Northeast
Utilities System

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August 30, 1996

Docket No. 50-423
B15846

Re: 10CFR50.73(a)(2)(i)
10CFR50.73(a)(2)(ii)(B)

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

This letter forwards a Licensee Event Report 96-012-01, which provides additional information on a condition identified May 15, 1996 for Millstone Unit No. 3. The supplement updates LER 96-012-00 which was submitted pursuant to 10CFR50.73(a)(2)(i) and 10CFR50.73(a)(2)(ii)(B).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

M. H. Brothers
Unit Director, Millstone Unit No. 3

Attachment: LER 96-012-01

cc: H. J. Miller, Region I Administrator
A. C. Cerne, Senior Resident Inspector, Millstone Unit No. 3
V. L. Rooney, NRC Project Manager, Millstone Unit No. 3

IE22

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Millstone Nuclear Power Station Unit 3	05000423	1 of 9

TITLE (4)

Containment Leakage in Excess of Technical Specification Limits Due to Valve Leakage

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	15	96	96	012	01	08	30	96	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	000	20.2201(b)	20.2203(a)(2)(v)	[X] 50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	[X] 50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
R. T. Laudenat, Nuclear Licensing Supervisor	(860)444-5248

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	MONTH	DAY	YEAR
[ ] YES (If yes, complete EXPECTED SUBMISSION DATE).	[X] NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 15, 1996, while performing containment penetration Local Leak Rate Tests (LLRTs) with the plant in cold shutdown, the leak rate for containment isolation valves exceeded the Technical Specification limit. The leakage through a High Pressure Safety Injection (SIH) valve, when combined with previously determined leakage for other penetrations, exceeded the Technical Specification limit of $0.6L_a$ (294,800.2 sccm).

Subsequent to May 15, 1996, the LLRTs performed on other isolation valves revealed additional leakage that further contributed to exceeding the Technical Specification limit. The valves that were major contributors to the total leak rate were those located on a containment Recirculation Spray (RSS) line, a Hydrogen Recombiner (HCS) line, a containment Quench Spray (QSS) line, the Containment Purge (HVU) supply line, and a Low Pressure Safety Injection (SIL) line.

On May 29, 1996, during the performance of LLRTs, an additional "as-found" leakage resulted in the total exceeding an analyzed condition. The leakage through valves on the HVU line was unquantifiable due to excessive leakage. Thus, an immediate notification was made on May 29, 1996, pursuant to 10CFR50.72(b)(2)(i) for an event found while shutdown, that if found while operating, would have resulted in an unanalyzed condition that significantly compromises plant safety.

The cause is attributed to boric acid buildup during the test sequence on the QSS and RSS valves. Foreign particulate is the attributed cause on the SIH, SIL, and HCS valves. A single root cause for the failure of the HVU valve could not be conclusively determined. The corrective action was flushing for the boron and particulate, and readjusting for the HVU seal. To prevent recurrence the testing and flushing procedures will be revised.

I. Description of Event

On May 15, 1996, while performing containment penetration Local Leak Rate Tests (LLRTs) with the plant in cold shutdown, the leak rate for containment isolation valves exceeded the Technical Specification limit. The leak rates through a high pressure safety injection isolation valve and a low pressure safety injection isolation valve, when combined with previously determined leakage for other penetrations, exceeded the Technical Specification 3.6.1.2.b Type C limit of $0.6L_a$ (294,800.2 sccm).

The subsequent LLRTs performed on other containment isolation valves revealed additional "as-found" leak rates that further contributed to exceeding the Technical Specification limit. The isolation valves that were major contributors to the total leak rate were those associated with: a containment quench spray line, a high pressure safety injection line, a containment Recirculation spray line, a hydrogen recombiner line, the containment purge supply line, and a low pressure safety injection line. Each of the major contributors to the total leak rate is described below.

- On May 10, 1996, the LLRT leakage through the inboard isolation check valve (3QSS*V4) on the Containment Quench Spray line (12-inch) penetration #100 was 156,000 sccm. This leakage, added to the "as-found" total for all other valves as of May 10, 1996, had not exceeded the Technical Specification limit, and by itself is not reportable. However, it is included in this LER because it was a major contributor to the total eventually exceeding the Technical Specification limit five days later. See Figure 1. The outboard isolation valve would have maintained containment integrity.

- On May 15, 1996, the combined LLRT leakage through both the inboard isolation check valve (3SIL*V13) on the Low Pressure Safety Injection line (6-inch) penetration #94; and through the inboard isolation check valve (3SIH*V24) on the High Pressure Safety Injection line (2-inch) penetration #98, was 43,900 sccm. This event, added to the total for all previous LLRTs, exceeded the Technical Specification limit. See Figure 2. The outboard isolation valve would have maintained containment integrity.

- Later on May 15, 1996, the LLRT leakage through the inboard isolation check valve (3RSS*V3) on the Containment Recirculation Spray line (10-inch) penetration #107 was 111,100 sccm. See Figure 3. The outboard isolation valve would have maintained containment integrity.

- On May 24, 1996, the LLRT leakage through the inboard isolation check valve (3HCS*V14) on the Hydrogen recombiner line (2-inch) penetration #114 was 51,900 sccm. See Figure 4. The outboard isolation valve would have maintained containment integrity.

- On May 29, 1996, the LLRT leakage through isolation valves on the Containment Purge supply line was unquantifiable due to excessive leakage. The Containment Purge supply line (42-inch) penetration #86 has three isolation valves, one inboard (3HVU*CTV33A), one outboard (3HVU*CTV32A), and an additional outboard valve on a 30-inch branch line (3HVU*V5). The inboard valve and both outboard valves are tested simultaneously because they cannot be tested independently. See Figure 5. The combined leakage through these three valves was unquantifiable due to excessive leakage that prevented the test pressure from being reached. This leakage alone exceeded the Technical Specification 3.6.1.2.c secondary containment bypass leakage limit of $0.042L_a$ (20,633.9 sccm), and it exceeded the Technical Specification 3.6.1.2.b Type C limit of $0.6L_a$ (294,800.2 sccm). It also resulted in the total leakage exceeding an analyzed condition that had been previously determined. Accordingly, an immediate notification was made on May 29, 1996, pursuant to 10CFR50.72(b)(2)(i) for an event found while shutdown, that if found while operating, would have resulted in an unanalyzed condition that significantly compromises plant safety. No immediate action was required because the plant was in a shutdown condition.

- On June 6, 1996, the LLRT leakage through the inboard isolation check valve (3SIL*V6) on the Low Pressure Safety Injection line (6-inch) penetration #93 was unquantifiable due to excessive leakage that prevented the test pressure from being reached. See Figure 6. The outboard isolation valve would have maintained containment integrity.

The attached Table 1 provides a summary of the leakage rates for these valves which had excess leakage, and it provides a comparison to the Technical Specification limits.

II. Cause of Event

The cause of the excessive leakage through the inboard isolation check valve 3QSS*V4 on the Containment Quench Spray line penetration #100 is attributed to boric acid residue which prevented the disc from fully closing. From the time the line is drained to perform the test, until the leak test is actually completed is approximately two days. It is believed that residual borated water in the bowl of the valve, which is the low point in the system, evaporated prior to performing the test. This cause was verified by having the line flushed with demineralized water and retested. The as-left results were acceptable and did not indicate any internal damage when compared to previous leak results. The valve internals were examined during the mid-1995 refueling outage, with no disc or seat wear identified.

The cause of the excessive combined LLRT leakage through both the inboard isolation check valve 3SIL*V13 on the Low Pressure Safety Injection line penetration #94 and through the inboard isolation check valve 3SIH*V24 on the High Pressure Safety Injection line penetration #98, was attributed to valve 3SIH*V24 either being improperly seated or foreign material being present in the valve. A flush of the line was performed and the penetration was retested. The as-left results were acceptable. A review of prior leak results for this penetration indicate that the check valve shows a decreasing leakage trend over the last three outages.

The cause of the excessive leakage through the inboard isolation check valve 3RSS*V3 on the Containment Recirculation Spray line penetration #107 is attributed to boric acid residue which prevented the disc from fully closing. From the time the line is drained to perform the test, until the leak test is actually completed is approximately two days. It is believed that residual borated water in the bowl of the valve, which is the low point in the system evaporated prior to performing the test. This cause was verified by having the line flushed with demineralized water and retested. The as-left results were acceptable and did not indicate any internal damage when compared to previous leak results. Further evidence of the cause was obtained by a visual inspection of the B train valve 3RSS*V6, performed this shutdown. Boron was present in the bowl of this valve.

The cause of the excessive leakage through the inboard isolation check valve 3HCS*V14 on the Hydrogen Recombiner line penetration #114 was foreign material present in the pipe and disk seating area. The material is believed to be a hydrocarbon byproduct caused by the higher temperatures produced during the hydrogen recombiner process. However, an evaluation of the material was Inconclusive.

The cause of the excessive combined leakage through the isolation valves 3HVU*CTV33A, 3HVU*CTV32A, and 3HVU*V5 on the Containment Purge supply line penetration #86 has been determined to be an inadequate procedure that resulted in a bulge in the outer valve (3HVU*CTV32A) seat ring. An evaluation identified several causal factors which contributed to the failures. These consisted of errors in the maintenance procedure which specified the incorrect number of T-ring segments, the method for performance of the "As-Found" and "As-Left" LLRTs, various valve design issues, and conservative administrative leakage criteria. Additionally, the valve was stroked open and closed prior to the "As-Found" test. Therefore, the root cause of this failure could not be conclusively determined.

The cause of the excessive leakage through the inboard isolation check valve 3SIL*V6 on the Low Pressure Safety Injection line penetration #93 was a small piece of material wedged between the disk and disk arm anti-rotation device. This prevented the disk from freely moving into the seat with no force applied to the disk. It is believed that the draining sequence for this penetration moved the disk off its seat. When air pressure was applied, the valve remained slightly open causing the test failure. During the disassembly inspection, the disk did fully close when moved from the full open position to the closed position.

III. Analysis of Event

The LLRT leakage through the inboard isolation check valve 3QSS*V4 on the Containment Quench Spray line penetration #100 was 156,000 sccm. This leakage, added to the "as-found" total for all other valves as of May 10, 1996, had not exceeded the Technical Specification limit, and by itself is not reportable. However, it is included in this LER because it was a major contributor to the total eventually exceeding the Technical Specification limit five days later. The leakage through the outboard valve 3QSS*MV34A was 107.3 sccm, which would have maintained containment integrity.

The combined LLRT leakage through both the inboard isolation check valve (3SIL*V13) on the Low Pressure Safety Injection line penetration #94; and through the inboard isolation check valve (3SIH*V24) on the High Pressure Safety Injection line penetration #98, was 43,900 sccm. This event, added to the total for all previous LLRTs exceeded the Technical Specification limit. The leakage through the outboard isolation valves 3SIL*MV8809B and 3SIH*MV8835 was 132 and 20 sccm respectively, which would have maintained containment integrity.

The subsequent LLRTs performed on other containment isolation valves revealed additional "as-found" leak rates that contributed to exceeding the Technical Specification limit. The additional isolation valves that were major contributors to the total leak rate were those associated with a containment Recirculation spray line, a hydrogen Recombiner line, the containment purge supply line, and a low pressure safety injection line. These additional contributors to the total leak rate are described below.

The LLRT leakage through the inboard isolation check valve (3RSS*V3) on the Containment Recirculation Spray line penetration #107 was 111,100 sccm. The outboard valve 3RSS*MOV20D leakage was 1850 sccm, which would have maintained containment integrity.

The LLRT leakage through the inboard isolation check valve (3HCS*V14) on the Hydrogen Recombiner line penetration #114 was 51,900 sccm. The outboard valve 3HCS*V13 leakage was 20 sccm, which would have maintained containment integrity.

The LLRT leakage through isolation valves on the Containment Purge supply line was unquantifiable due to excessive leakage. The Containment Purge supply line penetration #86 has three isolation valves, one inboard (3HVU*CTV33A), one outboard (3HVU*CTV32A), and an additional outboard valve on a 30-inch branch line (3HVU*V5). The inboard and both outboard valves are tested simultaneously because they cannot be tested independently. See Figure 5. The combined leakage through these three valves was unquantifiable due to excessive leakage that prevented the test pressure from being reached. This leakage alone exceeded the Technical Specification 3.6.1.2.c secondary containment bypass leakage limit of $0.042L_a$ (20,633.9 sccm), and it exceeded the Technical Specification 3.6.1.2.b Type C limit of $0.6L_a$ (294,800.2 sccm). It also resulted in the total leakage exceeding an analyzed condition. Accordingly, an immediate notification was made on May 29, 1996, pursuant to 10CFR50.72(b)(2)(i) for an event found while shutdown, that if found while operating, would have resulted in an unanalyzed condition that significantly compromises plant safety. No immediate action was required because the plant was in a shutdown condition.

The LLRT leakage through the inboard isolation check valve (3SIL*V6) on the Low Pressure Safety Injection line penetration #93 was unquantifiable due to excessive leakage that prevented the test pressure from being reached. The outboard valve 3SIL*MV8809A leakage was 403 sccm, which would have maintained containment integrity.

IV. Corrective Action

The corrective action for the inboard isolation check valve 3QSS*V4 on the Containment Quench Spray line penetration #100 was to perform a flush of the line to remove any boron deposits. Inspection results from the mid-1995 refueling outage did not indicate any adverse conditions including seat or disc damage. The as-left results from the mid-1995 refueling outage were comparable to the as-left results from this outage. Therefore it is concluded that no new damage to the seating surface is present. However, the historical review of this valve as compared to the B train valve: 3QSS*V8 shows that 3QSS*V4 has consistently higher leakage. This valve will be reworked during the next refueling outage, to further improve the seating surfaces. A clean water flush of the QSS system will be evaluated to determine if the flush should be performed on a routine basis for each penetration after each as-found LLRT test. In addition, the number of times the system is drained and refilled is being reduced. Currently the line is drained each quarter to allow cycling of the outboard isolation valves: 3QSS*MV34A/B. In this condition it is possible for boron to enter into the containment side of the penetration, due to the lower pressure condition inside containment (maintained at a slight vacuum). The draining frequency will be reduced to each cold shutdown, which will reduce the potential for boron to be present in the system.

The corrective action for the inboard isolation check valve 3SIH*V24 on the High Pressure Safety Injection line penetration #98, was flushing the line with water. A review of previous leak results indicates an improving trend of overall decreasing leakage. Therefore, it is determined that the valve internals are not adversely affected. Valve 3SIH*V24 will be disassembled for inspection during the next refueling outage if as-found leak rates increase above the current outage as-left results, deviating from the current trend.

The corrective action for the inboard isolation check valve 3RSS*V3 on the Containment Recirculation Spray line penetration #107 was flushing the line with water. The history of this valve does not indicate any decreasing valve leakage. An inspection of the other train valve 3RSS*V6 indicated boron in the valve body. Based on the limited data available, a flush of each penetration is being evaluated. It is believed that performing a closed cooling water flush after each as-found leak test will reduce the level of boron present in the valve.

The corrective action for the inboard isolation check valve 3HCS*V14 on the Hydrogen Recombiner line penetration #114 was to clean the valve internals of all foreign material. The other train was disassembled and inspected. A small amount of material was removed from the opposite train check valve 3HCS*V7. The material did not adversely effect valve 3HCS*V7 because it passed its as-found LLRT. An inspection of the piping downstream and upstream of the B train hydrogen recombiner blower did not identify any evidence of foreign material. It is not clear where the material came from or how long it was present. Therefore, an inspection of valve 3HCU*V14 will be performed during RFO6 to determine if any material is being created during the operating cycle.

The corrective action for the isolation valves 3HVU*CTV32A, 3HVU*CTV33A, and 3HVU*V5 on the Containment Purge supply line penetration #86 was to repair the seating surfaces of the 32A/33A valves. The t-ring seat of outboard valve 3HVU*CTV32A was fully adjusted after it was identified that a bulge existed in one segment of the t-ring. There are 14 20-segments each containing three set screws. The maintenance procedure was compared to the vendor recommendations to ensure full compliance with the adjustment process. An evaluation determined that the number of adjusting segments specified in the maintenance procedure differed from the actual field arrangement. Therefore, the

maintenance procedure will be revised to: correct these errors; give the mechanic more flexibility in tightening the T-ring bolts; and require new replacement allen bolts and washers every time the valve seat is replaced. Additionally it was determined that cycling the valves open and closed prior to performing the "As-Found" test does not identify the condition the valve would have been in during an accident condition. These valves are required to be locked closed during operation in modes 1 through 4. Therefore, the test procedure will be revised to perform an "As-Found" LLRT prior to cycling the valves. The test procedure will also require the "As-Left" test to be performed after the valves are closed prior to entry into mode 4. The frequency of testing will be increased to every cold shutdown whenever the containment purge system is required to be operating. This frequency will be reviewed after two operating cycles to determine the effectiveness of the increased frequency and corrective action. The revised test method will ensure that the valves are functioning properly during the operating cycle. Additionally, an LLRT will be performed on the valves prior to the valve alignment for the Type A test which is scheduled to be performed prior to unit restart. The root cause evaluation also identified potential problems in the leak tightness of the valve design, particularly with regards to the effect of the shaft bearing operation, and actuator operation/air supply on valve seating. Therefore, these components will be evaluated further. The administrative leakage criteria assigned to these valves will also be evaluated due to the small amount of allowable leakage relative to the large size of the valve. Due to the design of this penetration it is difficult to identify if both valves or only one valve caused the excessive leakage. Minor adjustments were performed on the inboard valve t-ring seat. A retest produced very low leak rates.

The corrective action for the inboard isolation check valve 3SIL*V6 on the Low Pressure Safety Injection line penetration #93 was to disassemble the valve and flush the internal surfaces to dislodge the material from the disk arm. A small piece of slag or metal shaving was found that prevented the disk from fully closing. The internals were capable of free movement in both the open and closed direction. When the valve was manually closed from the full open position, the disk moved freely into the seat as designed. Once the disk arm was flushed the disk moved freely into the seat with no applied force. The subsequent retest was completed successfully.

V. Additional Information

Similar Events

LER 91-004-01 and LER 95-009-02 discuss similar events of containment leakage in excess of Technical Specification limits due to containment isolation valve leakage.

Manufacturer Data

EIIS Equipment Code: Isolation Valves - ISV

TABLE 1

Containment Type C Leakage Data (in sccm)

Penetration (Number)	Valve (ID)	As-Left (Refuel 5)	As-Found (Mid-Cycle 6)	As-Left (Mid-Cycle 6)
Quench Spray (100)	3QSS*V4	3,740	156,000	8,090
Safety Injection (94) (98)	3SIL*V13 3SIH*V24	1,176	43,900	1,480
Recirculation Spray (107)	3RSS*V3	1,533	111,100	1,283
Hydrogen Recombiner (114)	3HCS*V14	1,800	51,900	**276**
Low Pressure Injection (93)	3SIL*V6	544	Indeterminate	**2,060**
Other Penetrations	Sub-Total	56,278.1	**138,231.2**	**60,167.5**
All Penetrations	Total	56,976.3	**501,131.2**	**73,356.5**
Technical Specification Allowable Limit ($0.6L_a$)		294,800.2	294,800.2	294,800.2

Containment Bypass Leakage Data (in sccm)

Penetration (Number)	Valve (ID)	As-Left (Refuel 5)	As-Found (Mid-Cycle 6)	As-Left (Mid-Cycle 6)
Purge Supply (86)	3HVU*CTV33A 3HVU*CTV32A 3HVU*V5	664	Indeterminate	20
Other Penetrations	Sub-Total	3,246	**4,403.3**	**4,403,3**
All Penetrations	Total	3,910.6	**4,403.3**	**4,424.3**
Technical Specification Allowable Limit ($0.042L_a$)		20,633.9	20,633.9	20,633.9

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

Figure 1, Containment Quench Spray Penetration #100

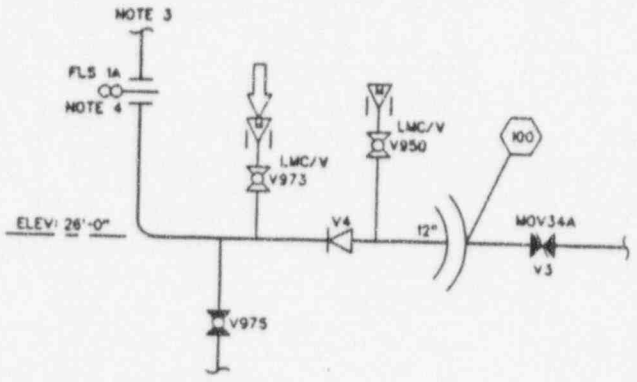

Figure 2, Low Pressure / High Pressure Safety Injection Penetration #98

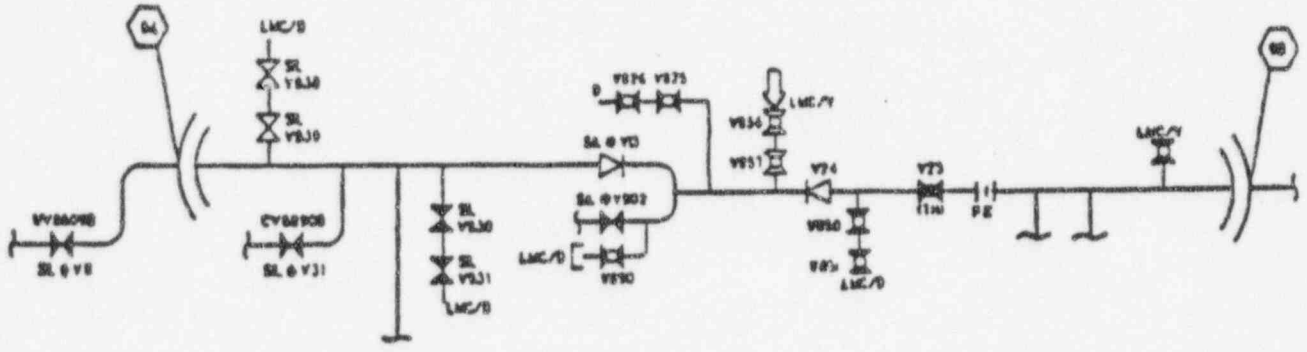

Figure 3, Containment Recirculation Spray Penetration #107

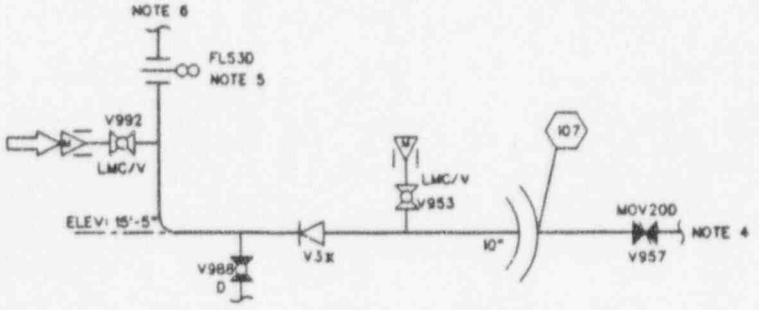

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Figure 4, Hydrogen Recombiner Penetration #114

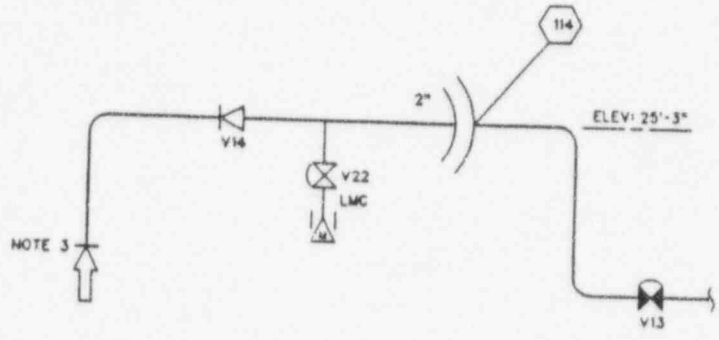

Figure 5, Containment Purge Supply Penetration #86

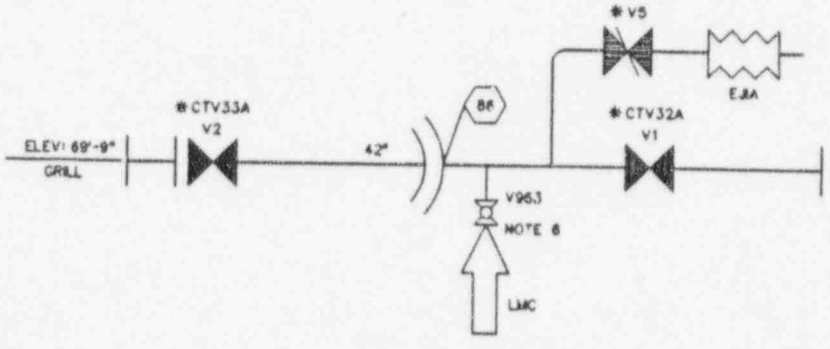

Figure 6, Low Pressure Safety Injection Penetration #93