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January 17, 1992

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United States Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: 91-031-00
DESIGN DEFICIENCY OF THE EMERGENCY SERVICE WATER SYSTEM RETURN PIPING FROM THE EMERGENCY DIESEL GENERATOR JACKET WATER COOLERS

Dear Sir:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B).

Questions regarding this report may be addressed to Mr. Christopher Ponzi at (315)349-6564.

Very truly yours,

RADFORD J. CONVERSE

Enclosure

RJC:CJP:nrb

cc: USNRC, Region I
USNRC, Resident Inspector
INPO Records Center

Cert# P 064 705 451

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NRC Form 366
(5-92)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 5/31/95

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
JAMES A. FITZPATRICK NUCLEAR POWER PLANT	0 5 0 0 0 3 3 3	1 OF 0 8

TITLE (4): Design Deficiency of the Emergency Service Water System Return Piping from the Emergency Diesel Generator Jacket Water Coolers

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER(S)
1 2	0 2	9 1	9 1	- 0 3 1 -	0 0	0 1	1 9	9 2		0 5 0 0 0
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OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Christopher Ponzi	AREA CODE 3 1 5 3 4 9 - 6 5 6 4

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

ABSTRACT

EIIS Codes are in [ ]

On 12/2/91, the plant was in the cold shutdown condition. The Design Basis Document reconstitution effort identified a potential design deficiency in the Emergency Service Water System (ESW) [BI]. The common 12 inch ESW return piping from the four Emergency Diesel Generator (EDG) [EK] jacket coolers (93WE-1A, 1B, 1C, 1D) is directed back into the A train ESW and Residual Heat Removal Service Water (RHRSW) [BI] pump bay [MK]. This condition results in heated water from the EDG jacket water coolers being recirculated to the ESW and RHRSW pump inlets.

No design documentation evaluating the effect of the ESW return line from the EDG jacket coolers was located. A conservative analysis was performed to determine the effect of the design configuration on ESW and RHRSW supply temperatures. Immediate corrective action was to limit plant operation to a maximum lake temperature of 65°F and change procedures to require running an RHRSW pump while the ESW pumps are supplying cooling water to the EDGs during EDG operation. This action will prevent exceeding the currently analyzed ESW and RHRSW supply temperature of 82°F. Long-term corrective actions will be a reanalysis of the effect of the ESW return flow from the EDG jacket coolers on ESW and RHRSW inlet temperature or a modification to reroute the ESW return piping from the EDGs.

NRC Form 366
(5-92)

DESCRIPTION

EISS Codes are in [ ]

On 12/2/91, the plant was in the cold shutdown condition. The Design Basis Document reconstitution effort identified a design deficiency in the Emergency Service Water System (ESW) [BI]. The 12 inch ESW return piping from the four Emergency Diesel Generator (EDG) [EK] jacket coolers (93WE-1A, 1B, 1C, 1D) is directed back into the train A ESW and Residual Heat Removal Service Water (RHRSW) [BI] pump bay [MK]. This condition results in heated water from the EDG jacket water coolers being recirculated to the ESW and RHRSW pump inlets.

No design documentation evaluating the effect of the ESW return line from the EDG jacket cooler on ESW and RHRSW operation was located. Both trains of ESW and RHRSW pumps are located in the same general area adjacent to the circulating water intake channel [NN]. During ESW pump operation while the EDGs are operating and the RHRSW pumps are idle, the potential exists for tripping the EDGs on high EDG jacket water temperature. With the RHRSW pumps operating, the effect would be limited to warmer ESW and RHRSW supply temperatures; i.e., operation of the RHRSW pumps would draw cooler lake water into the train A and B emergency pump bays [MK] and reduce the effect of the recirculated EDG jacket cooling water on the pump bay temperature. The potential exists for reducing the heat removal capability of the safety-related heat exchangers due to the reduced temperature differential across the heat exchangers.

This design deficiency has existed since original plant construction.

CAUSE

The most probable cause of this event was inadequate design review during the original construction of the facility. At the time the ESW system was installed, the pre-operational testing did not indicate a problem existed. No documentation was found evaluating the effect of the ESW return piping from the EDG jacket water coolers on ESW and RHRSW supply temperatures. Further evaluation of the causes is required. If the causes of the event are found, a supplement to this LER will be provided.

ANALYSIS

This event is reportable under the provisions of 10CFR50.73(a)(2)(ii)(B). That is, an event resulting in operation of the plant outside of the design basis. Recirculation of the ESW discharge flow from the EDG jacket water coolers has the potential to raise the ESW and RHRSW system supply temperatures above the current analyzed supply temperature limit of 82°F. During ESW pump operation while the EDGs are operating and the RHRSW pumps are idle, the potential exists for tripping the EDGs due to high EDG jacket water temperature. With the RHRSW pumps operating, the effect would be limited to warmer ESW and RHRSW supply temperatures, i.e., operation of the RHRSW pumps would draw cooler lake water into the A and B train emergency pump bays and reduce the effect of the recirculated EDG jacket cooling water on the pump bay temperature.

The ESW flow to the EDG jacket cooling water heat exchangers cools the EDC engine jackets and is discharged to the A train emergency pump bay. Because of this piping configuration, recirculation of heated water to the emergency pump bay occurs and the ESW supply temperature will be higher than the lake temperature. The return piping from other equipment supplied by the ESW system, the normal service water system [KG], and RHRSW system have been verified to be routed to the Circulating Water System (CWS) discharge canal [NN] as required.

The purpose of the ESW system is to supply cooling water to the following safety-related heat exchangers: EDG jacket water coolers, electric bay unit coolers, cable tunnel/EDG switchgear room coolers, control room and relay room air handling units, and crescent area unit coolers.

The system consists of two totally independent supply loops designed to seismic Class I criteria. Each loop is powered from a separate emergency bus connected to the EDGs. The safety objective of the system is to provide cooling to Emergency Core Cooling System components and equipment essential to safe reactor shutdown following a design basis Loss of Coolant Accident (LOCA). The ESW pumps start automatically on a low Reactor Building Closed Loop Cooling (RBCLC) [CC] System pressure or the start of the EDGs.

The RHRSW system supplies cooling water to the Residual Heat Removal (RHR) [BO] heat exchangers for residual heat removal during normal reactor shutdown and containment cooling under post-accident conditions. The system consists of two independent supply loops each with two RHRSW pumps. Each pair of pumps is powered from a separate emergency bus connected to the EDGs. The RHRSW system is manually activated in the event of a LOCA.

Geometry of Emergency Pump Bays (See Figure 1)

The three emergency pump bays are arranged with one ESW pump and two RHRSW pumps in each of two bays and two fire pumps [KF] in the third. Lake water enters the plant through the intake tunnel [NN], passes through the trash racks [NN] and traveling screens [NN] and is then supplied to the various raw water system loads. After the water reaches the traveling screens, it enters the circulating water pumps and normal service water [KG] pump bays [NN]. A dividing wall separates the normal service water pump bays from the emergency pump bays. A nine foot wide channel exists at the west end of the dividing wall through which the water enters the B ESW/RHRSW pump bay [MK]. It then flows to the A ESW/RHRSW pump bay [MK] to the north through a nine foot channel at the west end of the dividing wall between the A and B ESW/RHRSW pump bays. The water then enters the fire pump bay through a nine foot wide channel at the west end of the dividing wall which separates the A ESW/RHRSW bay and fire pump suction bay. Since there is no exit point from the three bays, the bays are a stagnant pool until a pump is started.

ESW and RHRSW System Operation

The ESW system operates as an open cycle system. The ESW pumps automatically start on an EDG start or when low RBCLC header pressure is sensed. ESW injection valves 46MOV-101A and B then open and ESW test line valves 46MOV-102A and B close automatically only for the low RBCLC pressure signal. In this operating configuration, lake water is supplied to the EDG jacket water coolers and various heat exchangers downstream of 46MOV-101A and B (see Figure 2) Otherwise only the EDGs receive ESW flow. Approximately 2,500 gpm (625 gpm per EDG jacket water cooler) is recirculated to the A pump bay if both ESW pumps are running. The ESW return line from the EDGs is located approximately 2.5 feet north of the dividing wall between the A and B pump bays and approximately one foot from the west end of the wall (see Figure 1).

The RHRSW system is also an open cycle system. This system does not have an auto initiation signal and must be manually started. Water is supplied by the pumps to the RHR heat exchangers and then returned to the CWS discharge canal.

An analysis was performed to determine the effect of recirculating the warmer ESW return flow from the EDG jacket water coolers on the emergency pump bay temperature. With the RHRSW pumps running, the ratio of recirculated flow to lake water intake flow is much smaller than with ESW running alone; and a lower steady state bay temperature can be achieved. However, until the RHRSW pumps are manually started, the bay temperature will continue to increase due to the heat input from the EDGs. No mixing between the A and B pump bays other than water supply was considered due to the difficulty of creating an accurate analytical model and the lack of empirical data. Perfect mixing is assumed to occur within each pump bay which results in very conservative analysis results, i.e., thermal stratification within the bay was not modeled. The analysis was performed during which all four EDGs are running fully loaded. Various equipment combinations were considered for the ESW and RHRSW systems to calculate the most limiting steady state emergency pump bay temperatures.

The results of the analysis are as follows:

1. With all four EDGs operating, both ESW pumps operating supplying only safety-related loads and no RHRSW pumps operating, a 29°F per hour temperature rise occurs in the A emergency pump bay.

2. The worst analyzed case is the condition where all four EDGs are operating, both ESW pumps operating, two RHRSW pumps operating in the B train emergency pump bay and only one RHRSW pump operating in the A train emergency pump bay. The RHRSW pumps are assumed to be started within 30 minutes of an EDG start. This configuration simulates the minimum ratio of cool lake water supplied to the A train emergency pump bay to water recirculated from the EDG jacket water coolers.

The analysis determined that a maximum lake temperature of 65°F results in a steady state temperature of 82°F in the A emergency pump bay for the worst case condition. 82°F is the current maximum analyzed ESW and RHRSW supply temperature.

Based on this analysis, the maximum analyzed ESW and RHRSW supply temperature could be exceeded during EDG operation when the lake temperature exceeds 65°F. Lake Ontario is the ultimate heat sink for the facility. Lake temperature is typically above 65°F from May to October.

Operating history has not shown a problem to exist while running the EDGs during the summer months. The EDGs are tested each month during ST-9B, EDG Full Load Test and ESW Operability Test, and have not tripped due to high temperature. The EDGs are required to run at full load (2600 KW per EDG) for one hour. During EDG operation, engine jacket temperature is recorded in the Diesel Operating Log. This data is not trended during each EDG test but no abnormal temperature readings have been recorded.

The analysis performed due to discovery of the ESW return piping from EDG jacket water cooler design error is conservative. Actual emergency bay temperature is difficult to model.

CORRECTIVE ACTIONS

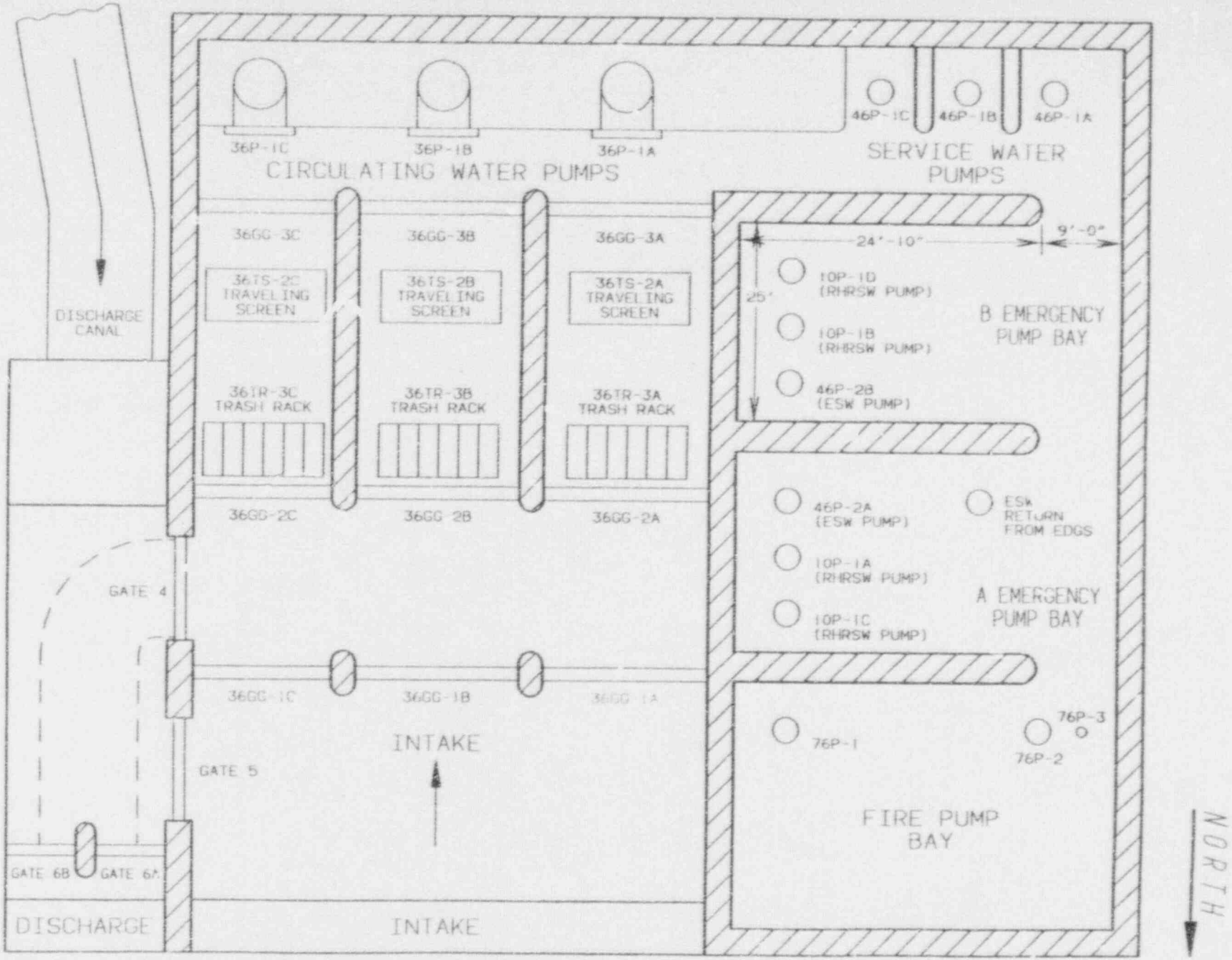
1. Procedural changes were made to require running an RHRSW pump during Emergency Diesel Generator operation (completed 12/91).

2. Plant operation will not be allowed when Lake Ontario temperature is above 65°F until a modification is performed to reroute the ESW return piping from the EDGs or a more extensive analysis of the existing configuration and the effect on emergency pump bay temperature is performed.

ADDITIONAL INFORMATION

1. Failed components: None

2. Similar Events: Similar events (if any) will be listed in a supplement to this LER if the causes of this event are discovered.



PLAN VIEW
SCREENWELL BLDG
BELOW FLOOR ELEV. 255'

Figure 1
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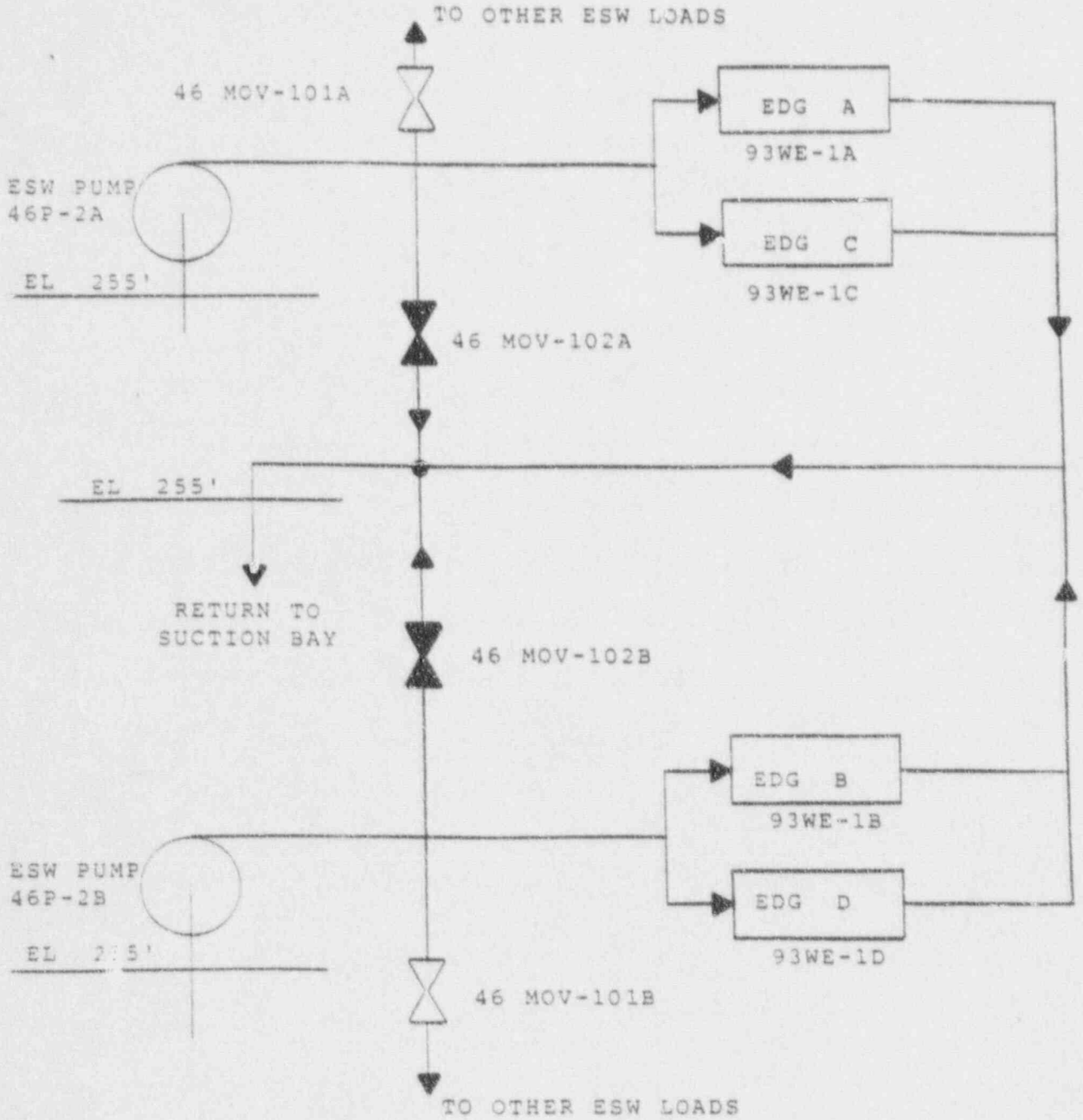

ESW SYSTEM FLOW DIAGRAM SHOWN SUPPLYING EDGs AND OTHER ESW LOADS