

REACTOR CONTAINMENT BUILDING  
INTEGRATED LEAK RATE TEST  
SEQUOYAH NUCLEAR PLANT UNIT 2

CONDUCTED APRIL 27-29, 1992

Docket No. 50-328

Prepared by:

TENNESSEE VALLEY AUTHORITY  
Maintenance & Systems Support  
Chattanooga, Tennessee

Prepared for:

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Reactor Containment Building  
Integrated Leak Rate Test  
Sequoyah Nuclear Plant Unit 2

Conducted April 27-29, 1992

Test Report

Prepared by: Crichton Miller,

Reviewed by: Connie E. James,

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The United States Nuclear Regulatory Commission  
Pursuant to  
Facility Operating License

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## 1.0 INTRODUCTION

This report contains the summary technical analysis of the Reactor Containment Building Integrated Leak Rate Test (CILRT) conducted on Sequoyah Nuclear Plant (SQN) Unit 2 April 27-29. As prescribed in SQN Unit 2 Technical Specification 4.6.1.2, the leakage of air from the boundary forming the reactor primary Containment Building is limited to 0.26 percent by weight of the containment air mass per day at a pressure of 12.0 psig. This test was conducted in accordance with the requirements of Title 10, Code of Federal Regulations, Part 50, Appendix J, which is implemented by SQN Surveillance Instructions (SI) 2-SI-SLT-088-156.0; the American National Standard for Containment Testing, ANSI 45.4-1972; the proposed American Nuclear Society for Containment Testing, ANS 56.8; and the procedure outlined in Bechtel's Topical Report, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structure for Nuclear Power Plants" (BN-TOP-1, Revision 1), provided guidance for the procedure implemented by the SI.

SQN Unit 2 is a 3,411-megawatt thermal, pressurized-water reactor employing an ice condenser pressure suppression containment. The Final Safety Analysis Report defines the calculated peak accident pressure, Pa, to be 12.0 psig. The Reactor Building containment is divided into four major compartments for the CILRT analysis--the lower ice condenser compartment which houses the energy-absorbing ice beds, the upper ice condenser compartment which encloses the support equipment for the ice condenser system, the lower compartment which contains the reactor and the main piping systems, and the upper compartment which can accommodate the displaced air mass from the other compartments in the unlikely event of a loss-of-coolant accident (LOCA). These four compartments are

connected by means of blowout panels located between the lower compartment and lower ice condenser compartment and between the upper compartment and upper ice condenser compartment. In the event of a LOCA, steam flows from the lower compartment through the ice condenser compartments and into upper containment. The upper compartment is sealed from the lower compartment to ensure that any steam released in an accident will be forced through energy-absorbing ice beds. For the performance of the CILRT, the lower and upper compartments were not sealed from each other to promote the free flow of air in containment.

This report outlines the objectives, principal events, special equipment used, and analysis of the test results for the CILRT completed on April 29, 1992, on SQN Unit 2. A summary of local leak rate tests (LLRTs) conducted since the previous CILRT are included in Appendix L.

In addition, results of an incident investigation conducted to determine the root cause and appropriate recurrence controls for excess leakage through a locally tested leakage path (penetration X-47A) are included in Appendix M.

## 2.0 SUMMARY

The SQN Unit 2 CILRT was conducted from April 27 to 29, 1992, in conjunction with the Cycle 5 refueling outage. The CILRT was successfully completed in 9 hours and 10 minutes and included 56 data samples.

The calculated total time leak rate (TTLR) for the CILRT was 0.06161 percent per day (%/day). The associated reportable "as found" 95 percent upper confidence limit (UCL), which includes Type B and C

leakages from testable penetrations in service at the time of the CILRT, the difference between the "as found" minimum and "as left" minimum path leakage rates (leakage savings) from tests performed in conjunction with the Unit 2 Cycle 5 refueling outage, and water level changes not accounted for by the CILRT computer system, was 0.42122 %/day.

The "as left" 95 percent UCL value of 0.15154 %/day includes Type B and C leakage for testable penetrations in service during the CILRT and compensation for water level changes not accounted for by the CILRT computer system.

The calculated "as found" mass leak rate (MLR) for the CILRT was .04739 %/day. The associated reportable "as found" 95 percent UCL was 0.32822 %/day, and the reportable "as left" 95 percent UCL was 0.05854 %/day. These values reflect the adjustment provisions as described for the TTLR.

### 3.0 TEST PURPOSE AND RESULTS

#### 3.1 Test Purpose

The objective of the inservice CILRT was to demonstrate the continuing leak tight integrity of the Unit 2 Reactor Building containment for return to power operations.

For Unit 2, the leak tight integrity is defined in Technical Specification 4.6.1.2 to be the leakage of air from containment is not to exceed 0.1875 %/day at peak accident pressure, Pa.

### 3.2 Test Results

Pressurization to 12.69373 psig was completed at 0647 on April 28, 1992, and the pressurization header was isolated from the air compressors.

The criteria for temperature stabilization phase was met at 1114 on April 28, 1992 (see Appendix A for stabilization graphs and tabular data). Although the pressurization rate had been limited to minimize destabilizing the containment parameters and the rate of change in containment temperature met the BN-TOP-1 requirement, the data was unstable beyond the initial four hours.

The pressurization rate had been controlled to achieve test pressure in about 10 hours. This was done to limit gross changes in containment vapor pressure and temperature which was experienced on the previous Unit 1 CILRT when full test pressure was reached after only 6-1/2 hours using maximum flow. However, there was a temperature inversion with an increase in humidity in the 24 hours immediately preceding pressurization for the Unit 2 CILRT. This inversion was partially countered by limiting the pressurization rate; however, the stabilization phase had to be extended so that the total stabilization time was 6 hours and 10 minutes.

The increase in stabilization time allowed humidity and temperature to settle sufficiently so that equilibrium data could be realized. The principal parameter which affected stability was the vapor



pressure in compartments 1 and 2. The initial values (during the 6 hour and 10 minute stabilization phase) were on the order of double the magnitude experienced for stable test conditions. There was also a temperature fluctuation in compartment 1 at the start of the temperature stabilization phase which served to destabilize conditions, but it is not certain whether the temperature fluctuation was due to stabilization or another influencing factor. When the test-related parameters became relatively stable (i.e., linear trend) the T<sub>1</sub>LR assumed an expected profile.

At approximately four hours into the CILRT, several test equipment hardware failures occurred. Initially, a Mensor pressure gauge measuring lower ice condenser pressure spontaneously began to oscillate (this type of pressure gauge uses a null and feedback system to track pressure changes). This incident was followed by the redundant pressure gauge in the lower ice compartment overranging with a subsequent error displayed on the data logger. Ultimately, the overranging instrument was "failed" in the data base which removed all readings from it in the calculations. During the recovery from the initial error condition, another alarm came in on the data logger display panel. In this case, the RS 232 serial port to the primary computer had failed, thus data was being collected and processed only on the backup computer system. No further failures occurred and the CILRT, as well as the verification test, was completed with the backup computer and with one Mensor pressure gauge removed from the data base.

The following table presents the test results for the CILRT and verification tests. Additional specific data on these tests are included in the appendices.

---

 Table of CILRT and Verification Test Results

Post Test ISG 1.48 percent of La (using repeatability)  
 17.31 percent La (using accuracy)

	<u>As Found TTLR</u>	<u>As Found MLR</u>
1. Leakage savings.	0.26968 %/day	0.26968 %/day
2. Leakage for systems in service during test.	0.00000 %/day	0.00000 %/day
3. Calculated 95% UCL during test.	0.15073 %/day	0.05773 %/day
4. Leakage due to sump level increase.	<u>0.00081 %/day</u>	<u>0.00081 %/day</u>
Total	0.42122 %/day	0.32822 %/day

Note: Leakage from X-47A = 0.23404 %/day. The total "as found" TTLR not including leakage from X47A is 0.18718 %/day.

	<u>As Left TTLR</u>	<u>As Left MLR</u>
1. Leakage for systems in service during CILRT.	0.00000 %/day	0.00000 %/day
2. Calculated 95 % UCL during test.	0.15073 %/day	0.05773 %/day
3. Leakage due to sump level increase.	<u>0.00081 %/day</u>	<u>0.00081 %/day</u>
Total	0.15154 %/day	0.05854 %/day

CILRT duration: 9 hours and 10 minutes  
 Number of samples: 56  
 Mean of measured LR: 0.04614 %/day

## Verification Test

TTLR agreement: -13.15396 % La  
 MLR agreement: -1.95106 % La

Verification duration: 4 hours and 40 minutes  
 Number of samples: 29

Extended ANSI statistical analysis (satisfaction of equations 1.1 or 1.2 and 2.1 is required)

CILRT

Equation	1.1	6.012022 < 4.022343
	1.2	0.1329388 < 0.205000
	2.1	0.7553893 > 0.2284258

Verification

Equation	1.1	0.06829850 < 4.224230
	1.2	0.02479189 < 0.250000
	2.1	0.9798009 > 0.9101551

4.0 CONDUCT OF TEST

The following is a summary of chronological events associated with the CILRT.

<u>Dates and Time</u>	<u>Event</u>
04/27/92 1800	Completed containment inspection.
04/27/92 2030	Started compressors.
04/27/92 2109	Started pressurization.
04/28/92 0639	Stopped pressurization.
04/28/92 0646	Pressurization header isolation valve shut.
04/28/92 0647	Containment pressure 12.69373 psig.
04/28/92 0913	Pressurization header isolated and removed from compressor.
04/28/92 1114	Met stabilization temperature criteria.
04/28/92 1327	Start CILRT at sample 39.
04/28/92 1703	Failed P8, Mensor pressure gauge for lower ice.

04/28/92 1731 Unfailed P8 and failed P7 due to overranging on P7.

04/28/92 1740 Error 02 on AD 10/10 - CPU communication failure.

04/28/92 1807 Error 21 from AD 10/10 on RS232 failure on port 1A data logger is no longer sending data to the primary computer.

04/28/92 1919 Taking data on backup computer. P7 failed, P8 in service.

04/28/92 2237 Test phase concluded with sample No. 94.

04/28/92 2310 Establish verification flow.

04/29/92 0027 Started verification with sample No. 105.

04/29/92 0507 End verification with sample No. 133.

04/29/92 0510 Started depressurization.

04/29/92 0950 Containment pressure 0.0 psig.

## 5.0 MEASUREMENTS AND CALIBRATIONS

### 5.1 Test-Equipment

Appendix K lists the range, accuracy, and repeatability of the special test equipment used in the Unit 2 Cycle 5 CILRT.

### 5.2 Sensor Location

Appendix J lists the final volumetric weighing factor for each temperature and dewpoint sensor based on the 4-compartment model. The associated figures indicate sensor locations. The pressure sensors were divided so that initially two sensors measured each of the four compartments through penetrations X-27C, X-87D, X-87A, and X-98. Utilizing two pressure sensors per compartment allows the removal of any one malfunctioning pressure gauge during the test while continuing to accurately monitor containment pressure. An additional pressure gauge measured barometric pressure at the test station.

### 5.3 Computer-Based Data Acquisition and Data Reduction

The raw test data measured by the special test instrumentation during the SQN Unit 2 CILRT was scanned and collected by a microprocessor-based data acquisition system. This raw test data was automatically presented to a portable minicomputer system for correction to calibration curves and reduction to containment leak

rate. The minicomputer produced immediate statistical and graphical results of the containment test parameters, including temperature, pressure, vapor pressure, mass, TTLR, and MLR plots.

These calculated results were reported automatically to the test director as the data was collected. Appendix I depicts the functional relationship between the special test instrumentation and the data acquisition and analysis system.

All calculations performed by the minicomputer system were in conformance with the procedure outlined in ANS 56.8, ANSI 45.5, and Bechtel Topical Report (BN-TOP-1), Revision 1.

Source listings for all computer programs are on file with the Real Time Computer Systems Section of Information Systems in Chattanooga, Tennessee.

#### 5.4 Reactor Building Containment Model

An ice condenser pressure suppression containment presents special problems not normally encountered in the leak testing of dry containment structures. The pressure suppression design feature requires the Reactor Building containment to be divided into distinct compartments, where vastly different temperatures and vapor pressures may exist. While each compartment is vented to the containment atmosphere during the performance of the CILRT, the direct circulation of air is limited.

Since an ice condenser containment typically exhibits a 40°F temperature differential between the ice compartments and others, it is necessary to compensate by compartmentalization so the leak rate is accurately measured. For SQN Unit 2 CILRT, a 4-compartment containment model was used to measure the leak rate. The free air mass is calculated individually for each compartment, and containment leak rate is calculated from the sum of the compartmental masses. Each sensor within a compartment is volume weighted for the calculation of compartment average temperature, vapor pressure, and absolute pressure.

## 6.0 ANALYSIS OF TEST DATA

The previous sections of this report have discussed the general test conduct and test equipment. In this section, events and problems that influenced the test results are discussed and are used to formulate conclusions on the performance of the SQN Unit 2 Cycle 5 CILRT.

### 6.1 Instrument Check

The instrument complement for SQN Unit 2 was 49 RTDs (temperature instruments), 13 Dewcells (measure vapor pressure), 1 flow meter (for verification test), and 9 Mensor quartz pressure gauges (8 containment pressure and one atmospheric pressure gauge).

Prior to the start of the test, 1 RTD was removed from the data base. The mode of failure was the extension cable from the signal conditioner to the sensor. This RTD had to be removed from the data base due to the unavailability of a replacement extension cable of sufficient length to reach the required RTD location.

During the test, one Mensor pressure gauge monitoring lower ice condenser pressure was also removed from the data base. The instrumentation analysis conducted in accordance with ANSI 56.8-1987 demonstrated that the measurement system provided excellent capability regarding determining the leak rate without these instruments included the data base.

## 6.2 Discussions of Graphical and Tabular Results of the CILRT

Upon completion of pressurization, the relevant parameters began to achieve equilibrium conditions. The vapor pressure in the two largest compartments, upper compartment and lower compartment comprising 87 percent of the total volume, was higher by a factor of approximately 1.8 over that which is normally expected when near equilibrium conditions exist. The condition may be an inherent tendency of an ice condenser containment following pressurizing to elevated pressures but this condition was also intensified by the temperature and humidity inversion which occurred prior to the test (i.e., the temperature dropped approximately 15°F and it rained 24 hours before the test and remained cloudy throughout pressurization). The ice condenser compartments are not as



susceptible to changes in vapor pressure and temperature due to pressurization since the temperature is controlled and is near the frost point most of the time.

In addition, the upper compartment temperature early in the stabilization phase (first 2 hours) did not follow the other three compartment temperature patterns. There was a sharp decrease then an increase with a delta in temperature of approximately 1°F followed by a transition to a linear trend in temperature pattern.

With the exception of extending the stabilization period and reverting to the backup system for data acquisition processing the CILRT progressed satisfactorily to completion in accordance with the requirements of BN-TOP-1, Revision 1.

#### 6.3 Discussion of Agreement (Verification Test)

Verification flow was allowed to stabilize for over an hour prior to the official start of the verification test. The stabilization of verification flow was performed in accordance with the requirements of BN-TOP-1, Revision 1, and the subsequent verification test was completed without significant trends or events which affected test results.

#### 6.4 Discussion of "As Found" Leak Rate Exceeding Technical Specifications

Applications of "leakage savings" per IE Notice 85-71 resulted in a technical failure of the CILRT before the test was performed. A single penetration (X-47A) in the ice condenser glycol system was

responsible for this failure. During performances of LLRTs on isolation valves FCV 61-191 (the outboard containment barrier), and FCV 61-192 and its associated thermal relief check valve CV 61-533 (the inboard containment barrier), it was discovered that both the inboard and outboard air operated diaphragm valves (FCV 61-191, FCV 61-192) failed to fully close. The resulting minimum path leak rate of 211.1943 SCFH was greater than the acceptance criteria of 168.75 SCFH for the CILRT. An Incident Investigation, II No. S-92-30, was conducted to determine the cause and extent of the problem, the history of these and similar valves, and appropriate recurrence control. Results of II No. S-92-30 are included in Appendix M. As can be seen from this investigation, these type valves have an excellent leakage history on both units at SQN. Additionally, stroke timing is performed quarterly to ensure their operability. Valves FCV 61-191 and FCV 61-192 were stroke tested satisfactorily as recently as February 22, 1992, which was only three weeks prior to the refueling outage (LLRTs were performed April 1, 1992). However, since valve stem lubrication frequency may have contributed to the failure of these particular valves to close, the preventive maintenance instructions for the Unit 1 and Unit 2 glycol containment isolation valves have been revised to include monthly lubrication of the valve stems.

## 7.0 CONCLUSIONS

The SQN Unit 2 Cycle 5 CILRT was conducted with a total "as found" leak rate of 0.42122 %/day (TLR) and a total "as left" leak rate of 0.15154 %/day (TLR). The "as found" failure was due to the LLRT failure of penetration X-47A which had a leakage savings of 0.23404 %/day. The MLR in comparison was 0.32822 %/day for the total "as found" and 0.05854 %/day for the total "as left."

The TLR "as found" was 0.18718 %/day excluding the "leakage savings" from glycol penetration X-47A. This value is less than 75 percent La. Historical data on leakage through penetration X-47A and penetrations employing like valves demonstrates that failure of these isolation valves to close was a random occurrence. Corrective action has been implemented to reduce the chance of a recurrence. The SQN Unit 2 containment demonstrated its leak-tight integrity during the CILRT. Corrective actions taken on the two previous CILRT failures on this unit have been demonstrated to be effective and are unrelated to the leakage experienced through penetration X-47A during performance of the LLRTs. Although this test represents the third failure on this unit, the causes are unrelated and have been fully addressed. Performing future CILRTs on an accelerated schedule would serve no technical purpose. We therefore propose to continue the normal test schedule for SQN Unit 2. The next regularly scheduled performance is during the Cycle 7 refueling outage currently scheduled for April 1995.

APPENDIX A

Pre-CILRT

Graphs and Tabular Data

Contents: Temperature stabilization criteria - sample 1 to 38.

Tabular Data - Review Temperature Stabilization Criteria

Containment Temperature

Containment Vapor Pressure

Containment Pressure

Containment Mass

Upper Compartment (1) Temperature

Lower Compartment (2) Temperature

Upper Ice Compartment (3) Temperature

Lower Ice Compartment (4) Temperature

Upper Compartment Vapor Pressure

Lower Compartment Vapor Pressure

Upper Ice Compartment Vapor Pressure

Lower Ice Compartment Vapor Pressure

## APPENDIX A

## Review Temperature Stabilization Criteria

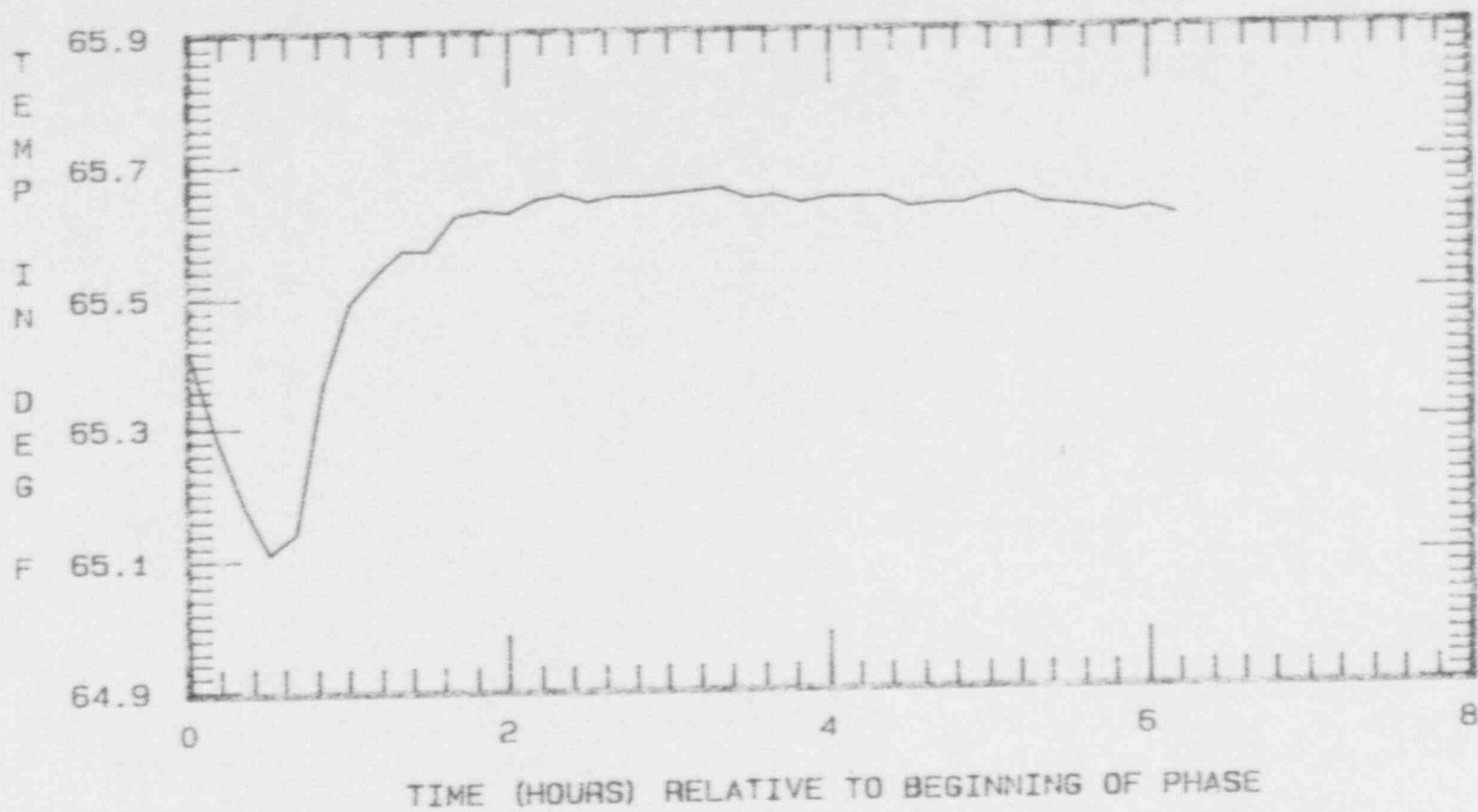
Sample No.	Elapsed Time	Average Temperature	Rate of Change of Containment temperature (DegF/Hr)
1	000:00	65.41079	0.0000000
2	000:10	65.28622	0.7474365
3	000:20	65.18288	0.6199951
4	000:30	65.10654	0.4580841
5	000:40	65.13988	0.2000885
6	000:50	65.36229	1.334427
7	001:00	65.48733	0.7502289
8	001:10	65.53026	0.2575836
9	001:20	65.56953	0.2356567
10	001:30	65.56909	0.2655029E-02
11	001:40	65.62239	0.3197937
12	001:50	65.62943	0.4225159E-01
13	002:00	65.62644	0.1794434E-01
14	002:10	65.64405	0.1056519
15	002:20	65.65356	0.5703735E-01
16	002:30	65.64249	0.6642151E-01
17	002:40	65.64948	0.4197693E-01
18	002:50	65.64706	0.1455688E-01
19	003:00	65.65312	0.3639221E-01
20	003:10	65.65555	0.1455688E-01
21	003:20	65.66160	0.3630066E-01
22	003:30	65.64295	0.1118774
23	003:40	65.64989	0.4161072E-01
24	003:50	65.63742	0.7479858E-01
25	004:00	65.64337	0.3570557E-01
26	004:10	65.64607	0.1620483E-01
27	004:20	65.64600	0.4119873E-03
28	004:30	65.62705	0.1137085
29	004:40	65.63454	0.4490662E-01
30	004:50	65.63248	0.1235962E-01
31	005:00	65.64340	0.6555176E-01
32	005:10	65.64831	0.2943420E-01
33	005:20	65.63262	0.9411621E-01
34	005:30	65.62901	0.2169800E-01
35	005:40	65.62565	0.2014160E-01
36	005:50	65.61523	0.6253052E-01
37	006:00	65.62421	0.5387878E-01
38	006:10	65.61209	0.7269287E-01

The avg rate of temp change for the last 4 hours = 0.5066212E-01 degF/hr.

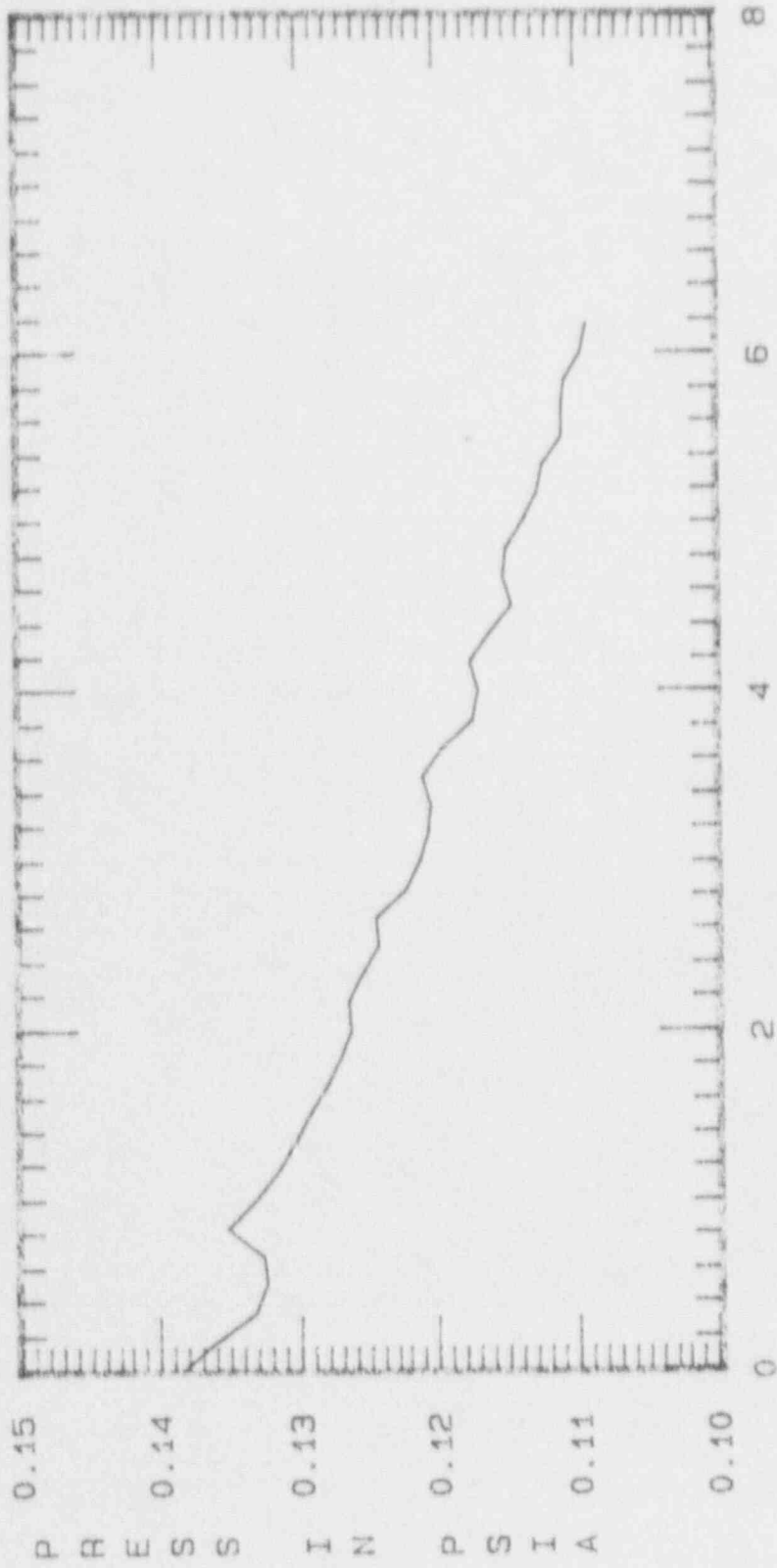
The avg rate of temp change for the last hour = 0.5339813E-01 degF/hr.

The temp stabilization check indicated a value of 0.2736017E-02 degF/hr, which is only 0.5472034 % of the recommended 0.5 degF/hr.

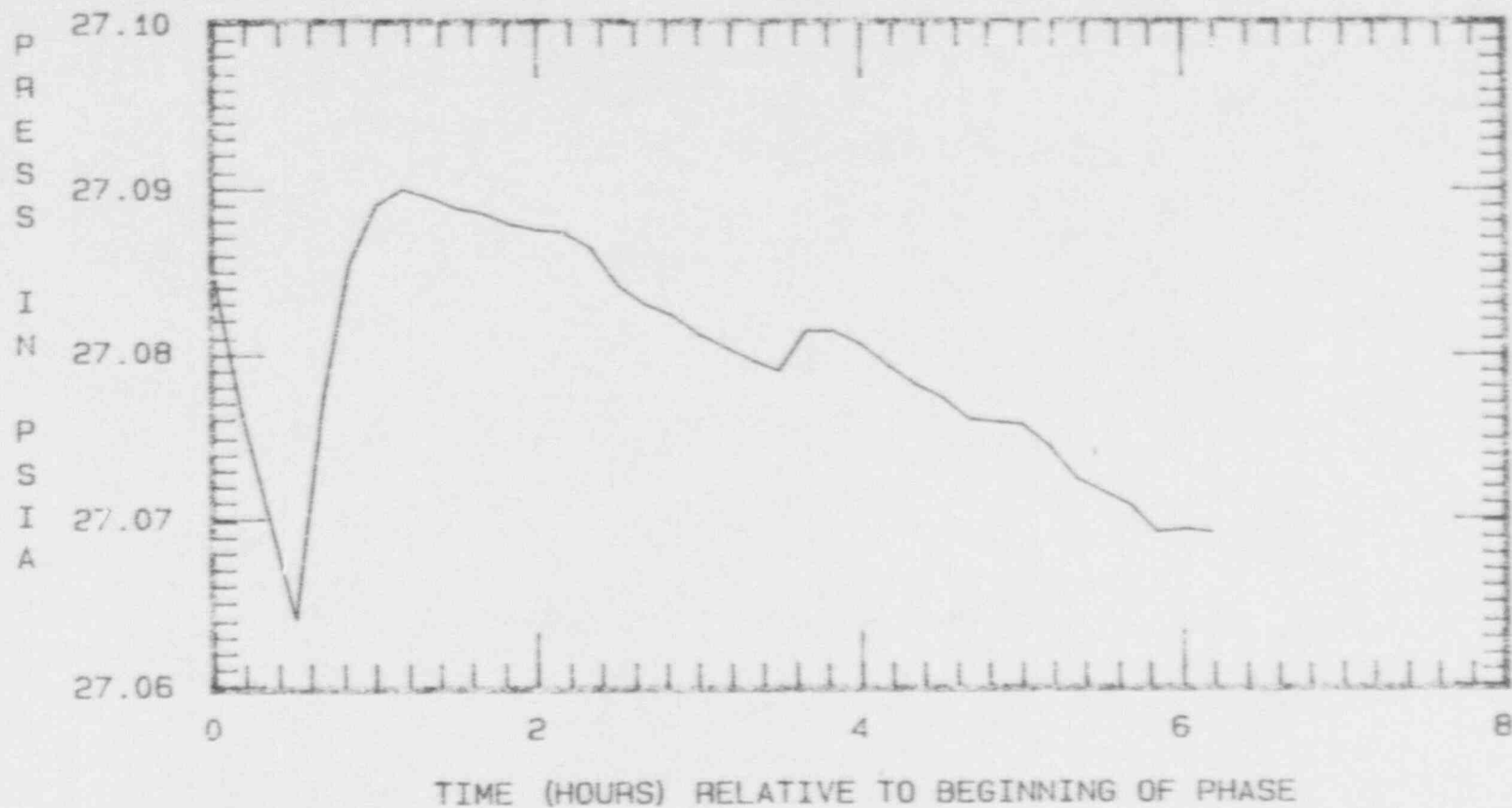
Stability check indicates conditions are favorable to proceed with CILRT.



CONTAINMENT TEMPERATURE  
TEMPERATURE STABILITY PHASE

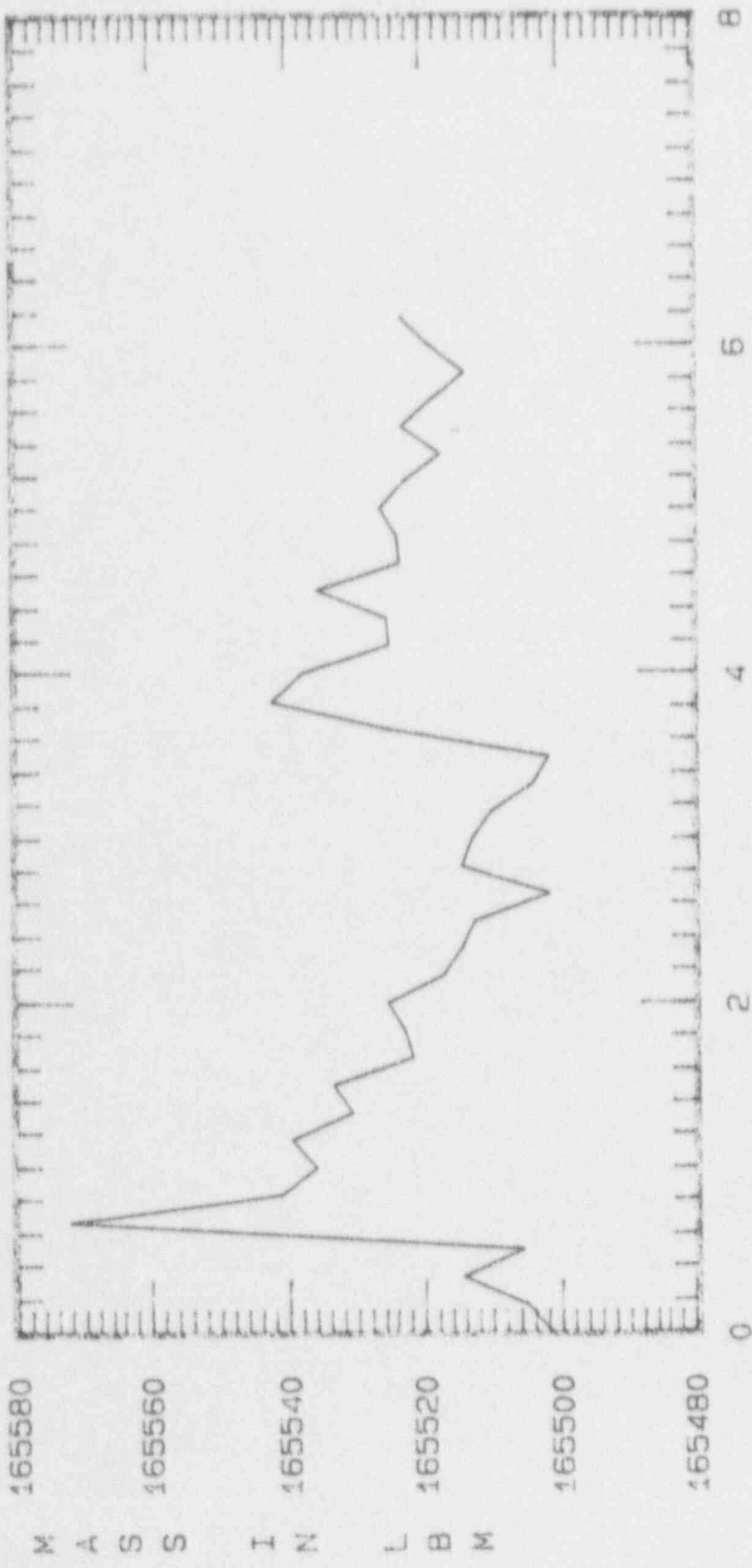


CONTAINMENT VAPOR PRESSURE  
TEMPERATURE STABILITY PHASE



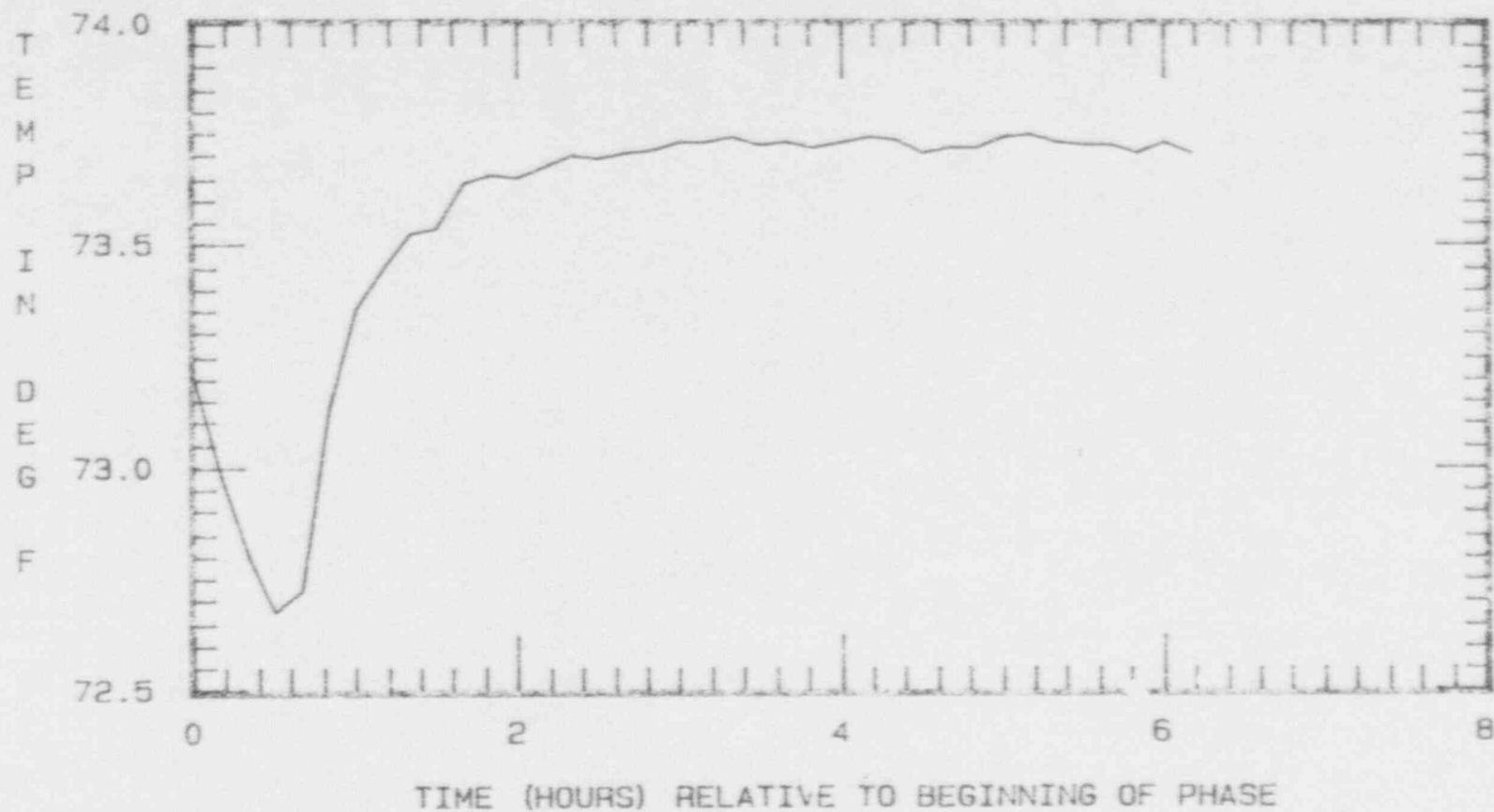
CONTAINMENT PRESSURE  
TEMPERATURE STABILITY PHASE





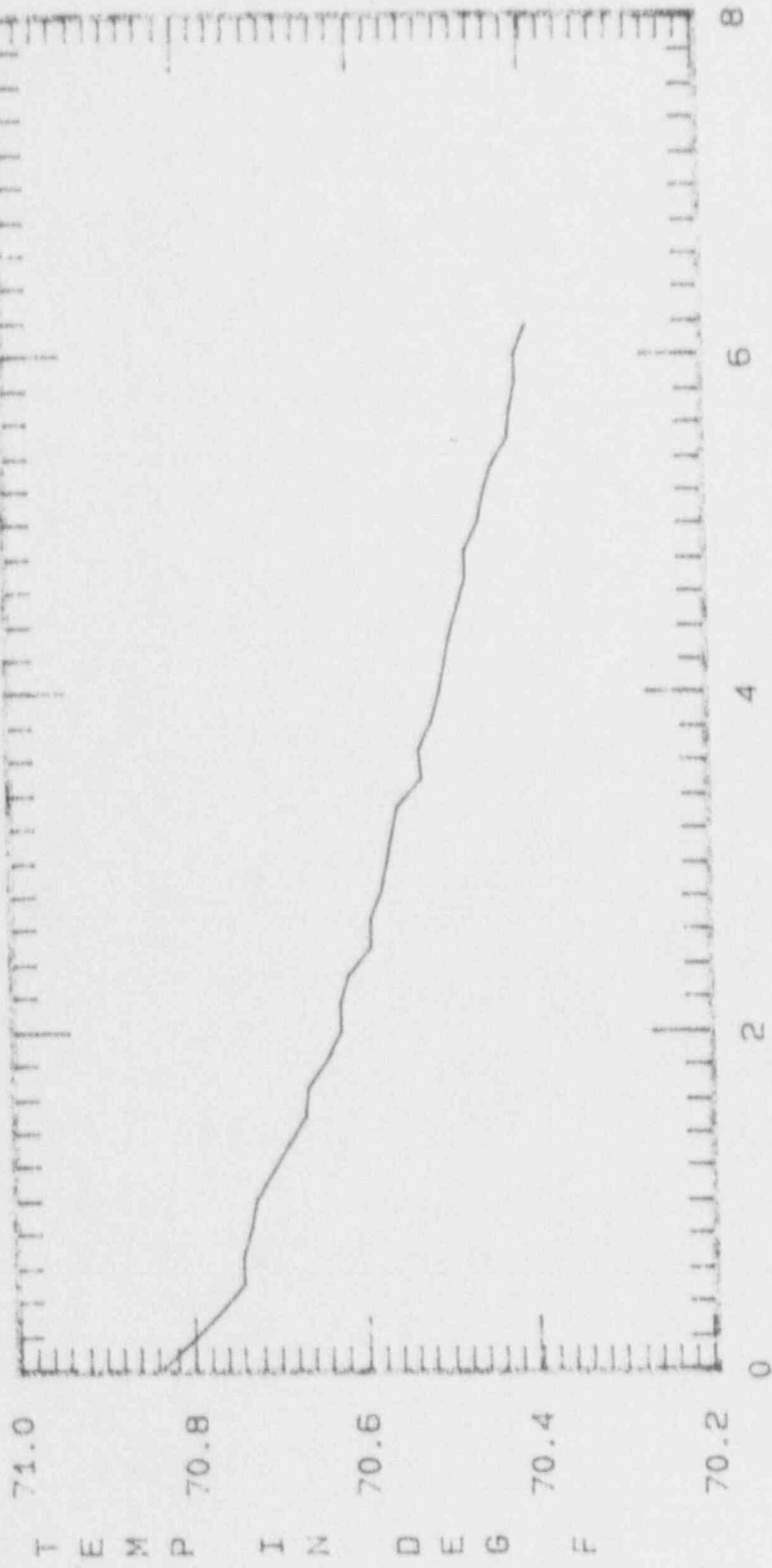
CONTAINMENT MASS  
TEMPERATURE STABILITY PHASE

CMPT. 1 = RED



COMPARTMENT TEMPERATURE  
TEMPERATURE STABILITY PHASE

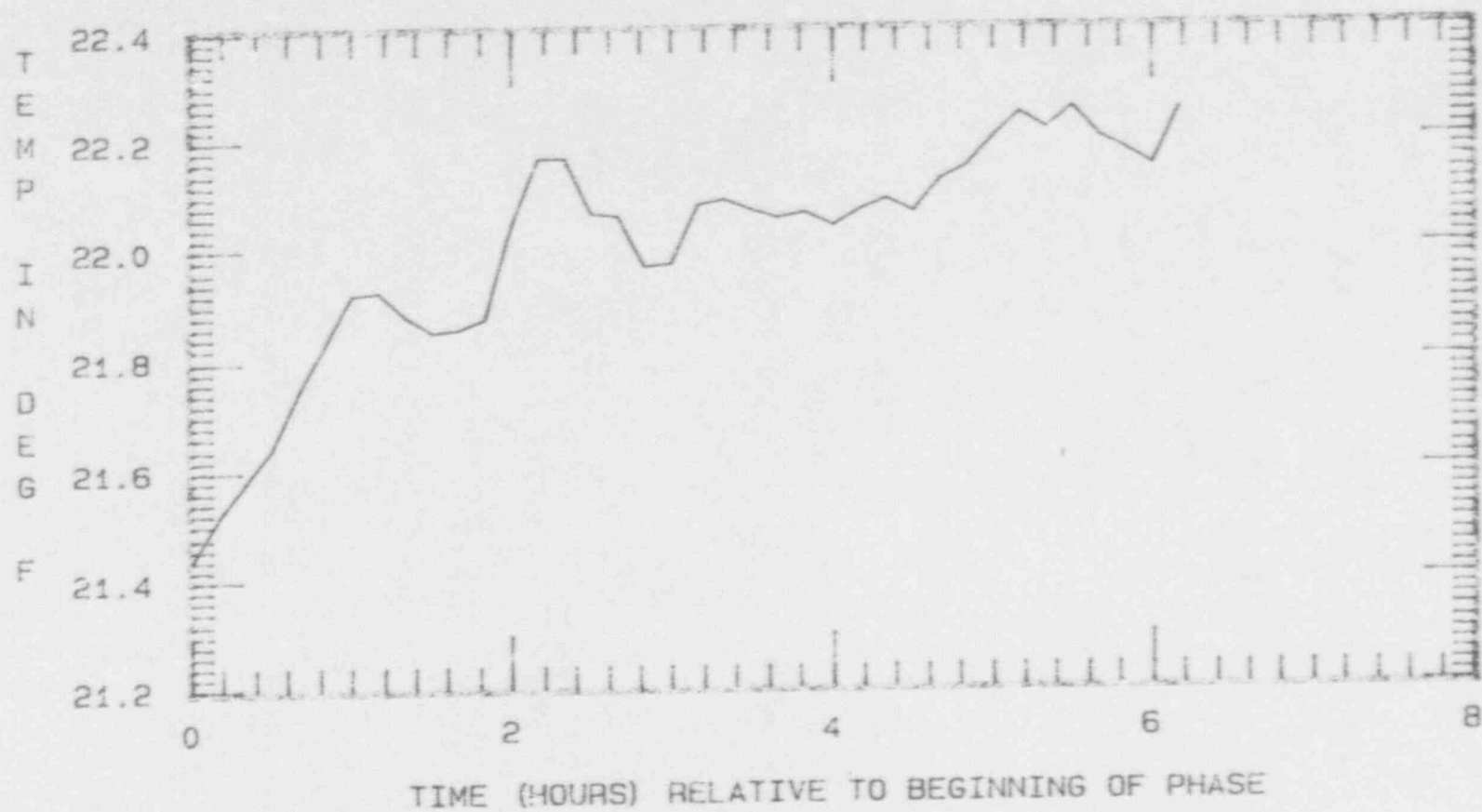
CMPT. 2 = RED



TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

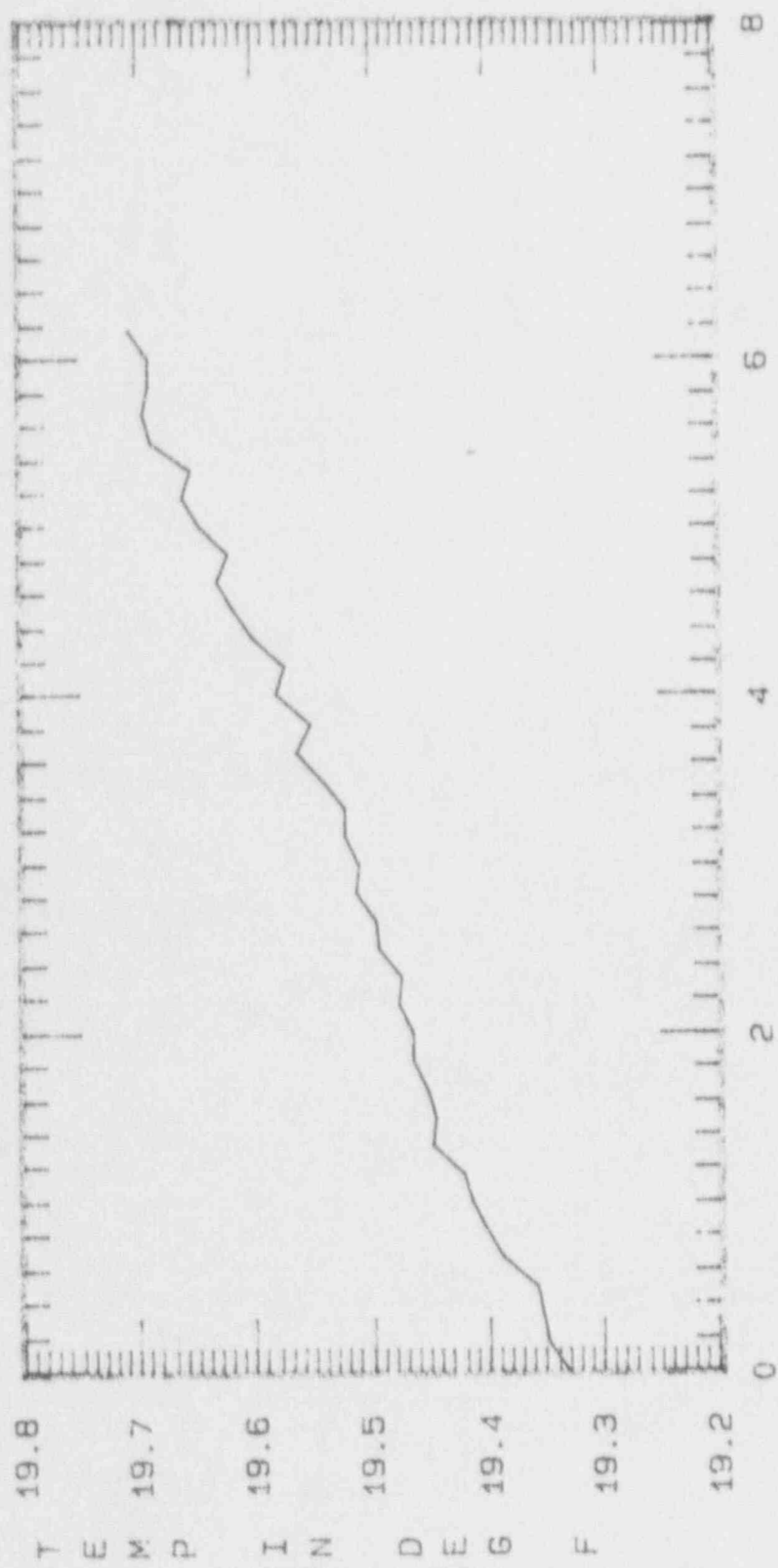
COMPARTMENT TEMPERATURE  
TEMPERATURE STABILITY PHASE

CMPT. 3 = RED



COMPARTMENT TEMPERATURE  
TEMPERATURE STABILITY PHASE

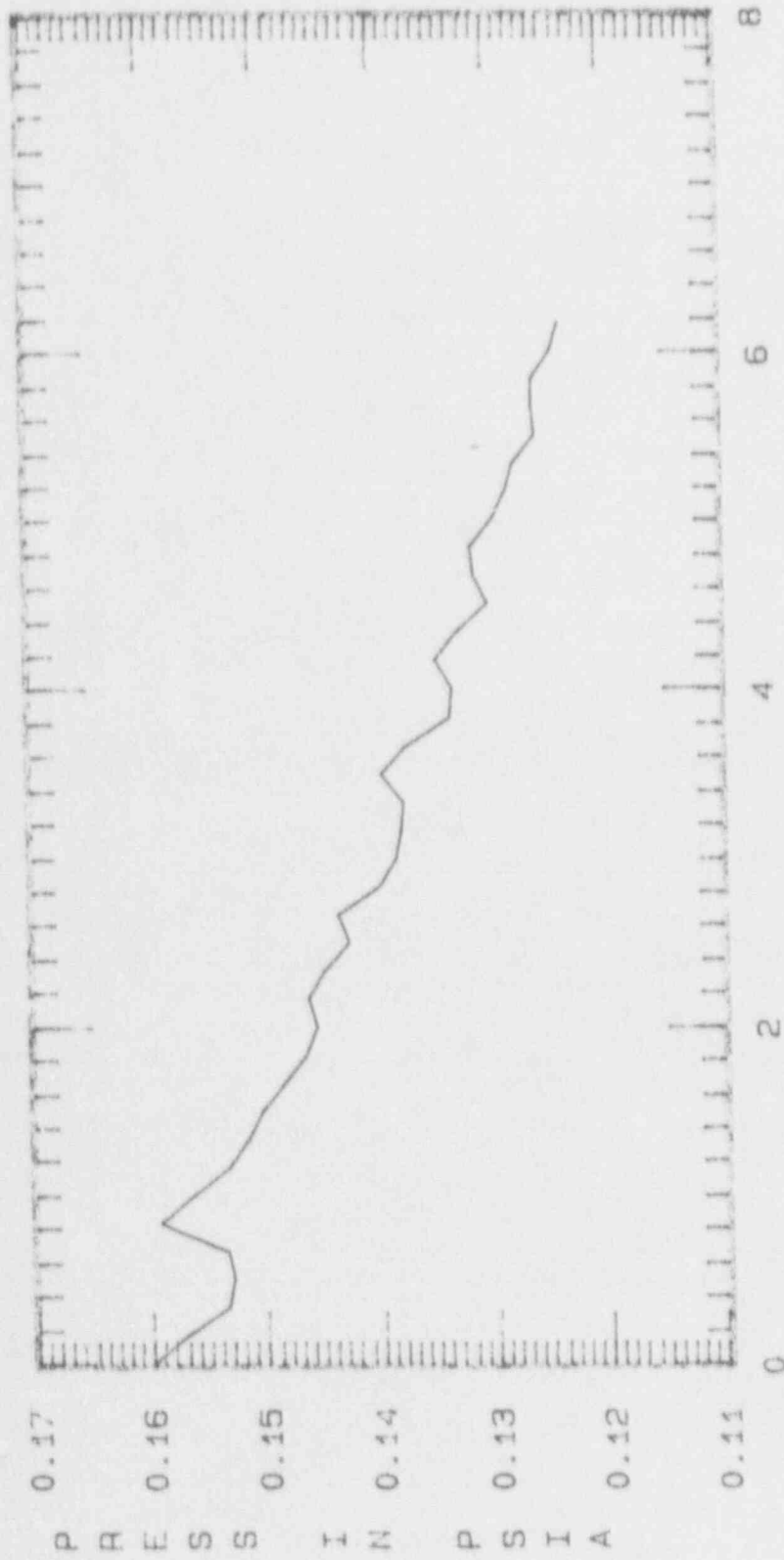
CMPT. 4 = RED



TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

COMPARTMENT TEMPERATURE  
TEMPERATURE STABILITY PHASE

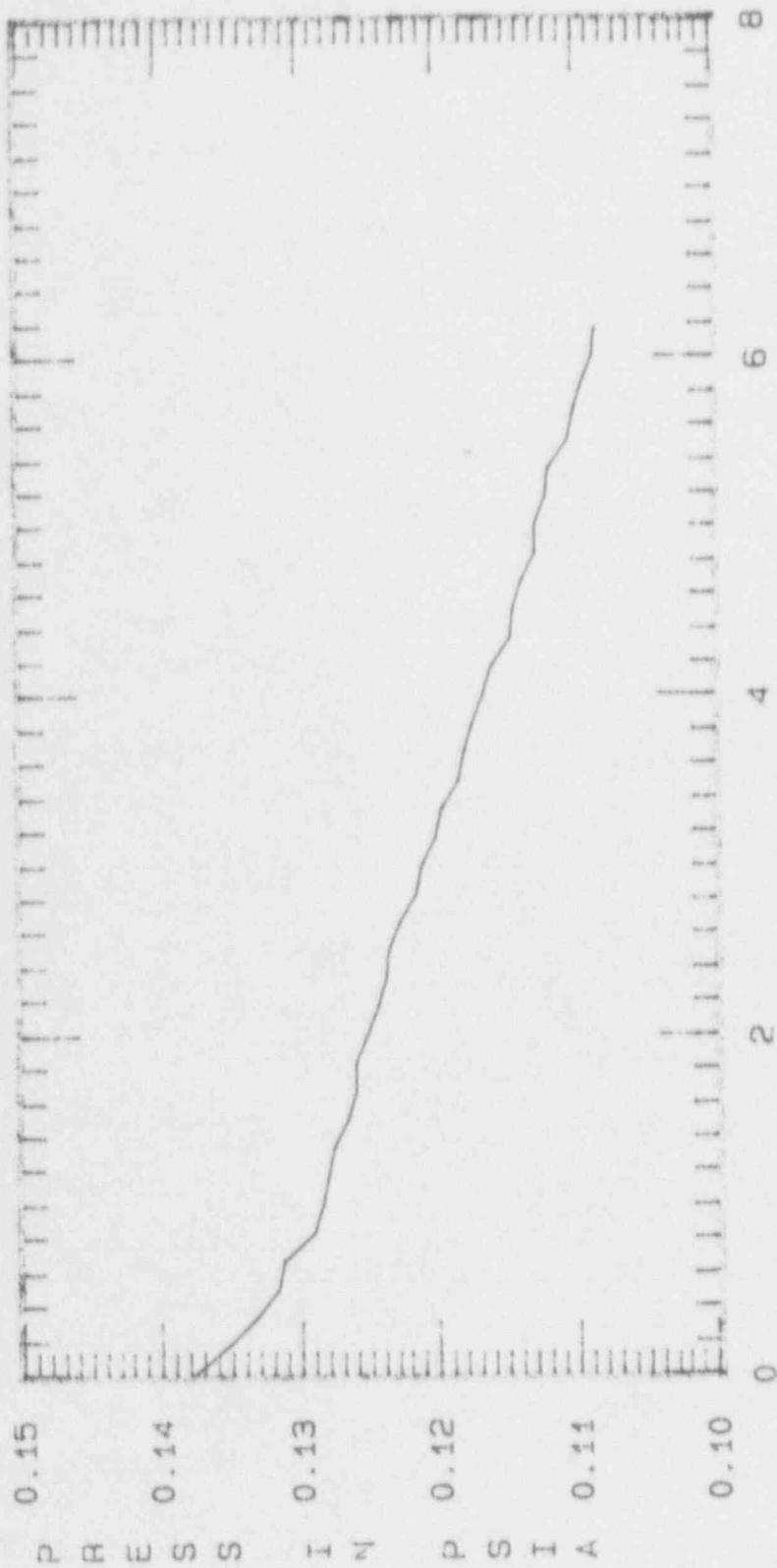
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TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

COMPARTMENT VAPOR PRESSURE  
TEMPERATURE STABILITY PHASE

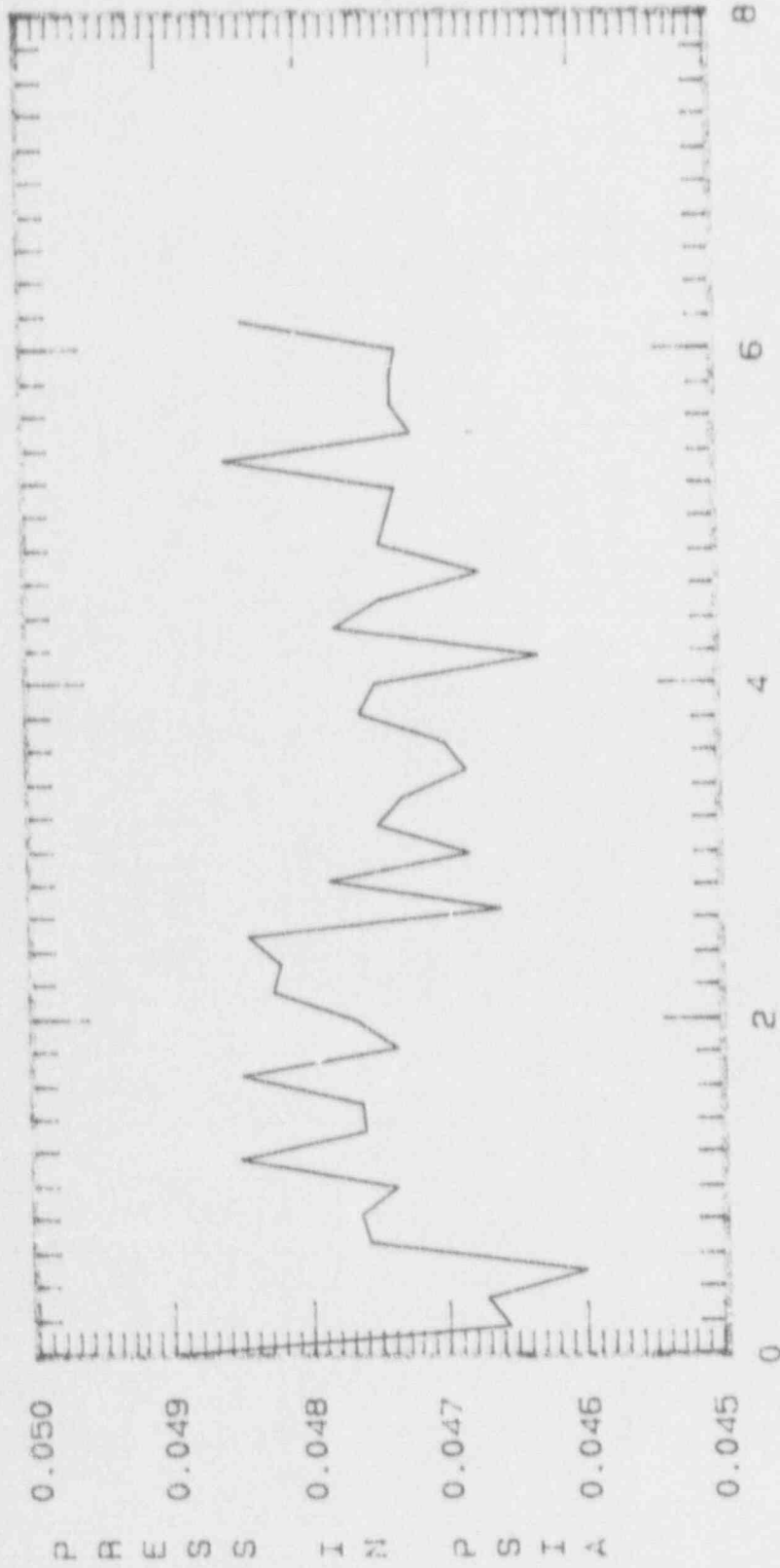
CMPT. 2 = RED



TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

COMPARTMENT VAPOR PRESSURE  
TEMPERATURE STABILITY PHASE

CMPT. 3 = RED

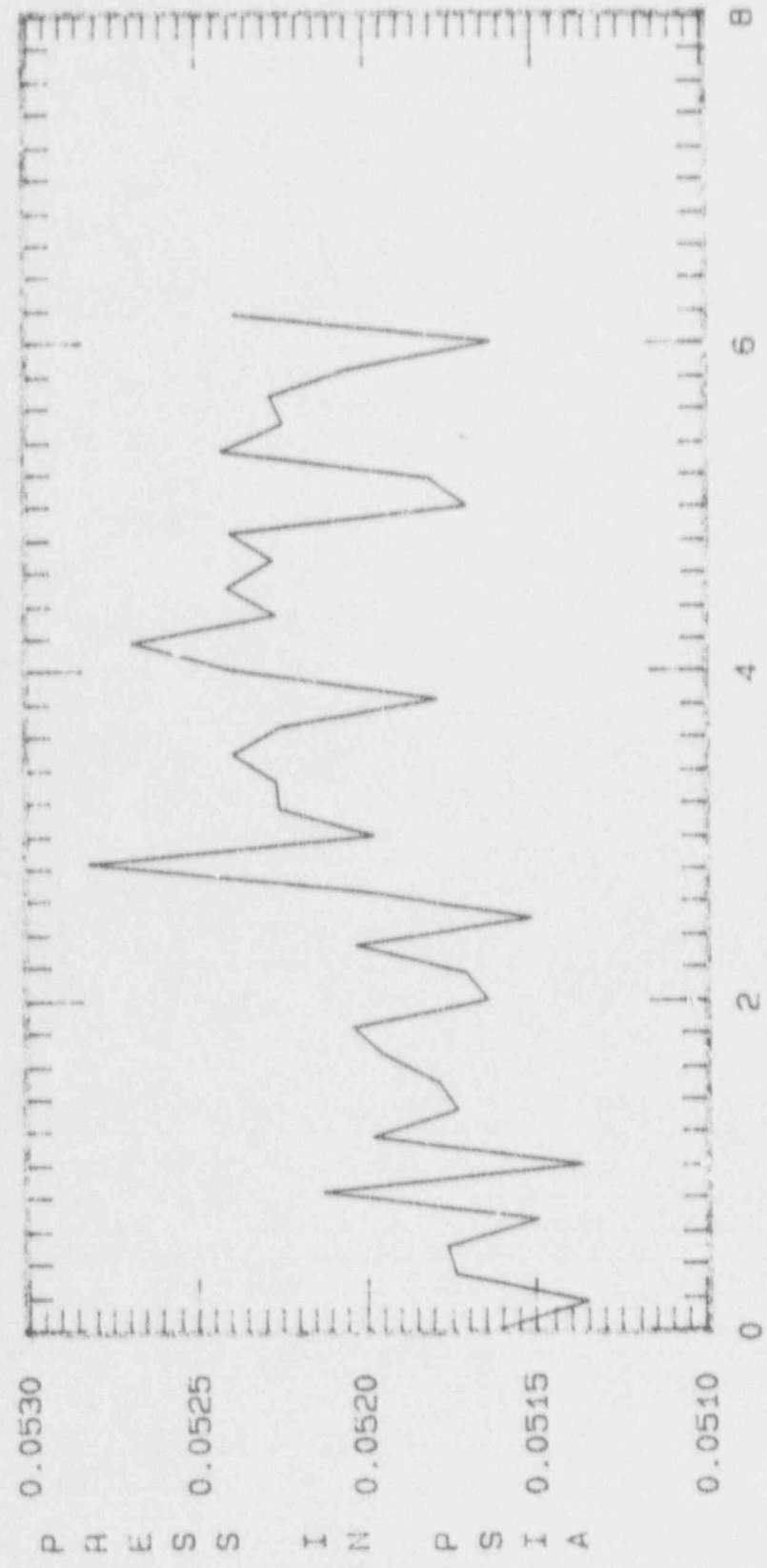


TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

COMPARTMENT VAPOR PRESSURE  
TEMPERATURE STABILITY PHASE



CMPT. 4 = RED



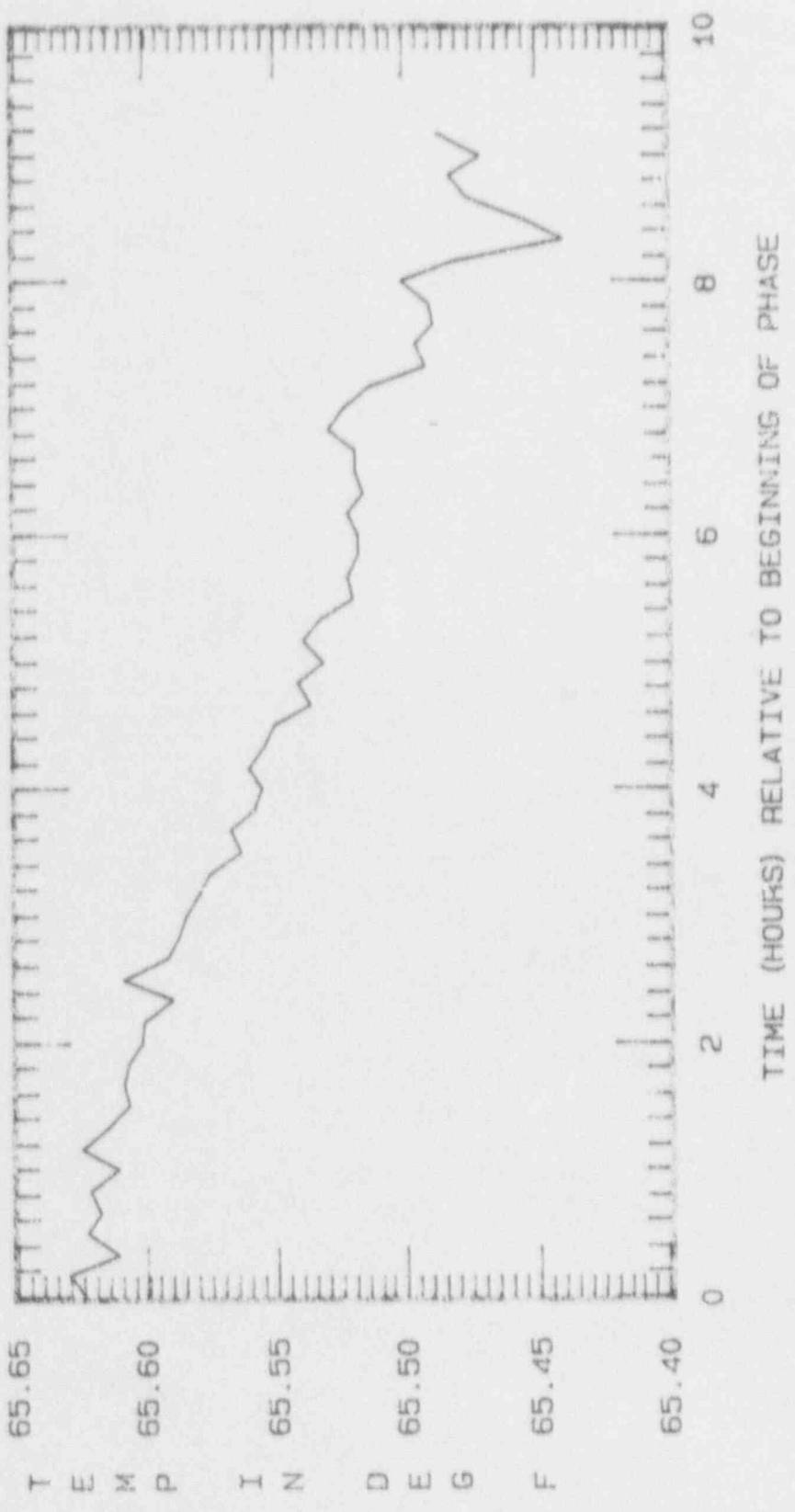
TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

COMPARTMENT VAPOR PRESSURE  
TEMPERATURE STABILITY PHASE

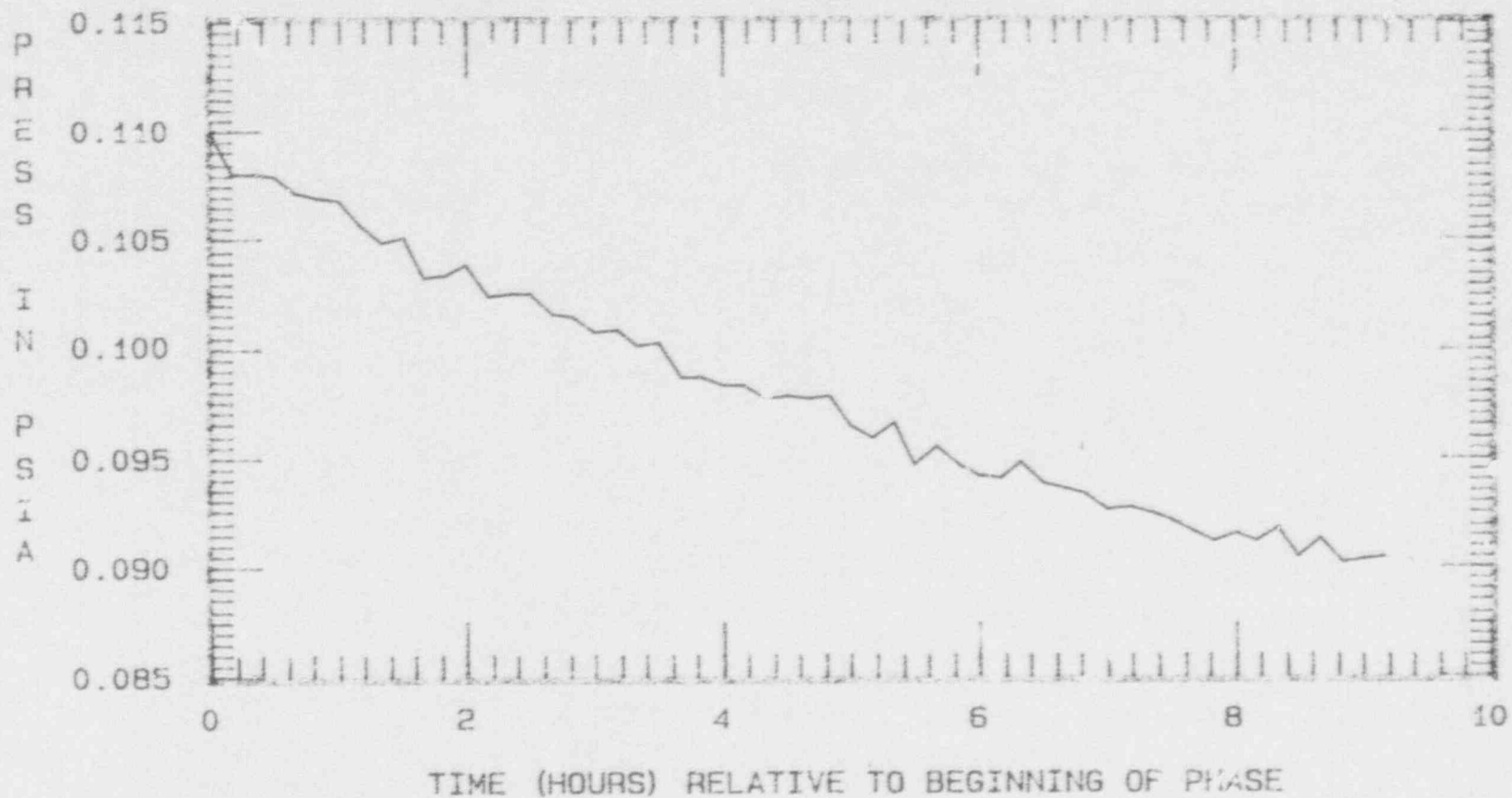
APPENDIX B

CILRT Graphs

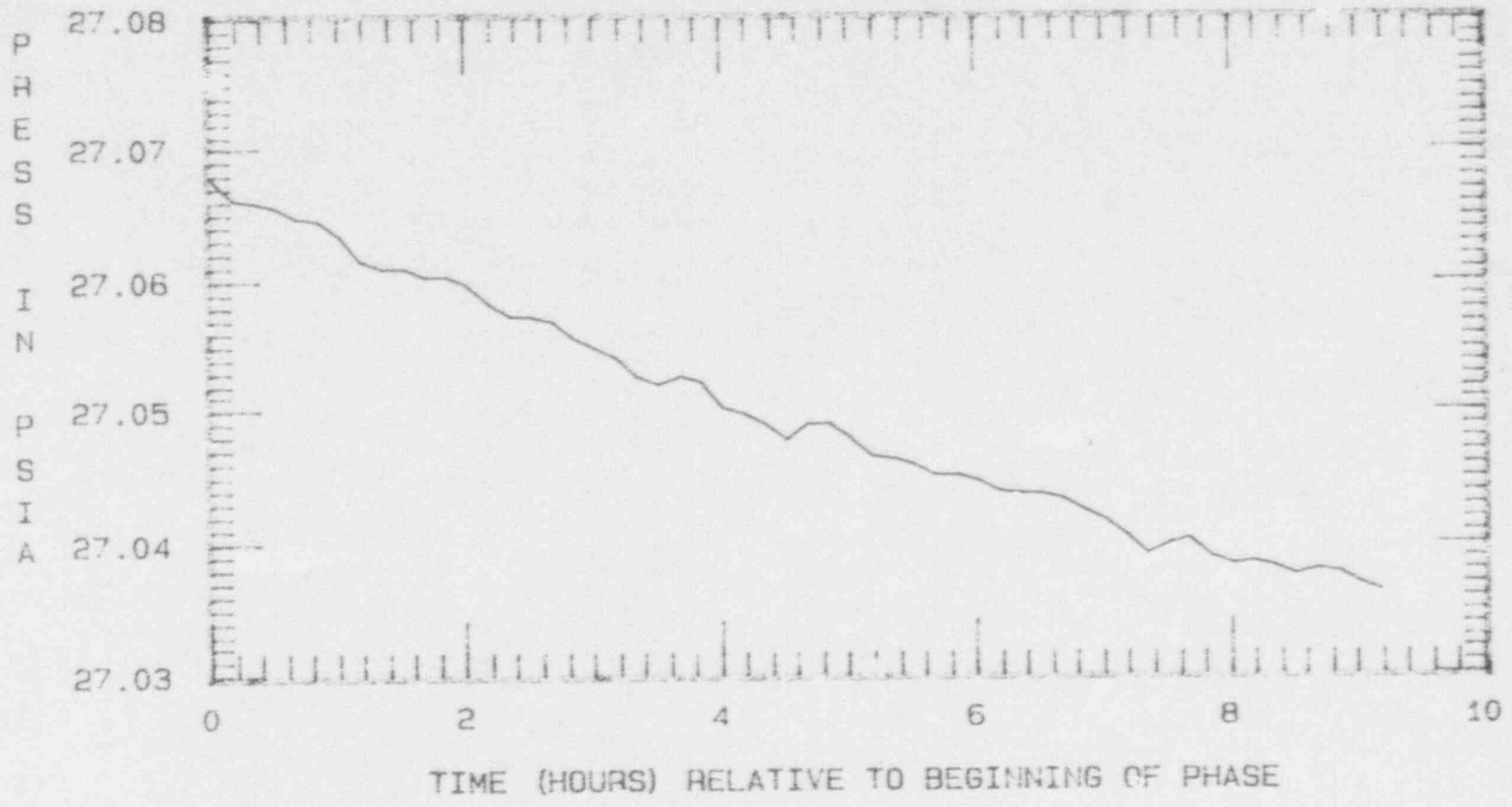
Contents: Containment Temperature  
Containment Vapor Pressure  
Containment Pressure  
Containment Mass  
TTLR Leak Rate  
MLR Leak Rate



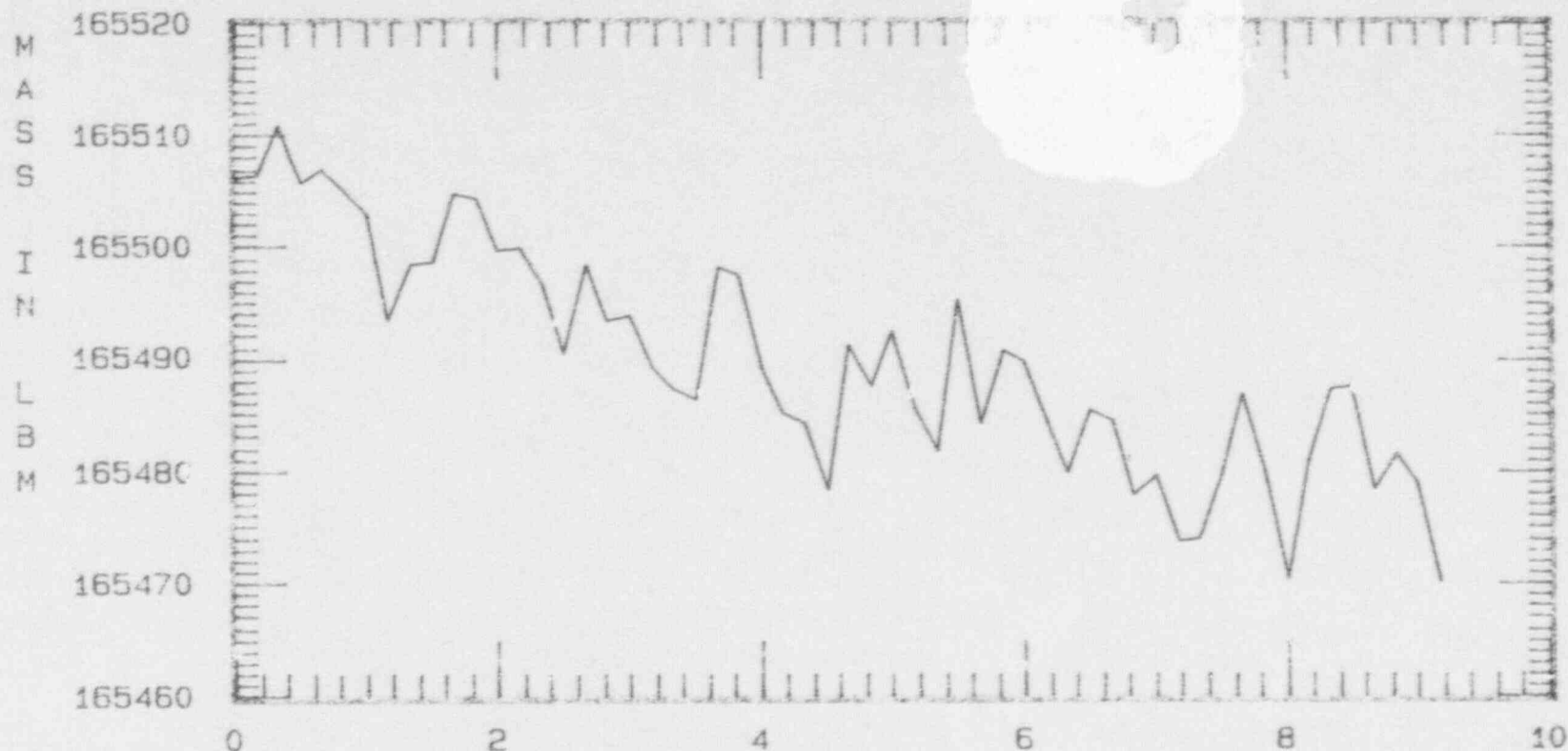
CONTAINMENT TEMPERATURE  
TEST PHASE



CONTAINMENT VAPOR PRESSURE  
TEST PHASE



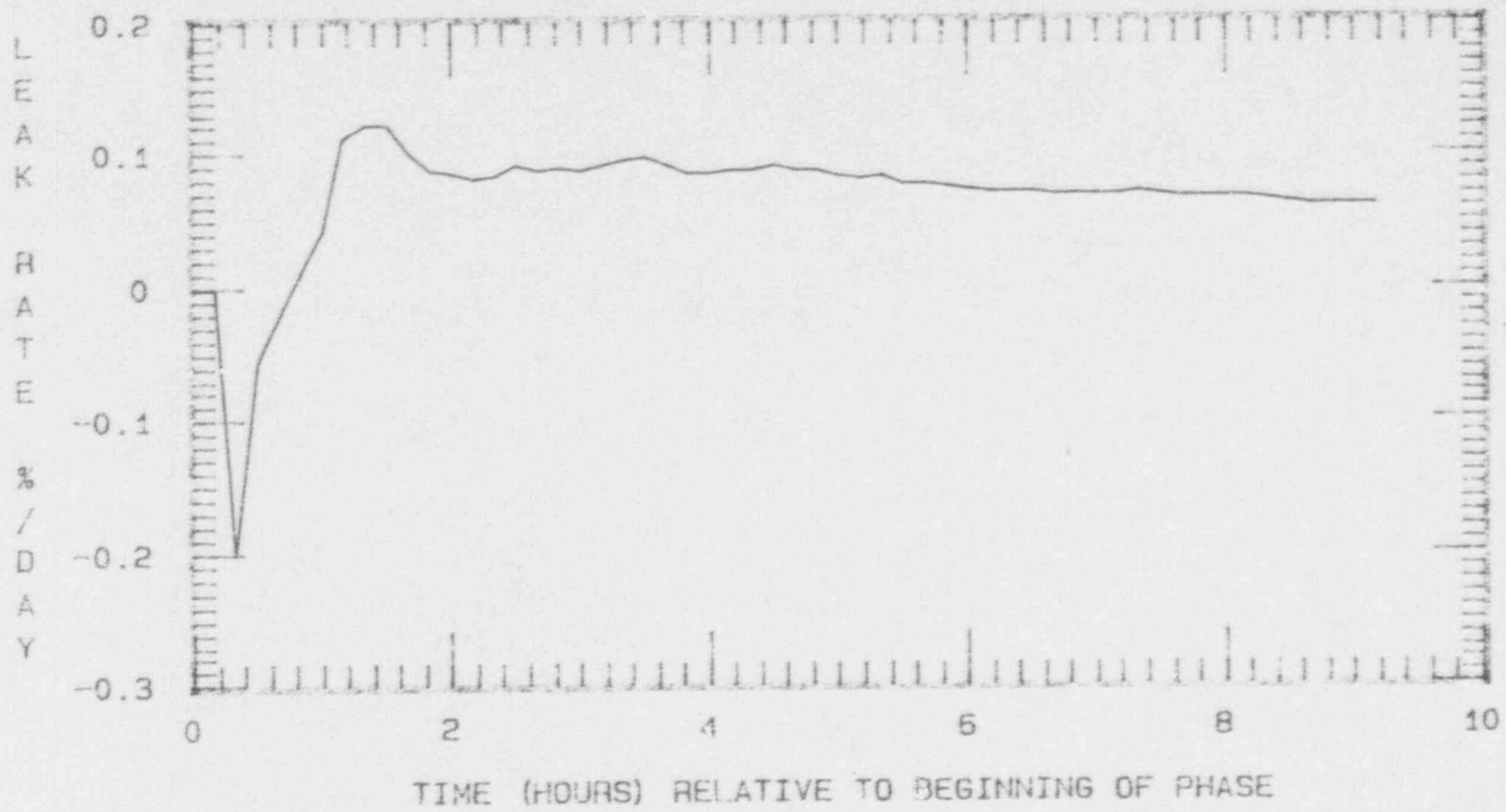
CONTAINMENT PRESSURE  
TEST PHASE



TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

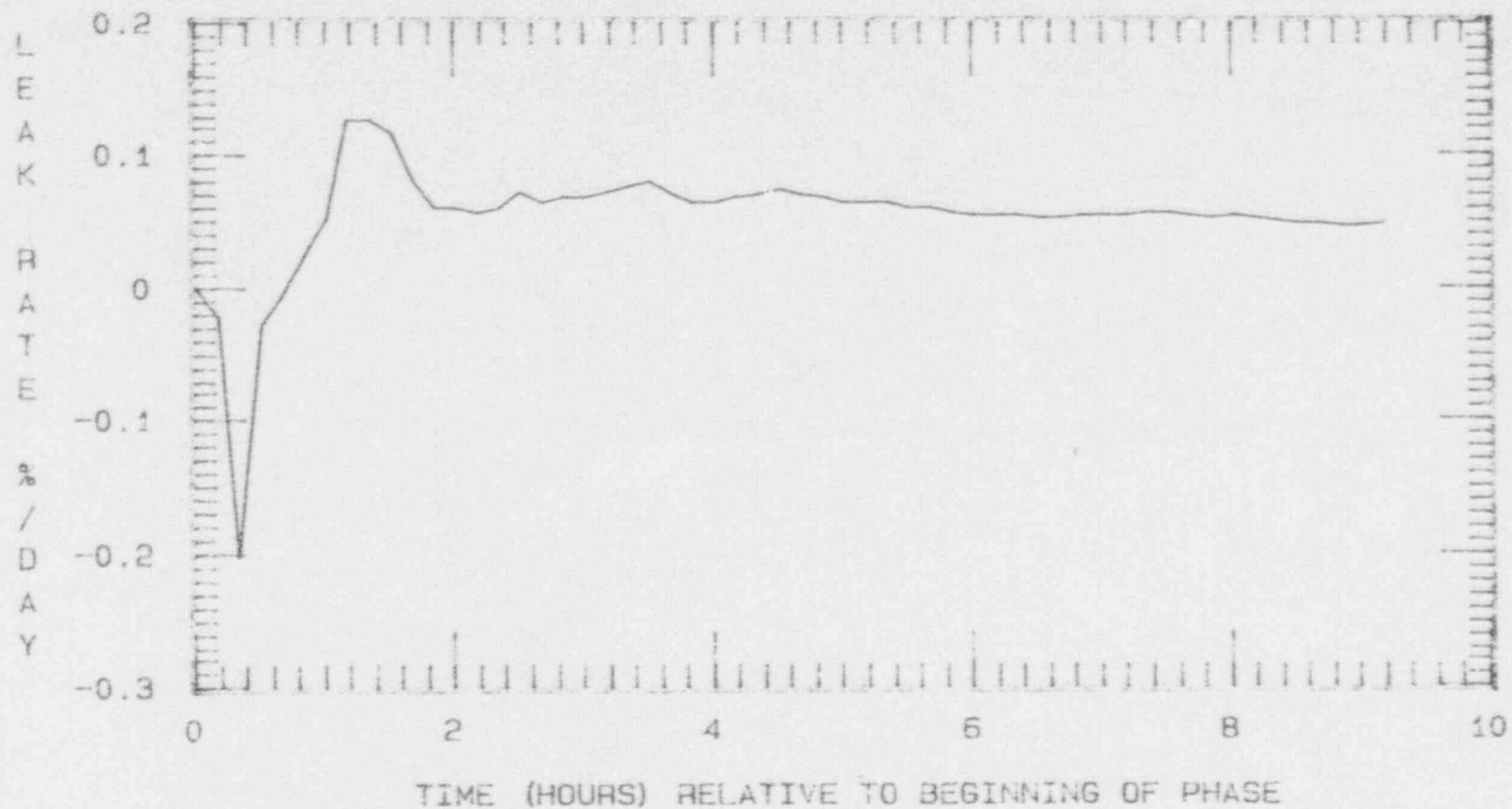
CONTAINMENT MASS  
TEST PHASE

CALCULATED TOTAL TIME LEAK RATE FOR THE LEAK RATE TEST PHASE



CALCULATED TOTAL TIME LEAK RATE  
TEST PHASE

CALCULATED MASS LEAK RATE FOR THE LEAK RATE TEST PHASE



CALCULATED MASS LEAK RATE  
TEST PHASE



APPENDIX C

CILRT Tabular Data

Contents: TLR Tabular Summary

MLR Tabular Summary

## APPENDIX C

## Total Time Leak Rate (TTLR) Summary

Results using 56 samples (samples T-039 - T-094) Elapsed time: 009:10

For the measured TTLR (%/day)

Mean = 0.46140E-01 Standard deviation = 0.43479E-01 Skew = 0.32508E-02  
 Extrapolated value = -0.15833E-01 (%/day) which is -6.3332 % of LA  
 Extrapolation value must be less than 75 % of LA (LA = 0.25000 (%/day))

## Individual Sample TTLR Summary

Sample No.	Elapsed Time	Measured TTLR (%/day)	Calculated TTLR (%/day)	95% UCL for TTLR (%/day)	Convergence (95%UCL-Calc)
39	000:00	0.0000000			
40	000:10	-0.2175146E-01			
41	000:20	-0.1998415			
42	000:30	0.1087573E-01	-0.5392550E-01	1.483777	1.537702
43	000:40	-0.1461426E-01	-0.2151353E-01	0.5439252	0.5654387
44	000:50	0.1957631E-01	0.1242551E-01	0.3696558	0.3572302
45	001:00	0.4894078E-01	0.4430887E-01	0.3134656	0.2691567
46	001:10	0.1598344	0.1130409	0.3502651	0.2372242
47	001:20	0.8547643E-01	0.1234520	0.3352843	0.2118323
48	001:30	0.7190065E-01	0.1239575	0.3235289	0.1995714
49	001:40	0.1209925E-01	0.1026833	0.3114823	0.2087990
50	001:50	0.1606642E-01	0.8806782E-01	0.2936574	0.2055896
51	002:00	0.4826104E-01	0.8633225E-01	0.2802458	0.1939136
52	002:10	0.4235259E-01	0.8303196E-01	0.2677888	0.1847568
53	002:20	0.5991361E-01	0.8470854E-01	0.2598197	0.1751112
54	002:30	0.9108423E-01	0.9330627E-01	0.2591271	0.1658209
55	002:40	0.4154868E-01	0.8863668E-01	0.2500386	0.1614019
56	002:50	0.6621400E-01	0.8998644E-01	0.2450408	0.1550544
57	003:00	0.5981651E-01	0.8961150E-01	0.2395254	0.1499139
58	003:10	0.7727491E-01	0.9255254E-01	0.2370209	0.1444684
59	003:20	0.8238364E-01	0.9582341E-01	0.2353375	0.1395140
60	003:30	0.8260375E-01	0.9849463E-01	0.2336201	0.1351255
61	003:40	0.3139131E-01	0.9194496E-01	0.2270150	0.13507017
62	003:50	0.3298183E-01	0.8650307E-01	0.2206214	0.1341183
63	004:00	0.6185571E-01	0.8625893E-01	0.2171866	0.1309277
64	004:10	0.7335679E-01	0.8771051E-01	0.2153178	0.1276073
65	004:20	0.7346345E-01	0.8892579E-01	0.2134923	0.1245665
66	004:30	0.8977512E-01	0.9221684E-01	0.2137447	0.1215278
67	004:40	0.4661027E-01	0.8920058E-01	0.2095182	0.1203096
68	004:50	0.5569123E-01	0.8768654E-01	0.2061851	0.1184986
69	005:00	0.4033083E-01	0.8433982E-01	0.2019002	0.1175604
70	005:10	0.5797465E-01	0.8548587E-01	0.1991442	0.1156583
71	005:30	0.6635894E-01	0.8368590E-01	0.1972846	0.1135987
72	005:30	0.2854879E-01	0.7945102E-01	0.1928314	0.1133803
73	005:40	0.5649781E-01	0.7875465E-01	0.1904069	0.1116523
74	005:50	0.3872536E-01	0.7615272E-01	0.1868115	0.1106588
75	006:00	0.3983991E-01	0.7389081E-01	0.1834446	0.1095538
76	006:10	0.5110858E-01	0.7298547E-01	0.1810364	0.1080509
77	006:20	0.6028159E-01	0.7307068E-01	0.1794859	0.1064152

## APPENDIX C

## Individual Sample TLR Summary (continued)

Sample No.	Elapsed Time	Measured TLR (%/day)	Calculated TLR (%/day)	95% UCL for TLR (%/day)	Convergence (95%UCL-Calc)
78	006:30	0.4643100E-01	0.7176378E-01	0.1769274	0.1051637
79	006:40	0.4737740E-01	0.7064307E-01	0.1745511	0.1039080
80	006:50	0.6038019E-01	0.7082405E-01	0.1732667	0.1034426
81	007:00	0.5502601E-01	0.7048470E-01	0.1716034	0.1011187
82	007:10	0.6563376E-01	0.7111260E-01	0.1708384	0.9972578E-01
83	007:20	0.6398760E-01	0.7153513E-01	0.1699398	0.9840468E-01
84	007:30	0.5105550E-01	0.7080200E-01	0.1681298	0.9732783E-01
85	007:40	0.3661692E-01	0.6889688E-01	0.1655599	0.9666305E-01
86	007:50	0.4888292E-01	0.6813148E-01	0.1637844	0.9565287E-01
87	008:00	0.6499947E-01	0.6871349E-01	0.1631991	0.9448563E-01
88	008:10	0.4500110E-01	0.6766285E-01	0.1612924	0.9362954E-01
89	008:20	0.3308941E-01	0.6575110E-01	0.1588489	0.9309780E-01
90	008:30	0.3198744E-01	0.6387638E-01	0.1564365	0.9256013E-01
91	008:40	0.4658785E-01	0.6321000E-01	0.1548744	0.9166437E-01
92	008:50	0.4078398E-01	0.6215500E-01	0.1530447	0.9088966E-01
93	009:00	0.4400642E-01	0.6139383E-01	0.1514582	0.9006439E-01
94	009:10	0.5717173E-01	0.6160707E-01	0.1507344	0.8912728E-01

## APPENDIX C

## Total Time Leak Rate (TTLR) Summary

Results using 56 samples (samples T-039 - T-094) Elapsed time: 009:10

For the measured TTLR (%/day)

Mean = 0.46140E-01 Standard deviation = 0.43479E-01 Skew = 0.32508E-02  
 Extrapolated value = -0.15833E-01 (%/day) which is -6.3332 % of LA  
 Extrapolation value must be less than 75 % of LA (LA = 0.25000 (%/day))

## Individual Sample TTLR Summary

Sample No.	Elapsed Time	Measured TTLR (%/day)	Mean Measured TTLR (%/day)	Calculated TTLR (%/day)	Delta Calc TTLR (%/day)
39	000:00	0.0000000			
40	000:10	-0.2175146E-01			
41	000:20	-0.1998415	-0.1107965		
42	000:30	0.1087573E-01	-0.7023908E-01	-0.5392550E-01	
43	000:40	-0.1461426E-01	-0.5633288E-01	-0.2151353E-01	0.3241197E-01
44	000:50	0.1957631E-01	-0.4115104E-01	0.1242551E-01	0.3393904E-01
45	001:00	0.4894078E-01	-0.2613574E-01	0.4430887E-01	0.3188336E-01
46	001:10	0.1598244	0.4314190E-03	0.1130409	0.6873206E-01
47	001:20	0.8547643E-01	0.1106205E-01	0.1234520	0.1041111E-01
48	001:30	0.7190065E-01	0.1782189E-01	0.1239575	0.5054921E-03
49	001:40	0.1209925E-01	0.1724963E-01	0.1026833	-0.2127426E-01
50	001:50	0.1606642E-01	0.1714206E-01	0.8806782E-01	-0.1461545E-01
51	002:00	0.4826104E-01	0.1973531E-01	0.8633225E-01	-0.1735568E-02
52	002:10	0.4235259E-01	0.2147510E-01	0.8303196E-01	-0.3300294E-02
53	002:20	0.5991361E-01	0.2422071E-01	0.8470854E-01	0.1676582E-02
54	002:30	0.9108423E-01	0.2867828E-01	0.9330627E-01	0.8597724E-02
55	002:40	0.4154868E-01	0.2948268E-01	0.8863668E-01	-0.4669584E-02
56	002:50	0.6621400E-01	0.3164334E-01	0.8998644E-01	0.1349762E-02
57	003:00	0.5981651E-01	0.3320852E-01	0.8961150E-01	-0.3749430E-03
58	003:10	0.7727491E-01	0.3552780E-01	0.9255254E-01	0.2941042E-02
59	003:20	0.8238364E-01	0.3787060E-01	0.9582341E-01	0.3270864E-02
60	003:30	0.8260375E-01	0.4000074E-01	0.9849463E-01	0.2671219E-02
61	003:40	0.3139131E-01	0.3960941E-01	0.9194476E-01	-0.6549671E-02
62	003:50	0.3298183E-01	0.3932125E-01	0.8650307E-01	-0.5441889E-02
63	004:00	0.6185571E-01	0.4026019E-01	0.8625893E-01	-0.2441392E-03
64	004:10	0.7335679E-01	0.4158406E-01	0.8771051E-01	0.1451574E-02
65	004:20	0.7346345E-01	0.4281019E-01	0.8892579E-01	0.1215287E-02
66	004:30	0.8977512E-01	0.4454963E-01	0.9221684E-01	0.3291048E-02
67	004:40	0.4661027E-01	0.4462322E-01	0.8920858E-01	-0.3008261E-02
68	004:50	0.5569123E-01	0.4500488E-01	0.8768654E-01	-0.1522042E-02
69	005:00	0.4033083E-01	0.4484908E-01	0.8433982E-01	-0.3346719E-02
70	005:10	0.5797465E-01	0.4527248E-01	0.8348587E-01	-0.8539483E-03
71	005:20	0.6635894E-01	0.4593144E-01	0.8368590E-01	0.2000332E-03
72	005:30	0.2854879E-01	0.4540469E-01	0.7945102E-01	-0.4234888E-02
73	005:40	0.5649781E-01	0.4573096E-01	0.7875465E-01	-0.6963685E-03
74	005:50	0.3872536E-01	0.4553080E-01	0.7615272E-01	-0.2601929E-02
75	006:00	0.3983991E-01	0.4537272E-01	0.7389081E-01	-0.2261914E-02
76	006:10	0.5110858E-01	0.4552775E-01	0.7298547E-01	-0.9053349E-03
77	006:20	0.6028159E-01	0.4591600E-01	0.7307068E-01	0.8521229E-04
78	006:30	0.4643100E-01	0.4592921E-01	0.7176378E-01	-0.1306899E-02

## APPENDIX C

## Individual Sample TLR Summary (continued)

Sample No.	Elapsed Time	Measured TLR (%/day)	Mean Measured TLR (%/day)	Calculated TLR (%/day)	Delta Calc TLR (%/day)
79	006:40	0.4737740E-01	0.4596541E-01	0.7064307E-01	-0.1120709E-02
80	006:50	0.6038019E-01	0.4631699E-01	0.7082405E-01	0.1809746E-03
81	007:00	0.5502601E-01	0.4652435E-01	0.7048470E-01	-0.3393516E-03
82	007:10	0.6563376E-01	0.4696875E-01	0.7111260E-01	0.6278977E-03
83	007:20	0.6398760E-01	0.4735555E-01	0.7153513E-01	0.4225299E-03
84	007:30	0.5105550E-01	0.4743777E-01	0.7080200E-01	-0.7331222E-03
85	007:40	0.3661692E-01	0.4720254E-01	0.6889688E-01	-0.1905121E-02
86	007:50	0.4888292E-01	0.4723829E-01	0.6813148E-01	-0.7653981E-03
87	008:00	0.6499947E-01	0.4760831E-01	0.6871349E-01	0.5820096E-03
88	008:10	0.4500110E-01	0.4755510E-01	0.6766285E-01	-0.1050644E-02
89	008:20	0.3308941E-01	0.4726579E-01	0.6575110E-01	-0.1911752E-02
90	008:30	0.3198744E-01	0.4696621E-01	0.6387638E-01	-0.1874715E-02
91	008:40	0.4658785E-01	0.4695894E-01	0.6321000E-01	-0.6663799E-03
92	008:50	0.4078398E-01	0.4684243E-01	0.6215500E-01	-0.1054998E-02
93	009:00	0.4400642E-01	0.4678991E-01	0.6139383E-01	-0.7611737E-03
94	009:10	0.5717173E-01	0.4697867E-01	0.6160707E-01	0.2132431E-03

## APPENDIX C

## Mass Leak Rate (MLR) Summary

Results using 56 samples (samples T-039 - T-094) Elapsed time: 009:10

Sample No.	Elapsed Time	Calculated MLR (%/day)	95 % UCL (MLR) (%/day) , approx	95 % UCL (MLR) (%/day) Exact
39	000:00	0.0000000		
40	000:10	-0.2243119E-01		
41	000:20	-0.2018816	0.6814920	0.6814510
42	000:30	-0.2773300E-01	0.2935728	0.2935630
43	000:40	-0.6525404E-02	0.1447511	0.1447480
44	000:50	0.2330494E-01	0.1201149	0.1201128
45	001:00	0.5127071E-01	0.1242230	0.1242211
46	001:10	0.1273986	0.2279789	0.2279729
47	001:20	0.1261557	0.2021357	0.2021315
48	001:30	0.1162691	0.1766935	0.1766902
49	001:40	0.8186357E-01	0.1427214	0.1427284
50	001:50	0.6114696E-01	0.1158561	0.1158537
51	002:00	0.5951727E-01	0.1053953	0.1053933
52	002:10	0.5621877E-01	0.9536350E-01	0.9536182E-01
53	002:20	0.5966068E-01	0.9353905E-01	0.9353751E-01
54	002:30	0.7216281E-01	0.1043030	0.1043021
55	002:40	0.6525378E-01	0.9422824E-01	0.9422673E-01
56	002:50	0.6788002E-01	0.9362371E-01	0.9362233E-01
57	003:00	0.6777228E-01	0.9072912E-01	0.9071960E-01
58	003:10	0.7222050E-01	0.9328534E-01	0.9328403E-01
59	003:20	0.7728718E-01	0.9686594E-01	0.9686460E-01
60	003:30	0.8076528E-01	0.9888986E-01	0.9888854E-01
61	003:40	0.7144371E-01	0.9043093E-01	0.9042969E-01
62	003:50	0.6400556E-01	0.8282077E-01	0.8281950E-01
63	004:00	0.6465153E-01	0.8193643E-01	0.8193526E-01
64	004:10	0.6746235E-01	0.8361759E-01	0.8361644E-01
65	004:20	0.6979513E-01	0.8489037E-01	0.8488919E-01
66	004:30	0.7586112E-01	0.8972763E-01	0.8972640E-01
67	004:40	0.7071821E-01	0.8512025E-01	0.8511907E-01
68	004:50	0.6898457E-01	0.8252611E-01	0.8252496E-01
69	005:00	0.6462241E-01	0.7798004E-01	0.7797899E-01
70	005:10	0.6410573E-01	0.7663082E-01	0.7662977E-01
71	005:20	0.6525384E-01	0.7703607E-01	0.7703505E-01
72	005:30	0.5982041E-01	0.7215443E-01	0.7215341E-01
73	005:40	0.5936845E-01	0.7098971E-01	0.7098874E-01
74	005:50	0.5643614E-01	0.6779510E-01	0.6779421E-01
75	006:00	0.6396098E-01	0.6496554E-01	0.6496460E-01
76	006:10	0.5346594E-01	0.6389450E-01	0.6389364E-01
77	006:20	0.5452836E-01	0.6445494E-01	0.6445406E-01
78	006:30	0.5328093E-01	0.6277201E-01	0.6277122E-01
79	006:40	0.5256739E-01	0.6163221E-01	0.6163143E-01
80	006:50	0.5346834E-01	0.6214802E-01	0.6214754E-01
81	007:00	0.5344912E-01	0.6171957E-01	0.6171884E-01
82	007:10	0.5503624E-01	0.6306857E-01	0.6306774E-01
83	007:20	0.5612385E-01	0.6387613E-01	0.6387543E-01
84	007:30	0.5550340E-01	0.6293526E-01	0.6293452E-01
85	007:40	0.5336258E-01	0.6081364E-01	0.6081292E-01

## APPENDIX C

## Mass Leak Rate (MLR) Summary

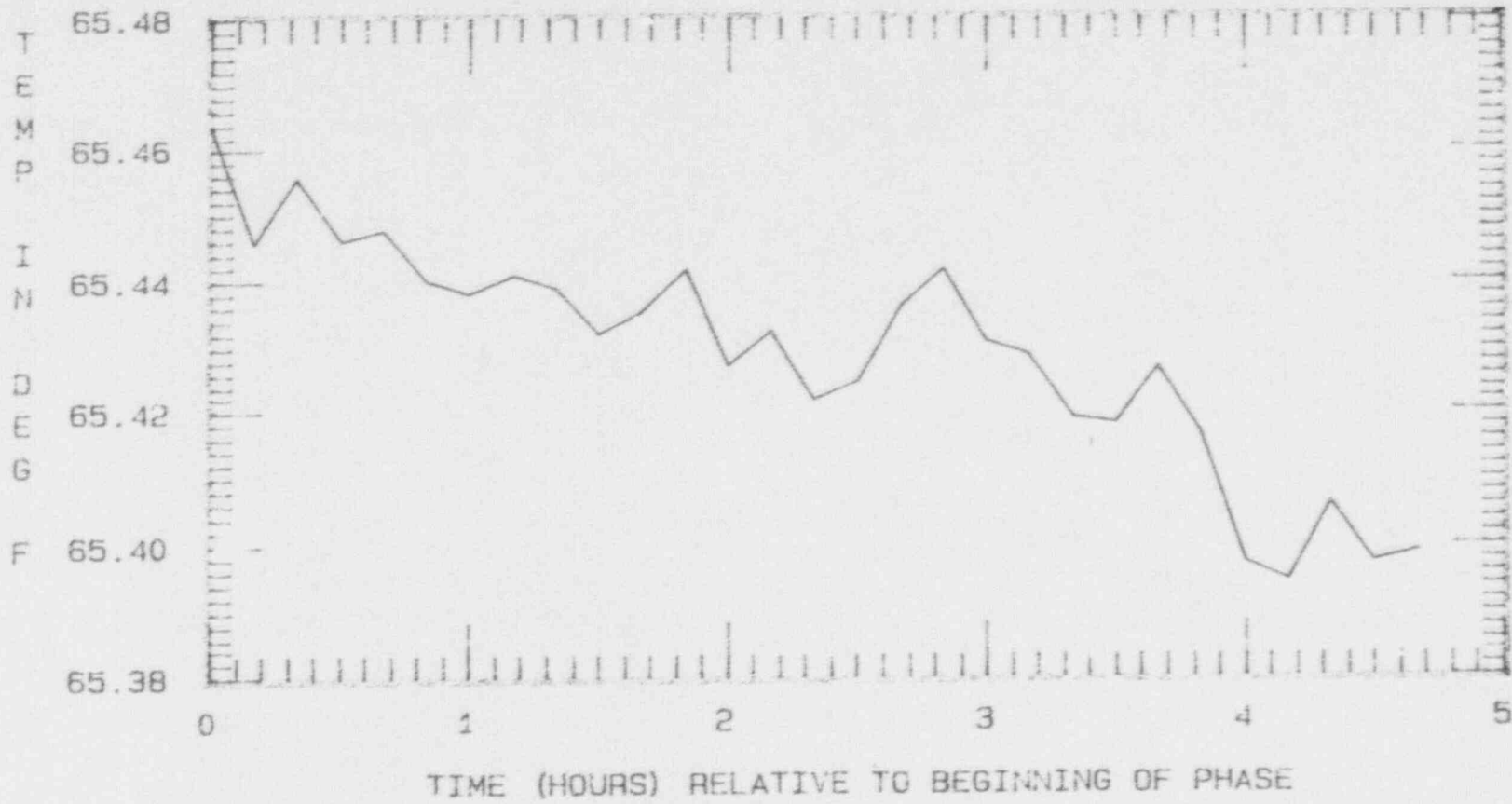
Sample No.	Elapsed Time	Calculated MLR (%/day)	95 % UCL (MLR) (%/day) Approx	95 % UCL (MLR) (%/day) Exact
86	007:50	0.5281561E-01	0.5997594E-01	0.5997524E-01
87	008:00	0.5422773E-01	0.6122013E-01	0.6121941E-01
88	008:10	0.5314362E-01	0.5993091E-01	0.5993021E-01
89	008:20	0.5083366E-01	0.5772590E-01	0.5772522E-01
90	008:30	0.4849124E-01	0.5545348E-01	0.5545282E-01
91	008:40	0.4815453E-01	0.5486391E-01	0.5486323E-01
92	008:50	0.4696067E-01	0.5349010E-01	0.5348949E-01
93	009:00	0.4655419E-01	0.5286609E-01	0.5286543E-01
94	009:10	0.4738673E-01	0.5352795E-01	0.5352730E-01

APPENDIX D

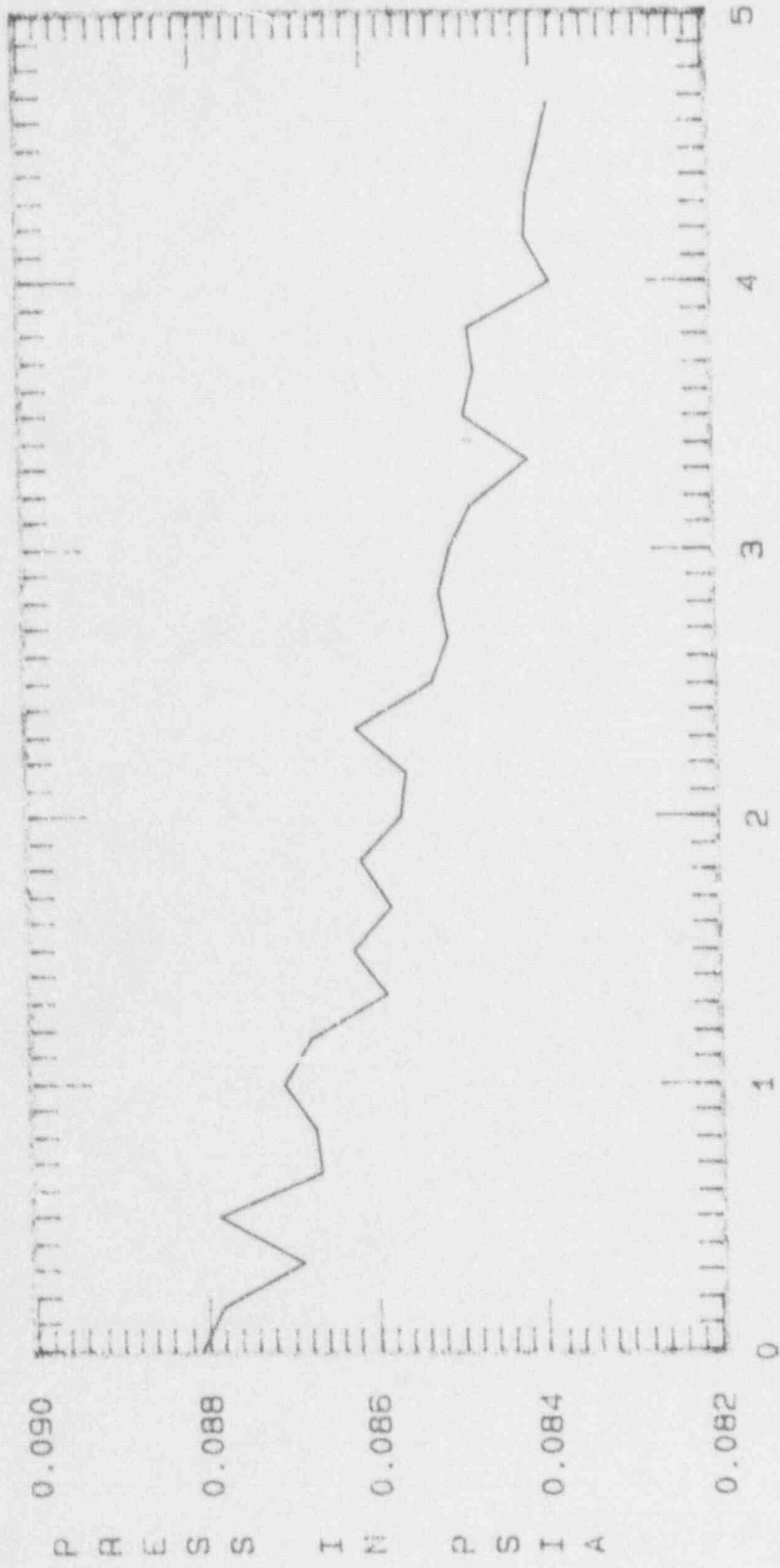
Verification Graphs

Contents: Containment Temperature  
Containment Vapor Pressure  
Containment Pressure  
Containment Mass  
TTLR Leak Rate  
MLR Leak Rate



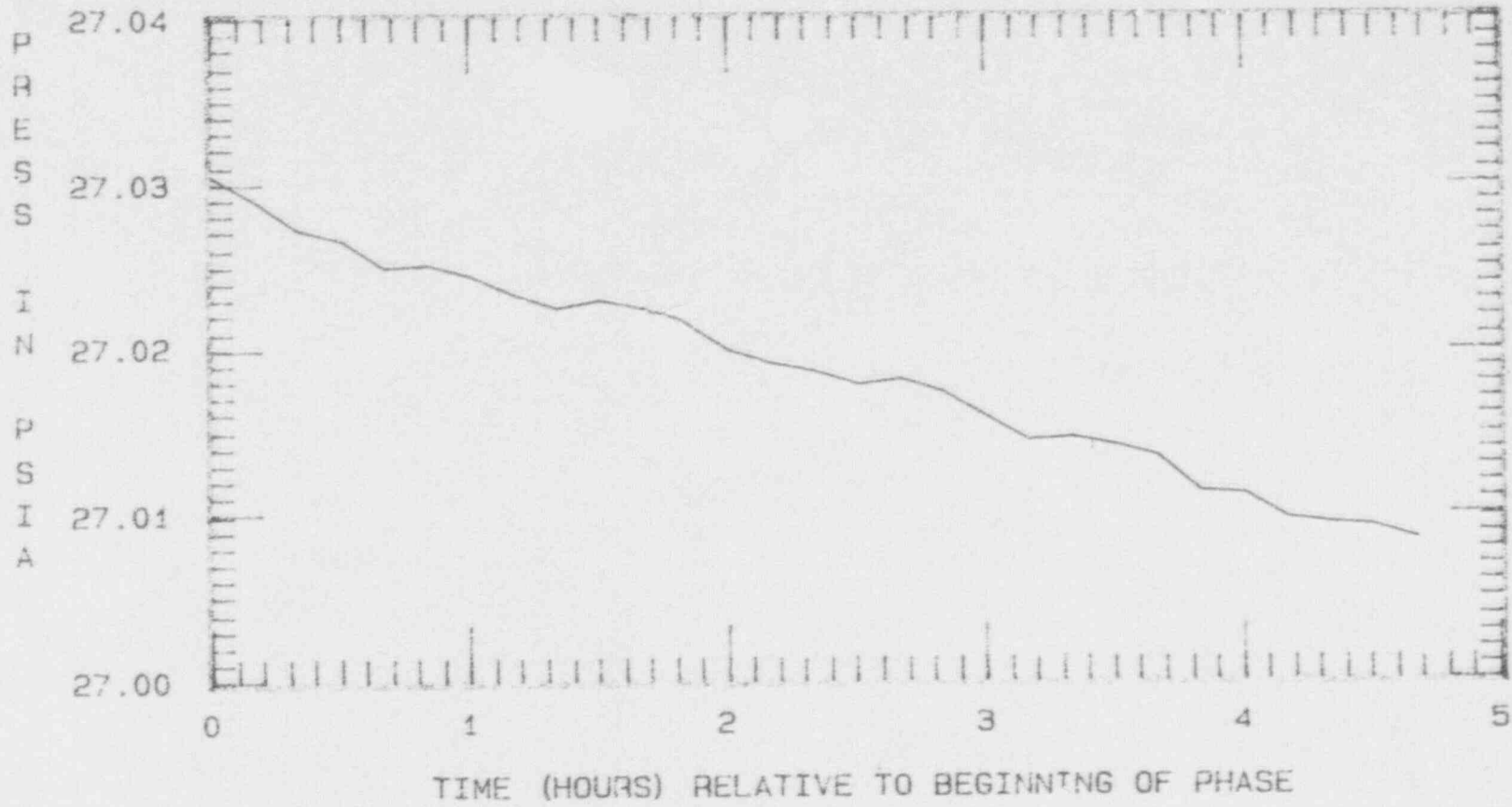


CONTAINMENT TEMPERATURE  
VERIFICATION PHASE

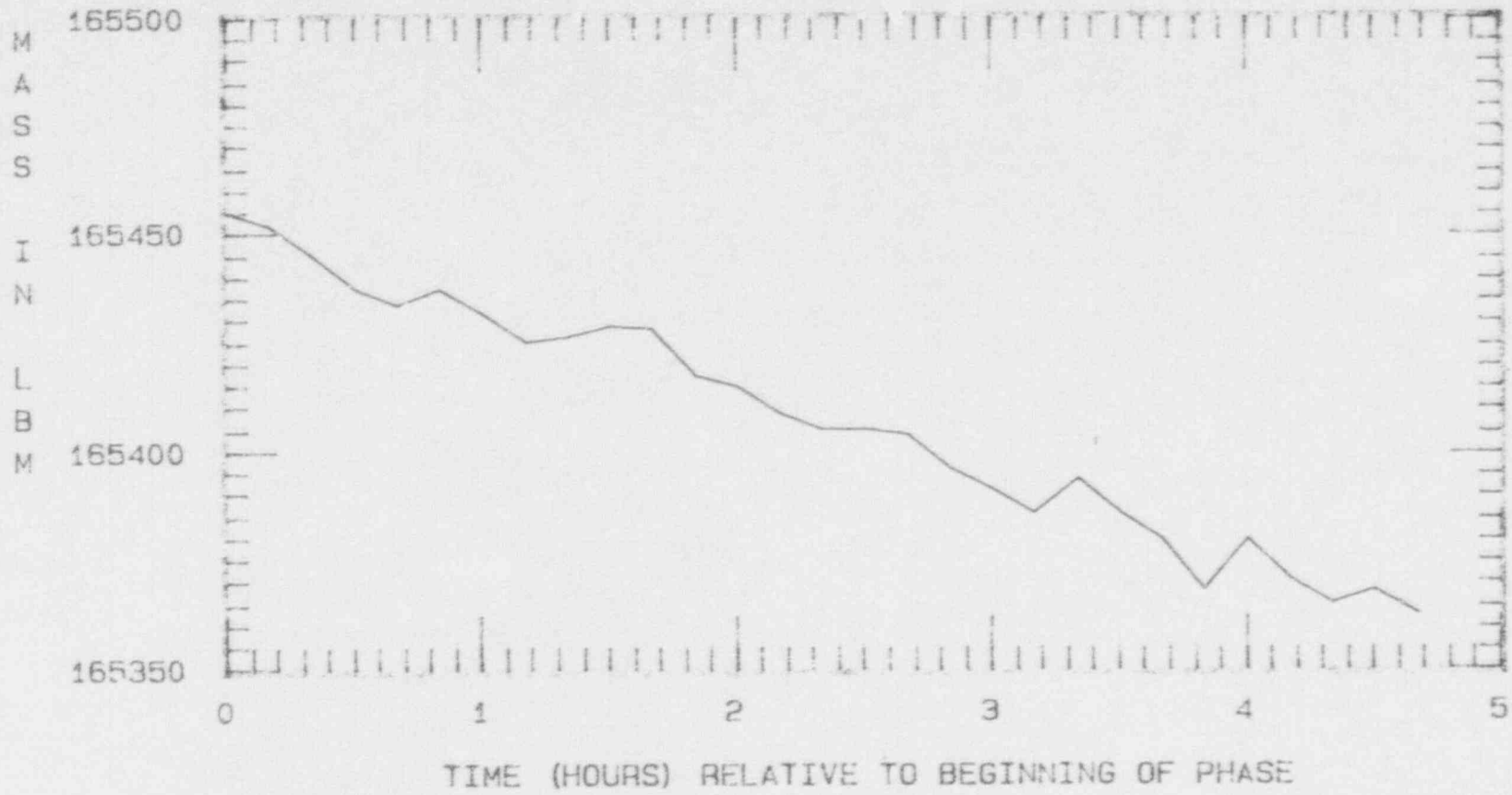


TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

CONTAINMENT VAPOR PRESSURE  
VERIFICATION PHASE

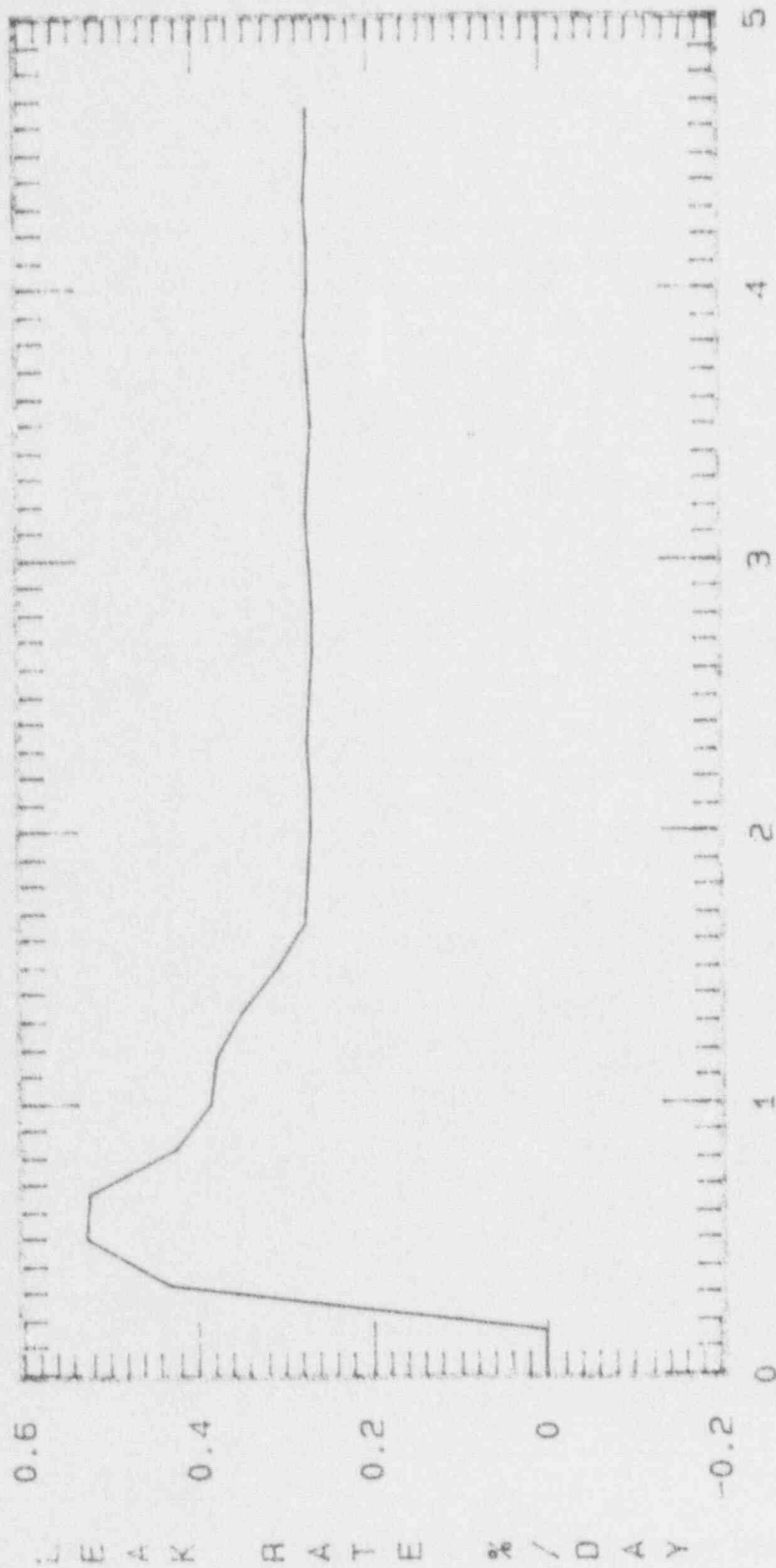


CONTAINMENT PRESSURE  
VERIFICATION PHASE



CONTAINMENT MASS  
VERIFICATION PHASE

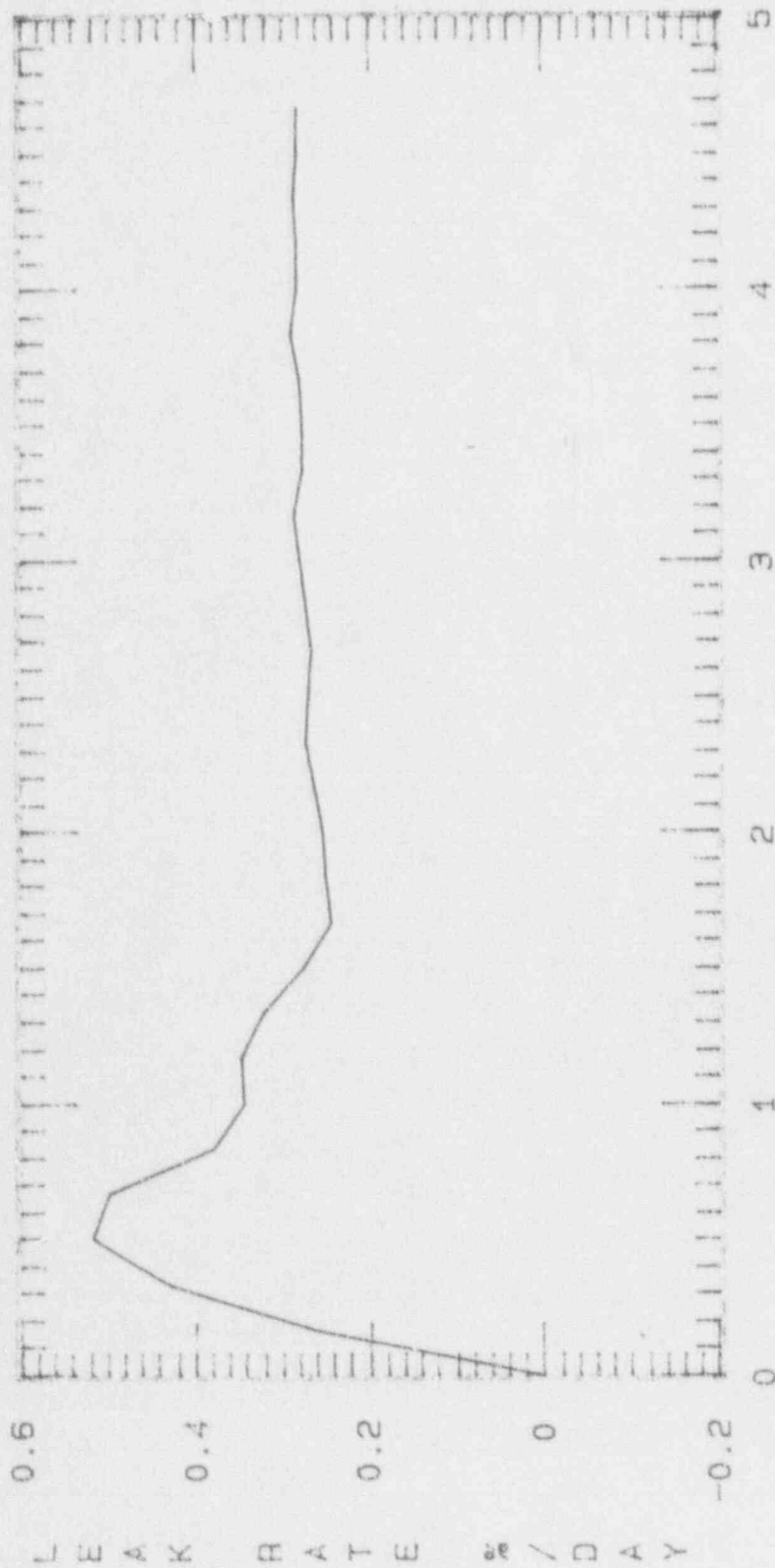
CALCULATED TOTAL TIME LEAK RATE FOR THE VERIFICATION TEST PHASE



TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

CALCULATED TOTAL TIME LEAK RATE  
VERIFICATION PHASE

CALCULATED MASS LEAK RATE FOR THE VERIFICATION TEST PHASE



TIME (HOURS) RELATIVE TO BEGINNING OF PHASE

CALCULATED MASS LEAK RATE  
VERIFICATION PHASE

APPENDIX E

Verification Tabular Data

Contents: TTLR Tabular Data

MLR Tabular Data

## APPENDIX E

## Total Time Leak Rate (TTLR) Summary

Results using 29 samples (samples V-105 - V-133) Elapsed time: 004:40

For the measured TTLR (%/day)

Mean = 0.30304 Standard deviation = 0.84000E-01 Skew = 0.20801E-01

Extrapolated value = 1.3735 (%/day) which is 549.38 % of LA

Extrapolation value must be less than 75 % of LA (LA = 0.25000 (%/day))

## Individual Sample TTLR Summary:

Sample No.	Elapsed Time	Measured TTLR (%/day)	Calculated TTLR (%/day)	95 % UCL for TTLR (%/day)	Convergence (95%UCL-Calc)
105	000:00	0.0000000			
106	000:10	0.2583783			
107	000:20	0.4297239			
108	000:30	0.5090505	0.5243871	0.8883147	0.3639275
109	000:40	0.4657609	0.5209497	0.9028198	0.3818702
110	000:50	0.3108699	0.4229608	0.8868784	0.4639177
111	001:00	0.7355717	0.3844245	0.7526780	0.3682534
112	001:10	0.3693061	0.3772692	0.6789771	0.3017078
113	001:20	0.3119238	0.3489649	0.6140698	0.2651049
114	001:30	0.2494635	0.3069340	0.5533618	0.2464278
115	001:40	0.2330844	0.2727196	0.4998641	0.2271445
116	001:50	0.2986803	0.2696627	0.4799514	0.2102887
117	002:00	0.2912422	0.2656859	0.4620425	0.1963567
118	002:10	0.3073342	0.2675032	0.4543599	0.1868567
119	002:20	0.3102482	0.2699820	0.4489469	0.1789649
120	002:30	0.2882051	0.2668700	0.4371180	0.1702480
121	002:40	0.2775867	0.2622041	0.4245720	0.1623680
122	002:50	0.3005348	0.2635945	0.4207644	0.1571698
123	003:00	0.3074097	0.2663236	0.4193644	0.1530409
124	003:10	0.3177122	0.2707438	0.4207871	0.1500433
125	003:20	0.2670816	0.2651639	0.4098261	0.1446522
126	003:30	0.2869359	0.2641065	0.4045119	0.1404054
127	003:40	0.2983713	0.2652627	0.4024483	0.1371857
128	003:50	0.3280281	0.2711857	0.4076943	0.1365086
129	004:00	0.2722605	0.2676333	0.4002940	0.1326607
130	004:10	0.2941705	0.2679341	0.3976944	0.1297604
131	004:20	0.3012147	0.2692894	0.3966802	0.1273908
132	004:30	0.2798343	0.2675414	0.3919558	0.1244144
133	004:40	0.2872273	0.2670621	0.3889270	0.1218650



## APPENDIX E

## Total Time Leak Rate (TTLR) Summary

Results using 29 samples (samples V-105 - V-133) Elapsed time: 004:40

For the measured TTLR (%/day)

Mean = 0.30304 Standard deviation = 0.84000E-01 Skew = 0.20801E-01  
 Extrapolated value = 1.3735 (%/day) which is 549.38 % of LA  
 Extrapolation value must be less than 75 % of LA (LA = 0.25000 (%/day))

## Individual Sample TTLR Summary

Sample No.	Elapsed Time	Measured TTLR (%/day)	Calculated TTLR (%/day)	Mean Measured TTLR (%/day)	Delta Calc TTLR (%/day)
105	000:00	0.0000000			
106	000:10	0.2583783			
107	000:20	0.4297239		0.3440511	
108	000:30	0.5090505	0.5243871	0.3990509	
109	000:40	0.4657609	0.5209497	0.4157284	-0.3437459E-02
110	000:50	0.3108699	0.4229608	0.3947567	-0.9798890E-01
111	001:00	0.3365717	0.3844245	0.3850592	-0.3853622E-01
112	001:10	0.3693061	0.3772692	0.3828088	-0.7155299E-02
113	001:20	0.3119238	0.3489649	0.3739482	-0.2830434E-01
114	001:30	0.2494635	0.3069340	0.3601165	-0.4203090E-01
115	001:40	0.2330844	0.2727196	0.3474133	-0.3421438E-01
116	001:50	0.2986803	0.2696627	0.3429830	-0.3056943E-02
117	002:00	0.2912422	0.2656859	0.3386713	-0.3976792E-02
118	002:10	0.3073342	0.2675032	0.3362608	0.1817316E-02
119	002:20	0.3102482	0.2699820	0.3344027	0.2478749E-02
120	002:30	0.2882051	0.2668700	0.3313229	-0.3111959E-02
121	002:40	0.2775867	0.2622041	0.3279644	-0.4665941E-02
122	002:50	0.3005348	0.2635945	0.3263509	0.1390457E-02
123	003:00	0.3074097	0.2663236	0.3252986	0.2729058E-02
124	003:10	0.3177122	0.2707438	0.3248993	0.4420191E-02
125	003:20	0.2670816	0.2651639	0.3220084	-0.5579889E-02
126	003:30	0.2869359	0.2641065	0.3203383	-0.1057357E-02
127	003:40	0.2983713	0.2652627	0.3193398	0.1156177E-02
128	003:50	0.3280281	0.2711857	0.3197176	0.5923063E-02
129	004:00	0.2722605	0.2676333	0.3177402	-0.3552437E-02
130	004:10	0.2941705	0.2679341	0.3167974	0.3007650E-03
131	004:20	0.3012147	0.2692894	0.3161981	0.1355350E-02
132	004:30	0.2798343	0.2675414	0.3148513	-0.1747996E-02
133	004:40	0.2872273	0.2670621	0.3138647	-0.4793406E-03

## APPENDIX E

## Mass Leak Rate (MLR) Summary

Results using 29 samples (samples V-105 - V-133) Elapsed time: 004:40

Sample No.	Elapsed Time	Calculated TLR (%/day)	95 % UCL (MLR) (%/day) Approx	95 % UCL (MLR) (%/day) Exact
105	000:00	0.000000		
106	000:10	0.2590582		
107	000:20	0.4283623	1.274946	1.274872
108	000:30	0.5172963	0.7160486	0.7160337
109	000:40	0.4993468	0.5944860	0.5944782
110	000:50	0.3795252	0.5386176	0.5386027
111	001:00	0.3450252	0.4584814	0.4584706
112	001:10	0.3489104	0.4305769	0.4305683
113	001:20	0.3220248	0.3905397	0.3905323
114	001:30	0.2761367	0.3483765	0.3483686
115	001:40	0.2433027	0.3112769	0.3112696
116	001:50	0.2515187	0.3080974	0.3080907
117	002:00	0.2546486	0.3021541	0.3021482
118	002:10	0.2645469	0.3060258	0.3060202
119	002:20	0.2722932	0.3089206	0.3089151
120	002:30	0.2714705	0.3033682	0.3033634
121	002:40	0.2678231	0.2960472	0.2960428
122	002:50	0.2726896	0.2980707	0.2980663
123	003:00	0.2780513	0.3013572	0.3013529
124	003:10	0.2850524	0.3071853	0.3071805
125	003:20	0.2777181	0.2989706	0.2989662
126	003:30	0.2771727	0.2964550	0.2964508
127	003:40	0.2794208	0.2971405	0.2971365
128	003:50	0.2883465	0.3067470	0.3067425
129	004:00	0.2831951	0.3008332	0.3008286
130	004:10	0.2838645	0.3001343	0.3001302
131	004:20	0.2856494	0.3008129	0.3008087
132	004:30	0.2832533	0.2975357	0.2975312
133	004:40	0.2824531	0.2957468	0.2957426

APPENDIX F

Verification Test Analysis

## APPENDIX F

## Verification Analysis Summary

TTLR Reported during verification (SCCM):	115991.7
MLR Reported During Verification (SCCM):	122676.4
TTLR Reported During CILRT (SCCM):	26770.86
MLR Reported During CILRT (SCCM):	20591.51
Average Flowmeter Reading (SCCM):	104478.4
Maximum Allowable Leak Rate (SCCM):	106405.3
TTLR Agreement by Appendix J Method:	-14.33904 %
MLR Agreement by Appendix J Method:	-2.249409 %
TTLR Agreement by BNI Method:	-13.15396 %
MLR Agreement by BNI Method:	-1.951060 %

APPENDIX G

Penetrations In Service During the CILRT

## APPENDIX G

## Testable Penetrations Required to be In Service During Test Performance

<u>Penetration</u>	<u>Description</u>	<u>Justification</u>	<u>Leakage Rate Added to 95% UCL</u>
X-27(C)	Integrated Leak Rate System Pressure	Isolation valves required to be open to monitor containment pressure.	0.0000 SCFH
X-47A	Ice Condenser System	Glycol cooling supply to air handling units in ice condenser required to ensure ice condition is maintained.	0.0000 SCFH
X-47B	Ice Condenser System	Same as X-47A	0.0000 SCFH
X-54	Thimble Renewal	Used as pressurization point for air compressors.	0.0000 SCFH
X-98	Integrated Leak Rate System Pressure	Same as X-47(C).	0.0000 SCFH
X-114	Ice Condenser System	Glycol return from air handling units required to ensure ice condition is maintained.	0.0000 SCFH
X-115	Ice Condenser System	Same as X-114.	0.0000 SCFH
X-118	Hatch	Used as source for verification flow and post-test depressurization.	0.0000 SCFH
X-46	Waste Disposal	Used to provide leak-off for RCP seals.	0.0000 SCFH
X-87A	Integrated Leak Rate System Pressure	Same as X-27C.	0.0000 SCFH
X-87D	Integrated Leak Rate System Pressure	Same as X-27C	0.0000 SCFH

APPENDIX H

Leak Rate Calculations Due to Sump Level Increase

## APPENDIX H

Calculation of increase in leak rate due to increase in ARBFEDS, RBFEDS, and RCDT level.

$$\begin{aligned} \text{The amount of mass at Pa is } P &= 26.696 \text{ psia } V = 1,191,500 \text{ ft}^3 \text{ } T^2 \text{ } 70^\circ\text{F} \\ M &= \frac{26.696 \text{ psia } (1,191,500.00 \text{ ft}^3) (144 \text{ in}^2/\text{ft}^2)}{(53.35) \text{ lbf ft} (529.67 \text{ R})} \\ &\quad \text{lbm}^\circ\text{R} \\ &= 162,071.2395 \text{ lbm} \end{aligned}$$

The combined increase in the sump levels was 2.7453 gallons/hour or 9.4489 ft<sup>3</sup> over 24 hours.

Average CILRT temperature 65.55702°F

Average CILRT pressure 27.05206 psia

Containment Volume 1,191,500 ft<sup>3</sup>

$$\begin{aligned} \frac{(9.4489 \text{ ft}^3) (27.05206 \text{ psia}) (144 \text{ in}^2/\text{ft}^2)}{(53.35) \text{ lbf ft} (525.22702^\circ\text{R})} &= 1.31343 \text{ lbm} \\ \text{lbm}^\circ\text{R} & \end{aligned}$$

$$\text{The increase in leak rate is } \frac{1.31343 \text{ lbm/day} \times 100}{162,071.2395} = 0.00081\%/day$$

ARBFEDS = Auxiliary Reactor Building Floor and Equipment Drain Sump

RBFEDS = Reactor Building Floor and Equipment Drain Sump

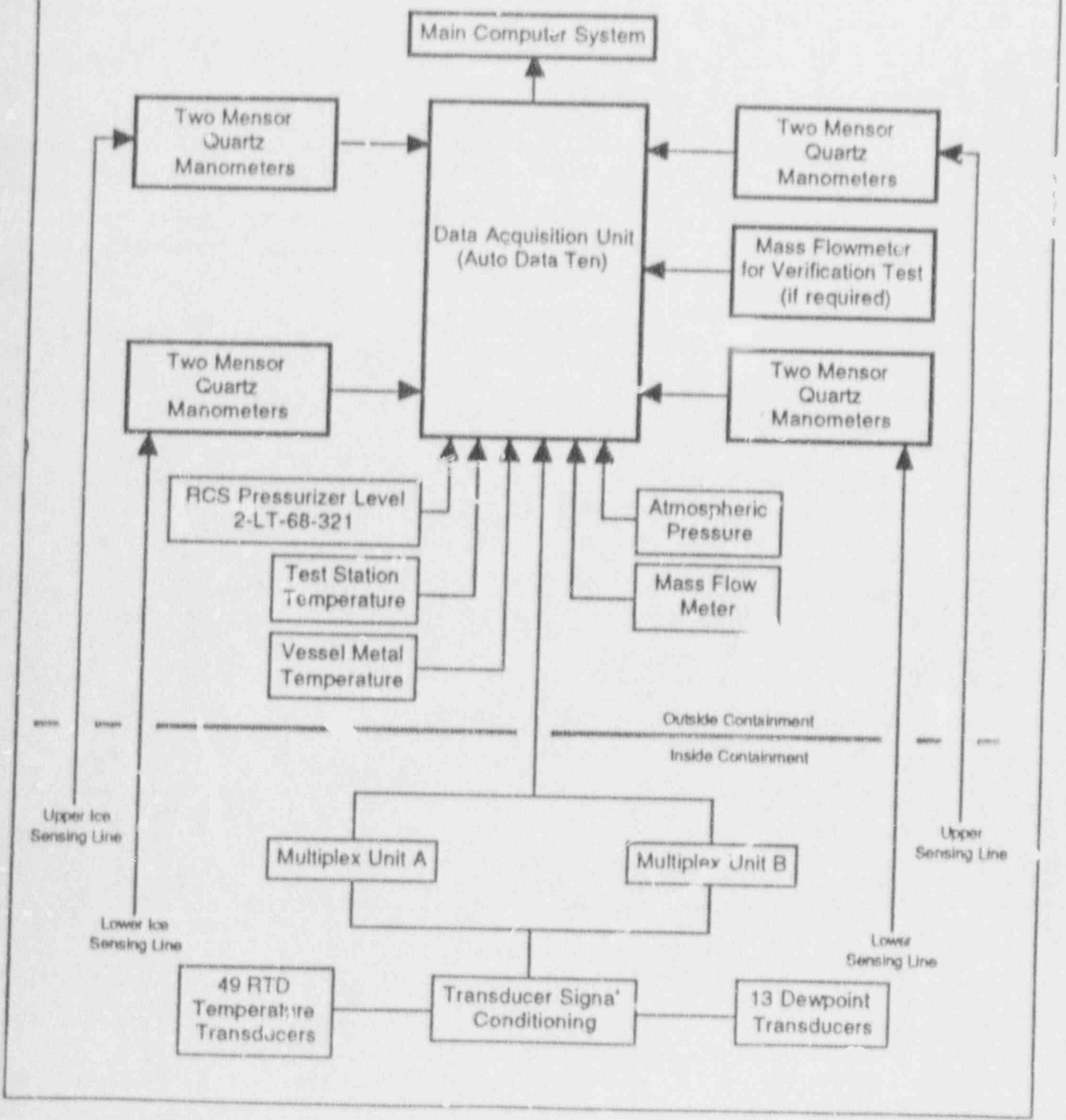
RCDT = Reactor Coolant Drain Tank



APPENDIX I

Computer System Block Diagram

### Temporary Test Instrumentation Diagrams



APPENDIX J

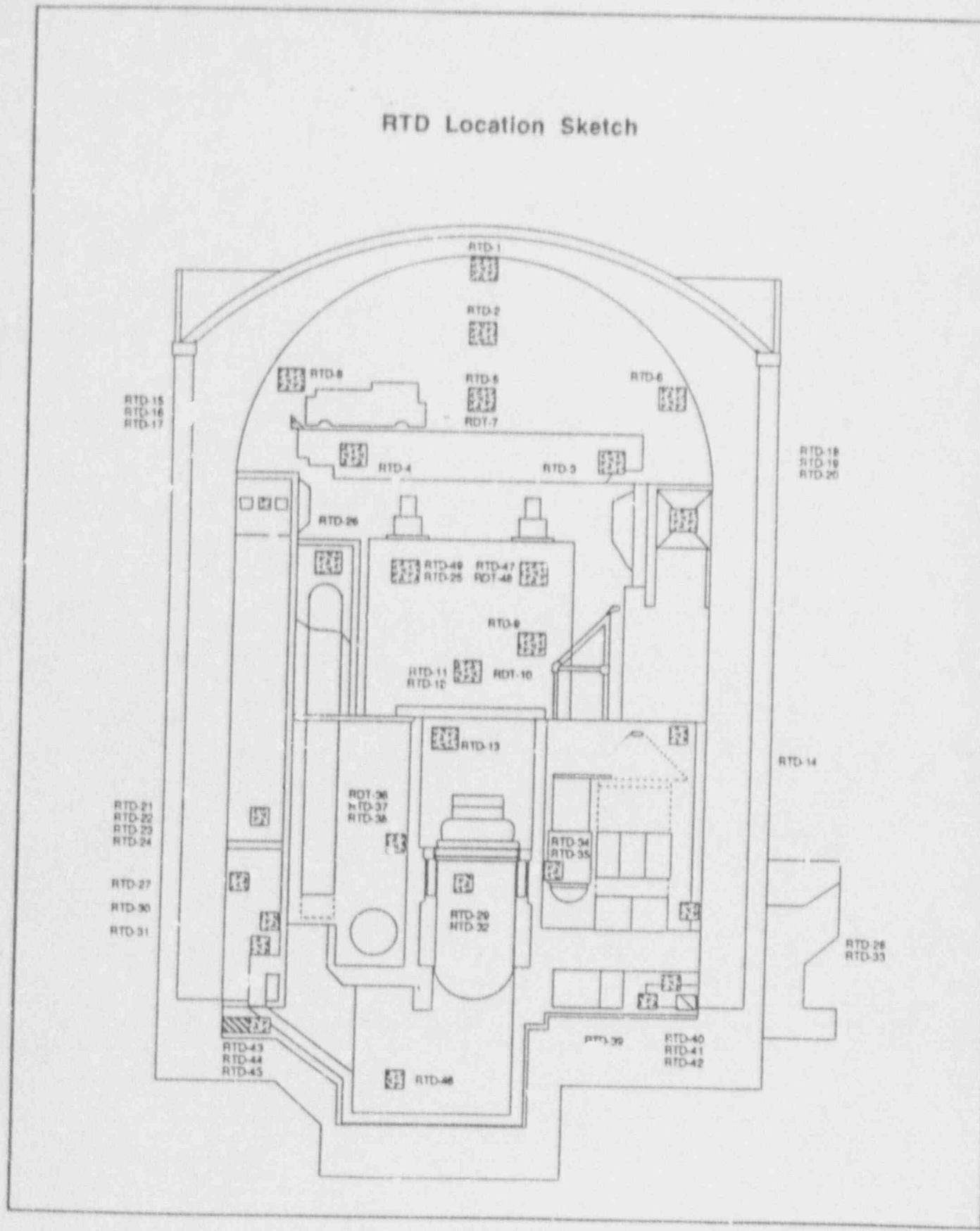
Compartment Parameters and Instrument Locations

## APPENDIX J

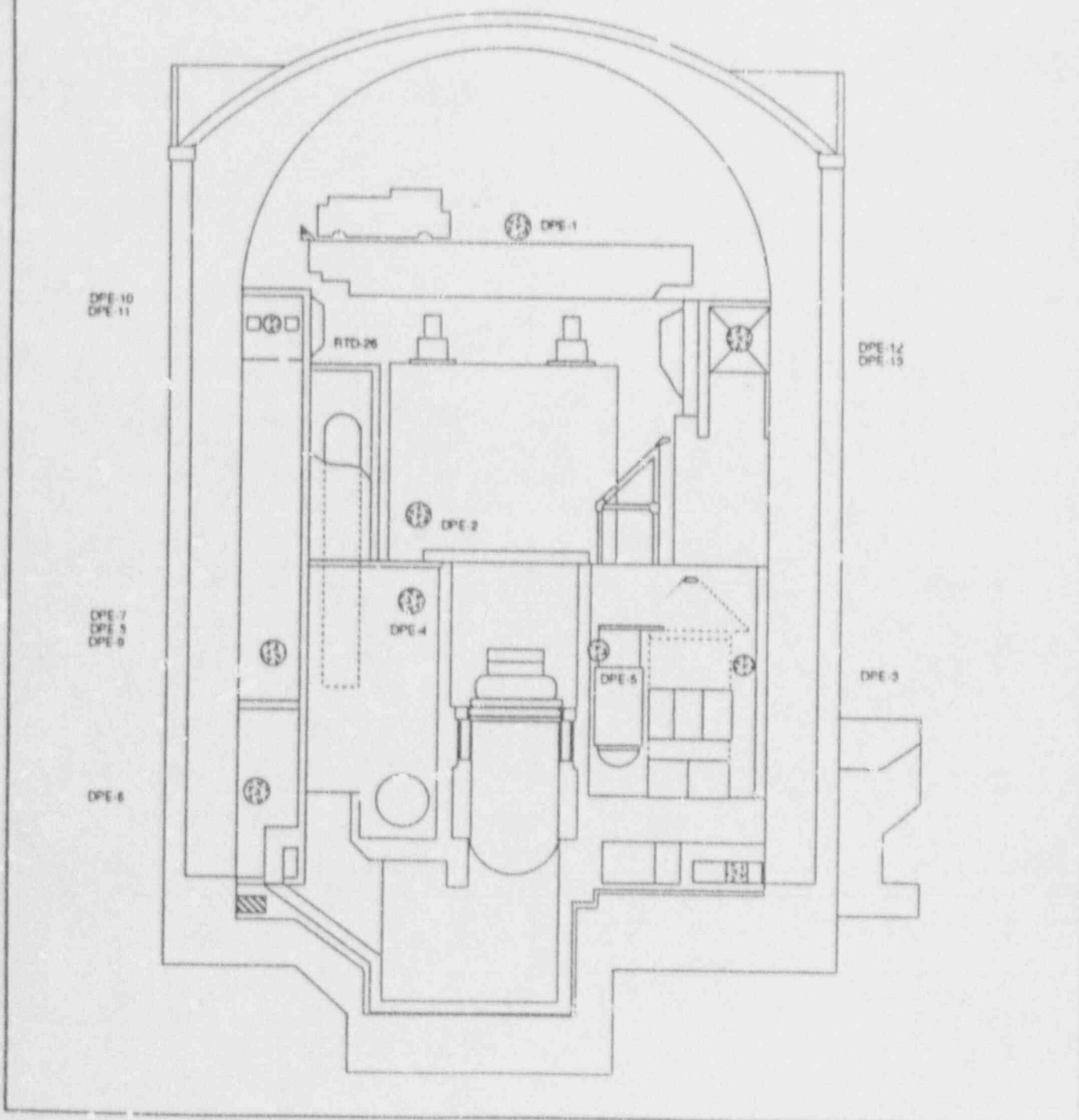
## Compartment parameter and Instrument Location

<u>Temperature</u>	<u>Number of Transducers</u>	<u>Segment Volume</u>	<u>Volumetric Weight Per Sensor by Compartment (Percent)</u>
I. Upper compartment	14	651,000	7.1429
II. Lower compartment	24	383,720	4.166
III. Ice-upper compartment	6	47,000	16.6667
IV. Ice-lower compartment	<u>4</u>	110,500	25.0000
	48		
 <u>Dewpoint</u>			
I. Upper compartment	3	651,000	33.3333
II. Lower compartment	3	383,720	33.3333
III. Ice-upper compartment	4	47,000	25.0000
IV. Ice-lower	<u>3</u>	110,500	33.3333
	13		

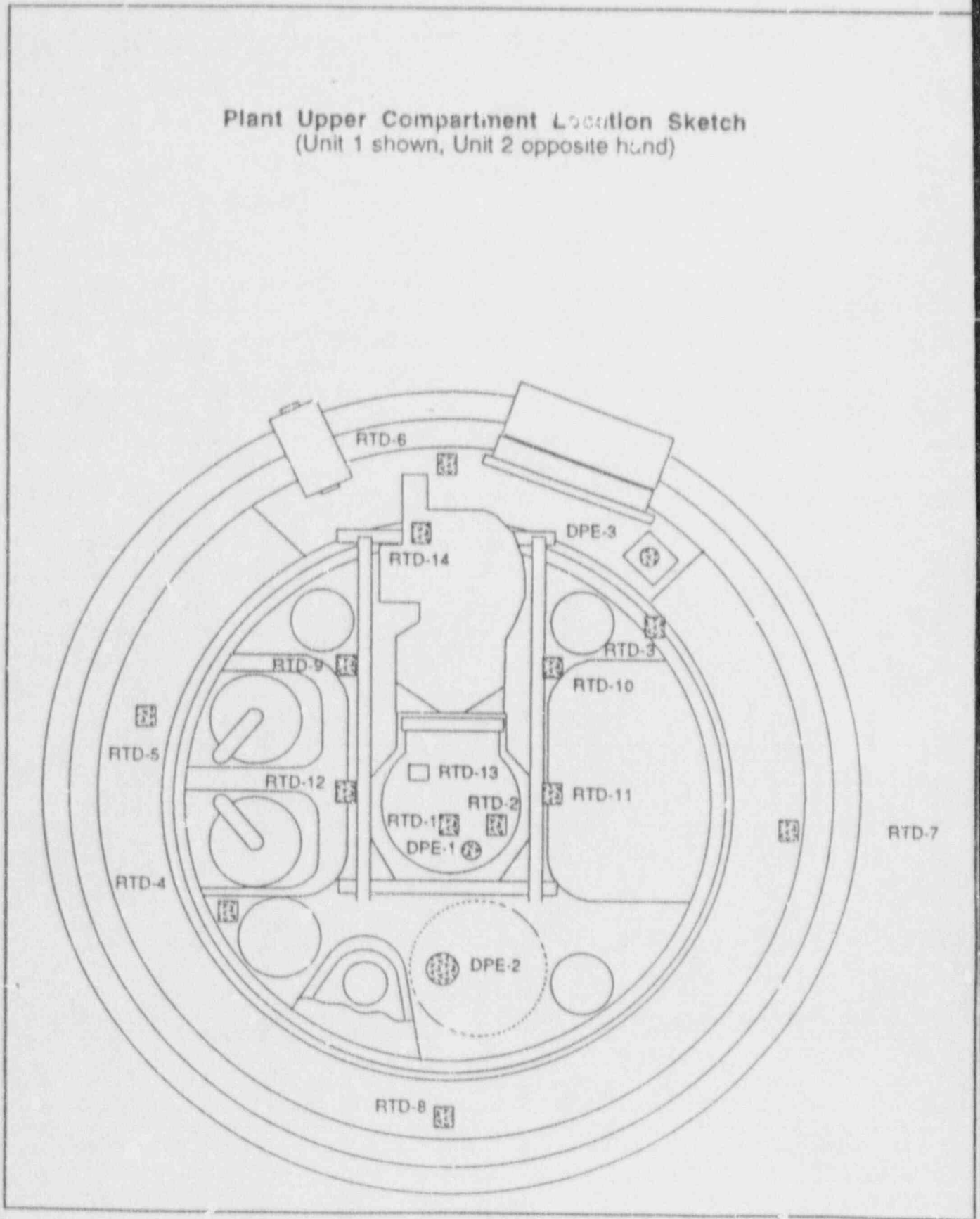
### RTD Location Sketch



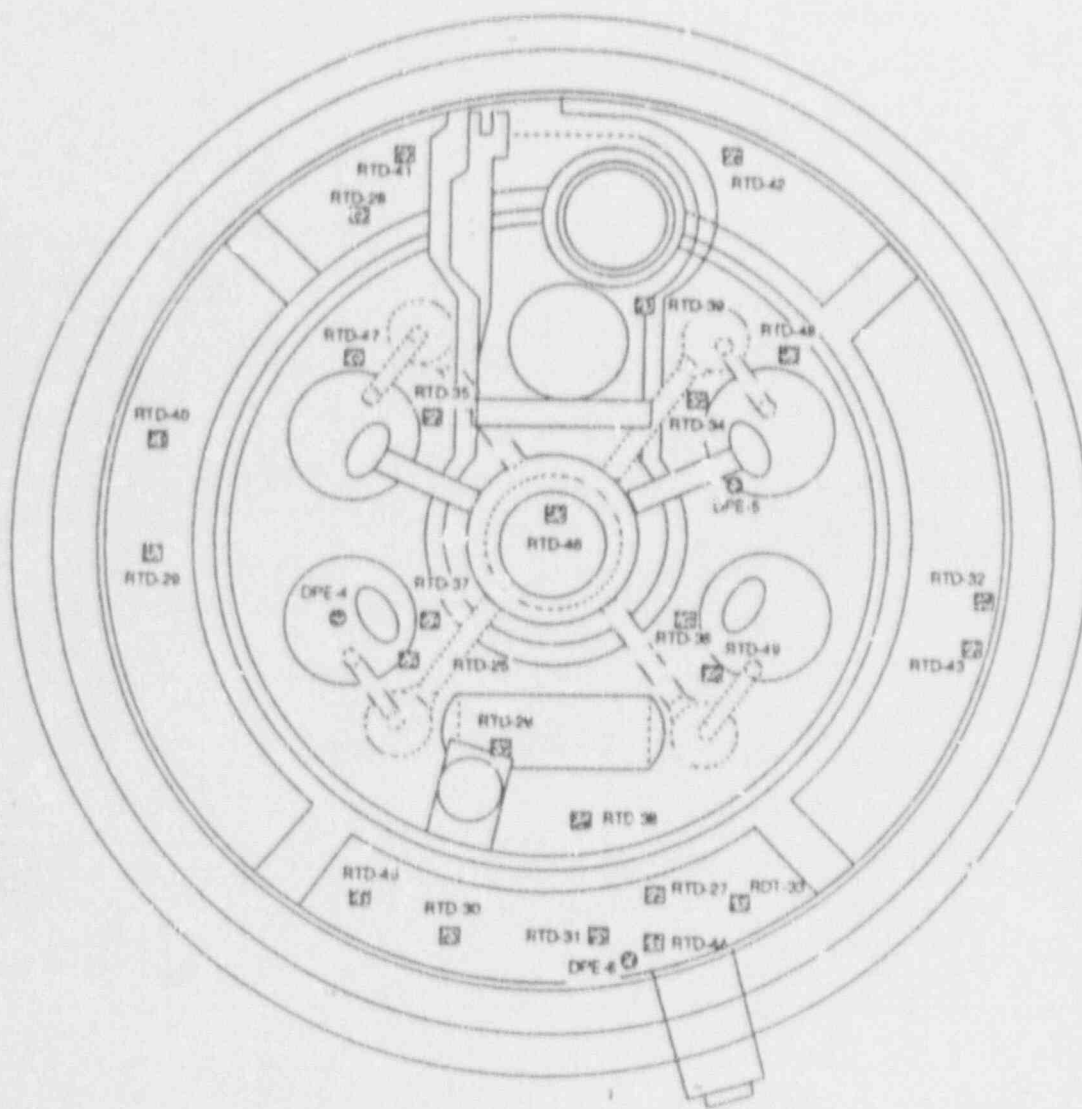
### DPE Location Sketch



Plant Upper Compartment Location Sketch  
(Unit 1 shown, Unit 2 opposite hand)



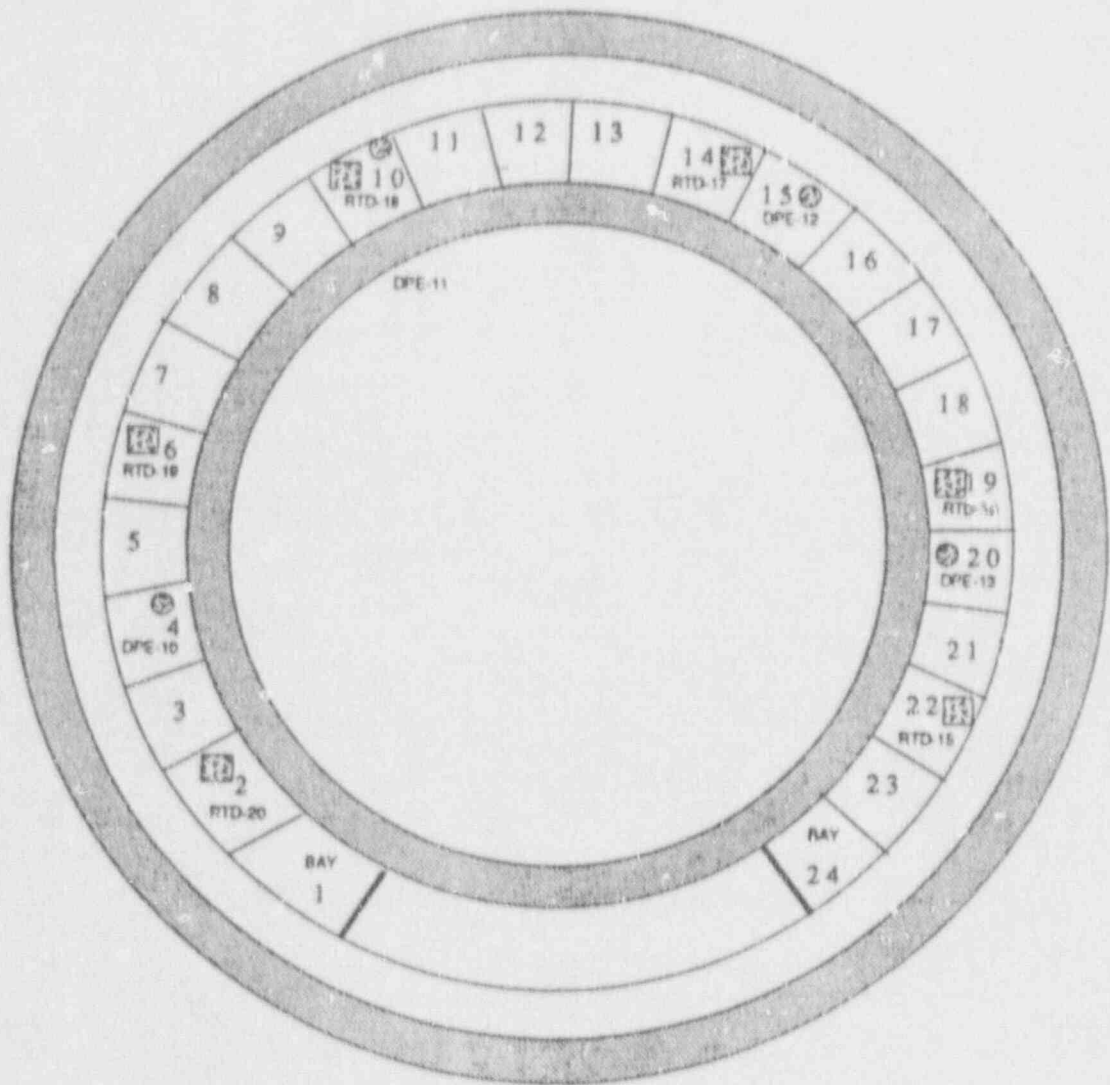
Plant Lower Compartment Location Sketch  
(Unit 1 shown, Unit 2 opposite hand)



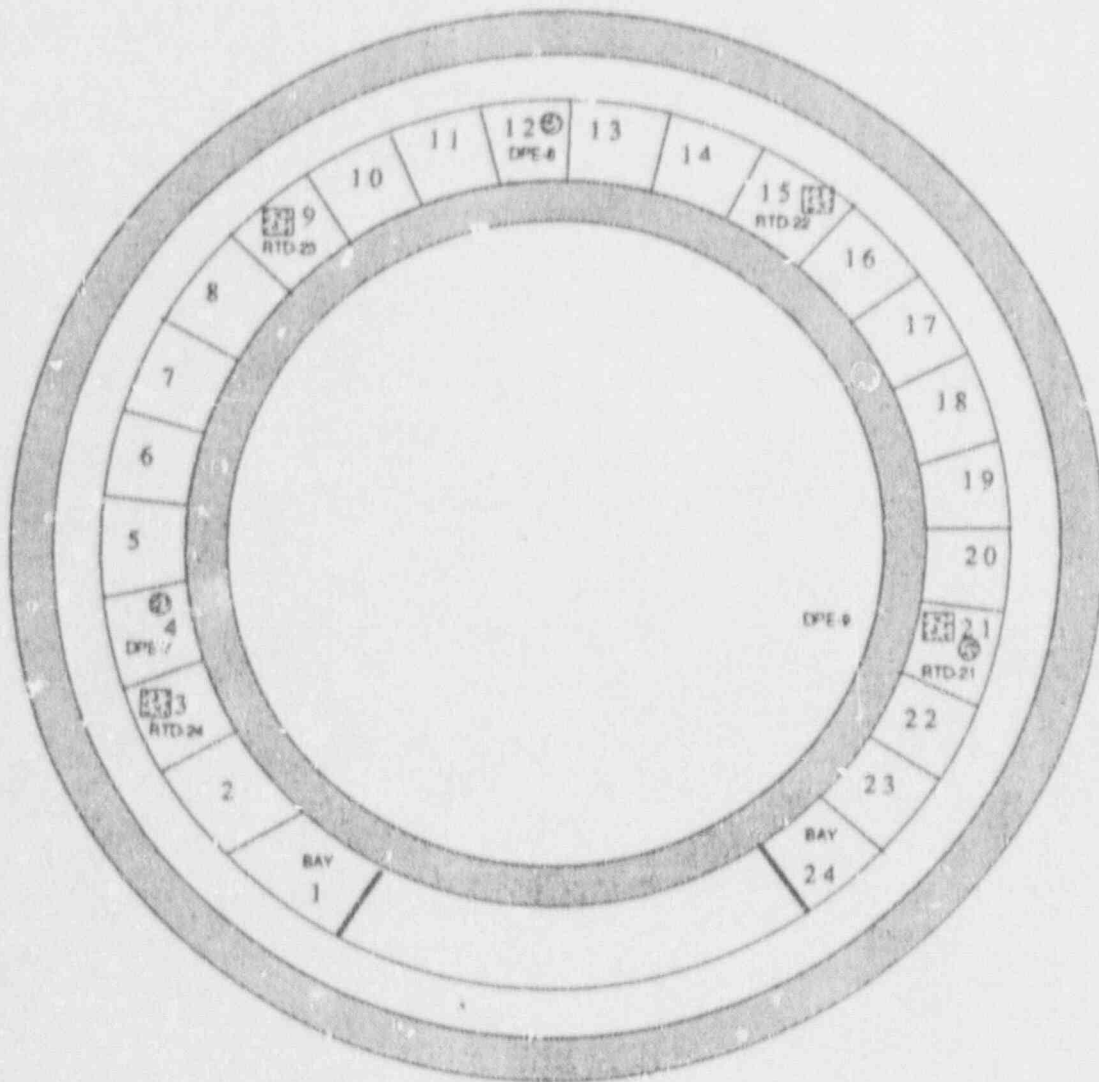


APPENDIX E  
Page 10 of 11

Upper Ice Compartment Sketch  
(Unit 1 shown, Unit 2 opposite hand)



**Lower Compartment Sketch**  
 (Unit 1 shown, Unit 2 opposite hand)



APPENDIX K

Instrumentation Specifications

## APPENDIX K

<u>Measured Parameter</u>	<u>Manufacturer and Model No.</u>	<u>Number Used</u>	<u>Instrument Specification</u>	
Containment Temperature	Leads & Northrup Model No. 178055	49	Range: Accuracy: Repeatability:	0-250°F ±0.1°F ±0.00°F
Containment Pressure	Mensor Corporation Model No. 10100-001	8	Range: Accuracy: Repeatability:	0-30 psia, 400,000 counts F.S. ±0.015% reading ±0.0005% reading
Containment Dewpoint	Foxboro Corporation Model No. 2701 RC	12	Range: Accuracy: Repeatability:	-50 to +142°F ±1°F dewpoint ±0.10°F
Analog to Digital Converter	Acurex Corporation Autodata Ten/10	1	Accuracy:	±0.001°F dewpoint ±0.001°F temperature ±1 count pressure
Verification Flow	Teledyne-Hastings Mass Flow Meter Model AHL 25 with H-3M Transducer TVA No. 469936	1	Range: Accuracy: Repeatability:	0-5 SCFM ±2% range ±1/2% of range
Mensor Chamber Temperature	Princo ASTM 19L	8	Range: Accuracy:	49% to 57°C ±0.12°C
Atmospheric Pressure	Mensor Corporation Model No. 10100-001	1	Range: Accuracy:	0-30 psia ±0.015% reading
RCS Pressurizer Water level	Plant Process Transmitter Model LT-68-321	1	Range: Accuracy:	0-100 level ±5% F.S.

## APPENDIX L

## Summary of Local Leak Rate Tests Conducted from Cycle 3 to Cycle 5

- Note: 1. All leak rates are given in standard cubic feet per hour
2. IB = Inboard
  3. OB = Outboard
  4. PS = Pressure Switch
  5. FCV = Flow Control Valve
  6. FSV = Flow Solenoid Valve
  7. VLV = Hand Control Valve

## APPENDIX L

Penetration No.	Type	As Found	Date	As Left	Date
X-1	equipment	0.0000	03/15/92	0.0000	04/26/92
	hatch	0.0000	09/08/90	0.0000	10/31/90
X-3	fuel	0.0000	03/15/92	0.0000	05/04/92
		0.0000	09/12/90	0.0000	04/26/92
	hatch	0.0000		0.0000	10/18/90
X-12A (IB&OB)	bellows	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/02/90	0.0000	10/02/90
X-12B (IB&OB)	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/01/90	0.0000	10/01/90
X-12C (IB&OB)	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/01/90	0.0000	10/01/90
X-12D (IB&OB)	"	0.0000	04/07/92	0.0000	04/07/90
		0.0000	10/01/90	0.0000	10/01/90
X-13A (OB)	"	0.0000	04/24/92	0.0000	04/24/92
		0.0000	10/31/90	0.0000	10/31/90
X-13A (IB)	"	0.0000	04/16/92	0.0000	04/16/92
		0.0000	10/02/90	0.0000	10/02/90
X-13B (IB)	"	0.0000	04/16/92	0.0000	04/16/92
		0.0267	10/01/90	0.0267	10/01/90
X-13B (OB)	"	0.0000	04/16/92	0.0000	04/16/92
		0.0000	10/01/90	0.0000	10/01/90
X-13C (IB&OB)	"	0.0000	04/16/92	0.0000	04/16/92
		0.0000	10/01/90	0.0000	10/01/90
X-13D (IB)	"	0.0000	04/16/92	0.0000	04/16/92
		0.0000	10/01/90	0.0000	10/01/90
X-13D (OB)	"	0.0000	04/24/92	0.0000	04/24/92
		0.0000	10/31/92	0.0000	10/31/92
X-14A	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/01/90	0.0000	10/01/90
X-14B	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/10/90	0.0000	10/01/90
X-14C	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/01/90	0.0000	10/01/90

Penetration No.	Type	AJ Found	Date	As Left	Date
X-14D	bellows	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/01/90	0.0000	10/01/90
X-15	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/01/92	0.0000	10/01/92
X-17	"	0.0000	04/09/92	0.0000	04/09/92
		0.0000	10/03/90	0.0000	10/03/90
X-20	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/02/90	0.0000	10/02/90
X-20B	"	0.0000	04/09/92	0.0000	04/09/92
		0.0000	10/02/90	0.0000	10/02/90
X-21	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/02/92	0.0000	10/02/92
X-22	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/02/90	0.0000	10/02/90
X-24	"	0.0000	04/07/92	0.0000	04/07/92
		0.0000	10/02/90	0.0000	10/02/90
X-30	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/03/90	0.0000	10/03/90
X-32	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/03/90	0.0000	10/03/90
X-33	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/03/90	0.0000	10/03/90
X-40D	resil seal	0.0000	04/06/92	0.0000	04/06/92
		6.3706	10/10/90	0.0000	10/24/90
X-45	bellows	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/03/90	0.0000	10/03/90
X-46	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/03/90	0.0000	10/03/90
X-47A (IB&OB)	"	0.0000	04/09/92	0.0000	04/09/92
		0.0000	10/03/90	0.0000	10/03/90
X-47B (IB&OB)	"	0.0000	04/09/92	0.0000	04/09/92
		0.0000	10/03/90	0.0000	10/03/90
X-54	resil seal	0.0000	03/15/92	0.0000	03/15/92
		0.0000	09/09/90	0.0000	10/16/90

Penetration No.	Type	As Found	Date	As Left	Date
X-79A	resil seal	0.0000	03/14/92	0.0000	04/25/92
		0.0000	09/09/90	0.0000	10/24/90
X-79B	"	0.0000	03/14/92	0.0000	04/25/92
		0.0000	09/09/90	0.0000	10/24/90
X-81	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/03/90	0.0000	10/03/90
X-88	"	0.0000	03/15/92	0.0000	04/24/92
		0.0042	09/09/90	0.0000	10/23/90
X-107	"	0.0000	04/08/92	0.0000	04/08/92
		0.0000	10/03/90	0.0000	10/03/90
X-108	"	0.0000	04/09/92	0.0000	04/09/92
		0.0000	10/21/90	0.0000	10/21/90
X-109	"	0.0000	04/09/92	0.0000	08/09/92
		0.0000	10/21/90	0.0000	10/21/90
X-111	"	0.0000	04/06/92	0.0000	04/06/92
		0.0000	09/17/90	0.0000	09/17/90
X-112	"	0.0000	04/06/92	0.0000	04/06/92
		0.0000	09/17/90	0.0000	09/17/90
X-113	"	0.0000	04/06/92	0.0000	04/06/92
		0.0000	09/17/90	0.0000	09/27/90
X-117	"	0.0000	03/14/92	0.0000	04/25/92
		0.0015	09/09/90	0.0000	10/21/90
X-118	"	0.0000	03/14/92	0.0000	04/30/92
		0.0000	07/09/90	0.0000	10/29/90
X-120E	elect pent	0.0000	04/04/92	0.0000	04/04/92
		0.0000	09/21/90	0.0000	09/21/90
X-121E	"	0.0000	03/31/92	0.0000	03/31/92
		0.0000	09/22/90	0.0000	09/22/90
X-122E	"	0.0000	03/31/92	0.0000	03/31/92
		0.0000	09/22/90	0.0000	09/22/90
X-124E	"	0.0000	04/04/92	0.0000	04/04/92
		0.0000	09/21/90	0.0000	09/21/90
X-126-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90



Penetration No.	Type	As Found	Date	As Left	Date
X-127-E	elect pent	0.0000	03/26/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-128-E	"	0.0000	03/26/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-129-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90
X-131-E	"	0.0000	04/03/92	.0000	04/17/92
		0.0000	09/22/90	0.0533	09/22/90
X-132-E	"	0.0000	03/27/92	0.0000	03/27/92
		0.0000	09/21/90	0.0000	09/21/90
X-133-E	"	0.0799	03/28/92	0.0799	03/28/92
		0.0000	09/21/90	0.0000	09/21/90
X-134-E	"	0.0000	03/31/92	0.0000	03/31/92
		0.0000	09/21/90	0.0000	09/21/90
X-135-E	"	0.0000	03/31/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-136-E	"	0.0000	03/31/92	0.0000	03/31/92
		0.0000	09/22/92	0.0000	09/22/92
X-137-E	"	0.0000	03/31/92	0.0000	03/31/92
		0.0000	09/22/90	0.0000	09/22/90
X-138-E	"	0.0000	03/31/92	0.0000	03/31/92
		0.0000	09/21/90	0.0000	09/21/90
X-139-E	"	0.0000	04/03/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-140-E	"	0.0000	03/31/90	0.0000	03/31/92
		0.0000	09/22/90	0.0000	09/22/90
X-141-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90
X-142-E	"	0.0000	03/31/92	0.0000	03/31/92
		0.0000	09/22/90	0.0000	09/22/90
X-143-E	"	0.0000	03/27/92	0.0000	03/27/92
		0.0085	09/09/90	0.0000	09/16/90
X-144-E	"	0.0000	03/27/92	0.0000	03/27/92
		0.0000	09/21/90	0.0000	09/21/90

Penetration No.	Type	As Found	Date	As Left	Date
X-145-E	elect	0.0000	04/09/92	0.0000	04/03/92
	pent	0.0000	09/22/90	0.0000	09/22/90
X-146-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90
X-147-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90
X-148-E	"	0.0000	04/03/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-149-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90
X-150-E	"	0.0000	04/02/92	0.0000	04/02/92
		0.0000	09/21/90	0.0000	09/21/90
X-151-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0424	09/09/90	0.0000	10/09/90
X-152-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90
X-153-E	"	0.0000	03/26/92	0.0000	04/18/92
		0.0000	09/21/90	0.0000	09/21/90
X-154-E	"	0.0000	03/26/92	0.0000	03/28/92
		0.0000	09/21/90	0.0000	09/21/90
X-156-E	"	0.0000	03/26/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-157-E	"	0.0000	03/26/92	0.0000	03/26/92
		0.0000	09/21/92	0.0000	09/21/92
X-158-E	"	0.0000	03/26/92	0.0000	03/26/92
		0.0000	09/21/90	0.0000	09/21/90
X-159-E	"	0.0000	03/25/92	0.0000	03/25/92
		0.0000	09/21/90	0.0000	09/21/90
X-160-E	"	0.0000	03/27/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-161-E	"	0.0000	03/27/92	0.0000	03/27/92
		0.0000	09/21/90	0.0000	09/21/90
X-163-E	"	0.1946	03/27/92	0.1359	04/16/92
		0.1660	09/21/90	0.1660	09/21/90

Penetration No.	Type	As Found	Date	As Left	Date
X-164-E	elect	0.0000	03/27/92	0.0000	03/27/92
	pent	0.0000	09/21/92	0.0000	09/21/92
X-165-E	"	0.0000	03/25/92	0.0000	03/25/92
		0.0000	09/21/92	0.0000	09/21/92
X-166-E	"	0.0000	03/26/92	0.0000	03/26/92
		0.0000	09/21/90	0.0000	09/21/90
X-167-E	"	0.0000	04/03/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-168-E	"	0.0000	04/03/92	0.0000	04/03/92
		3.814	09/09/90	0.0000	10/01/90
X-169-E	"	0.0000	04/03/92	0.0000	04/16/92
		0.0000	09/21/90	0.0000	09/21/90
X-170-E	"	0.0000	04/03/92	0.0000	04/03/92
		0.0000	09/21/90	0.0000	09/21/90
X-108	resil	0.0000	03/17/92	0.0000	03/17/92
	scal	0.0000	10/03/90	0.0000	10/03/90
X-109	"	0.0000	03/17/92	0.0000	03/17/92
		0.0085	10/03/90	0.0085	10/03/90
X-2A	090 Airlock	20.0080	03/21/92	1.8589	04/26/92
		6.5792	12/13/91	6.5792	12/13/91
		4.4795	07/30/91	4.4795	07/30/91
		9.2399	03/04/92	9.2399	03/04/91
		9.1933	09/29/90	9.1933	09/29/90
		4.2482	06/05/90	4.2482	06/05/90
		9.8442	01/11/90	9.8442	01/11/90
		34.7979	08/15/89	2.4645	08/15/89
X-2B	734 Airlock	0.2878	03/17/92		
		4.6086	12/12/91	4.6086	12/12/91
		1.1291	07/25/91	1.1291	07/25/91
		16.2183	03/01/91	4.004	03/01/91
		4.9178	09/27/90	4.9178	09/27/90
		5.1164	06/07/90	5.1164	06/07/90
		0.1649	01/09/90	0.1649	01/09/90
		0.6969	08/08/89	0.6969	08/08/89

<u>COMPONENT</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
A Train	0.0000	03/24/92	0.0000	03/27/92
H <sub>2</sub> Analyzer	5.6291	09/28/90	0.0000	10/30/90
B Train	0.0520	03/27/92	0.0000	04/06/92
H <sub>2</sub> Analyzer	0.1224	09/28/90	0.0000	10/30/90
PS-30-46A	0.0000	04/22/92	0.0000	04/22/92
	0.0000	10/18/90	0.0000	10/18/90
PS-30-46B	0.0000	04/22/92	0.0000	04/22/92
	0.0000	10/18/90	0.0000	10/18/90
PS-30-47A	0.0000	04/22/92	0.0000	04/22/92
	0.0000	10/19/90	0.0000	10/19/90
PS-30-47B	0.0000	04/22/90	0.0000	04/22/92
	0.0000	10/19/90	0.0000	10/19/90
PS-30-48A	0.0000	04/27/92	0.0000	04/22/92
	0.0000	10/19/90	0.0000	10/19/90
PS-30-48B	0.0000	04/22/92	0.0000	04/22/92
	0.0000	10/19/90	0.0000	10/19/90
PS-30-30C	0.0000	04/23/92	0.0000	04/23/92
	0.0000	10/20/90	0.0000	10/20/90
PS-30-310	0.0000	04/23/92	0.0000	04/23/92
	0.0000	10/20/90	0.0000	10/20/90
PS-30-311	0.0000	04/23/92	0.0000	04/23/92
	0.0000	10/20/90	0.0000	10/20/90
PS-30-42	0.0000	04/23/92	0.0000	04/23/92
	0.0000	10/28/90	0.0000	10/28/90
PS-30-43	0.0000	04/23/92	0.0000	04/23/92
	0.0000	10/28/90	0.0000	10/28/90
PS-30-44	0.0000	04/23/92	0.0000	04/23/92
	0.0000	10/28/90	0.0000	10/28/90
PS-30-45	0.0000	04/23/92	0.0000	04/23/92
	0.0000	10/28/92	0.0000	10/28/90
<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 30-56/57	0.0000	04/03/92	0.0000	04/03/92
	0.0000	01/08/92	0.0000	01/08/92
	0.0000	10/02/91	0.0000	10/02/91
	0.0000	07/10/91	0.0000	07/10/91
	0.0000	04/17/91	0.0000	04/17/91
	0.0000	01/30/91	0.0000	01/30/91
	0.0000	10/17/90	0.0000	10/17/90

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 30-56/57	0.0000	06/13/90	0.0000	06/13/90
	0.0000	03/21/90	0.0000	03/21/90
	0.0000	01/03/90	0.0000	01/03/90
	0.0000	10/11/89	0.0000	10/11/89
	0.0000	09/13/89	0.0000	09/13/89
	0.0000	09/11/89	0.0000	09/11/89
	0.0000	09/08/89	0.0000	09/08/89
	0.0000	09/06/89	0.0000	09/06/89
	0.0000	09/04/89	0.0000	09/04/89
	0.0000	09/01/89	0.0000	09/01/89
	0.0000	08/30/89	0.0000	08/30/89
	0.0000	08/25/89	0.0000	08/25/89
	0.0000	08/23/89	0.0000	08/23/89
	0.0000	08/21/89	0.0000	08/21/89
	0.0000	08/18/89	0.0000	08/18/89
	0.0000	08/16/89	0.0000	08/16/89
	0.0000	08/14/89	0.0000	08/14/89
	0.0000	08/11/89	0.0000	08/11/89
	0.0000	08/07/89	0.0000	08/07/89
	0.0000	08/04/89	0.0000	08/04/89
	0.0000	08/02/89	0.0000	08/02/89
	0.0000	07/31/89	0.0000	07/31/89
	0.0000	07/28/89	0.0000	07/28/89
	0.0000	07/26/89	0.0000	07/26/89
	0.0000	07/24/89	0.0000	07/24/89
	0.0000	07/21/89	0.0000	07/21/89
	0.0000	07/19/89	0.0000	07/19/89
	0.0000	07/17/89	0.0000	07/17/89
	0.0000	07/14/89	0.0000	07/14/89
	0.0000	07/12/89	0.0000	07/12/89
	0.0000	07/10/89	0.0000	07/10/89
	0.0000	07/07/89	0.0000	07/07/89
	0.0000	07/05/89	0.0000	07/05/89
	0.0000	07/03/89	0.0000	07/03/89
	0.0000	06/30/89	0.0000	06/30/89
	0.0000	06/28/89	0.0000	06/28/89
	0.0000	06/26/89	0.0000	06/26/89
	0.0000	06/23/89	0.0000	06/23/89
	0.0000	06/21/89	0.0000	06/21/89
	0.0000	06/19/89	0.0000	06/19/89
	0.0000	06/16/89	0.0000	06/16/89
	0.0000	06/14/89	0.0000	06/14/89
	0.0000	06/12/89	0.0000	06/12/89
	0.0000	06/09/89	0.0000	06/09/89
	0.0000	06/07/89	0.0000	06/07/89
	0.0000	06/05/89	0.0000	06/05/89
	0.0000	06/02/89	0.0000	06/02/89
	0.0000	05/31/89	0.0000	05/31/89
	0.0000	05/29/89	0.0000	05/29/89
	0.0000	05/26/89	0.0000	05/26/89
	0.0000	05/24/89	0.0000	05/24/89
	0.0000	05/22/89	0.0000	05/22/89

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>	
FCV 30-56/57	0.0000	05/19/89	0.0000	05/19/89	
	0.0000	05/17/89	0.0000	05/17/89	
	0.0000	05/15/89	0.0000	05/15/89	
	0.0000	05/12/89	0.0000	05/12/89	
	0.0000	05/10/89	0.0000	05/10/89	
	0.0000	05/08/89	0.0000	05/10/89	
	0.0000	05/05/89	0.0000	05/05/89	
	0.0000	05/03/89	0.0000	05/03/89	
	0.0000	05/01/89	0.0000	05/01/89	
	0.0000	04/28/89	0.0000	04/28/89	
	0.0000	04/26/89	0.0000	04/26/89	
	0.0000	04/24/89	0.0000	04/24/89	
	0.0000	04/21/89	0.0000	04/21/89	
	0.0000	04/19/89	0.0000	04/19/89	
	0.0000	04/17/89	0.0000	04/17/89	
	0.0000	04/14/89	0.0000	04/14/89	
	0.0000	04/12/89	0.0000	04/12/89	
	0.0000	04/10/89	0.0000	04/10/89	
	0.0000	04/07/89	0.0000	04/07/89	
	0.0000	04/05/89	0.0000	04/05/89	
	0.0000	04/03/89	0.0000	04/03/89	
	0.0000	03/31/89	0.0000	03/31/89	
	0.0000	03/29/89	0.0000	03/29/89	
	0.0000	03/26/89	0.0000	03/26/89	
	0.0000	08/28/89	0.0000	08/28/89	
	0.0000	08/09/89	0.0000	08/09/89	
	FCV 30-58/59	0.0000	04/03/92	0.0000	04/03/92
		0.0000	01/08/92	0.0000	01/08/92
0.0000		10/02/91	0.0000	10/02/91	
0.0000		07/10/91	0.0000	07/10/91	
0.0000		04/17/91	0.0000	04/17/91	
0.0000		01/30/91	0.0000	01/30/91	
0.0000		10/15/90	0.0000	10/15/90	
0.0545		06/13/90	0.0545	06/13/90	
0.0000		03/21/90	0.0000	03/21/90	
0.0000		01/03/90	0.0000	01/03/90	
0.0000		10/11/89	0.0000	10/11/89	
0.0000		07/19/89	0.0000	07/19/89	
0.0000		04/16/89	0.0000	04/26/89	
0.0000		03/26/89	0.0000	03/26/89	

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 30-50/51	0.0000	04/03/92	0.0000	04/03/92
	0.0000	01/08/92	0.0000	01/08/92
	0.0000	10/02/91	0.0000	10/02/91
	0.0000	07/10/91	0.0000	07/10/91
	0.0000	04/17/91	0.0000	04/17/91
	0.0000	01/30/91	0.0000	01/30/91
	0.0000	10/17/90	0.0000	10/17/90
	0.0000	06/13/90	0.0000	06/13/90
	0.0000	03/21/90	0.0000	03/21/90
	0.0000	01/03/90	0.0000	01/03/90
	0.0000	06/05/89	0.0000	06/05/89
	0.0000	05/21/89	0.0000	05/26/89
	FCV 30-52/53	0.0000	04/02/92	0.0000
0.0000		01/08/92	0.0000	01/08/92
0.0000		10/02/92	0.0000	10/02/92
0.0000		07/10/91	0.0000	07/10/91
0.0000		04/17/91	0.0000	04/17/91
0.0000		01/30/91	0.0000	01/30/91
0.0000		10/15/90	0.0000	10/15/90
0.0000		06/13/90	0.0000	06/13/90
0.0000		03/21/90	0.0000	03/21/90
0.0000		01/03/90	0.0000	01/03/90
0.0000		10/11/89	0.0000	10/11/89
0.0000		07/19/89	0.0000	07/19/89
0.0000		04/26/89	0.0000	04/26/89
0.0000	03/26/89	0.0000	03/26/89	
FCV 30-7/8	0.0000	04/03/92	0.0000	04/03/92
	0.0000	01/08/92	0.0000	01/08/92
	0.0000	10/02/92	0.0000	10/02/92
	0.0000	07/10/91	0.0000	07/10/91
	0.0000	04/17/91	0.0000	04/17/91
	0.0000	01/30/91	0.0000	01/30/91
	0.0000	10/17/90	0.0000	10/17/90
	0.0000	06/13/90	0.0000	06/13/90
	0.0000	03/21/90	0.0000	03/21/90
	0.0000	01/03/90	0.0000	01/03/90
	0.0000	10/11/89	0.0000	10/11/89
	0.0000	09/08/89	0.0000	09/08/89
	0.0000	08/02/89	0.0000	08/02/89
	0.0000	07/19/89	0.0000	07/19/89
	0.0000	07/02/89	0.0000	07/02/89
0.0000	06/05/89	0.0000	06/05/89	
0.0000	05/26/89	0.0000	05/26/89	
0.0000	04/26/89	0.0000	04/26/89	
0.0000	03/26/89	0.0000	03/26/89	

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>	
FCV 30-9/10	0.0000	04/02/92	0.0000	04/02/92	
	0.0000	01/08/92	0.0000	01/08/92	
	0.0000	10/02/92	0.0000	10/02/92	
	0.0000	07/10/91	0.0000	07/10/91	
	0.0000	04/17/91	0.0000	04/17/91	
	0.0000	01/30/91	0.0000	01/30/91	
	0.0000	10/15/90	0.0000	10/15/90	
	0.0000	06/13/90	0.0000	06/13/90	
	0.0000	03/21/90	0.0000	03/21/90	
	0.0000	01/03/90	0.0000	01/03/90	
	0.0000	10/11/89	0.0000	10/11/89	
	0.0000	07/19/89	0.0000	07/19/89	
	0.0000	04/26/89	0.0000	04/26/89	
	0.0000	03/26/89	0.0000	03/26/89	
	FCV 30-14/15	0.0000	04/03/92	0.0000	04/03/92
		0.0000	01/08/92	0.0000	01/08/92
0.0000		10/02/91	0.0000	10/02/91	
0.0000		07/10/91	0.0000	07/10/91	
0.0000		04/17/91	0.0000	04/17/91	
0.0000		01/30/91	0.0000	01/30/91	
0.0000		10/17/90	0.0000	10/17/90	
0.0000		06/13/90	0.0000	06/13/90	
0.0000		03/21/90	0.0000	03/21/90	
0.0000		01/03/90	0.0000	01/03/90	
0.0000		10/11/89	0.0000	10/11/89	
0.0000		09/15/89	0.0000	09/15/89	
0.0000		09/13/89	0.0000	09/13/89	
0.0000		09/11/89	0.0000	09/11/89	
0.0000		09/08/89	0.0000	09/08/89	
0.0000		09/06/89	0.0000	09/06/89	
0.0000		09/04/89	0.0000	09/04/89	
0.0000		09/01/89	0.0000	09/01/89	
0.0000		08/30/89	0.0000	08/30/89	
0.0000		08/28/89	0.0000	08/28/89	
0.0000		08/25/89	0.0000	08/25/89	
0.0000		08/23/89	0.0000	08/23/89	
0.0000		08/21/89	0.0000	08/21/89	
0.0000		08/18/89	0.0000	08/18/89	
0.0000		08/16/89	0.0000	08/16/89	
0.0000		08/14/89	0.0000	08/14/89	
0.0000		08/11/89	0.0000	08/11/89	
0.0000		08/09/89	0.0000	08/09/89	
0.0000		08/07/89	0.0000	08/07/89	
0.0000		08/04/89	0.0000	08/04/89	
0.0000		08/02/89	0.0000	08/02/89	
0.0000		07/31/89	0.0000	07/31/89	
0.0000		07/28/89	0.0000	07/28/89	
0.0000		07/26/89	0.0000	07/06/89	
0.0000		07/24/89	0.0000	07/24/89	
0.0000	07/21/89	0.0000	07/21/89		
0.0000	07/19/89	0.0000	07/19/89		



<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 30-14/15	0.0000	07/17/89	0.0000	07/17/89
	0.0000	07/14/89	0.0000	07/14/89
	0.0000	07/12/89	0.0000	07/12/89
	0.0000	07/10/89	0.0000	07/10/89
	0.0000	07/07/89	0.0000	07/07/89
	0.0000	07/05/89	0.0000	07/05/89
	0.0000	07/03/89	0.0000	07/03/89
	0.0000	06/30/89	0.0000	06/30/89
	0.0000	06/28/89	0.0000	06/28/89
	0.0000	06/26/89	0.0000	06/26/89
	0.0000	06/23/89	0.0000	06/23/89
	0.0000	06/21/89	0.0000	06/21/89
	0.0000	06/19/89	0.0000	06/19/89
	0.0000	06/16/89	0.0000	06/16/89
	0.0000	06/14/89	0.0000	06/14/89
	0.0000	06/12/89	0.0000	06/12/89
	0.0000	06/09/89	0.0000	06/09/89
	0.0000	06/07/89	0.0000	06/07/89
	0.0000	06/05/89	0.0000	06/05/89
	0.0000	06/02/89	0.0000	06/02/89
	0.0000	05/31/89	0.0000	05/31/89
	0.0000	05/29/89	0.0000	05/29/89
	0.0000	05/26/89	0.0000	05/26/89
	0.0000	05/24/89	0.0000	05/24/89
	0.0000	05/22/89	0.0000	05/22/89
	0.0000	05/19/89	0.0000	05/19/89
	0.0000	05/17/89	0.0000	05/17/89
	0.0000	05/15/89	0.0000	05/15/89
	0.0000	05/12/89	0.0000	05/12/89
	0.0000	05/10/89	0.0000	05/10/89
	0.0000	05/08/89	0.0000	05/08/89
	0.0000	05/05/89	0.0000	05/05/89
	0.0000	05/03/89	0.0000	05/03/89
	0.0000	05/01/89	0.0000	05/01/89
	0.0000	04/28/89	0.0000	04/28/89
	0.0000	04/26/89	0.0000	04/26/89
	0.0000	04/24/89	0.0000	04/24/89
	0.0000	04/21/89	0.0000	04/21/89
	0.0000	04/19/89	0.0000	04/19/89
	0.0000	04/17/89	0.0000	04/17/89
	0.0000	04/14/89	0.0000	04/14/89
	0.0000	04/12/89	0.0000	04/12/89
	0.0000	04/10/89	0.0000	04/10/89
	0.0000	04/17/89	0.0000	04/17/89
	0.0000	04/05/89	0.0000	04/05/89
	0.0000	04/03/89	0.0000	04/03/89
	0.0000	03/31/89	0.0000	03/31/89
	0.0000	03/29/89	0.0000	03/29/89
	0.0000	03/26/89	0.0000	03/26/89

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>	
FCV 30-16/17	62.5502	04/02/92	0.0000	04/03/92	
	0.0000	01/08/92	0.0000	01/08/92	
	0.0000	10/02/91	0.0000	10/02/91	
	0.0000	07/10/91	0.0000	07/10/91	
	0.0000	04/17/91	0.0000	04/17/91	
	0.0000	01/30/91	0.0000	01/30/91	
	0.0000	10/15/90	0.0000	10/15/90	
	0.0000	06/13/90	0.0000	06/13/90	
	0.0000	03/21/90	0.0000	03/21/90	
	0.0000	01/03/90	0.0000	01/03/90	
	0.0000	10/11/89	0.0000	10/11/89	
	0.0000	07/19/89	0.0000	07/19/89	
	0.0000	04/26/89	0.0000	04/26/89	
	0.0000	03/26/89	0.0000	03/26/89	
	FCV 30-19/20	0.0000	04/03/92	0.0000	04/03/92
		0.0000	01/08/92	0.0000	01/08/92
0.0000		10/02/91	0.0000	10/02/91	
0.0000		07/10/91	0.0000	07/10/91	
0.0000		04/17/91	0.0000	04/17/91	
0.0000		01/30/91	0.0000	01/30/91	
0.0000		10/15/90	0.0000	10/15/90	
0.0000		06/13/90	0.0000	06/13/90	
0.0000		03/21/90	0.0000	03/21/90	
0.0000		01/03/90	0.0000	01/03/90	
0.0000		10/11/89	0.0000	10/11/89	
0.0000		07/19/89	0.0000	07/19/89	
0.0000		04/26/89	0.0000	04/26/89	
0.0000		03/26/89	0.0000	03/26/89	
FCV 30-37/40	0.0000	04/03/92	0.0000	04/03/92	
	0.0000	01/08/92	0.0000	01/08/92	
	0.0000	10/02/91	0.0000	10/03/91	
	0.0000	07/10/91	0.0000	07/10/91	
	0.0000	04/17/91	0.0000	04/17/91	
	0.0000	01/30/91	0.0000	01/30/91	
	0.0000	10/15/90	0.0000	10/15/90	
	0.0000	03/21/90	0.0000	03/21/90	
	0.0000	01/03/90	0.0000	01/03/90	
	0.0000	10/11/89	0.0000	10/11/89	
	0.0000	07/19/89	0.0000	07/19/89	
	0.0000	06/13/90	0.0000	06/13/90	
	0.0000	05/19/89	0.0000	05/19/89	
	0.0000	04/26/90	0.0000	04/26/90	
	0.0000	03/26/89	0.0000	03/26/89	
FCV 77-128	0.0000	03/27/92	0.0000	03/27/92	
	0.0000	01/03/92	0.0000	01/03/92	
FSV 30-134	0.0000	03/20/92	0.0000	03/20/92	
	0.0000	11/18/90	0.0000	11/19/90	

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 61-96	0.0000	04/01/92	0.0000	04/01/92
	0.0000	12/13/90	0.0000	12/13/90
	0.0000	09/28/90	0.0000	09/28/90
FCV 61-97/692	0.6786	04/01/92	0.0000	04/02/92
	0.0370	12/13/90	0.0370	12/13/90
	0.3558	09/28/90	0.3558	09/28/90
FSV 43-23	0.0000	03/24/92	0.0000	03/24/92
	0.0000	01/04/91	0.0000	01/04/91
	0.0000	09/16/90	0.0000	09/16/90
FCV 90-117	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/29/90	0.0000	09/29/90
FSV 43-309	0.0000	03/18/92	0.0000	03/18/92
	1.8093	09/15/90	0.0000	10/05/90
FSV 43-310	0.0000	03/18/92	0.0000	03/18/92
	0.0000	09/15/90	0.0000	09/15/90
FSV 43-250	0.9272	03/17/92	0.0000	03/17/92
	0.0000	09/15/90	0.0000	09/15/90
FSV 42-251	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/15/92	0.0000	09/15/92
FSV 43-318	0.0000	03/18/92	0.0000	03/18/92
	0.0544	09/15/90	0.0544	09/15/90
FSV 43-319	0.0389	03/18/92	0.0389	03/18/92
	0.0544	09/15/90	0.0544	09/15/90
FSV 43-317/341	0.0000	03/18/92	0.0000	03/18/92
	0.0000	09/15/90	0.0000	09/15/90
VLV 43-461	0.0000	03/18/92	0.0000	03/18/92
	0.0000	09/14/90	0.0000	09/14/90
FSV 43-288	0.0000	03/20/92	0.0000	03/20/92
	0.0000	09/15/90	0.0000	09/15/90
FSV 43-287	0.0000	03/20/92	0.0000	03/20/92
	0.0000	09/15/90	0.0000	09/15/90
VLV 43-460	0.0000	03/18/92	0.0000	03/18/92
	0.0000	09/14/90	0.0000	09/14/90
FSV 43-325/307	0.0000	03/15/92	0.0000	03/15/92
	0.0000	09/14/90	0.0000	09/14/90

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 67-138	0.0000	03/21/92	0.0000	03/21/92
	0.0000	10/03/90	0.0000	10/03/90
VLV 67-580B	0.0000	03/21/92	0.0000	03/21/92
	0.0000	10/03/90	0.0000	10/03/90
FCV 67-141	0.0000	03/21/92	0.0000	03/21/92
	0.0000	10/03/90	0.0000	10/03/90
VLV 67-580D	0.0000	03/02/92	0.0000	03/02/92
	374.3522	10/03/90	0.0000	10/24/90
FCV 67-87/575A	84.0349	03/23/92	0.0000	04/10/92
	533.75	10/18/90	0.0000	10/25/90
FCV 67-88	0.0000	03/23/92	0.0000	03/23/92
	0.0000	10/18/90	0.0000	10/18/90
FCV 67-95/575C	0.6743	03/25/92	0.0000	04/10/92
	0.0000	10/18/90	0.0000	10/18/90
FCV 67-96	0.0000	03/25/92	0.0000	03/25/92
	0.0000	10/18/92	0.0000	10/18/92
FCV 67-103/575D	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-104	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-111/575D	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-112	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-131	0.0000	03/19/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/27/90
FCV 67-295/585A	0.0000	03/19/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/27/90
FCV 67-134	0.0000	03/19/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/27/90
FCV 67-296/585C	0.0000	03/19/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/27/90
FCV 67-139	0.0000	03/21/92	0.0000	03/21/92
	0.0000	10/03/90	0.0000	10/03/90

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 67-297/585B	0.0000	03/31/92	0.0000	03/31/92
	0.0000	10/03/90	0.0000	10/03/90
FCV 67-142	0.0000	03/21/92	0.0000	03/21/92
	0.0000	10/03/90	0.0000	10/03/90
FCV 67-298/585D	0.0000	03/21/92	0.0000	03/21/92
	0.2644	10/03/90	0.2644	10/03/90
FCV 68-305	0.0000	03/20/92	0.0000	03/20/92
	0.0000	09/12/90	0.0000	09/12/90
VLV 77-849	486.4200	03/20/92	0.0000	04/02/92
	0.0000	09/12/90	0.0000	09/12/90
FCV 68-307	0.0000	03/20/92	0.0000	03/20/92
	0.0000	09/12/90	0.0000	09/12/90
FCV 68-308	0.0000	03/20/92	0.0000	03/20/92
	0.0000	09/12/90	0.0000	09/12/90
FCV 70-85/143/703	0.3545	03/19/92	0.3545	03/19/92
	0.0000	09/17/90	0.0000	10/15/90
FCV 70-87/687	131.95	09/14/90		
FCV 61-194/680	0.0000	04/01/92	0.0000	04/01/92
	0.0000	09/17/90	0.0000	09/17/90
FCV 62-61/639	0.0000	03/21/92	0.0000	03/21/92
	0.0000	09/18/90	0.1456	10/12/90
FCV 62-63	0.0000	03/21/92	0.0000	03/21/92
	0.0000	09/18/90	0.0000	10/12/90
FCV 62-72/73/74	0.0000	03/20/92	0.0000	03/20/92
	43.9243	09/28/90	0.0000	10/23/90
FCV 62-77/662	0.5103	03/20/92	0.6152	03/27/92
	0.0000	09/28/90	0.0000	10/23/90
FCV 63-64	0.0000	03/20/92	0.0000	03/27/92
	0.0000	09/12/90	0.0000	09/12/90
VLV 77-868	0.0000	03/20/92	0.0000	03/20/92
	0.0000	09/12/90	0.0000	09/12/90
FCV 63-71	0.0000	03/27/92	0.0000	03/27/92
	4.8009	09/26/90	0.0000	10/26/90
FCV 63-84/23/344E	1.6760	03/27/92	0.0000	04/16/92
	0.3148	09/26/90	0.0000	10/26/90

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 67-107	0.0000	03/24/92	0.0000	03/24/92
	0.0000	10/18/90	0.0000	10/18/90
FCV 67-106/1523A	0.3985	03/25/92	0.0000	04/06/92
	0.0000	10/18/92	0.0000	10/18/92
FCV 67-99	0.0000	03/24/92	0.0000	03/24/92
	0.0000	10/18/90	0.0000	10/18/90
FCV 67-105/1523C	0.0390	03/24/92	0.0000	04/06/92
	533.7500	10/18/90	0.0000	10/24/90
FCV 67-91	6.700	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-90/1523B	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-83	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-89/1523D	0.0000	03/31/92	0.0000	03/31/92
	0.0000	09/24/90	0.0000	09/24/90
FCV 67-130	0.0000	03/12/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/27/90
VLV 67-580A	0.0000	03/19/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/26/90
FCV 67-33	0.0000	03/19/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/26/90
VLV 67-580C	0.0000	03/19/92	0.0000	03/19/92
	0.0000	09/13/90	0.0000	09/26/90
FCV 43-34	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/92	0.0000	10/27/90
FCV 43-35	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/90	0.0000	09/16/90
FCV 43-75	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/90	0.0000	10/27/90
FCV 43-77	0.0000	03/24/92	0.0000	03/24/92
	0.0000	07/16/90	0.0000	09/16/90
FSV 43-201	0.0000	03/25/92	0.0000	03/25/90
	0.0000	09/27/90	0.0000	09/27/90

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FSV 43-202	0.0000	03/25/92	0.0000	03/25/92
	0.0000	09/27/90	0.0000	09/27/90
FSV 43-207	0.0390	03/25/92	0.0390	03/25/92
	0.0000	09/27/90	0.0000	09/27/90
FSV 43-208	0.0390	03/25/92	0.0390	03/25/92
	0.0000	09/27/90	0.0000	09/27/90
FSV 43-200A	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/27/90	0.0000	11/02/90
FSV 43-200I	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/27/90	0.0000	09/27/90
FSV 43-210A	0.0000	03/25/92	0.0000	03/25/92
	0.0000	09/26/90	0.0000	11/02/90
FSV 43-210I	0.0000	03/25/92	0.0000	08/25/92
	0.0000	09/26/90	0.0000	09/26/90
VLV 52-504	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 52-505	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 52-506	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 52-507	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 52-500	0.0000	03/16/92	0.0000	03/16/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 52-501	0.0000	03/16/92	0.0000	03/16/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 52-502	0.0000	03/16/92	0.0000	03/16/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 52-503	0.0000	03/16/92	0.0000	03/16/92
	0.0000	09/11/90	0.0000	09/11/90
VLV 59-521/529	0.0000	03/15/92	0.0000	03/15/92
	0.0000	09/10/90	0.0000	09/10/90
VLV 59-633	0.0000	03/15/92	0.0000	03/15/92
	0.0000	09/10/92	0.0000	09/10/92

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 61-110	0.0000 0.0000	04/01/92 09/28/90	0.0000 0.0000	04/01/92 09/28/90
FCV 61-122/745	0.0000 0.0000	04/01/92 09/28/90	0.0000 0.0000	04/01/92 09/28/90
FCV 61-191	526.6563 0.0000	04/01/92 09/17/90	0.0000 0.0000	04/02/92 09/17/90
FCV 61-192/533	211.1943 0.0000	04/01/92 09/17/90	0.0000 0.0000	04/02/92 09/17/90
FCV 61-193	0.0000 0.0000	04/01/92 09/17/90	0.0000 0.0000	04/01/92 09/17/90
VLV 30-48AY	0.0000 0.0000	03/17/92 09/17/90	0.0000 0.0000	03/17/92 09/19/90
VLV 30-48AY	0.0000 0.0000	03/17/92 09/17/90	0.0000 0.0000	03/17/92 09/17/90
VLV-30-30CY	0.0000 0.1449	03/16/92 09/13/90	0.0000 0.1447	03/16/92 09/13/90
VLV 30-30CY	0.0000 0.0971	03/16/92 09/13/90	0.0000 0.0971	03/16/92 09/13/90
VLV 30-310Y	0.0000 0.0000	03/16/92 09/13/90	0.0000 0.0000	03/16/92 09/13/90
VLV 30-310X	0.0000 0.0000	03/16/92 09/13/90	0.0000 0.0000	03/16/92 09/13/90
VLV 30-311Y	0.0000 0.1817	03/16/92 09/13/90	0.0000 0.1817	03/16/92 09/13/90
VLV 30-311X	0.0000 0.0772	03/16/92 09/13/90	0.0000 0.0772	03/18/92 09/13/90
FCV 31C-222	0.0856 0.0000	03/21/92 09/19/90	0.0000 0.0000	04/02/92 09/19/90
FCV 31C 223/752	0.0000 0.0000	03/21/92 09/19/90	0.0000 0.0000	03/21/92 09/19/90
FCV 31C-224	0.0000 0.0000	03/21/92 09/19/90	0.0000 0.0000	05/21/92 09/19/90
FCV 31C-225/734	0.0000 0.0000	03/21/92 09/19/90	0.0000 0.0000	03/21/92 09/19/90



<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
FCV 31C-229	0.0000	03/26/92	0.0000	03/26/92
	0.0000	09/13/90	0.0000	09/13/90
FCV 31C-230/715	0.0000	03/26/92	0.0000	03/26/92
	0.0000	09/13/90	0.0000	09/13/90
FCV 31C-231	0.0000	03/26/92	0.0000	03/26/92
	0.0000	09/13/90	0.0000	09/13/90
FCV 31C-232/697	0.0000	03/26/92	0.0000	03/26/92
	0.0000	09/13/90	0.0000	09/13/90
FCV 32-81/353	0.0000	03/25/92	0.0000	03/25/92
	0.0547	09/18/90	0.0547	09/18/90
VLV 32-358	0.0000	03/25/92	0.0000	03/25/92
	0.0000	09/18/90	0.0000	09/18/90
FCV 32-103/341	0.0000	03/23/92	0.0000	03/23/92
	0.0000	09/18/90	0.0000	09/18/90
VLV 32-348	0.0000	03/23/92	0.0000	03/23/92
	0.0000	09/18/90	0.0000	09/18/90
FCV 32-111/385	0.0000	04/08/92	0.0000	04/08/92
	0.0000	10/19/90	0.0000	10/19/90
VLV 32-387	0.0000	04/08/92	0.0000	04/08/92
	0.0000	10/19/90	0.0000	10/19/90
VLV 33-722	0.0000	03/15/92	0.0000	03/15/92
	0.0000	09/10/90	0.0000	09/10/90
VLV 33-739	0.0993	03/15/92	0.0993	03/15/92
	0.0000	09/10/90	0.0000	09/10/90
FCV 43-2	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/90	0.0000	10/27/90
FCV 43-3	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/90	0.0000	09/16/90
FCV 43-11	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/90	0.0000	10/27/90
FCV 43-12	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/90	0.0000	09/16/90
FCV 43-22	0.0000	03/24/92	0.0000	03/24/92
	0.0000	09/16/90	0.0000	10/27/90

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>1</u>
FCV 26-240	0.1877 7.7436	03/27/92 09/16/90	0.1877 0.3004	03/27/92 10/31/90
VLV 26-1260	0.0392 0.0000	03/27/92 09/16/90	0.1600 0.0000	04/17/92 09/16/90
FCV 26-243	0.0000 0.0000	03/26/92 09/16/90	0.0000 0.0000	03/26/92 09/16/90
VLV 26-1296	0.0392 1.8127	03/26/92 09/16/90	0.0392 0.2933	03/26/92 10/15/90
FCV 30-46/571	0.0000 0.0000	03/17/92 09/17/90	0.0000 0.0000	03/17/92 09/17/90
FCV 30-47/572	0.0000 0.0000	03/17/92 09/12/90	0.0000 0.0000	03/17/92 09/12/90
FCV 30-48/573	0.0000 0.0000	03/16/92 07/17/90	0.0000 0.0000	03/16/92 07/17/90
FCV 30-134	0.0000 0.0000	03/20/92 09/12/90	0.0000 0.0000	03/20/92 11/02/90
FCV 30-135	0.0000 0.0000	03/20/92 09/12/90	0.0000 0.0550	03/20/92 11/02/90
VLV 30-42X	0.0000 0.0625	03/16/92 09/13/90	0.0000 0.0625	03/16/92 09/13/90
VLV-30-42Y	0.0000 0.0625	03/16/92 09/13/90	0.0000 0.0625	03/16/92 09/13/90
VLV 30-43Y	0.0000 0.0000	03/16/92 09/13/90	0.0000 0.0000	03/16/92 09/13/90
VLV 30-43X	0.0000 0.1501	03/16/92 09/13/90	0.0000 0.1501	03/16/92 09/13/90
VLV 30-44Y	0.0000 0.4040	03/16/92 09/13/90	0.0000 0.4040	03/16/92 09/13/90
VLV 30-44X	0.0000 0.0000	03/16/92 09/13/90	0.0000 0.0000	03/16/92 09/13/90
VLV 30-45Y	0.0000 0.0625	03/17/92 09/13/90	0.0000 0.0625	03/17/92 09/13/90
VLV 30-45X	0.0000 0.1501	03/17/92 09/13/90	0.0000 0.0000	03/17/92 09/13/90

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
VLV 30-46AY	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/17/90	0.0000	09/17/90
VLV 30-46AX	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/17/90	0.0000	09/17/90
VLV 30-47AY	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/17/90	0.0000	09/17/90
VLV 30-47AX	0.0000	03/17/92	0.0000	03/17/92
	0.0000	09/17/90	0.0000	09/17/90
FCV 77-18	0.0856	03/25/92	0.0856	03/25/92
	0.0000	10/06/89	0.0000	10/06/89
70-89/698	0.0000	09/14/90	0.0000	09/14/90
	0.0000	03/19/92	0.0000	03/19/92
70-92	0.0000	09/14/90	0.0000	09/14/90
	0.0000	03/19/92	0.0000	03/19/92
77-127	0.0000	09/26/90	0.0000	09/26/90
	0.0000	03/27/92	0.0000	03/27/92
81-12	0.0000	09/25/90	0.0000	09/25/90
	0.0000	03/19/92	0.0000	03/19/92
81-502	0.0000	09/25/90	0.0000	09/25/90
	0.0000	03/19/92	0.0000	03/19/92
77-19/20	0.0000	09/18/92	0.0000	09/08/92
	0.0748	03/25/92	0.1072	04/21/92
77-9	0.0000	09/19/90	0.0000	09/19/90
	0.0000	03/27/92	0.0000	04/21/92
77-10/84-511	0.0000	09/19/90	0.0000	09/09/90
	0.0000	03/27/92	0.0000	03/27/92
61-194/680	0.0000	09/17/90	0.0000	09/17/90
	0.0000	04/01/92	0.0000	04/01/92
70-90	0.0000	09/14/90	0.0000	09/14/90
	0.0000	03/19/92	0.0000	03/19/92
70-134	0.0000	09/14/90	0.0000	10/20/90
	0.0000	03/19/92	0.0000	03/19/92
70-679	0.0000	09/14/90	0.0000	09/14/90
	0.0000	03/19/92	0.0000	03/19/92

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
78-557	0.0000 0.0000	09/11/90 03/16/92	0.0000 0.0000	09/11/90 03/16/92
78-558	0.0000 0.0000	09/11/90 03/16/92	0.0000 0.0000	09/11/90 03/16/92
78-560	0.0000 0.0000	09/11/90 03/16/92	0.0000 0.0000	09/11/90 03/16/92
78-561	0.0000 0.0000	09/11/90 03/16/92	0.0000 0.0000	09/11/90 03/16/92
90-107	0.0000 0.0000	10/04/90 03/30/92	0.0000 0.0000	10/04/90 03/30/92
90-108	0.0000 0.0000	10/04/90 03/30/92	0.0000 0.0000	10/04/90 03/30/92
90-109	0.0000 0.0000	10/04/90 03/30/92	0.0000 0.0000	10/04/90 03/30/92
90-110	0.0000 0.0000	10/04/90 03/30/92	0.0000 0.0000	10/04/90 03/30/92
90-111	0.0000 0.0000	10/04/90 03/30/92	0.0000 0.0000	10/04/90 03/30/92
90-114	0.0000 0.0000	09/29/90 03/31/92	0.0000 0.0000	09/29/90 03/31/92
90-115	0.0000 0.0000	09/29/90 03/31/92	0.0000 0.0000	09/29/90 03/31/92
90-113	0.0000 0.0000	09/29/90 03/31/92	0.0000 0.0000	09/29/90 03/31/92
90-116	0.0000 0.0000	09/29/90 03/31/92	0.0000 0.0000	09/29/90 03/31/92
70-140	0.0000 0.0000	09/14/90 03/19/92	0.0000 0.0000	09/14/90 03/19/92
70-141/791	0.0000 0.0000	09/14/90 03/19/92	0.0000 0.0000	09/14/90 03/19/92
72-39	18.1376 9.1376	09/12/90 03/18/92	18.2751 7.13 6	10/06/90 04/20/92
72-2	18.2751 9.1376	09/12/90 03/18/92	18.2751 9.1376	10/16/90 03/18/92

<u>VALVE(S)</u>	<u>"AS FOUND"</u>	<u>DATE</u>	<u>"AS LEFT"</u>	<u>DATE</u>
72-40/215F/216F				
215E/216E	8.1678	09/26/90	8.1678	10/09/90
	9.8013	03/26/92	15.6348	04/04/92
72-41/217F/218F				
217E/218E	61.8384	09/26/90	27.1857	10/04/90
	56.0629	03/30/92	8.1678	04/09/92

APPENDIX M

Investigation Report on Excessive Leakage From Penetration X-47A

S 1 0 9 2 0 5 1 9 8 0 2

# INCIDENT INVESTIGATION EVENT REPORT

CATEGORY 1   
CATEGORY 2   
CATEGORY 3

## QA Record

II No. 8-92-030

Problem Title: Glycol Valves Excessive Leakage

Cause Codes HW

LER No. N/A

Event Manager Signature [Signature]

Date 5/14/92

Responsible Organization Maintenance

~~Plant~~ Manager Signature [Signature]

Date 5/18/92

Site VP Signature (Category 1 & 2 events) N/A

Date N/A

### C/A PROGRAM MANAGER

#### Problem Resolution Sheet Closeout:

- Investigation report distribution listing completed.
- Open Corrective Action entered into tracking system.
- Causes entered into tracking system.
- Report review and approval complete.
- Open items listing issued to actionees.

CAF Manager [Signature]

Date 5/20/92

PAGE 1 OF 4

# INCIDENT INVESTIGATION FORM

II No. S-7C-030

Location  
(Plant Unit) SDW UNIT 2

Event Time  
(Date/Time) 4-1-92 1830

Discovery Time  
(Date/Time) 4-1-92 1830

Initiator Name JOHN E. KEVIN Organization MEU Extension 7526

DESCRIPTION OF PROBLEM: THE UNIT 2 "AS FOUND" LOCAL LEAK RATE (SI ISB.1) FOR THE REACTOR BUILDING CONTAINMENT EXCEEDED ACCEPTABLE LIMITS; I.E. OVERALL LEAKAGE IS LIMITED TO 60% L<sub>9</sub> = 135.1 SCFH AND OVERALL TABULATED PATH LEAKAGE = 1102.0567 SCFH. BYPASS LEAKAGE IS LIMITED TO 25% L<sub>9</sub> = 56.29 SCFH AND TABULATED BYPASS LEAKAGE = 1102.0567 SCFH. ONE PENETRATION X-47A HAD BOTH

ACTIVITIES IN PROGRESS: \_\_\_\_\_

Proposed Category?  1  2  3  Deliver to SOS  N/A

Initiator's Supervisor JOHN MILLER Organization MEU Extension 7526

Cause (if known) UNDETERMINED AT THIS TIME (4252)

CORRECTIVE ACTION PLAN: VALVES SEEMS CLEANED AND LUBED. ADJUSTED SPRING ON 2-FV-001-194. VALVES THEN PASSED LOCAL LEAK RATE WITH 0 SCFH.

Plant Condition at Discovery MODE 6 & CORE EMPTY Documents Initiated \_\_\_\_\_

Determination Operability Affected  Yes  No

COMMENTS: UC not in applicable mode (1,2,3 and 4) when discovery of condition found. ACTION requires repair prior to exceeding 200°F. Problem since corrected.

Shift Operations Supervisor John Dwyer Date/Time 4-1-92 2317

### Responsibility Determination

- Notification Not Required
- Corporate Notification Required Date/Time call made \_\_\_\_\_
- NRC Notification Required per 10 CFR 50.72 Date/Time \_\_\_\_\_
- NRC Notification Required per 10 CFR 50.73 Date/Time \_\_\_\_\_
- Other Notification Required (specify) \_\_\_\_\_
- Tech. Spec. Action Entered Date/Time \_\_\_\_\_

Investigation Responsibility Category  1  2  3

Investigation Required \_\_\_\_\_  
Event Manager John Miller Report Due Date 5-15-92

Team Members \_\_\_\_\_

Problem Not Valid - Return to Corrective Action Program Manager

Plant Manager W.R. [Signature] Date 4-4-92

Identify Appropriate Immediate Actions.

Action Complete



INBOARD AND OUTBOARD CONTAINMENT ISOLATION VALVES TO LEAK EXCESSIVELY  
 2-FCV-061-0191 AND 2-FCV-061-192. THIS WILL CAUSE SQN UNIT 2 TO FAIL  
 THE "AS FOUND" CONTAINMENT INTEGRATED LEAK RATE TEST (CILRT)  
 WITH A ~~LEAK~~<sup>PATH</sup> PATH LEAKAGE FOR X-47A OF 211,1943 SCFH. ACCEPTABLE  
 LEAK RATE FOR CILRT (2-SI-SLT-088-156.0) IS < 168.75 SCFH.

~~THE FOLLOWING VALVES ARE THE HIGHEST VALVE LEAKAGE:~~

~~2-VLV-077-849 = 486.42~~

FCV

~~2-VLV-063-0023 = 1.~~

~~2-FCV-061-0191 =~~

FCV

~~2-FCV-061-0192 =~~

~~2-RV-067-535A =~~ JFK 4-2-92

2-FCV-061-0191 = 526.6563 SCFH

2-FCV-061-0192 = 211.1943 SCFH

### I. DESCRIPTION OF THE PROBLEM

On April 1, 1992 during the performance of Surveillance Instruction (SI) 158.1, local leak rate testing of containment isolation valves, the valves in path X-47A were found to have excessive as-found leakage rates. 2-FCV-61-191 (outboard) had a leakage rate of 526.6563 Standard Cubic Feet per Hour (SCFH) and 2-FCV-61-192/2-CV-61-533 (inboard) had a leakage rate of 211.1943 SCFH. The minimum path leakage may be used for tabulating the as-found leakages when figuring the margin of improvement that must be added on to the final containment integrated leak rate as required by I.E. Bulletin 85-71. Since the acceptance criteria for SI-156, the Containment Integrated Leak Rate Test (CILRT), is less than 168.75 SCFH, the minimum path leakage of X-47A (211.1943 SCFH) caused the leakage to exceed the allowable thus failing the CILRT before it was actually performed.

### II. ROOT CAUSE

Personnel statements indicate that a small nut (approximately 1/4") was found under the valve stem nut on 2-FCV-61-191 that prevented the valve from going fully closed. This appears to have come from unrelated work in the immediate vicinity of the valve. There was not a subsequent test on the valve after the nut was removed and prior to maintenance. Maintenance was performed using Work Order (WO) 92-08413-00, as planned for Work Request (WR)C046615. The only maintenance performed was the lubrication of the stem on each of the FCVs. It cannot be ascertained if the leakage on 2-FCV-61-191 was caused solely by the small nut or if the stem was also a problem. In any case the stem was lubricated. Both FCVs were stroked a number of times and were then retested and had 0.0 leakage rates. Based on these observations, there are two possible causes; the first would be foreign material that prevented the outboard valve from closing all the way and the second would be hardware related (e.g. valve stems sticking).

### III. SIMILAR PROBLEMS

A WK history of the glycol FCVs for units 1 and 2 reveals three documented occurrences, since 1979, of the valve stems requiring lubrication. However, this is not necessarily indicative of the number of times the valve stems were lubricated since the stems would have been lubricated as a matter of course during most of the maintenance.

activities on the valves (e.g. diaphragm replacement, stroke adjustment, etc.).

The leakage history of the valves is shown in the following table:

VALVE NUMBER (2-FCV-61-)	U2C1 LEAKAGE SCFH	U2C4 LEAKAGE SCFH	U2C5 LEAKAGE SCFH
191	0.0000	0.0000	526.6563 *
192/533	0.0000	0.0000	211.1943 *
193	0.0000	0.0000	0.0000
194/680	0.0000	0.0000	0.0000
110	0.0000	0.0000	0.0000
122/745	1.9733 *	0.0000	0.0000
96	0.0000	0.0000	0.0000
97/692	7.3075 *	0.3558	0.6786 *

\* - The as-left leakages were 0.0000 after maintenance.

Based on the valve leakage history (unit 1 valves show a similar leakage history) these particular valves do not seem to be "problem" valves. However, to ensure the smooth operation of the valves and the leak tight integrity of containment, a corrective action will be taken to preclude further problems with the valve stem sticking.

#### IV. RECURRENCE CONTROLS

Action: Revise the PM for the periodic visual inspection of the units 1 and 2 glycol containment isolation valves to include lubrication of the valve stems monthly.

Responsible Person/Section: John Klein/MEG

Due Date: 6-30-92

This action has been coordinated with the responsible person.