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402/636-2000

December 22, 1992
LIC-92-341

Mr. S. D. Bloom
NRC Project Manager
U. S. Nuclear Regulatory Commission
Mail Stop: OWFN 13-H-3
Washington, DC 20555

Reference: Docket No. 50-285

Dear Mr. Bloom:

SUBJECT: Potential Overpressurization of Component Cooling Water (CCW) System - Preliminary Probabilistic Risk Assessment (PRA) Evaluation

Enclosed is a summary report on the preliminary PRA evaluation concerning the potential overpressurization of the Fort Calhoun Station (FCS) CCW system following a postulated reactor coolant pump seal cooler tube failure. During a telephone conference with the NRC on November 17, 1992 to discuss this preliminary PRA finding, Omaha Public Power District agreed to submit the enclosed report and drawings to summarize the discussion.

If you should have any questions, please contact me.

Sincerely,

W. C. Jones
Senior Vice President

WCJ/sel

Enclosure

c: LeBoeuf, Lamb, Leiby & MacRae
J. L. Milhoan, NRC Regional Administrator, Region IV
R. P. Mullikin, NRC Senior Resident Inspector

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PRA PRELIMINARY EVALUATION - POTENTIAL OVERPRESSURIZATION OF CCW SYSTEM

In 1991, the final report was issued for Combustion Engineering Owners Group (CEOG) Task 656 which addressed NRC Information Notice (IN) 89-54, "Potential Overpressurization of the Component Cooling Water System." CEOG Task 656 evaluated a postulated reactor coolant pump (RCP) seal cooler tube rupture resulting in a LOCA outside of Containment. In 1991, OPPD concluded that the postulated event is outside of the design basis for the Fort Calhoun Station (FCS) component cooling water (CCW) system but recognized that further analysis (including a poss ble PRA evaluation) was necessary. The preliminary results of the PRA evaluation indicate that this event constitutes a potential vulnerability warranting additional investigation.

Event Description

CEOG Task 656 determined that an RCP seal cooler tube rupture event could cause reactor coolant (RC) to enter the CCW system at a rate of approximately 220 gpm. This could lead to an overpressurization and failure of the CCW system. Reactor coolant could be spilled either into Containment or into the Auxiliary Building depending upon subsequent failure mechanisms. Although the CCW system is designed to accommodate and detect small amounts of reactor coolant system (RCS) leakage, a failure of this type is not part of the CCW system's design basis.

If either the RCP seal cooler shell or the CCW piping (Schedule 40) located in Containment was to fail due to overpressurization, then the subsequent leakage would occur in Containment. The mitigating strategy would then be similar to other accident scenarios involving a small-break LOCA with a concurrent loss of CCW. Since the RC would collect in the Containment Sump where it would be available for recirculation, the consequences would not be as severe as for a CCW overpressurization event where the failure occurs in the Auxiliary Building.

If the RCP seal cooler tube rupture did not cause a subsequent failure of the RCP seal cooler shell or the CCW piping located in Containment, then the RC leakage would pressurize the CCW piping leading to the Auxiliary Building. The CCW containment isolation valve could not close to isolate the leak in Containment due to the high pressure resulting from the RCS pressure boundary breach. Ultimately, the CCW surge tank could rupture and reactor coolant would spill into the Auxiliary Building where it would be unavailable for recirculation. Depressurization of the RCS would cause a safety injection actuation signal. The safety injection pumps initially take suction from the safety injection and refueling water tank (SIRWT) and discharge borated water into the RCS. Thermal-hydraulic analysis has determined that the contents of the SIRWT could be emptied into the Auxiliary Building in approximately 80 hours if no actions were taken to stop the leak and RCS cooldown and inventory control were accomplished in accordance with FCS Emergency Operating Procedures (EOPs).

Event Mitigation

Mitigating actions would require a cooldown and depressurization of the RCS using either EOP-03 "Loss of Coolant Accident" or EOP-20 "Functional Recovery." By operating all three charging pumps, RCS inventory control could be achieved within one hour of beginning RCS depressurization. Depressurizing the RCS to 380 psia would take approximately four hours after which a CCW containment isolation valve could be hand-jacked closed in Room 13 of the Auxiliary Building. Depressurizing the RCS to less than 180 psia would take approximately five hours and allow closure of a CCW containment isolation valve from the Control Room.

Following closure of the CCW containment isolation valve and isolation of the leak inside Containment, long-term decay heat removal could be accomplished using the steam generators or by initiating shutdown cooling using raw water as the cooling source. Manual operator actions in Corridor 4 of the Auxiliary Building are necessary to provide raw water backup to the shutdown cooling heat exchangers following the loss of CCW. Although RCS inventory requirements can be maintained by the charging pumps, a flooding hazard to the safety injection pumps could result if the leak was not isolated before the SIRWT was depleted. However, flooding is not expected to significantly affect equipment performance, if the event is mitigated in a timely manner.

Control Room operating crews have been trained on this scenario using the FCS simulator. The operators are aware of the sequence of events and the general mitigation strategy. An additional access point from Room 19 to Room 18 in the Auxiliary Building has been established to improve access to the CCW isolation valve (located in Room 13). The additional access point also provides an alternate route to Room 13 should flooding occur in the stairwell. OPPD is also considering other actions to further reduce the probability of this event such as adding RCP seal cooler header relief valves which would permit closure of the CCW containment isolation valves without the need to cool down and depressurize the RCS.

Conclusion

The probability of occurrence of the postulated event at FCS has been substantially reduced due to the establishment of the additional access point into Room 18, completion of operator training and refinement of the PRA model. Although several preliminary calculations or analyses associated with this event have been completed, further evaluation of the following items will be performed within the scope of Generic Letter 88-20:

1. The PRA human reliability analysis concerning the ability of the plant operators to diagnose and respond to a RCP seal cooler tube rupture.
2. The probability for failure of the shell side of the RCP seal cooler or the CCW piping located in Containment.
3. The habitability of the Auxiliary Building (necessary for hand-jacking the CCW isolation valve closed or initiating raw water backup to the shutdown cooling heat exchanger).
4. The effects of flooding in the Auxiliary Building.

Attachments:

- Figure A-2 OPPD/RCS/CCW Flow Path Schematic
- Drawing of Primary Coolant Pump (IF-5817)
- Materials of Construction for Primary Coolant Pump (Drawing IF-5817)
- Simplified drawings of Auxiliary Building

Attachment
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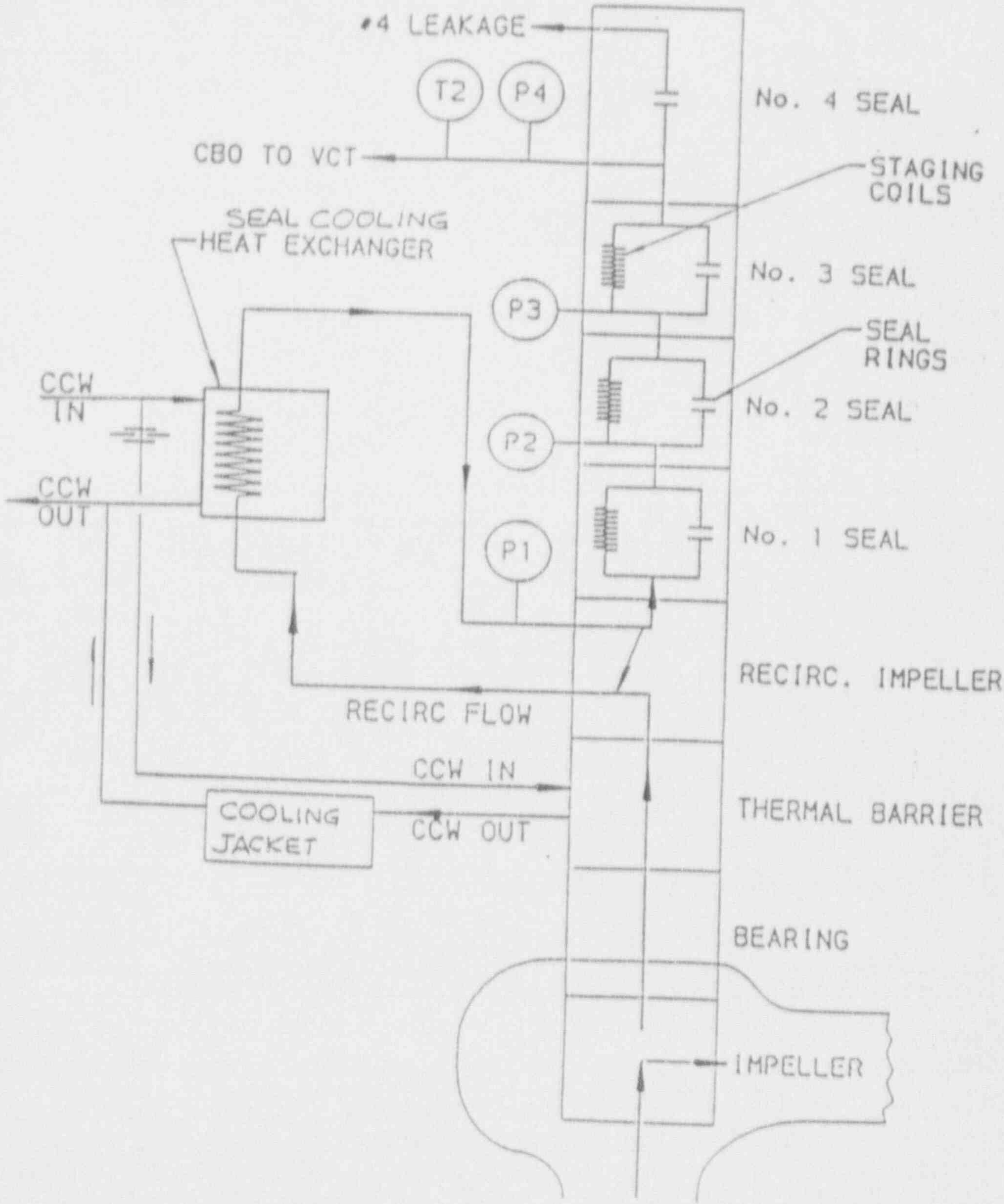

OPPD/RCP/CCW FLOW PATH SCHEMATIC

FIGURE A-2

Attachment
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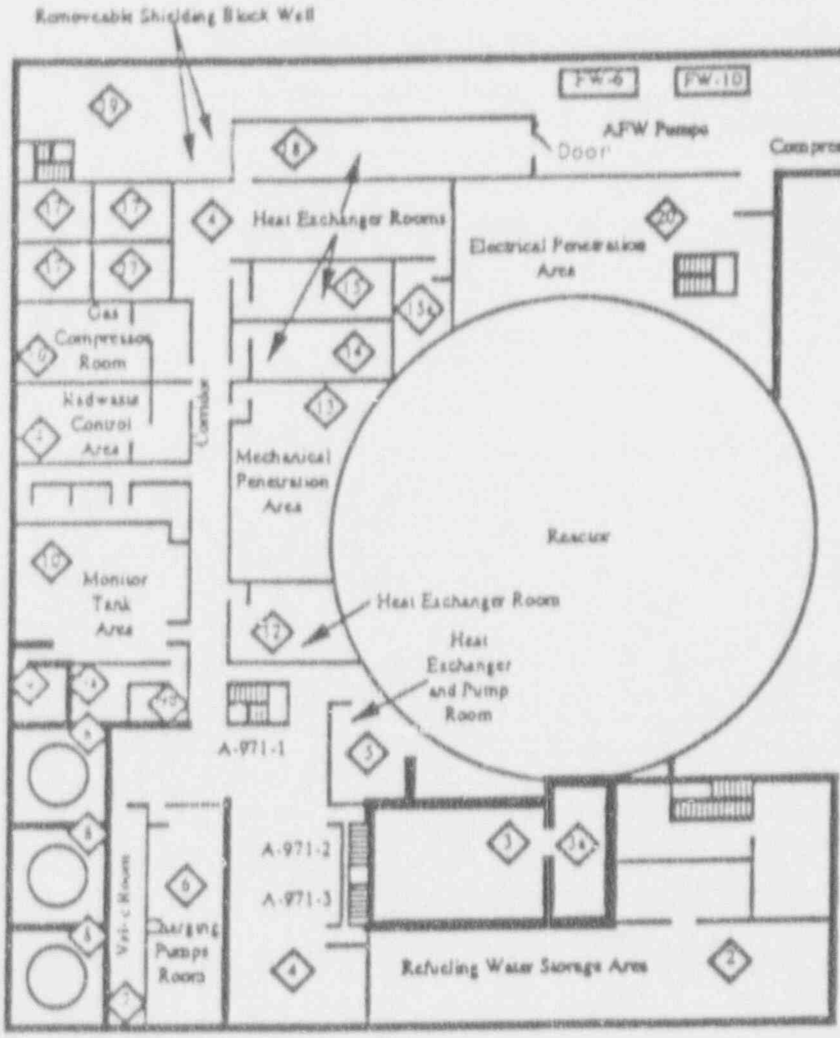
MATERIALS OF CONSTRUCTION

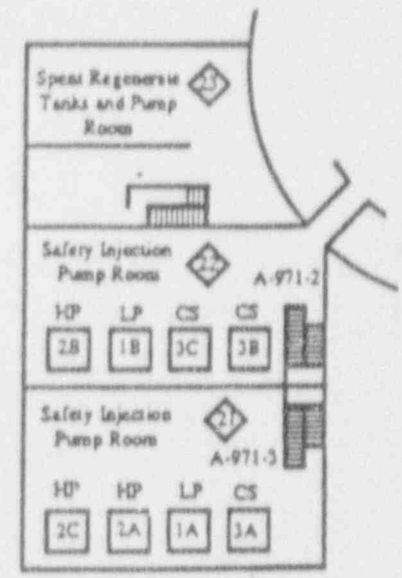
COMBUSTION ENGINEERING – OMAHA PUBLIC POWER DISTRICT
FORT CALHOUN PLANT
CONTRACT NO. 23866 PURCHASE ORDER NO. 1703370
BYRON JACKSON ORDER No. 671-N-0029/32

REF. DWGS: 1F-5817 and 1E-3432

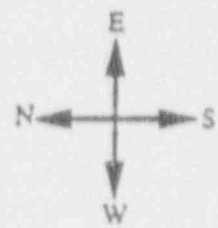
PART NO.	No. Req.	NAME	MATERIAL SPECIFICATION
1		Pump Case Assembly	
1-1	1	Pump Case	ASTM A-351, Gr. CF8M Ann.
1-2	1	Case Wear Ring	ASTM A-362, Gr. CF8 Ann.
1-3	4	Soc.Hd. Cap Screw - Wear Ring	ASTM A-276, Type 304 Cond. A (Flash Chrome Plate Thread Only)
1-5	5	Locating Pin - Cover to Case	ASTM A-276, Type 304 Cond. A.
2		Pump Cover Assembly	
2-1	1	Pump Cover	ASTM A-351, Gr. CF8M Ann.
2-1-1	1	Outer Shell - Pump Cover	ASTM A-240, Type 304 Cond. A
		Cover Sub-Components	
2-2	1	Heat Exchanger Assembly	
2-2-1	2	Manifold - L.P. Cooling Water	ASTM A-240, Type 304 Cond. A
2-2-2	1	Bottom Ring	ASTM A-240, Type 304 Cond. A
2-2-3	8	Hex. Head Cap Screw	ASTM A-276, Type 304 Cond. A
2-2-4	1	Fitting-Pump Cover to Ht. Exch. Coil	ASTM A-351, Gr. CF8
2-2-5	1	Heat Exchanger Coil	ASTM A-213, Type 304 SMLS Cond. A
2-2-6	1	Inner Shell - Heat Exchanger	ASTM A-240, Type 304 Cond. A
2-2-7	1	Outer Shell - Heat Exchanger	ASTM A-240, Type 304 Cond. A
2-2-8	1	Fitting - Heat Exch. - Top	ASTM A-351, Gr. CF8
2-2-9	1	Top Ring	ASTM A-240, Type 304 Cond. A
2-2-10	1	Flange - Cover Cooling Water Inlet	ASTM A-182, Gr. F 304 Cond. A
2-2-11	2	Union - Ht.Ex.Cooling water Inlet and Outlet	ASTM A-182 GR. F 304 Cond. A
2-2-12	2	Fitting - Ht.Ex.Cooling Water Inlet and Outlet	ASTM A-240, Type 304 Cond. A
2-2-13	1	Flange - Cover Cooling Water Outlet	ASTM A-182, GR. F304 Cond. A
2-2-14	1	Temperature Sensor - Lower Seal Cavity	Commercial

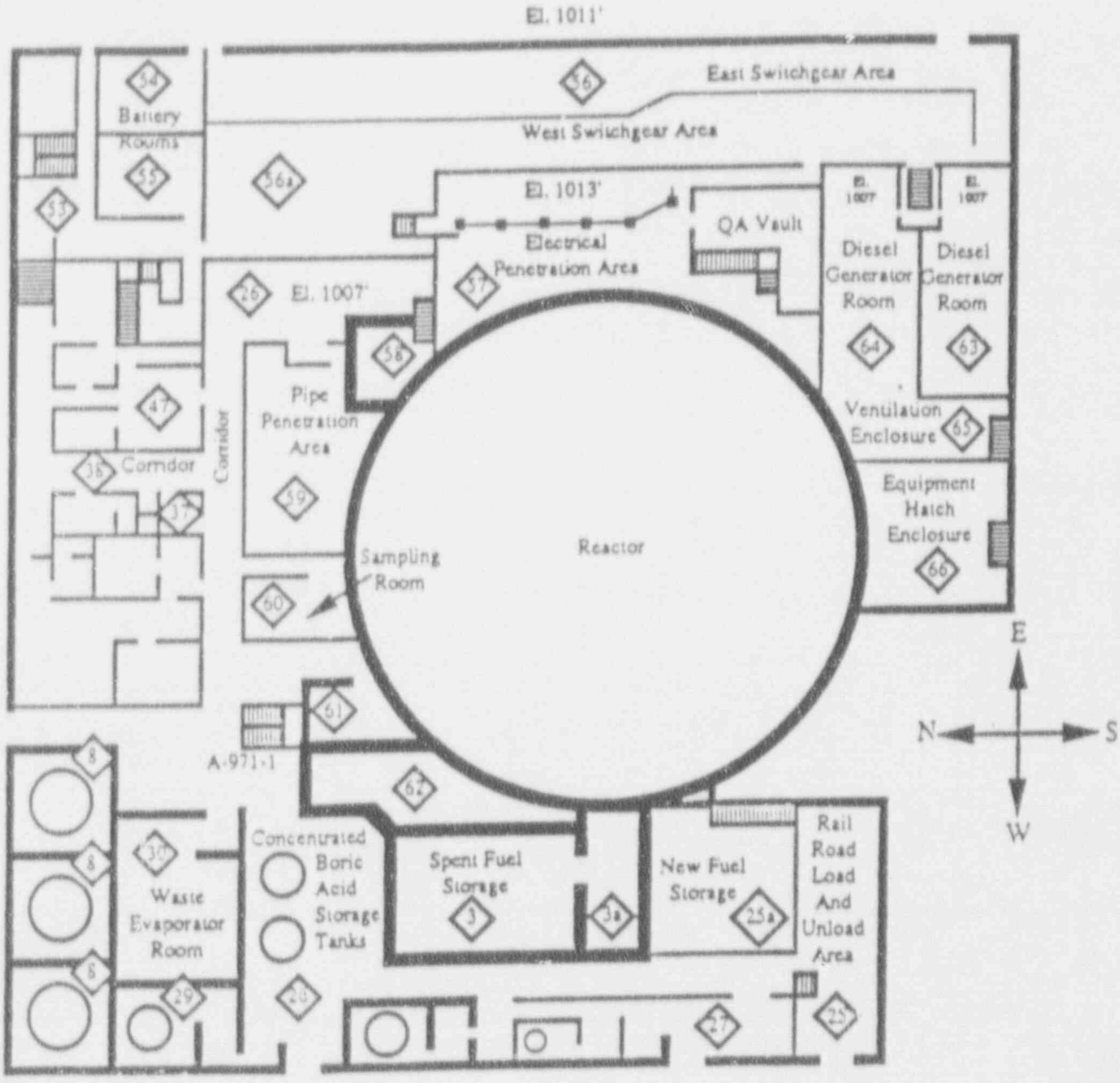


Auxiliary Building
Plant Elevation 989'-0"

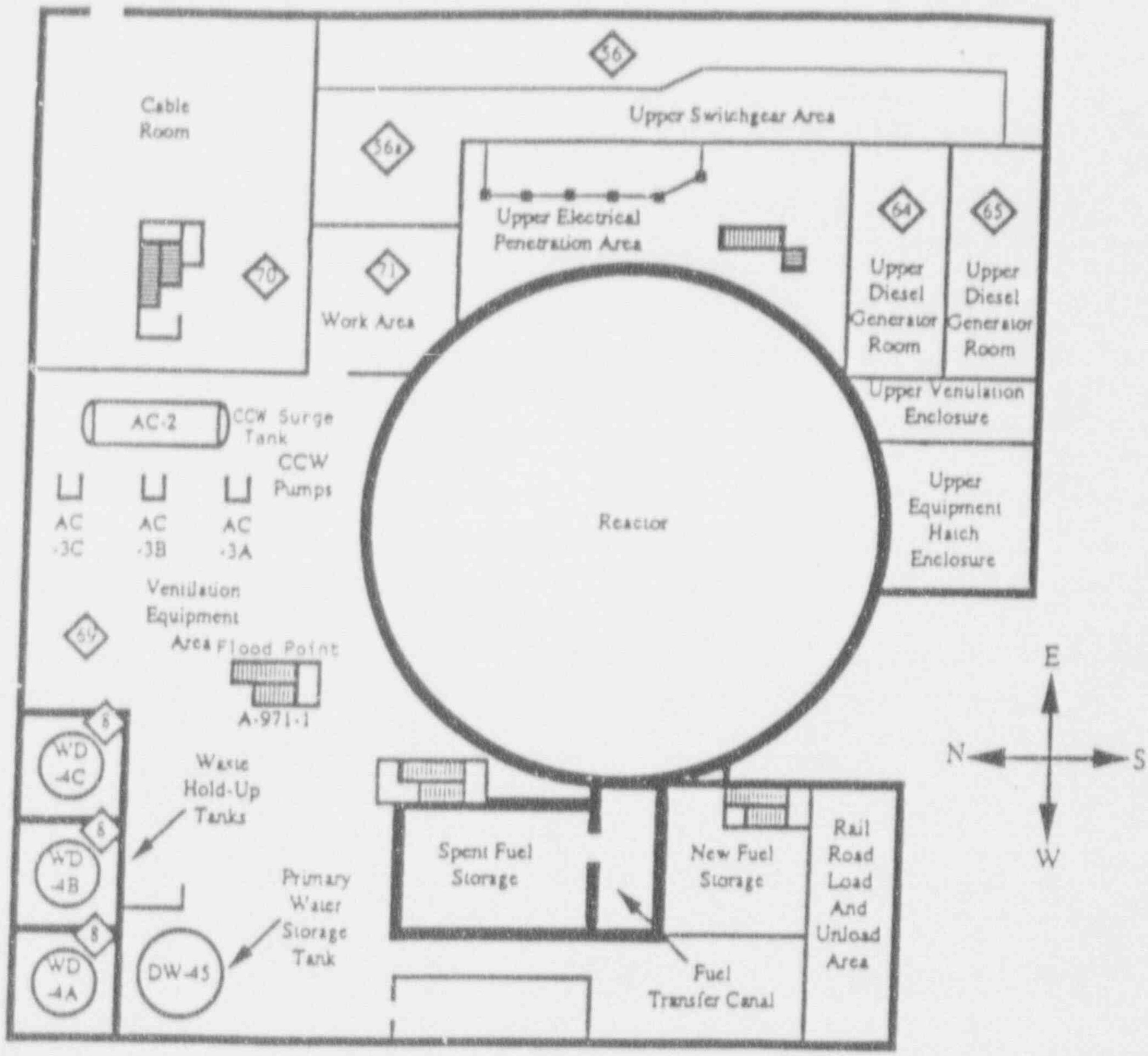


Auxiliary Building
Plant Elevation 971'-0"

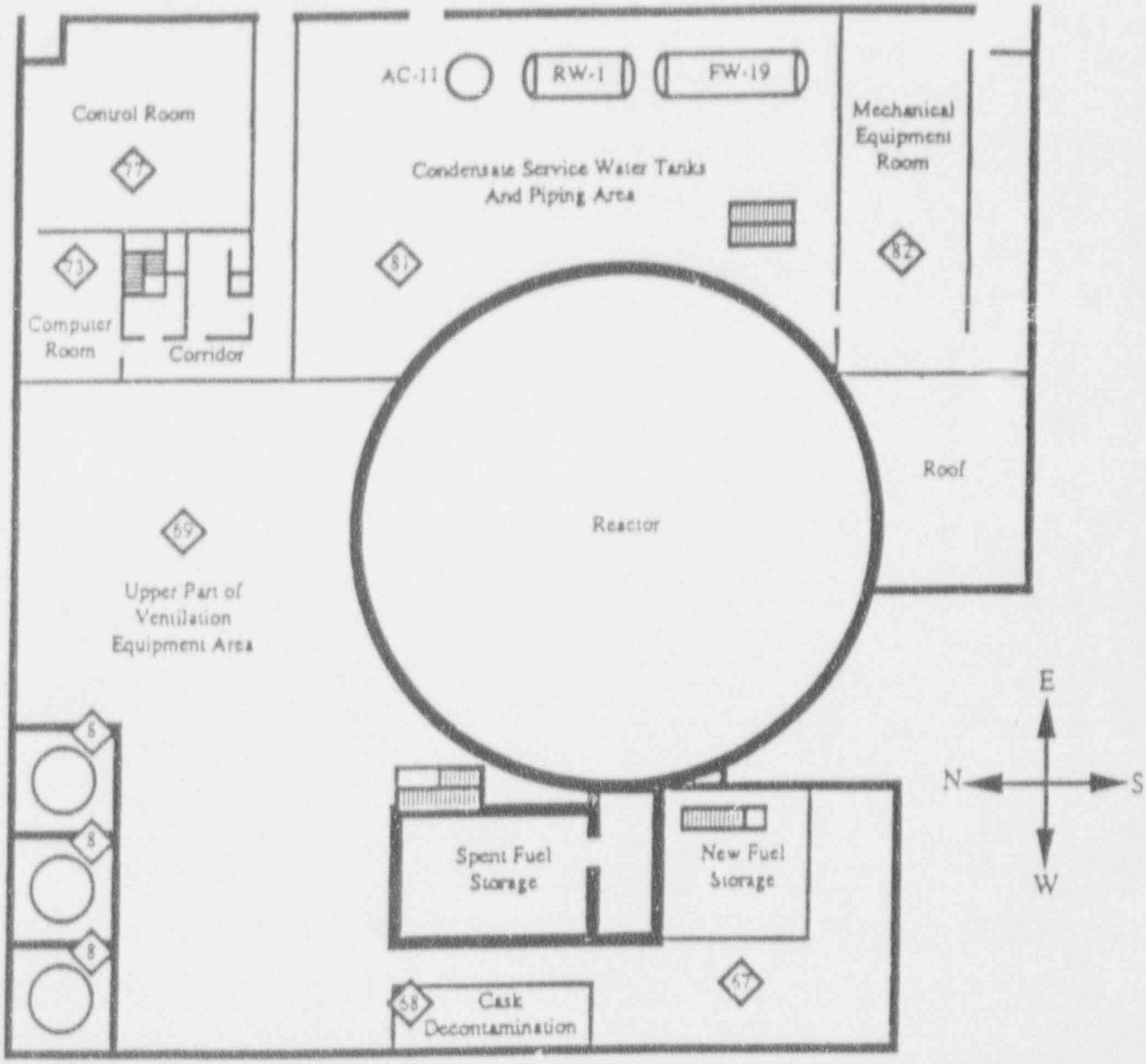




Auxiliary Building
Plant Elevation 1007'-0", 1011'-0", & 1013'-0"



Auxiliary Building
Plant Elevation 1025'-0"



Auxiliary Building
Plant Elevation 1036'-0"