

# PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION  
 P. O. BOX A  
 SANATOGA, PENNSYLVANIA 19464

(215) 327-1200 EXT. 2000

M. J. McCORMICK, JR., P.E.  
 PLANT MANAGER  
 LIMERICK GENERATING STATION

May 21, 1990  
 Docket Nos. 50-352  
 50-353  
 License Nos. NPF-39  
 NPF-85

U.S. Nuclear Regulatory Commission  
 Attn: Document Control Desk  
 Washington, DC 20555

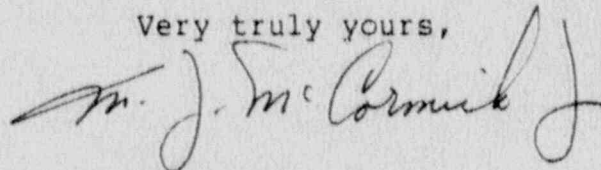
SUBJECT: Licensee Event Report  
Limerick Generating Station - Units 1 and 2

This LER reports a condition where the 'B' Loop of the Emergency Service Water (ESW) system was inoperable resulting in several safety systems being in a condition that could have prevented them from performing their safety functions. This also resulted in independent trains in multiple systems being inoperable due to a single cause and resulted in a condition prohibited by Technical Specifications. This condition resulted from a personnel error that occurred during maintenance of the 'B' ESW pump discharge check valve.

Reference: Docket Nos. 50-352  
 50-353  
 Report Number: 1-90-011  
 Revision Number: 00  
 Event Date: April 20, 1990  
 Report Date: May 21, 1990  
 Facility: Limerick Generating Station  
 P.O. Box A, Sanatoga, PA 19464

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(v)(D), 10 CFR 50.73(a)(2)(vii), and 10 CFR 50.73(a)(2)(i)(B).

Very truly yours,



DMS:nlk

cc: T. T. Martin, Administrator, Region I, USNRC  
 T. J. Kenny, USNRC Senior Resident Inspector, LGS

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Limerick Generating Station, Unit 1	DOCKET NUMBER (2) 0   5   0   0   0   3   5   2	PAGE (3) 1 OF 1   1
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TITLE (4) The 'B' ESW System Loop was Inoperable Due to a Partially Stuck Open 'B' ESW Pump Discharge Check Valve Resulting from a Personnel Error during Maintenance

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	4	20	9	0	0	0	1	1	0	0	0	0	5	0	0	0	3	5	3		
0	4	20	9	0	9	0	0	0	0	5	2	1	9	0	0	5	0	0	0		

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)									
POWER LEVEL (10) 11010	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(e)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)						
	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.38(a)(1)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)						
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.38(a)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 306A)						
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)							
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							
<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(vi)								

LICENSEE CONTACT FOR THIS LER (12)									
NAME G. J. Madsen, Regulatory Engineer, Limerick Generating Station							TELEPHONE NUMBER 2   1   5   3   2   7   -   1   2   0   0		

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS

SUPPLEMENTAL REPORT EXPECTED (14)							EXPECTED SUBMISSION DATE (15)		
<input type="checkbox"/> YES (if yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO									

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

On April 20, 1990, during post maintenance testing of the 'B' Emergency Service Water (ESW) pump discharge check valve, operators discovered that the check valve was not preventing reverse flow. An operator found that the check valve disc actuating arm was in the normal/neutral position and pinned. However, the pinned actuating arm was restricting the full closure of the valve disc. This resulted in the 'B' Loop of ESW being inoperable. Upon removal of the pin from the actuating arm the valve fully closed, and the system was then considered operable. While the 'B' Loop of ESW was inoperable, adequate flow to the loop cooling loads could not have been guaranteed. There was no automatic demand to the 'B' Loop of ESW while this condition existed, and the plant Service Water system was providing adequate cooling water flow to all operating equipment serviced by the 'B' Loop of ESW. The cause of this event was a personnel error in that the actuating arm was incorrectly reassembled. A contributing factor was that the maintenance procedure lacked a step that assured the actuating arm was "match marked" prior to its removal. The incorrectly assembled actuating arm was repositioned to the correct orientation on April 20, 1990. The technicians involved in this event were counseled regarding the need for attention to detail. A procedure will be revised to include a procedural step to "match mark" the actuating arm prior to its removal. A walkdown inspection of all other check valves of this type was conducted and no other similar problems were found.



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TEXT IF more space is required, use additional NRC Form 200A's (17)

Unit Conditions Prior to the Event:

	<u>Unit 1</u>	<u>Unit 2</u>
Operating Condition:	1	1
Power Level:	100%	100%

On April 19, 1990, the 'B' Emergency Service Water (ESW) pump was out of service with maintenance work being performed on the 'B' ESW pump discharge check valve. The maintenance work was completed on April 20, 1990, and at 0120 hours operations personnel initiated the post maintenance testing of this check valve utilizing Surveillance Test (ST) ST-6-011-232-0, "B Loop ESW Pump, Valve, and Flow Test."

Description of the Event:

On April 20, 1990, at 0330 hours, procedure ST-6-011-232-0 was being performed for post maintenance testing of the 'B' ESW (EIIS:BI) pump discharge check valve (EIIS:ISV,BFP), 11-0001B. Step 6.5.24 of this procedure requires the operator to check that while the 'D' ESW pump is operating, the 'B' pump is not reverse rotating, verifying that check valve 11-0001B is properly closed. The operator discovered that this check valve was not preventing reverse water flow through the 'B' ESW pump. Upon immediate investigation, a station operator found that the check valve disc actuating arm (EIIS:XCV) was in the normal/neutral position and pinned. Pinning of the actuating arm secures the arm in the normal/neutral position preventing potential personal injury when the check valve opens. However, the pinned actuating arm was restricting the full closure of the check valve disc. This resulted in the 'B' Loop of ESW being inoperable. With a single failure of the 'B' ESW pump, the redundant 'D' ESW pump would not have been guaranteed to provide adequate flow to the 'B' Loop of ESW due to the reverse flow through the 'B' ESW pump (refer to Figure 1). Upon removal of the pin (EIIS:66) from the actuating arm at 0350 hours, the check valve fully closed and the 'B' Loop was then considered operable. The 'B' ESW pump discharge check valve was then retested and the station operators verified the check valve was preventing reverse flow. The 'B' ESW pump was then declared operable at 0524 hours on April 20, 1990.

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TEXT (If more space is required, use additional NRC Form 305A's) (17)

On April 20, 1990, at 1130 hours, maintenance personnel determined that the check valve disc actuating arm was incorrectly reassembled following maintenance work performed on the check valve on April 19, 1990. The actuating arm was installed backwards such that when the actuating arm was pinned in the normal/neutral position as directed by the maintenance procedure, the check valve disc was held open off its seat approximately ten degrees (refer to Figures 2 and 3). The actuating arm is not directly connected to the disc and when correctly installed, does not prevent the disc from operating properly. Pinning of the actuating arm does not affect the operation of the disc when properly installed. As a result of the check valve disc being partially opened, the 'B' Loop of ESW was determined to be incapable of performing its intended safety function. This condition existed for two hours and thirty minutes between 0120 hours, when the 'B' ESW pump was unblocked following completion of maintenance work, and 0350 hours, when the pin was removed from the check valve disc actuating arm closing the check valve disc.

The 'B' Loop of ESW provides cooling water to the following equipment:

- o the four (4) heat exchangers for the Unit 1 and Unit 2 Emergency Diesel Generators (EDG)(EIIS:EK) aligned to the 'B' Loop of ESW (D12, D14, D22, D24),
- o the High Pressure Coolant Injection (HPCI)(EIIS:EJ) system pump compartment unit coolers (EIIS:CLR) for both Unit 1 and Unit 2,
- o the common 'B' Control Enclosure chiller (EIIS:VI),
- o the 'B' and 'D' Core Spray (CS)(EIIS:BG) system pump compartment unit coolers for both Unit 1 and Unit 2,
- o the 'B' and 'D' Residual Heat Removal (RHR)(EIIS:BO) system pump compartment unit coolers for both Unit 1 and Unit 2, and
- o the 'B' and 'D' RHR pump motor oil coolers and seal coolers for both Unit 1 and Unit 2.

With the 'B' Loop of ESW inoperable, the Action Statement a.3 for Technical Specifications (TS) Section 3.7.1.2, "Emergency Service Water System," requires that the above stated equipment which is serviced by the 'B' Loop of ESW be declared inoperable. Since



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TEXT IF more space is required, use additional NRC Form 306A (17)

the problem with the check valve was resolved within twenty minutes of discovery, the TS Action Statement for the inoperable equipment was exited at 0350 hours. However, when the 'B' Loop of ESW became inoperable at 0120 hours, the equipment serviced by the 'B' Loop was not declared inoperable since the Main Control Room (MCR) operators were not aware of the check valve condition until 0330 hours. This resulted in a failure to comply with the Action Statements of Unit 1 and Unit 2, TS Section 3.7.1.2.a.3. This also resulted in a failure to comply with the Action Statements of Unit 1 and Unit 2 TS Section 3.8.1.1.a and 3.8.1.1.e (inoperable EDGs) which require actions to be taken within 1 and 2 hours respectively. Additionally, this resulted in failure to comply with TS Section 3.0.3 (TS required plant shutdown) which requires actions to be taken within 1 hour. TS Section 3.0.3 should have been entered since the Action Statements of TS Section 3.5.1 (Emergency Core Cooling Systems) could not be met.

A four (4) hour notification was made to the NRC in accordance with the requirements of 10 CFR 50.72 (b)(2)(iii)(D) on April 20, 1990, at 0710 hours, since this event resulted in a condition that alone could have prevented the fulfillment of the Unit 1 and Unit 2 HPCI systems (single train safety system) from performing their safety related functions. This event also resulted in independent trains becoming inoperable in multiple systems (RHR, CS and EDGs systems) due to a single cause. Additionally, this event resulted in a condition prohibited by TS. Therefore, this report is being submitted in accordance with the requirements of 10 CFR 50.73(a)(2)(v)(D), 10 CFR 50.73(a)(2)(vii), and 10 CFR 50.73(a)(2)(i)(B).

#### Consequences of the Event:

The consequences of this event were minimal in that no radioactive material was released to the environment as a result of the open 'B' ESW pump discharge check valve. This condition was identified and immediately corrected during the post maintenance testing of the 'B' ESW pump. This minimized the amount of time that the adverse condition could have impacted operations. There was no automatic demand to the 'B' Loop of ESW during the time period in which this condition existed. Additionally, during this event, the plant Service Water system

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TEXT (If more space is required, use additional NRC Form 266A's (17))

(EIIS:KG) was providing adequate cooling water flow to all of the operating equipment serviced by the affected 'B' Loop of ESW.

Had an event occurred in which the 'B' Loop of ESW was called upon to perform its required design function and the 'B' ESW pump failed, adequate cooling water flow to the equipment serviced by the 'B' Loop of ESW could not have been guaranteed. With the 'B' ESW pump discharge check valve not fully seated, the discharge water flow from the 'D' ESW pump could have been diverted into the Spray Pond through the idle 'B' ESW pump. The diverted water flow through the partially opened check valve could have reduced the 'B' Loop of ESW cooling water flow rates and could have prevented the associated systems from performing their safety functions. The degraded system operation would have been detected by the MCR operators observing the lower than expected flow indication on the MCR flow indicator for the 'B' Loop of ESW. Also, lower than normal flow rates through the heat exchangers for the EDG would have been observed by the MCR operators during EDG operation. Even with this degraded condition, the redundant 'A' Loop of ESW was available to provide cooling to sufficient safety related systems to ensure safe shutdown of the two units.

Cause of the Event:

The cause of this event was personnel error. The maintenance reassembly work on the 'B' ESW pump discharge check valve occurred during two working shifts. The technician working on the first shift was experienced with the repair and assembly of this type of check valve with an actuating arm. However, while the technician was reassembling the check valve, he inadvertently installed the actuating arm 180 degrees horizontally out of position (refer to Figures 2 and 3). The reassembly of the check valve continued into the second shift, and the work package was then turned over to the second shift technician with a few minor items to complete. The second shift technician was familiar with general check valve repair, however, he had not received any specific training nor did he have any experience with the repair of this particular type of check valve with an actuating arm. The few minor items remaining required no specific knowledge of the check valve in question, provided that the work done previously was correct. One of the last items the technician had to complete was the pinning of the check valve



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TEXT (If more space is required, use additional NRC Form 356A's (17))

disc actuating arm. Due to a lack of experience and believing the actuating arm was correctly installed by the first shift technician, the second shift technician pinned the actuating arm to the valve bracket causing the valve disc to lift off its seat approximately ten degrees.

A contributing factor to the cause of this event was that the maintenance procedure, PMQ-500-073, "Preventive Maintenance Procedure for Q-listed Anchor Darling Bolted Donnet Swing Check Valve with Test Levers, Repair, Lap," lacked a procedural step that assured the actuating arm was "match marked" for proper reinstallation orientation prior to its removal.

Corrective Actions:

Operations personnel removed the pin from the 'B' ESW pump discharge check valve disc actuating arm on April 20, 1990, at 0350 hours, correcting the immediate problem. The 'B' Loop of ESW was then considered operable. Following completion of procedure ST-6-011-232-0, at 0524 hours on April 20, 1990, the 'B' ESW pump was declared operable. On April 20, 1990, at 1400 hours, maintenance technicians repositioned the incorrectly assembled actuating arm to the correct orientation.

Actions Taken to Prevent Recurrence:

The following actions are being implemented to prevent recurrence of a similar event.

- o The maintenance technicians involved in this event were counseled regarding the need for attention to detail. This event will be discussed with all plant maintenance technicians directly involved with valve repair work with the emphasis placed on the need for attention to detail during the bi-weekly maintenance group meetings to be conducted by May 31, 1990.
- o Preventive Maintenance procedure, PMQ-500-073, will be revised to include a procedural step to "match mark" the disc actuating arm prior to its removal. Additionally, two

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

procedural notes will be included to assure that no excessive force is exerted when pinning the disc actuating arm to the arm bracket, and a note to emphasize the importance of installing the actuating arm correctly.

PMQ-500-073 is presently undergoing its five year revision. This one procedure encompasses the four types of Anchor Darling check valves and will be superseded by four individual procedures for each check valve. Each procedure will include the procedural step and the two notes described above. These procedures will be completed and implemented by August 31, 1990.

- o A plant walkdown inspection of all other Anchor Darling check valves with disc actuating arms of this type was conducted to assure that the actuation arms are properly assembled and pinned. This walkdown was completed on May 16, 1990, and no other check valves of this type have similar problems.

Surveillance tests are performed following maintenance of all check valves in safety related systems. This testing verifies proper operation of the valve prior to restoring the system to normal operation. Therefore, there is no generic concern regarding other safety related check valves in the plant being partially open due to maintenance work. However, it must be recognized that whenever a system is being returned to service following maintenance work, there is a potential for problems to be identified whenever post maintenance testing is performed.

In addition to the actions stated above, the following actions will be taken to ensure that post-maintenance testing is performed as expeditiously as possible to minimize the interval between removal of equipment blocking and identification of equipment inoperability.

- o Operations will issue a "Shift Training Bulletin" describing this event and the potential for equipment damage due to delays in detecting equipment problems following maintenance. This bulletin will be issued by May 30, 1990.
- o Operations will review and revise as necessary the applicable guidance for post-maintenance testing of the ESW system to ensure that this testing is performed expeditiously and check valve problems are promptly identified. This action will be completed by June 30, 1990.



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

- o Similar systems will be reviewed for generic implications and the applicable guidance will be revised as necessary. This action will be completed by August 15, 1990.

Previous Similar Occurrences:

None

Tracking Codes: A - Personnel Error

FACILITY NAME (1)

BUCKET NUMBER (2)

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Limerick Generating Station, Unit 1

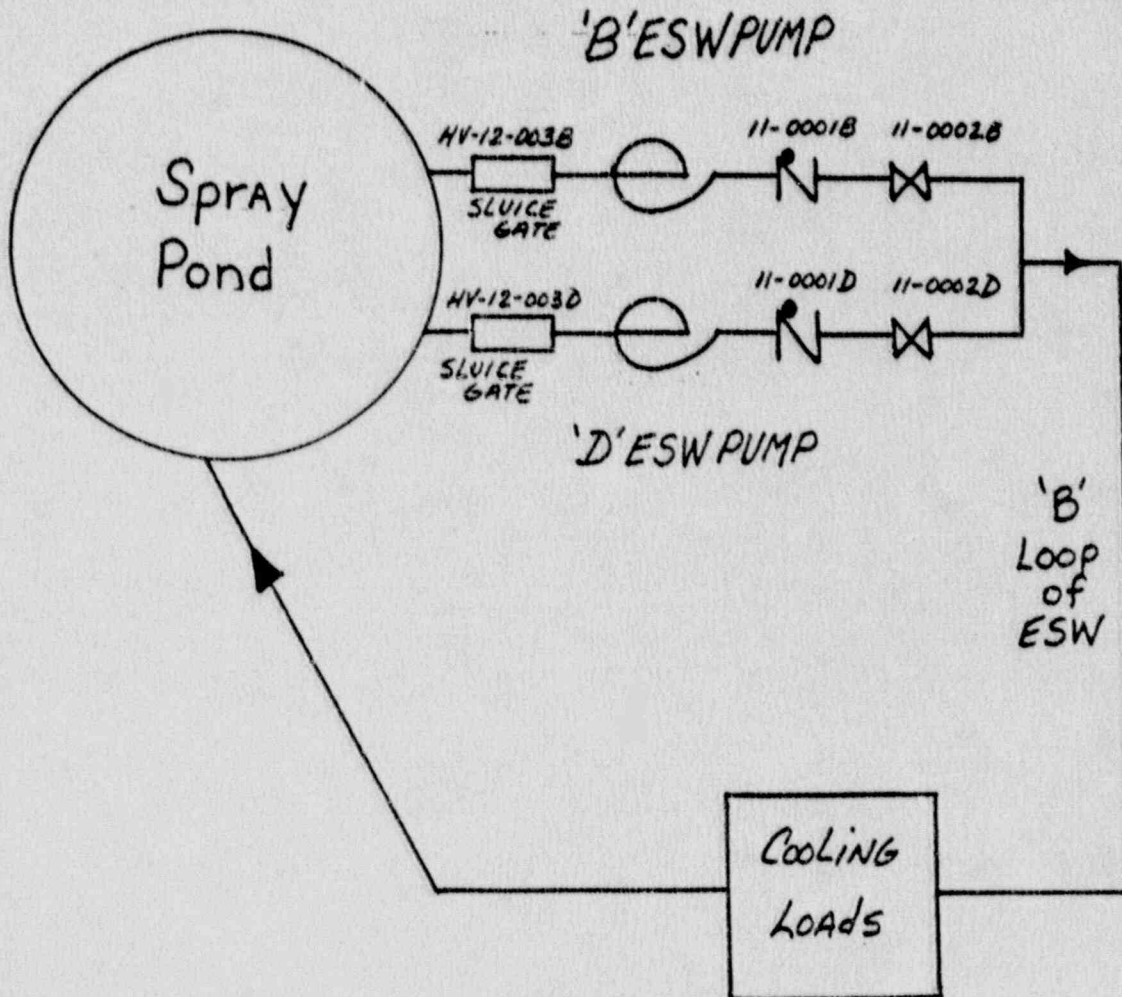
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TEXT *if more space is required, use additional NRC Form 366A (2/1/77)*

FIGURE 1

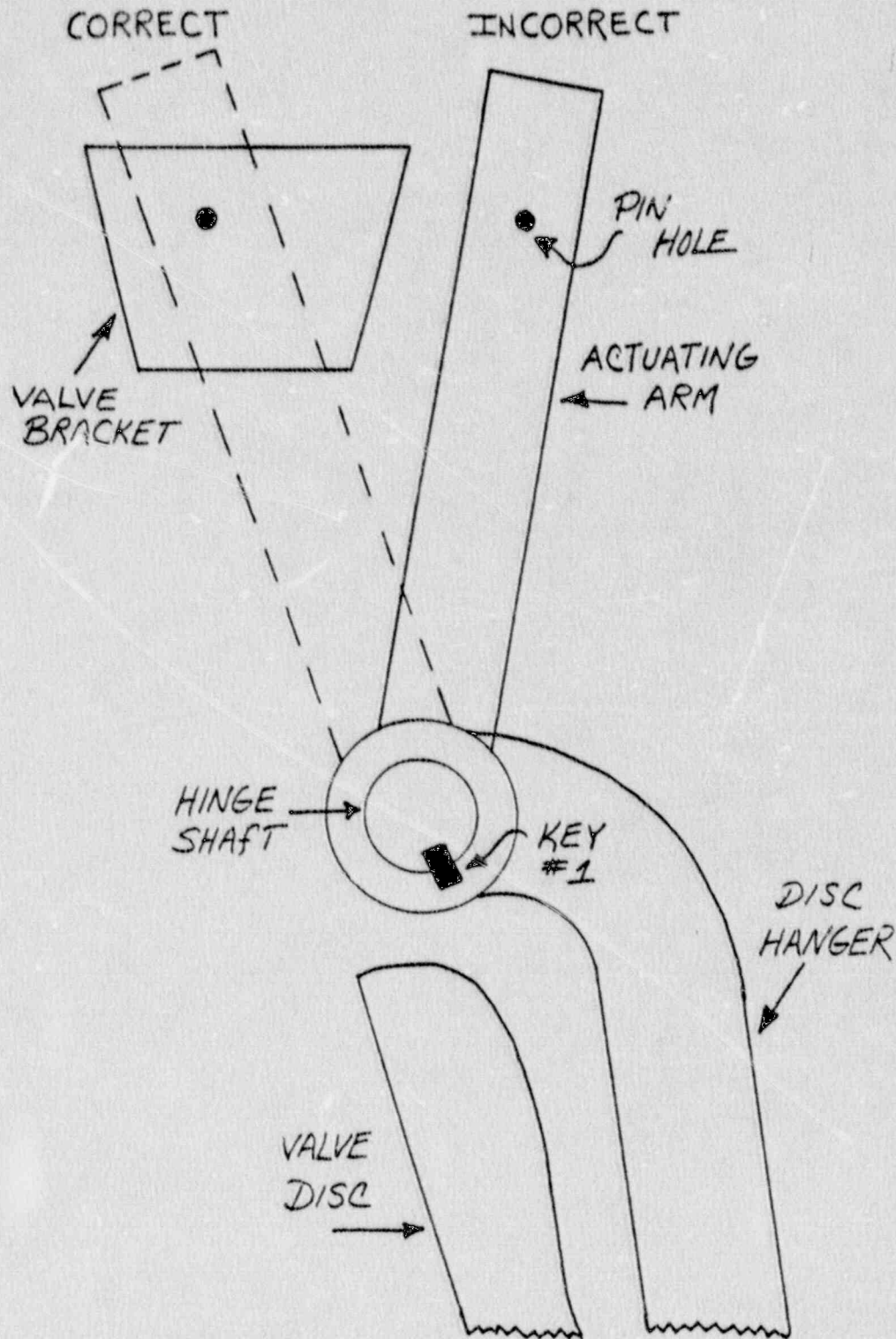




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FIGURE 2



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FIGURE 3

