment Modification - see sheet 10

Room 230 - Unit 1 Containment

Cold Shutdown

Reactivity Control Function - See Attachment 9

Equipment in Containment:

1) 1-CV-517 Auxiliary Spray Valve
2) 1-CV-518 Charging Line Isolation Valve
3) 1-CV-519 Charging Line Isolation Valve

Analysis:

1) 1-CV-518 and 1-CV-519 are affected by a common fire, however, if neither valve can be opened, charging can be accomplished through one of four safety injection auxiliary header valves, all located outside of the containment.

2) Pressurizer spray due to damage to 1-CV-517 can be compensated for by pressurizer heaters. As noted on sheet 1 pressurizer heaters and related cables and 1-CV-517 and related cables are not subject to damage due to a common fire. 1-CV-517 can be closed manually after the postulated fire is extinguished. Additionally, manual valve 1-CVC-183 is located outside containment and can be closed to eliminate pressurizer spray. In this case, the safety injection auxiliary header will be utilized for charging.

Modifications:

No modifications are required.

Room 230 - Unit 1 Containment

General Containment Modification

1) Instrument trays ZE1CF19, ZF1CL17, ZD1CF07 and ZG1CL10 run east and west at elevation 10'-0" and present the only fire propogation path between RCP bay 11 and RCP bay 12 and between east and west penetration halves at higher elevations. These trays will be covered with fire barriers top and bottom to prevent a fire from being transmitted accross the containment by one or more of these trays. Note that this is not intended to protect the cables in these trays since they do not contain cables for equipment necessary for safe shutdown.

2. The fire detection system will be extended to all areas containing equipment or cables required for hot standby or cold shutdown. The zones will be arranged to give a clear indication of which containment half (east or west) is involved in order to provide quick identification of the equipment to be used to achieve a safe and orderly shutdown.

Room 229 - Unit 2 Containment

Hot Standby

Reactor Heat Removal Function - See Attachments 2 & 2a

Equipment in Containment (non-instrumentation):

1. Pressurizer Heaters

2. Pressurizer Heater Alternate Equipment:

   a) 2-CV-515 RCS Letdown Stop Valve
   b) 2-CV-516 RCS Letdown Stop Valve
   c) 2-CV-517 Auxiliary Spray Valve
   d) 2-CV-518 Charging Line Isolation Valve
   e) 2-CV-519 Charging Line Isolation Valve

Analysis:

1. Pressurizer heater cables enter the containment through the east electrical penetration room and are routed only on the east side of the containment. 2-CV-517 cables enter the containment through the west electrical penetration room. 2-CV-517 and 2-SV-517 are located in the soutwest side of the containment at elevation 45'-0". Since separation of over 20 feet of clear horizontal air space is present, 2-CV-517, 2-SV-517 and their related cables are not subject to a fire common to the pressurizer heaters or their related cables. Therefore, either pressurizer heaters or an alternate path utilizing charging or HPSI pumps will be available to maintain RCS pressure.
2. A common fire can affect 2-CV-507 (see sheet 17) and 2-CV-517, however, charging pumps and pressurizer heaters will be unaffected allowing charging to compensate for RCP seal bleed-off, and pressurizer heaters to offset pressurizer spray. 2-CV-517 can be closed manually after the postulated fire to permit charging without a concurrent need for pressurizer heaters. Additionally, manual valve 2-CVC-183, located outside containment, can be closed eliminating pressurizer spray, and charging accomplished through the safety injection auxiliary header.

3) 2-CV-518 and 2-CV-519 are affected by a common fire. If neither valve can be opened, charging can be accomplished through safety injection auxiliary header valves which are all outside containment.

4) 2-CV-515 and 2-CV-516 can be affected by a common fire. If neither valve can be opened, RCS pressure can be maintained by HPSI pumps or pressurizer heaters. Pressurizer heaters cables are separated from 2-CV-515, 2-SV-515, 2-CV-516, 2-SV-516 and related cables (all routed to the west electrical penetration room) by over 20 feet of clear horizontal air space and HPSI pumps and related valves are outside containment.

Modifications:

1. General Containment Modification - see sheet 20.

Room 229 - Unit 2 Containment

Hot Standby

Reactor Heat Removal Function

RCS Instrumentation - See Attachment 2b

Equipment in Containment:

1) RCS Loop 21 Hot Leg Temperature Transmitters 2-TE-112HA, 2-TE-112HB, 2-TE-112HC, 2-TE-112HD and 2-TE-111X.
2) RCS Loop 21 Cold Leg Temperature Transmitters 2-TE-112CA, 2-TE-112CB, 2-TE-112CC, 2-TE-112CD, 2-TE-111Y and 2-TE-115.
3) Steam Generator 21 Level Transmitters 2-LT-1113A, 2-LT-1113B, 2-LT-1113C, 2-LT-1113D, 2-LT-1111 and 2-LT-1105.
4) Steam Generator 21 Pressure Transmitter 2-PT-1013A, 2-PT-1013B, 2-PT-1013C and 2-PT-1013D.
5) RCS Loop 22 Hot Leg Temperature Transmitters 2-TE-122HA, 2-TE-122HB, 2-TE-122HC, 2-TE-122HD and 2-TE-121X.
6) RCS Loop 22 Cold Leg Temperature Transmitters 2-TE-122CA, 2-TE-122CB, 2-TE-122CC, 2-TE-122CD, 2-TE-121Y and 2-TE-125.
7) Steam Generator 22 Level Transmitters 2-LT-1123A, 2-LT-1123B, 2-LT-1123C, 2-LT-1123D, 2-LT-1121 and 2-LT-1106.
8) Steam Generator 22 Pressure Transmitters 2-PT-1023A, 2-PT-1023B, 2-PT-1023C and 2-PT-1023D.

Analysis:

Instrumentation is assured for at least one RCS Loop and associated Steam Generator since:

1) 2-TE-111Y, 2-TE-115, 2-TE-111X, 2-LT-1105 and 2-LT-1111 are located in RCP bay 21 and related cables routed directly to the east electrical penetration room.

2) 2-TE-121Y, 2-TE-125, 2-TE-121X, 2-LT-1121 and 2-LT-1106 are located in RCP bay 22 and related cables are routed directly to the west electrical penetration room.

3) Transmitters and related cables listed in 1) and 2) above are separated by over 20 feet of clear horizontal air space and therefore are not affected by a common fire.

4) Redundant Steam Generator 21 and 22 pressure transmitters, 2-PT-3991 and 2-PT-4008 respectively, are located outside containment.

Modifications:

1) General Containment Modification - see sheet 20.

Room 229 - Unit 2 Containment

Hot Standby

Reactor Heat Removal Function

Pressurizer Instrumentation - See Attachment 2c

Equipment in Containment:

1) Pressurizer pressure transmitters (high range) 2-PT-102A, 2-PT-102B, 2-PT-102C, 2-PT-102D, 2-PT-100X and 2-PT-100Y.
2) Pressurizer pressure transmitters (low range) 2-PT-103, and 2-PT-103-1.
3) Pressurizer level transmitters 2-LT-110X, 2-LT-110Y and 2-LT-103.

Analysis:

1) 2-LT-110X and 2-PT-100X are located together at elevation 45'-0" approximately 20 feet horizontally from 2-LT-110Y and 2-PT-100Y. This space, however, contains vertical cable trays and is not clear air space. All cables related to these devices are routed to the east electrical penetration room. Redundant devices and related cables are subject to damage from a common fire.
2) 2-PT-103 is located less than 20 feet horizontally from 2-PT-103-1. Both devices are at elevation 45'-0" and all related cables are routed to the east electrical penetration room. Both devices and related cables are subject to damage from a common fire.

Modifications:

1) 2-LT-110Y, 2-PT-100Y and 2-PT-103-1 will be relocated to provide 20 feet of clear horizontal air space between these devices and the vertical cable trays.

2) Cables related to 2-LT-110Y, 2-PT-100Y and 2-PT-103-1 will be rerouted to the west electrical penetration room in order to provide 20 feet of clear horizontal air space between these cables and those of 2-LT-110X, 2-PT-100X and 2-PT-103.

3) General Containment Modification - see sheet 20.

Room 229 - Unit 2 Containment

Hot Standby

Reactor Coolant Make-Up Function - See Attachment 5

Equipment in Containment:

1)	2-ERV-402	RCS Power Operated Relief Valve
2)	2-MOV-403	RCS Motor Operated Block Valve
3)	2-ERV-404	RCS Power Operated Relief Valve
4)	2-MOV-405	RCS Motor Operated Block Valve
5)	2-CV-515	RCS Letdown Stop Valve
6)	2-CV-516	RCS Letdown Stop Valve
7)	2-CV-506	RCP Seal Leak Off Stop Valve
8)	2-CV-5465	Sample Valve
9)	2-CV-5466	Sample Valve
10)	2-CV-5467	Sample Valve
11)	2-CV-507	RCP Bleed Relief Isolation Valve
12)	2-MOV-652	Shutdown Cooling Return Isolation Valve
13)	2-CV-103	Reactor Vessel Vent Valve
14)	2-CV-104	Reactor Vessel Vent Valve
15)	2-CV-105	Pressurizer Vessel Vent Valve
16)	2-CV-106	Pressurizer Vessel Vent Valve

Analysis:

1) 2-ERV-402, 2-MOV-403, 2-ERV-404 and 2-MOV-405 are located in the pressurizer house and related cables are routed in close proximity to ...e east electrical penetration room. All cables are subject to damage from a common fire.

2) 2-CV-515, 2-SV-515, 2-CV-516 and 2-SV-516 are located less than 5 feet apart and are subject to damage from a common fire, however, redundant valves, 2-CV-110P and 2-CV-110Q are located outside the containment.

3) 2-CV-506 has a redundant valve, 2-CV-505, located outside the containment.

4) 2-CV-5465, 2-CV-5466 and 2-CV-5467 have a redundant valve, 2-CV-5464, located outside the containment.

5) 2-CV-507 opens on loss of power or air allowing RCP seal bleed-off. No redundant equipment is available. This valve, however, can be closed manually after the postulated fire is extinguished and RCP seal bleed-off (4gpm) can be tolerated until this time.

6) 2-MOV-652 has a redundant valve, 2-MOV-651 located outside the containment.

7) 2-CV-103, 2-CV-104, 2-CV-105 and 2-CV-106 are solenoid operated, 125VDC valves. All valves are controlled manually, close on loss of power, are normally closed (de-energized) and have both their positive and negative leads opened by control switches in the control room. Each valve is powered by a separate cable (i.e. no two valves utilize conductors in one common jacket). The series of four unique "hot shorts" required to open both valves on either the reactor or pressurizer vessel is not considered credible.

Modifications:

1) Cables to 2-ERV-402 and 2-ERV-404 will be rerouted in separate conduits with no other cables. These valves close on loss of power therefore inadvertent operation due to hot shorts will not be possible.

2) General Containment Modification - see sheet 20.

Room 229 - Unit 2 Containment

Cold Shutdown

Reactivity Control Function - See Attachment 9

Equipment in Containment:

1) 2-CV-517 Auxiliary Spray Valve
2) 2-CV-518 Charging Line Isolation Valve
3) 2-CV-519 Charging Line Isolation Valve

Analysis:

1) 2-CV-518 and 2-CV-519 are affected by a common fire, however, if neither valve can be opened, charging can be accomplished through one of four safety injection auxiliary header valves, all located outside of the containment.

2) Pressurizer spray due to damage to 2-CV-517 can be compensated for by pressurizer heaters. As noted on sheet 1 pressurizer heaters and related cables and 2-CV-517 and related cables are not subject to damage due to a common fire. 2-CV-517 can be closed manually after the postulated fire is extinguished. Additionally, manual valve 2-CVC-183 is located outside containment and can be closed to eliminate pressurizer spray. In this case, the safety injection auxiliary header will be utilized for charging.

Modifications:

No modifications are required.

Room 229 - Unit 2 Containment

General Containment Modification

1) Instrument trays ZF2CL07, ZD2CF08 and ZE2CF18 run east and west at elevation 10'-0" and present the only fire propogation path between RCP bay 21 and RCP bay 22 and between east and west penetration halves at higher elevations. These trays will be covered with fire barriers top and bottom to prevent a fire from being transmitted across the containment by one or more of these trays. Note that this is not intended to protect the cables in these trays since they do not contain cables for equipment necessary for safe shutdown.

2) The fire detection system will be extended to all areas containing equipment or cables required for hot standby or cold shutdown. The zones will be arranged to give a clear indication of which containment half (east or west) is involved in order to provide quick indentification of the equipment to be used to achieve a safe and orderly shutdown.