James A. FitzPatrick
Nuclear Power Plant
P.O. Box 41
Lycoming, New York 13093
315 342-3840

New York Power Authority

Harry P. Salmon, Jr.
Resident Manager

August 5, 1992
JAFP-92-0580

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

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: 90-025-02
Service Water Check Valves

Dear Sir:

This revised Licensee Event Report is submitted in accordance with 10 CFR 50.73 (a)(2)(vii).

This revision is an update to the previous report due to additional information obtained for the cause of the check valve failures, to clarify information, editorial changes and change the corrective action taken. Also, the previous report was submitted as a voluntary report.

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

Very truly yours,

HARRY P. SALMON, JR.

HPS:CJP:llm

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

Cert # P 064 705 241

IE22 1/1

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

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 1 2

TITLE (4) FIVE SERVICE WATER TO EMERGENCY SERVICE WATER SWING CHECK VALVES FAIL TO CLOSE DURING TESTING

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)
										0 5 0 0 0
1 1	1 5	9 0	9 0	0 2 5	0 2	0 6	2 6	9 2		0 5 0 0 0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
	N	20.402(b)	20.406(c)	60.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	1 0 0	20.406(a)(1)(i)	60.36(c)(1)	60.73(a)(2)(v)	73.71(c)
		20.406(a)(1)(ii)	60.36(c)(2)	X 60.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.406(a)(1)(iii)	60.73(a)(2)(i)	60.73(a)(2)(viii)(A)	
		20.406(a)(1)(iv)	60.73(a)(2)(ii)	60.73(a)(2)(viii)(B)	
		20.406(a)(1)(v)	60.73(a)(2)(iii)	60.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
MR. CHRISTOPHER J. PONZI	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	
X	K G		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)

Updated Report - Previous Report Date 12/17/90 and 01/25/91

EIIS Codes are in []

On 11/15/90 and 12/26/90 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 on 11/15/90. Two additional valves failed on 12/26/90. Following the initial tests, four of the five valves closed when tapped with a tool handle. The valves supply service water (SWS) [KG] to nine area ventilation unit coolers located in spaces containing safety-related electrical switchgear and emergency core cooling system equipment. The valves are intended to close upon loss of service water pressure to prevent diversion of the emergency service water (ESW) [BI] supply away from the coolers. The as-found stuck open valve condition could have resulted in lower than required flows of service water to coolers than stated in the FSAR. On 11/16/90, 12/27/90 and 4/2/91 carbon steel valve internals were replaced with stainless steel components to avoid corrosion problems which contributed to the sticking condition.

Related LERs: 88-055, 88-009, and 90-012.

EIIS Codes are in []

Updated Report - Previous Report Date 12/17/90 and 1/25/91

Description

The plant was operating at full power on November 15, 1990 and December 26, 1990. As a part of an accelerated ASME Section XI In-Service Testing (IST) program, 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 on 11/15/90. One 3-inch and one 4-inch valve did not close on 12/26/90.

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 emergency service water (ESW) [BI] flow.

During normal operation service water (SWS) [KG] flows through each of the check valves to supply unit coolers. The unit coolers remove heat from four rooms containing safety-related electrical switchgear and cable and emergency core cooling system equipment. On 11/15/90 at 1045 hours check valve 46SWS-67B failed to close after two tests. 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 on 11/15/90 at 1200 hours and 1245 hours respectively and then closing during the retest after they had been tapped with the wrench handle while they were isolated in the test configuration. Similar results (except that 46SWS-60A did not close) were observed on 12/26/90 at 2105 hours and 2130 hours respectively when valves 46SWS-68 and 46SWS-60A were tested and initially failed.

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.

On 11/16/90 at 0640 hours the unit cooler for the west electric bay was removed from service to facilitate inspection and repair of valve 46SWS-67A. This placed the plant in a Limiting Condition for Operation (LCO). The carbon steel internals were replaced with stainless steel components. The valve was retested and closed satisfactorily. The unit cooler was restored to service on 11/16/90 at 1500 hours ending the LCO. On 11/16/90 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 carbon steel 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 11/16/90 at 2107 hours.

On 12/27/90 at 0950 hours the unit cooler for the west cable tunnel was removed from service to facilitate inspection and repair of valve 46SWS-68. This placed the plant in a 24-hour LCO in accordance with Technical Specification Section 3.5. The hinge pin and carbon steel swing arm were replaced with stainless steel components. The disc was replaced with carbon steel due to the unavailability of stainless steel parts.

On 12/27/90 at 1050 hours the ten unit coolers located in both the east and west crescent areas were removed from service to facilitate inspection and repair of 4-inch header swing check valve 46SWS-60A. This is also an 24-hour LCO in accordance with Technical Specification Sections 3.11.B and 3.5. The internals of this valve were replaced with stainless steel components.

On 12/27/90 at 1615 hours the west cable tunnel cooler was returned to service and post-work testing of valve 46SWS-68 was completed satisfactorily. The post-work testing of 46SWS-60A was completed satisfactorily. The ten east and west crescent area unit coolers were returned to service ending the LCOs on 12/27/90 at 1950 hours.

On 4/2/91 while the plant was in the cold shutdown condition, the carbon steel disc of 46SWS-68 was replaced with a stainless steel disc. The carbon steel hanger arm was previously replaced with a stainless steel part. Post work testing was satisfactorily completed on 4/5/91. The disc was replaced as a preventative measure.

Cause

The event was caused by the failure of the swing check valve discs to fully close under test conditions. 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. Originally the cause of the check valve failures was attributed to friction in the hanger arm/hinge pin due to corrosion products and silt. However, testing of 46SWS-68 after the hanger arm was replaced with stainless steel and prior to replacing the carbon steel disc with a stainless steel part, showed this valve to have a tendency to stick open momentarily prior to closing under reverse flow conditions. The other valves which had the internals replaced with all stainless steel parts did not exhibit this behavior. Review of the valve design, materials and configuration

determined that the cause of the swing check valve failures was corrosion bonding between the carbon steel valve disc stud and the carbon steel valve body. The disc stud is used as the disc stop against the valve body. Replacing the internals of these valves with stainless steel parts corrected the problem described in this report.

As reported in LER-90-012, each of these five valves had previously been found stuck in a partially open position during inspection during the spring 1990 outage. They had closed satisfactorily during each of the four monthly surveillance tests prior to 11/15/90 and three times at two week intervals prior to the event on 12/26/90.

Analysis

This event is reportable under the provisions of 10CFR50.73 (a)(2)(vii). That is, an event which caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a system. In this case two independent trains could have been inoperable in the ESW system during the 11/15/90 event. The 12/26/90 event affected only the A train equipment (division 1). Available ESW flow to some coolers could have been less than the values assumed in the FSAR.

Four valves of this event, 46SWS-67A, 67B, 68 and 69, supply cooling water to four area unit coolers. These heat exchangers provide area ventilation cooling for portions of the 4 KV, 120 VAC, 600 VAC switchgear [FA, 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 west and east cable tunnels (Safety Divisions 1 and 2) including both EDG [EK] switchgear rooms.

The coolers are designed to remove the normal heat load, which is approximately 40% greater than the post-accident heat load for the electric bays and 330% 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 exchangers.

Flow diagrams showing the SWS and ESW supply to each heat exchanger are attached as Pages 8 through 11. 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 crescent area unit cooler heat exchangers provide cooling for portions of the emergency core cooling system (ECCS) [BJ, BM, BN, BO] equipment located in the reactor building west crescent (Safety Division 1) (see Page 12). The coolers are arranged in a bank of five (5).

Each cooler approximates a counterflow air to water heat exchanger. The tubes of each heat exchanger are normally provided with service water through a 6-inch header that tees off in two 4-inch headers (1 per division). The 4-inch header contains the 4-inch swing check valve (46SWS-60A) which initially failed to close under test conditions. Downstream of this valve the header has five tee connections into 2-1/2-inch supply lines to each cooler. The ESW supply also ties into the same header downstream of the failed check valve. Upon initiation of the ESW, the service water check valve 46SWS-60A is designed to close to prevent diversion of ESW from the unit coolers.

During the 11/15/90 event, one division of cable tunnel/switchgear room coolers and both divisions of electric bay unit coolers were affected due to their respective service water to ESW check valves failing to close. The 12/26/90 event resulted in one cable tunnel/switchgear room cooler (division 1) and the same division of crescent area unit coolers being affected due to failure of their respective service water to ESW check valves. The division 2 cable tunnel/switchgear room cooler and crescent area unit coolers were available during the 12/26/90 event.

The swing check valves in the SWS were operable in the open position and supplied adequate cooling water flow to the electric bay, cable tunnel area ventilation unit coolers and west crescent area 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 period of time until the SWS supply lines to the unit coolers could have been isolated by closing local manual valves.

The isolation valves (for the four SWS check valves supplying the electric bay unit coolers and cable tunnel/switchgear room coolers) are in an accessible portion of the turbine building. Annunciators in the control room and at the local heating and ventilation panels would alert operators of a high temperature condition in the electric bays and cable tunnels due to a stuck open check valve following transfer to the ESW supply to the coolers. Also, normal operator walkthrough

monitoring of the spaces cooled by the heat exchangers would contribute to identifying a potentially stuck open check valve. Operator action could then be taken to mitigate the consequences of the flow diversion from the coolers.

The isolation valve for the west crescent area check valve is located in the reactor building. Access to this valve could be prevented by a post LOCA environment.

The normal service water system could be lost due to piping failure (i.e., from a seismic event) or loss of the non-safety related service water pumps. It was demonstrated during the surveillance test that a tap of a wrench of the valve bonnet was sufficient to result in closure of four of the five valves. An event of sufficient magnitude to shear a 3-inch supply line would probably have been of sufficient force to loosen the valve disc 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. A loss of SWS pressure could have resulted in lower than required ESW flow rates to the electric bay unit coolers, cable tunnel/switchgear room coolers and the A train crescent area unit coolers.

In contrast to the reduced heat loads during FSAR events in the electric bays and cable tunnels, the crescent area heat loads resulting from events postulated in the FSAR are on the order of five times the heat load present during normal operation. Thus the excess capacity of the electric bay and cable tunnel unit coolers is not present in the crescent area coolers.

In conclusion, there is little flow capacity margin to the A train crescent area coolers. Thus diversion of ESW flow due to the failure of check valve 46SWS-60A to close during some FSAR postulated events could offset a portion of the existing margin available in heat removal capacity. There was, therefore, a possibility of an increased temperature in the west crescent area in excess of that assumed in the FSAR conditions, if the crescent area service water supply check valve had stuck open during accident conditions.

The ability to manually isolate the electric bay unit cooler and cable tunnel/switchgear room cooler check valves (46SWS-67A, 67B, 68 and 69) would have mitigated the consequences of an event and ensured adequate cooling for these four areas.

Corrective Action

1. The valve internals for the five valves were replaced with stainless steel parts.

2. In November 1990, the frequency of surveillance testing was increased from once each month to once every two weeks for the eight SWS to ESW swing check valves which are normally held in the open position by service water flow. This accelerated inspection frequency was able to provide earlier identification of degraded check valve performance and has since been relaxed.

3. Similar swing check valves (SWS to ESW) were verified to have stainless steel internals already installed to prevent recurrence of the corrosion bonding problem. In the previous report for this event, it was stated that the check valves would be replaced. However, since the actions taken to mitigate the corrosion bonding problem have corrected the situation, the check valves will not be replaced.

Additional Information

Failed Component Data:

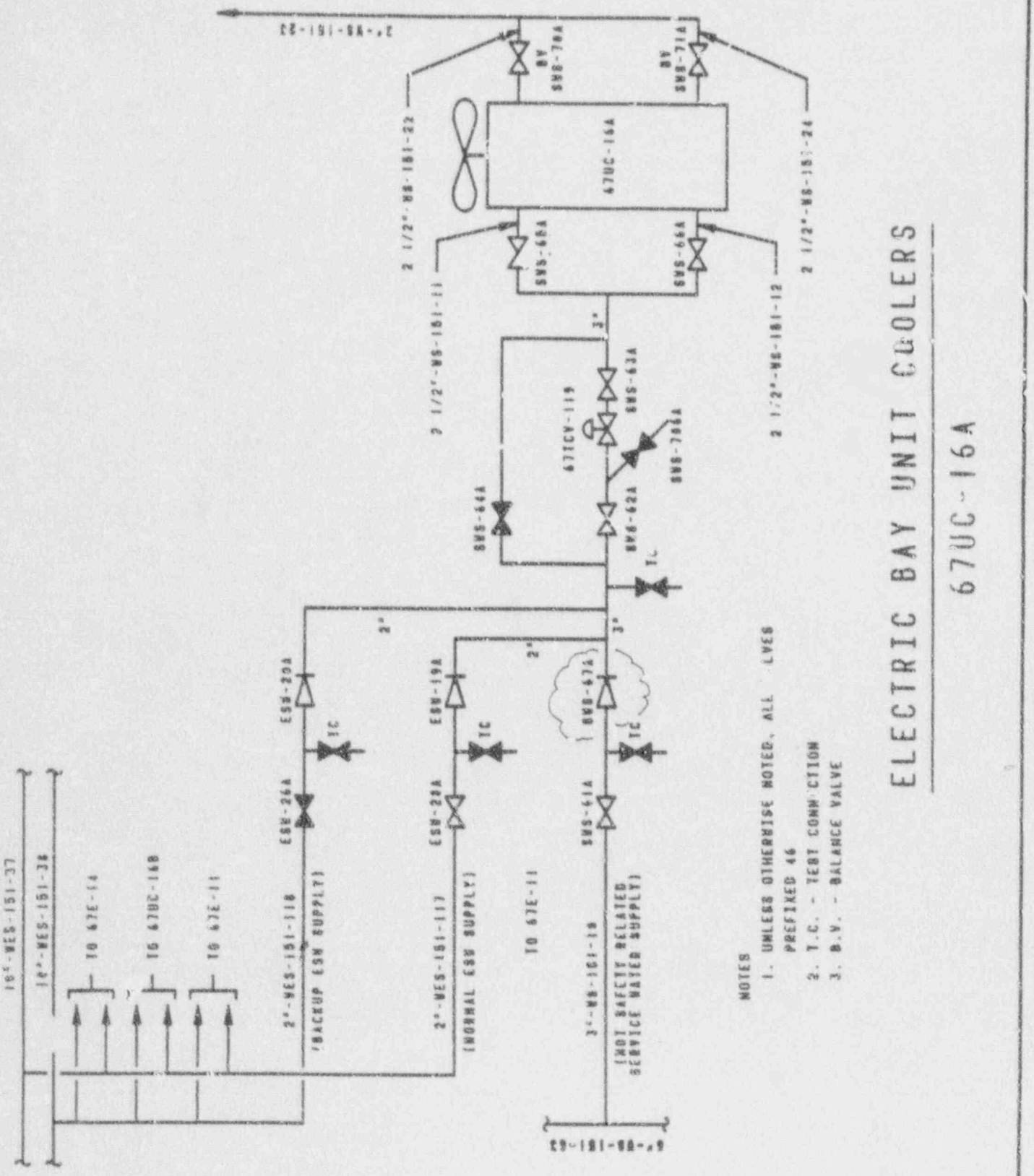
Name:	Service Water Check Valves
Description:	Swing Check Valve
Function:	Prevent emergency service water diversion to the normal service water system in the event of loss of service water pressure.
Plant Component Identification:	46SWS-60A, 67A, 67B, 68, and 69
Manufacturer:	Velan Valve Corporation
Model:	F-10-0114B-2T and B10-0114B-2T
Pressure Rating:	150 psig
Size:	3-Inch and 4-Inch
Material:	Carbon Steel
NPRDS Vendor Code:	V085
NPRDS Component Code:	VALVE
IEEE Component Code:	V

Similar Events: LERs 88-005, 83-009, 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.

Reason for Update: This report has been updated due to additional information obtained for the cause of the check valve failures, to clarify information, editorial changes and to change the corrective actions taken. Also, the previous report was submitted as a voluntary report.

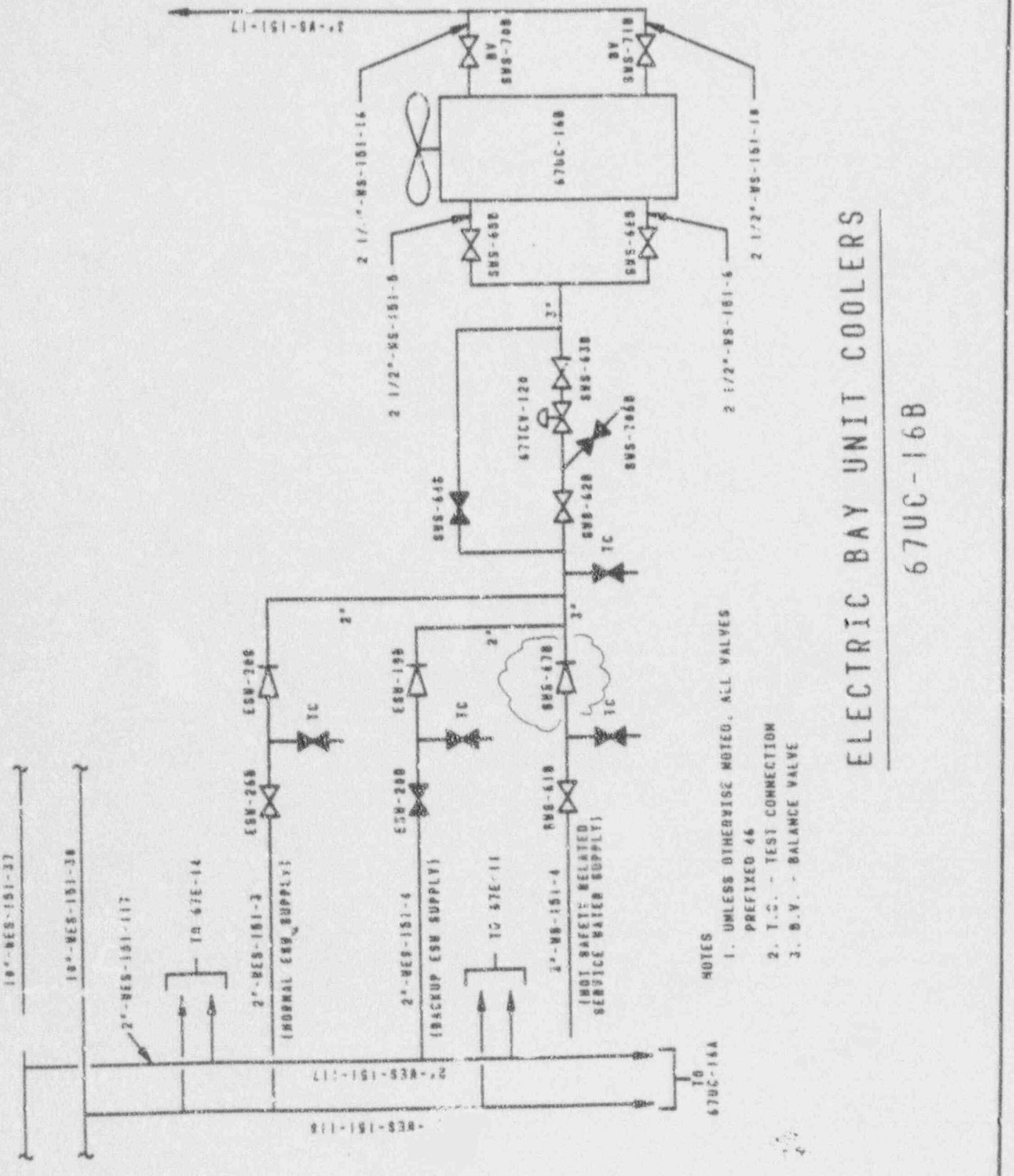
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
JAMES A. FITZPATRICK NUCLEAR POWER PLANT	0 5 0 0 0 3 3 3	9 0	— 0 2 5	— 0 2	0 1 8 OF 1 2

TEXT (If more space is required, use additional NRC Form 366A's) (17)



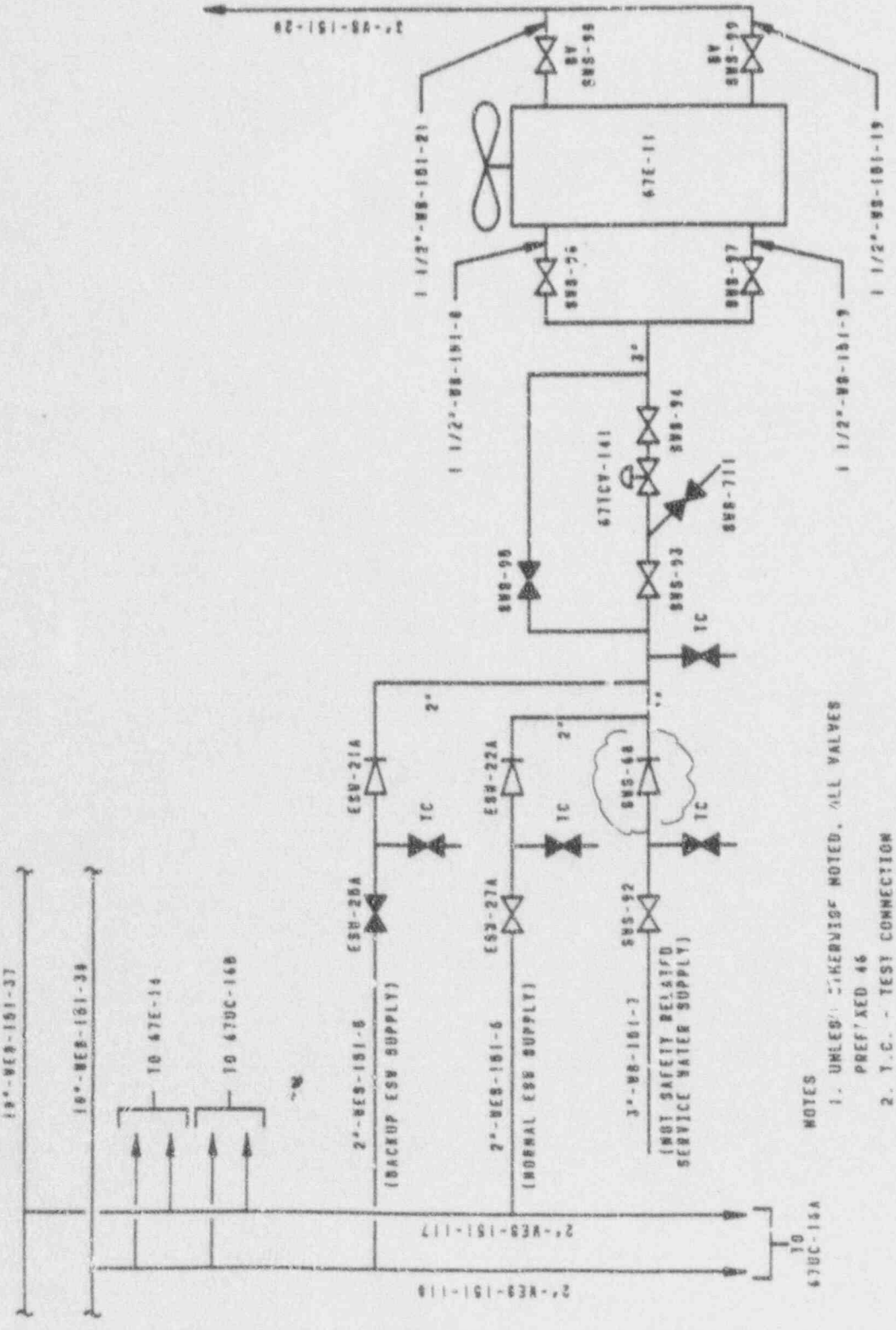
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
JAMES A. FITZPATRICK NUCLEAR POWER PLANT	0 5 0 0 0 3 3 3	9 0	— 0 2 5	— 0 2	0 9 OF 1 2

TEXT (If more space is required, use additional NRC Form 366A's) (17)



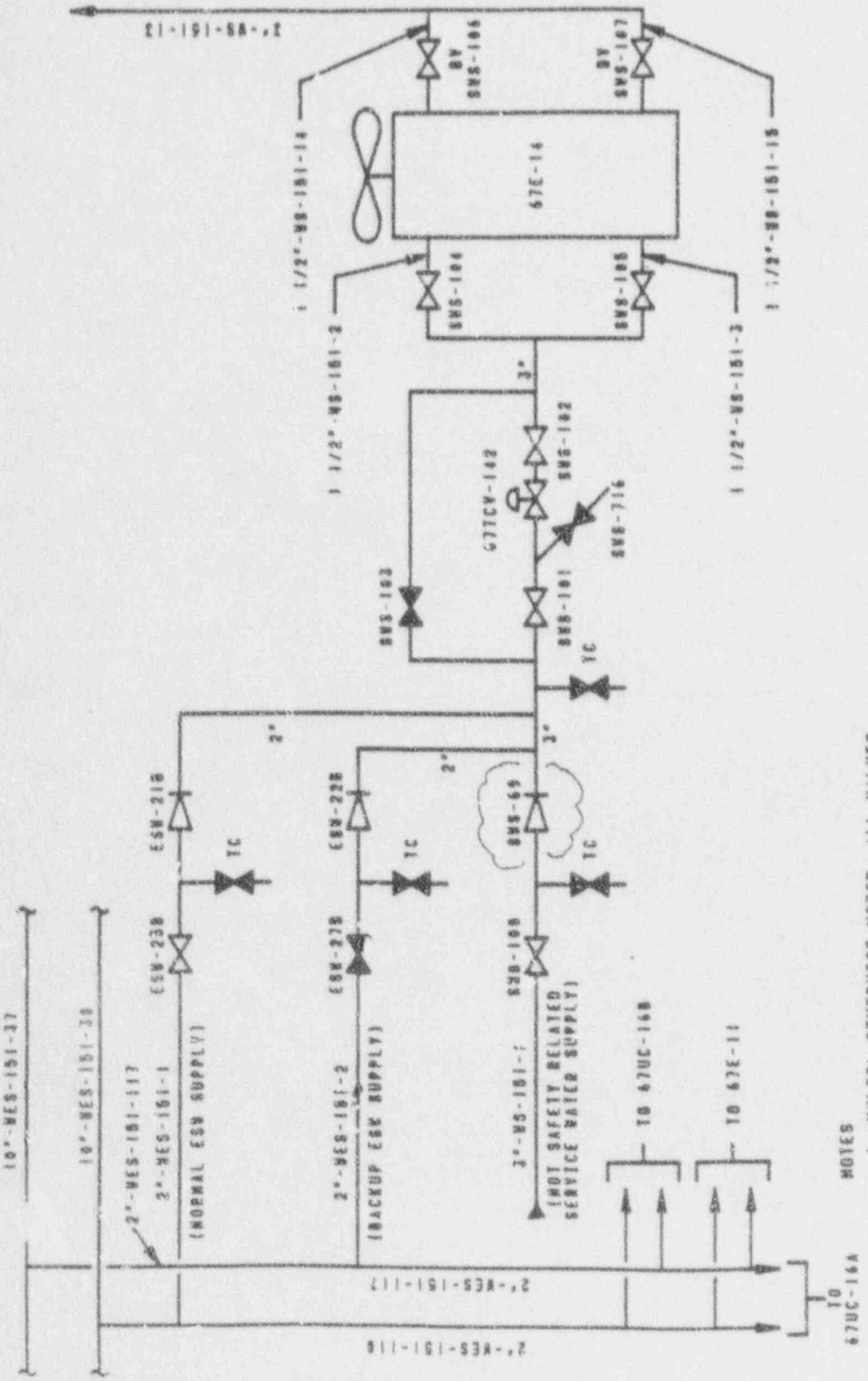
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
JAMES A. FITZPATRICK NUCLEAR POWER PLANT	0 5 0 0 0 3 3 3	9 0	— 0 2 5	— 0 2	1 0 OF 1 2

TEXT (If more space is required, use additional NRC Form 366A's) (17)



FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
JAMES A. FITZPATRICK NUCLEAR POWER PLANT	0 5 0 0 0 3 3 3	9 0	— 0 2 5	— 0 2	1 1 OF 1 2

TEXT (If more space is required, use additional NRC Form 366A's) (17)



FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
JAMES A. FITZPATRICK NUCLEAR POWER PLANT	0 5 0 0 0 3 3 3	9 0	— 0 2 5	— 0 2	1 2 OF 1 2

TEXT (If more space is required, use additional NRC Form 366A's) (17)