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New York Power Authority

William Fernandez II
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December 17, 1990
JAFP-90-0897

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

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: 90-025-00
Service Water Check Valves

Dear Sir:

This Licensee Event Report is submitted in accordance with 10 CFR 50.73 "Other" as a voluntary report.

Questions concerning this report may be addressed to Mr. Hamilton Fish at (315) 349-6013.

Very truly yours,

R. Lesens by direction
WILLIAM FERNANDEZ

WF:HCF:lar

cc: USNRC, Region I
USNRC Resident Inspector
INPO Records Center
American Nuclear Insurers

Cert NO P030410667
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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NUMBER (2): 0 5 0 0 0 3 3 3

PAGE (3): 1 OF 0 5

TITLE (4): Three Service Water to Emergency Service Water Check Valves Fail to Close During Testing Due to Corrosion and Silt Accumulation

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 NAMES	DOCKET NUMBER(S)
1 1	1 5	9 0	9 0	— 0 2 5 —	0 0					0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): N

POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

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)	X OTHER (Specify in Abstract below and in Text, NRC Form 366A) Voluntary
20.405(a)(1)(iii)	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
Hamilton C. Fish	AREA CODE 3 1 5 — 3 4 9 — 6 0 1 3

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
X	K G	V	V 0 8 5	Y					

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 November 15, 1990 the plant was operating at 100% power. During a scheduled ASME Section XI In-Service Test program surveillance test, three 3-inch swing check valves failed to close. The valves supply service water [KG] to three area ventilation unit coolers supplying spaces containing safety-related electrical switchgear. The valves are intended to close upon loss of service water pressure to prevent diversion of the emergency service water [BI] supply away from the coolers. On November 16th carbon steel valve internals were replaced with stainless steel components to avoid corrosion problems which contributed to the sticking condition. The as-found stuck open valve condition would most probably not have resulted in conditions adverse to safety in the event of an FSAR postulated accident. This is a voluntary report.

Related LERs: 88-005, 88-009, and 90-012.

Description

The plant was operating at full power on November 15, 1990. As a part of an accelerated ASME Section XI In-Service Testing program (IST), a regularly scheduled monthly surveillance test (ST), "Emergency Service Water Check Valve Test" (ST-8R), was being conducted. Three 3-inch swing check valves did not close when reverse flow conditions were simulated.

The ST acceptance criteria require that the valves close when: 1) service water flow through the valve is isolated, and 2) the upstream side of the valve is vented to the atmosphere, and 3) the downstream side of the valve is pressurized by ESW flow.

During normal operation service water [KG] flows through each of the check valves to supply three unit coolers. The unit coolers remove heat from three rooms containing safety-related electrical switchgear and cable. Check valve 46SWS-67B failed to close after two tests at 1045 hours. With the valve isolated from both SWS and ESW, the valve bonnet was tapped with a wrench handle. The valve then closed promptly when reverse flow was initiated for the retest. The other two valves (46SWS-67A and 46SWS-69) were tested with similar results, initially failing at 1200 and 1245 hours respectively and then closing during the retest after they had been tapped with the wrench handle while they were isolated.

Following notification of each valve failure, the shift supervisor directed closure of the appropriate manual isolation gate valves upstream of check valves in the service water system (SWS) [KG] supply to the affected unit cooler. Cooling water was then supplied to the unit coolers from the emergency service water (ESW) [BI] system.

The following day, November 16th, the unit cooler for the west electric bay was removed from service at 0640 to facilitate inspection and repair of valve 46SWS-67A. This placed the plant in a Limiting Condition for Operation (LCO). The internals were replaced with stainless steel components. The valve was retested and closed satisfactorily. The unit cooler was restored to service at 1500 ending the LCO. At 1720 the unit coolers for the east electric bay and the east cable tunnel (which includes cooling for one Emergency Diesel Generator (EDG) [EK] switchgear room) were removed from service to facilitate inspection or repair of valves 46SWS-67B and 46SWS-69. This placed the plant in an LCO. The internals of these two valves were replaced with stainless steel components. The valves were retested and closed satisfactory. The unit coolers were returned to service ending the LCO at 2107.

Cause

The event was caused by the failure of the swing check valve discs to fully close under test conditions. The failure of the discs to swing closed was the result of excessive friction in the hinge pin mechanism of the valve. Opening the valves for inspection revealed the valve parts to be coated with mud, sand, and corrosion products. The hinge pin and hanger arm had a distinct gritty feel to them when they were hand-operated. Therefore, the excess friction is attributed to the build-up of corrosion products and abrasive mud and sand between the hinge pin and hanger arm. Because accumulations of mud and sand had been cleaned from the service water pump suction bays only four months prior to this event, the sand and mud accumulation in the valves is viewed as an unavoidable result of the naturally occurring storms which cause turbulence and entrainment of sand and silt in the lake water which is the source of the service water. The corrosion between the carbon steel metal hinge and stainless steel hinge pin is an oxidation reaction resulting from the oxygen content and 360 micro mho conductivity of the lake water. The volume of service water flow, coupled with the return of the water to the lake, precludes treatment of the water to reduce the oxygen content or conductivity. The pH of the water is in the 7 to 9 range and is not viewed as a contributing factor to the corrosion.

As reported in LER-90-012, each of these three valves had previously been found stuck in a partially open position during inspection during the spring 1990 outage. They have closed satisfactorily during each of the four monthly surveillance tests prior to this event.

Analysis

This event is voluntarily reported under the provisions of 10CFR50.73 as being related to our previous voluntary report, LER-90-012, which involved similar conditions with the same valves. Available ESW flow to some coolers could have been less than the values assumed in the FSAR. The three valves of this event supply cooling water to three area unit coolers. These heat exchangers provide area ventilation cooling for portions of the 4 KV, 120 VAC, 600 VAC switchgear [EA, EB, EC, ED], the Reactor Protection System (RPS), and Uninterruptible Power Supply (UPS) [EF] located in the west electric bay (Safety Division 1), the east electric bay (Safety Division 2), and the east cable tunnel (Safety Division 2) including one EDG [EK] switchgear room.

The coolers are designed to remove the normal heat load, which is approximately 50% greater than the post-accident heat load for the electric bays and 350% to 450% greater than the post-accident heat load for the cable tunnel and associated EDG switchgear room. The cooler design approximates counterflow air to water heat exchange.

Flow diagrams showing the SWS and ESW supply to each heat exchangers are attached as Figures 1, 2, and 3. The tube side of each heat exchanger is normally provided with service water from a 3-inch line that branches off the SWS main header. Teeing into this line, just downstream of the 3-inch swing check valves (which failed to close in this event), are two 2-inch ESW supply lines. One of these supply lines is normally valved-in and is considered safety-related. The other line is normally valved-out and is not safety-related.

The swing check valves in the SWS were operable in the open position and supplied adequate cooling water flow to the electric bay and cable tunnel area ventilation unit coolers. However, it is possible that they may not have closed on reverse flow. If the service water pressure had failed, operators could have manually initiated the ESW system, which would then have injected into these coolers. The SWS swing check valves would then have been required to close to maintain full ESW flow through the unit coolers by preventing ESW flow diversion into the normal SWS. The ESW is not designed to have sufficient pumping capacity to supply both the ESW and SWS systems. Therefore, the ability of the ESW system to remove heat from the components it is designed to supply could have been reduced for a brief period of time until the SWS supply lines to the unit coolers could have been isolated by closing local manual valves. These isolation valves (for each SWS check valve) are in an accessible portion of the turbine building. Normal operator monitoring of the spaces cooled by these systems following transfer to the ESW supply would have identified any significant flow diversion (due to stuck open check valves) prior to the ambient air temperature exceeding equipment design temperature limits.

It was demonstrated during the surveillance test that a simple tap of a wrench on the valve bonnet was sufficient to result in valve closure. An event of sufficient magnitude to shear a 3-inch supply line would probably have been of sufficient force to loosen the valve hinge mechanism and permit valve closure.

The more probable event is loss of SWS pressure due to SWS pump power supply failure. The inherent flow resistance of the SWS system would have resulted in a flow diversion less than that which would have resulted from a pipe break. Because the design heat removal capacity of the coolers for normal operation provides a margin of approximately 50% above the post-accident heat load for the electric bays and at least 350% for the east cable tunnel, the remaining ESW flow may have been able to provide sufficient heat removal capacity to avoid a degradation of the safety functions of the equipment located in these spaces.

The ability to manually isolate any of the check valves which failed would have mitigated the consequences of any event and ensured continued and adequate cooling capacity to the electric bays and cable tunnel.

Accordingly, the failure of these three valves to close under test conditions would most probably not have had a significant adverse impact on plant safety in the event of the accidents postulated in the FSAR.

Corrective Action

1. The valve internals for the three valves were replaced with stainless steel components. It is anticipated that this will increase the service interval for the hinge pin and hanger arm by reducing corrosion between these components and reducing clearances which allow entry of foreign material.

2. The frequency of surveillance testing has been increased from once each month to twice each month for eight SWS to ESW swing check valves which are normally held in the open position by service water flow.

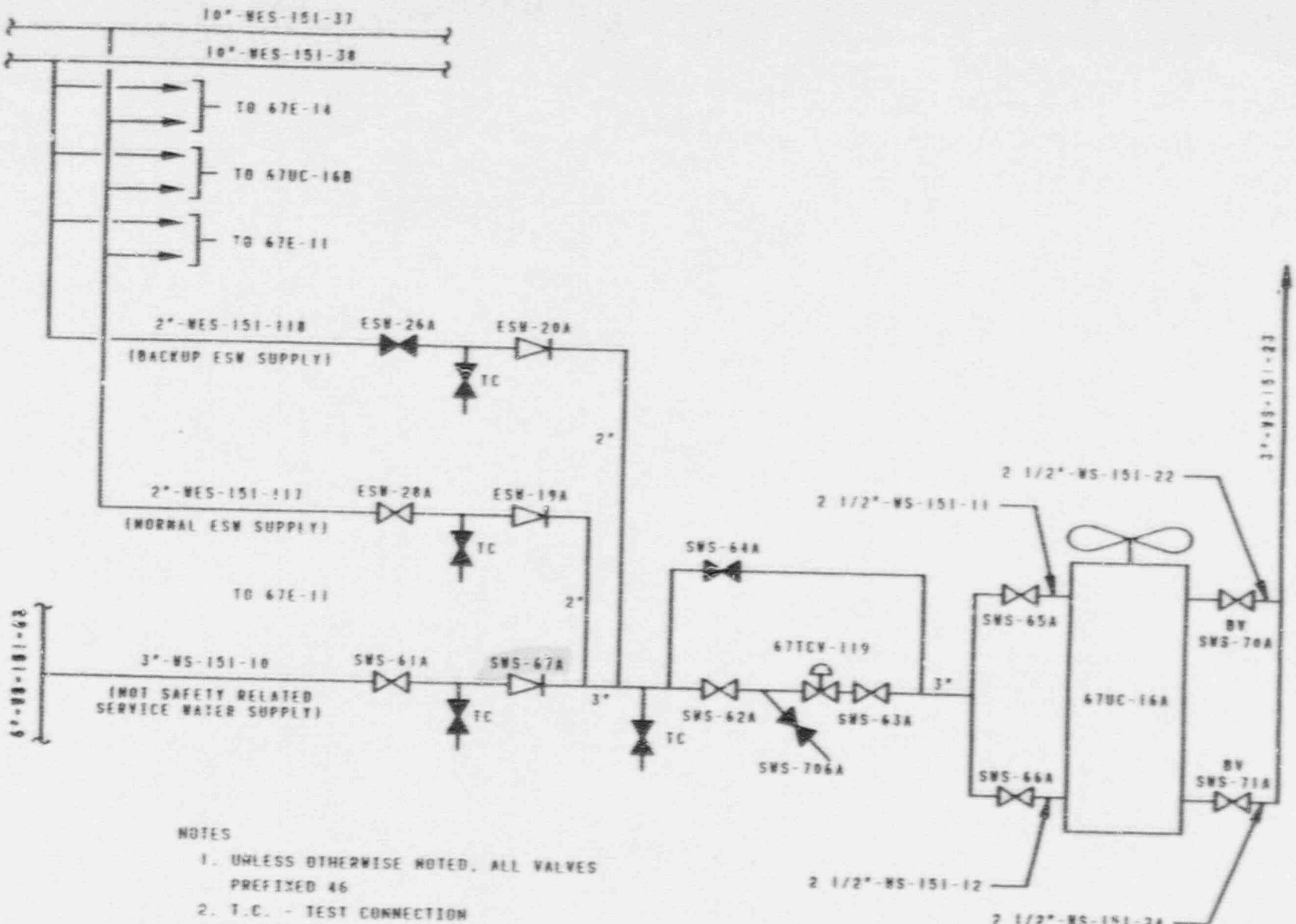
Additional Information

Failed Component Data

Name:	Service Water Check Valves
Description:	Swing Check Valve
Function:	Prevent emergency service water diversion to the normal service water system in the event of low service water pressure.
Plant Component Identification:	46SWS-67A, 67B, and 69
Manufacturer:	Velan Valve Corporation
Model:	F-10-0114B-2T
Pressure Rating:	150 psig
Size:	3 Inch
Material:	Carbon Steel
NPRDS Vendor Code:	V085
NPRDS Component Code:	VALVE
IEEE Component Code:	V

Similar Events

LERs 88-005, 88-009, and 90-012 reported similar events in which ESW isolation swing check valves in the service water flow path were not operable due to accumulation of sediment and corrosion of valve parts.



NOTES

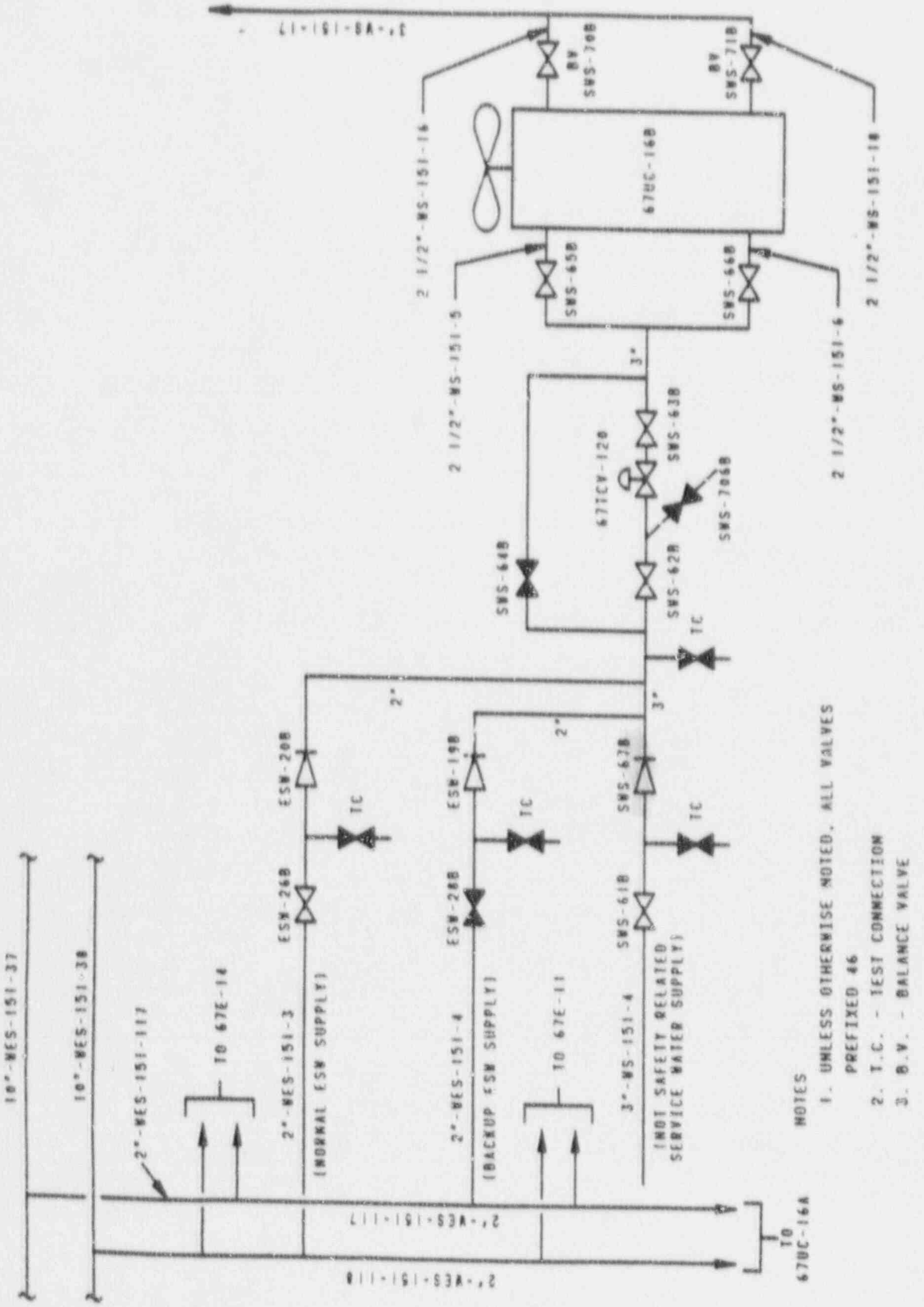
1. UNLESS OTHERWISE NOTED, ALL VALVES PREFIXED 46
2. T.C. - TEST CONNECTION
3. B.V. - BALANCE VALVE

Figure 1 to
LER 90-025-00
Docket No. 50-333

ELECTRIC BAY UNIT COOLERS

67UC-16A

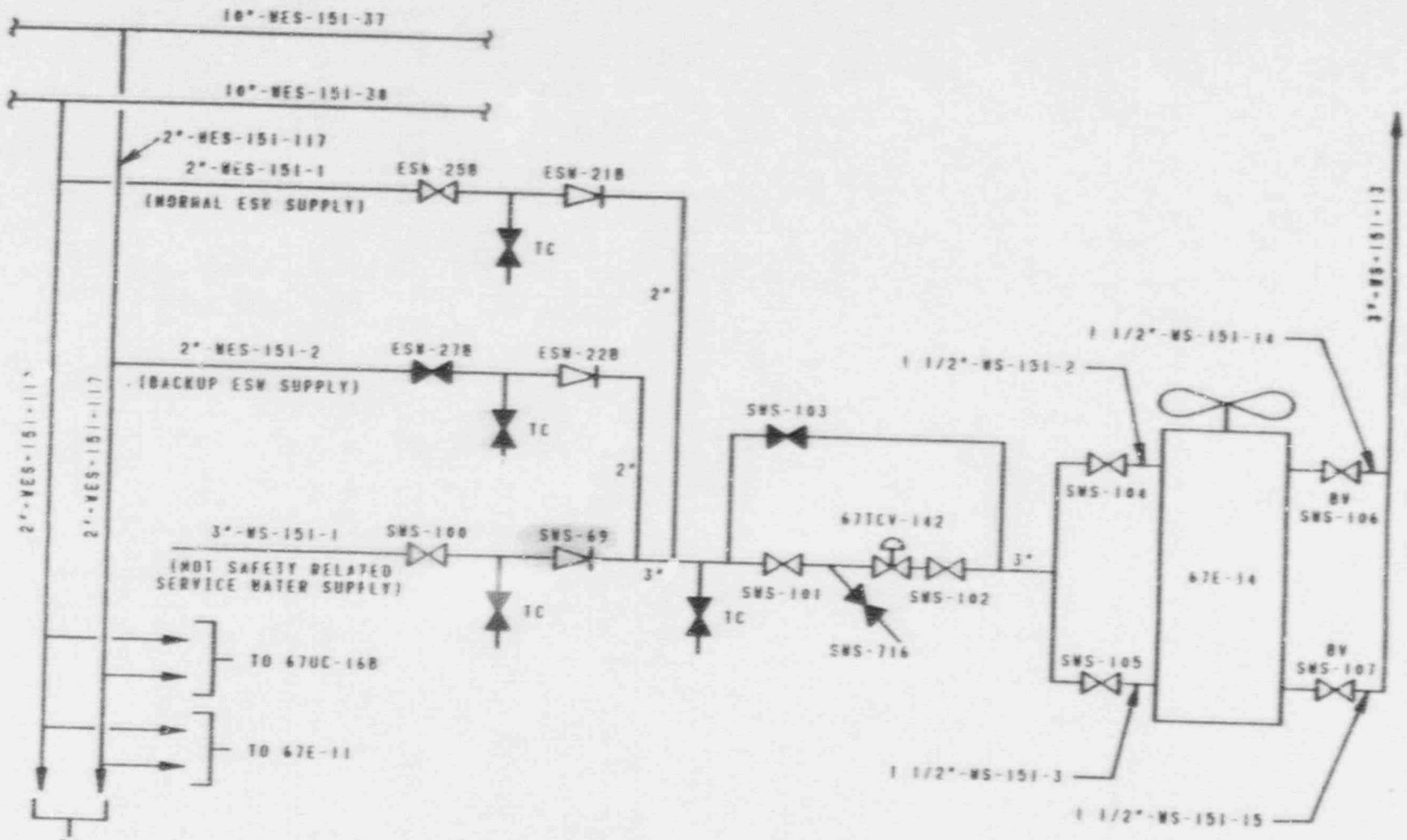
Figure 2 to
LER 90-025-00
Docket No. 50-333



ELECTRIC BAY UNIT COOLERS

67UC-16B

Figure 3 to
LER 90-025-00
Docket No. 50-323



NOTES

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3. B.V. - BALANCE VALVE

CABLE TUNNEL/SWITCHGEAR ROOM COOLER

67E-14