

REACTOR CONTAINMENT BUILDING  
INTEGRATED LEAKRATE TEST

BYRON NUCLEAR POWER STATION  
UNIT ONE  
September 2 - September 26, 1983

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## 1.0 ABSTRACT

This report provides the details of the Byron Unit One Preoperational Containment Integrated Leakage Rate Test (ILRT) performed on September 2 - September 26 of 1983. The test was performed in accordance with 10CFR50 - Appendix J, ANSI N45.4-1972 and the Byron Station Final Safety Analysis Report (FSAR).

The report includes information about 8 phases of the Byron Unit 1 Containment Leakage Rate Test Program which are defined as follows:

- Phase 1 - Type B & C Local Leakage Rate Testing
- Phase 2 - ILRT/SIT Plant Equipment Lineup
- Phase 3 - Unit 1 Structural Integrity Test (SIT)
- Phase 4 - Completion of remaining Type B & C Tests
- Phase 5 - Reduced Pressure ILRT
- Phase 6 - Full Pressure ILRT
- Phase 7 - Full Pressure Supplemental ILRT
- Phase 8 - Post ILRT Restoration
- Phase 9 - Type B and C Retesting

Phase 1 testing took place in June-August of 1983. A brief discussion of the Phase 1 Local Leakage Rate Test Methodology and a summary of the leakage rates can be found in section 9. Phase 2 started on September 2 and Phase 8 concluded on September 26, 1983.

Phase 9 was necessary because a number of penetrations would not yield acceptable leakage rates prior to the ILRT and were blocked or sealed during the ILRT. Their leakage rates were obtained subsequent to the ILRT and added to the Overall Integrated Leakage Rate determined for Unit 1 Containment.

Final Approval of the Byron Unit One Pre-Operational Test - Containment Integrated Leakage Rate Test (ILRT) - was given on December 15, 1983.

## 2.0 SUMMARY OF TYPE A, B, & C TEST RESULTS

### 2.1 Acceptance Criteria for the Type A Test.

Each acceptance criteria for the Integrated Leakage Rate Test was met as follows.

- 2.1.1 Acceptance Criteria #1 stated the Overall Integrated Leakage Rate, which is equal to the 95% Upper Confidence Limit (UCL) of  $L_{am}$  ( $L_{uc1a}$ ) added to the required Local Leakage Rate additions, shall be less than  $0.75 L_a$  for the Full Pressure ILRT.  $L_a$  is equivalent to 0.1 weight %/24 hours of the containment free air mass pressurized to  $P_a$  (43.6 psig). Therefore,  $0.75 L_a$  equals 0.075 %/day or 342.51 SCFH.

The 95% Upper Confidence Limit of  $L_{am}$  ( $L_{uc1a}$ ) recorded for the 24 hour Full Pressure ILRT is 0.0058%/day or 26.49 SCFH. The required Local Leakage Rate additions are as follows:

Pene.#	System	Condition during ILRT	Reason	Leakage**
P-1*	CS	Sealed	1CS008A-leaked	9.0 $\pm$ 0.7 SCFH
P-16*	CS	Sealed	1CS008B-leaked	16.5 $\pm$ 0.7 SCFH
P-4*	VQ	Open to Cont.	Cont.Press/Line	0.0 $\pm$ 0.1 SCFH
P-4*	VQ	Open to Cont.	Cont.Press/Line	0.0 $\pm$ 0.1 SCFH
P-82	SD	Flooded	No way to drain	0.4 $\pm$ 0.1 SCFH
P-83	SD	Flooded	No way to drain	3.7 $\pm$ 0.1 SCFH
P-80	SD	Flooded	No way to drain	0.0 $\pm$ 0.1 SCFH
P-81	SD	Flooded	No way to drain	0.95 $\pm$ 0.1 SCFH
P-88	SD	Flooded	No way to drain	0.40 $\pm$ 0.1 SCFH
P-89	SD	Flooded	No way to drain	0.40 $\pm$ 0.1 SCFH
P-90	SD	Flooded	No way to drain	1.25 $\pm$ 0.1 SCFH
P-91	SD	Flooded	No way to drain	1.45 $\pm$ 0.1 SCFH
P-52*	PR	Sealed	1PR032-leaked	16.0 $\pm$ 0.7 SCFH
P-28*	CV	Sealed	1CV8113-leaked	0.4 $\pm$ 0.1 SCFH
P-31*	PS	Sealed	1PS231B-leaked	18.36 $\pm$ 0.7 SCFH
P-65*	RE	Sealed	1RE9160A-leaked	2.83 $\pm$ 0.1 SCFH
P-27*	RY	Sealed	1RY8047-leaked	11.11 $\pm$ 0.7 SCFH
P-24*	CC	Sealed	1CC9518-leaked	3.57 $\pm$ 0.1 SCFH
P-I3	VQ	Open to Cont.	ILRT Use	0.4 $\pm$ 0.1 SCFH
P-I3	VQ	Open to Cont.	ILRT Use	0.0 $\pm$ 0.1 SCFH
P-6*	WO	Sealed	1WO007A-leaked	11.11 $\pm$ 0.7 SCFH
P-10*	WO	Sealed	1WO007B-leaked	14.14 $\pm$ 0.7 SCFH
Local Leakage Rate Additions -			TOTAL	111.97 $\pm$ 1.9 SCFH

\* Local Leakage Rate tests for these items were conducted subsequent to the ILRT

\*\*Errors are calculated throughout this evaluation using the following method:

$$\text{Error total} = (E_1^2 + E_2^2 + \dots E_n^2)^{1/2} \quad ; n = \text{number of additions}$$

The Overall Integrated Leakage Rate for Unit 1 Containment is equal to 138.46  $\pm$  1.9 SCFH or 0.031 %/day.



### 2.1.1 CONTINUEE

- 2.1.2 Acceptance Criteria #2 stated the measured Composite Leakage Rate  $L_C$  shall be within  $0.25 L_A$  of the sum of the superimposed leakage  $L_O$  and the previously measured leakage  $L_{am}$ . In equation form, using  $0.25 L_A$  equal to 1.90 SCFM:

$$(L_O + L_{am} - 1.90) \leq L_C \leq (L_O + L_{am} + 1.90)$$

$$(7.528 + 0.282 - 1.903) \leq 6.103 \leq (7.528 + 0.282 + 1.903)$$

$5.907 \leq 6.103 \leq 9.713$  at 4 hours, leakage rates are in SCFM.

or, in another form  $|L_C - L_O - L_{am}| \leq 1.90$  SCFM.

The value of the expression " $L_C - L_O - L_{am}$ " was equal to -1.707 SCFM after four hours of the Full Pressure Supplemental Test. The absolute value, 1.707 SCFM, was less than 1.90 SCFM and therefore met the acceptance criteria. The superimposed leakage rate shall be between 75% and 125% of  $L_A$  or, in equation form:

$$5.71 \text{ SCFM} < L_O < 9.51 \text{ SCFM}$$

$L_O$  was within its criteria at an average value of 7.528 SCFM for the four hour Full Pressure Supplemental Test.

## 2.2 Acceptance Criteria for the Type B & C Tests.

2.2.1 Acceptance Criteria #1 stated that the combined leakage rate, including the measurement error for all penetrations and valves subject to Type B & C tests shall be less than  $0.60 L_a$  at a minimum pressure of  $P_a$ . For Byron Unit 1 containment  $L_a$  is equal to 0.1 weight percent per 24 hours of the containment free air mass pressurized to  $P_a$  (43.6 psig). Therefore  $0.60 L_a$  is equal to 0.060%/day or 274.00 SCFH.

The combined leakage rate including the measurement error for all performed Type B & C tests including retests is  $225.28 \pm 2.82$  SCFH. This measured combined leakage rate of  $225.28 \pm 2.82$  SCFH falls below the acceptance criteria limit of 274.00 SCFH.

2.2.2 Acceptance Criteria #2 for Containment Air Locks, stated that the Equipment Door Airlock and the Emergency Personnel Airlock shall each have a leakage rate of less than or equal to  $0.05 L_a$  at a minimum pressure of  $P_a$  (43.6 psig), where  $0.05 L_a = 22.83$  SCFH.

Two 4-bolt, blind flanged test ports are included on each airlock. One of these test ports on each lock was used as the pressurization path. The individual leakage rate for the 4-bolt, blind flange removed during pressurization must be added to the respective airlock's leakage rate. However, each individual test ports' blind flange was found to have a leakage rate of zero SCFH. The leakage rates for the Equipment Door Integral Personnel Lock and the Emergency Personnel Lock are as follows:

Equip. Door Integral Personnel Lock	$0.4 \pm 0.1$ SCFH
+ Blind Flange #1	$0.0 \pm 0.1$ SCFH
<hr/>	
	$0.4 \pm 0.14$ SCFH
Emerg. Personnel Lock	$6.5 \pm 0.7$ SCFH
+ Blind Flange #1	$0.0 \pm 0.1$ SCFH
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	$6.5 \pm 0.71$ SCFH

The leakage rates for the Equipment Door and Emergency Personnel Airlock,  $0.4 \pm 0.14$  SCFH and  $6.5 \pm 0.71$  SCFH, respectively, fall below the acceptance criteria limit of 22.83 SCFH.

- 2.2.3 Acceptance Criteria #3 requires that the Normal Containment Purge penetrations P-95 & P-97 (Containment isolation valves LVQ001A, & B, LVQ006, LVQ002A, & B, LVQ007) shall each have a measured leakage rate less than  $0.05 L_a$  (22.83 SCFH) at a minimum pressure of  $P_a$  (43.6 psig).

P-97 Containment Normal Purge Leakage Rate =  $3.2 \pm 0.1$  SCFH  
(LVQ001A, B & LVQ006)

P-95 Containment Normal Purge Leakage Rate =  $4.8 \pm 0.1$  SCFH  
(LVQ002A, B & LVQ007)

Penetration 97's and 95's test connection isolation valves, LVQ006 and LVQ007 respectively, each had a measured leakage rate of zero.

The maximum leakage rate for Penetration 97 was 3.2 plus 0.1 SCFH or 3.3 SCFH. This falls below the acceptance criteria limit of 22.83 SCFH.

The maximum leakage rate for Penetration 95 was 4.8 plus 0.1 SCFH or 4.9 SCFH. This falls below the acceptance criteria limit of 22.83 SCFH.

- 2.2.4 Acceptance Criteria #4 requires that the Miniflow Containment Purge penetrations P-94 & P-96 (Containment isolation valves LVQ004A & B, LVQ008, LVQ005 A,B & C, LVQ003, and LVQ009) shall each have a measured leakage rate less than  $0.05 L_a$  (22.83 SCFH) at a minimum pressure of  $P_a$  (43.6 psig).

P-96 Cont. Miniflow Purge Leakage Rate =  $16.0 \pm 0.7$  SCFH  
(LVQ004A, B & LVQ008)

P-94 Cont. Miniflow Purge Leakage Rate =  $1.4 \pm 0.1$  SCFH  
(LVQ005A, B, C, LVQ003 and LVQ009)

Penetration 96's and 94's test connection isolation valves LVQ008 and LVQ009 respectively, each had a measured leakage rate of zero.

The maximum leakage rate for Penetration 96 was 16.0 plus 0.7 SCFH or 16.7 SCFH. This falls below the acceptance criteria limit of 22.83 SCFH.

The maximum leakage rate for Penetration 94 was 1.4 plus 0.1 SCFH or 1.5 SCFH. This falls below the acceptance criteria limit of 22.83 SCFH.

- 2.2.5 Acceptance Criteria #5 stated each Personnel Lock Door Gasket Interspace shall have a measured leakage rate less than 9.67 SCFH at a minimum pressure of 10 psig\*. This leakage limit was calculated assuming a linear relationship between leakage rate and test volume pressure.

The measured leakage rate for each Lock Door Gasket on the Equipment Door Integral Personnel Airlock was less than  $0.4 \pm 0.1$  SCFH.

Lock Inner Door Gasket Interspace Leakage Rate	$0.4 \text{ SCFH} \pm 0.1 \text{ SCFH}$
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Lock Outer Door Gasket Interspace Leakage Rate	$0.4 \text{ SCFH} \pm 0.1 \text{ SCFH}$
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The maximum leakage rate in each case was  $0.4 + 0.1$  SCFH or 0.5 SCFH. Each was less than the acceptance criteria limit of 9.67 SCFH.

The measured leakage rate for each Lock Door Gasket on the Emergency Personnel Airlock was zero.

Lock Inner Door Gasket Interspace Leakage Rate	$0 \text{ SCFH} \pm 0.1 \text{ SCFH}$
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Lock Outer Door Gasket Interspace Leakage Rate	$0 \text{ SCFH} \pm 0.1 \text{ SCFH}$
--	---------------------------------------

The maximum leakage rate in each case was then  $0.0 + 0.1$  SCFH or 0.1 SCFH. Each was less than the acceptance criteria limit of 9.67 SCFH.

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\* The maximum design pressure for the Door gasket interspace is 11.0 psig as found in the Vendor Instruction Manual for Airlocks and Closures.



### 3.0 Test Preparations

#### 3.1 Type A Test Procedure

The Unit 1 Preoperational Containment ILRT was performed in accordance with Byron Startup Manual, Revision 15 and Preoperational Test Procedure 2.58.11, Revision 2. During the performance of the test 18 Test Change Requests (TCR's) were written to change the 2.58.11 procedure. The majority of the TCR's were of a minor nature.

The ILRT procedure (2.58.11, Rev. 2) was written to comply with Appendix J of 10CFR50 and ANSI N45.4-1972. Although much of the methodology employed was that of ANSI 56.8 - 1981, Containment System Leakage Testing Requirements.

#### 3.2 Type A Test Instrumentation

Attachment 10.1 (ILRT Sensor Placement) shows the physical locations of the temperature (RTD or T) and humidity (DEW or D) sensors within the Containment. RTD's and DEW cells located below the 426' level and above the containment basement floor at 377' were placed in one of two subvolumes. Either Inside the Missile Barrier (IMB) or Outside the Missile Barrier (OMB) at the location indicated at the bottom of Attachment 10.1.

Twenty-Five RTD's, ten Dew Cells and two absolute pressure gauges connected to a Volumetrics Dual Multiplexor Scanner and Data Acquisition System (DAS) were the main instrumentation used in the Byron Unit 1 ILRT. Additional instrumentation used included an ambient pressure transducer, ambient temperature RTD, vacuum gauges for zeroing the absolute quartz-bourdon tube pressure gauges and a thermal mass flowmeter used to measure the superimposed leakage of the supplemental verification test.

Attachment 10.2 contains specifications for the aforementioned equipment including values for accuracy, repeatability, sensitivity and resolution for RTD, Dew Cell and pressure sensors. The quality and quantity of sensors chosen were such that the Instrument Selection Guide (ISG)\* value would still be less than  $0.25 L_a$  for a test duration less than 24 hours assuming failure of several RTD's or Dew Cells and one pressure sensor.

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\* ISG is defined in ANSI 56.8 - 1981.



Attachment 10.3 depicts the general arrangement relative to the containment wall of sensors, Multiplexor Scanner and the Data Acquisition System (also known as the Integrated Leakage Rate Monitoring System). The two absolute quartz bourdon tube pressure gauges were physically located outside containment within the DAS console. They were connected to Containment by a short run of poly-flo tubing. The thermal mass flowmeter, also located in the DAS console, was connected to containment by an independent run of poly-flo tubing. All electrical interconnection between the Multiplexor Scanner and the DAS was made through permanent Electrical Penetration E-13.

### 3.3 Type A Test Data Processing

Leakage rate data was acquired by the DAS every 15 minutes. This included Time, Julian Date, RTD temperatures, Dew Cell temperatures and absolute pressure sensor readings. The data was sent electronically to the Prime Computer through two telephone modems in a RS232 format as shown in Attachment 10.4. The Prime Computer placed the incoming data into a permanent file from which it drew one data set at a time to compute the leakage rate. From the Prime Computer User Terminal the data was reviewed for completeness and accuracy and then entered into the leakage rate program. Leakage rates, raw data and calculation summaries could be printed as desired for review and later permanent storage. The multicolor plotting of leakage rates and other data on both hard copy (Calcomp Plotter) and the RAMTEK 6200 CRT was available to facilitate trending parameters such as containment leakage rate, dry air pressure, vapor pressure and containment average temperature.

### 3.4 Type A Test Subvolume Determination

The containment was divided into 5 discrete subvolumes. Subvolume demarkation, size and weighting factors are indicated on Attachment 10.1. Subvolume calculations are shown for subvolumes 1, 2 and 3. Subvolumes 4 and 5 were arrived at by totalling subcompartment volumes used in the LOCA nodal analyses by Sargent and Lundy (plant architect-engineer). Subvolume 4 is defined as the annulus between the outermost containment wall and the Missile barrier below the 426' level. Subvolume 5 is the volume inside the Missile Barrier below the 426' level, not including the reactor cavity.

Two dew cell sensors were distributed to each subvolume so that loss of any one sensor would not leave a subvolume uncovered. RTD sensors were placed so that each sensor had a weighting factor of 3-5% and loss of any one sensor would not result in an RTD weighting factor of greater than 10% for any single sensor.

### 3.5 ILRT/SIT Plant Equipment Lineup

The valve and equipment lineups were detailed and specific, i.e. component by component with individual signoffs. This ensured containment integrity conditions as close as possible to those which would exist after a design basis Loss of Coolant Accident (LOCA). It also assured penetrations were properly drained and vented.

### 3.6 Structural Integrity Test and Remaining Local Leakage Rate Tests

The Structural Integrity Test (SIT) of Unit 1 containment preceded the Integrated Leakage Rate Tests. It utilized the valve and equipment lineup of the ILRT procedure to isolate the containment and protect equipment within exposed to pressure. During the SIT the containment was pressurized to greater than 57.5 psig or 115% of its design pressure of 50 psig. A post-SIT/pre-ILRT inspection of accessible interior and exterior containment surfaces indicated no significant deterioration of the containment structure. Immediately after the SIT a few remaining local leakage rate tests were performed, such as Electrical Penetration Zones, Equipment and Emergency Personnel Locks and several Type C process line isolation valves. Valve and equipment lineups were reperformed if disturbed by the activity after the SIT.

### 3.7 Type A Test Pressurization

Two 3000 SCFM and two 1800 SCFM electrical "oil free" air compressors were used to pressurize containment.

The compressors were located outside on the west side of the Fuel Handling Building. Pressurization was accomplished through a six inch header pipe which penetrates containment at penetration P-4. (See Attachment 10.5 for a general arrangement).

## 4.0 Test Methodology

### 4.1 Reduced Pressure ILRT

During this 24 hour test, pressure, temperature, and humidity data were taken to determine the statistically averaged containment leakage rate  $L_{tm}$  (weight percent/24 hours). The test was conducted at a nominal pressure of  $P_c$  (24 psig) above the required minimum of 21.8 psig ( $0.5 P_a$ ). Reactor Containment Fan Coolers were operated during this test. The purpose was to obtain data which can be compared to the Full Pressure ILRT data and future Reduced Pressure ILRT results.

### 4.2 Full Pressure ILRT

During this 24 hour test, pressure, temperature, and humidity data were taken to determine the statistically averaged containment leakage rate  $L_{am}$  (weight percent/24 hours). The test was conducted at a nominal pressure of 45 psig above the required minimum of  $P_a$  (43.6 psig) the Design Basis Accident containment pressure. Reactor Containment Fan Coolers were not run during this test. The purpose of this test was to determine a 95% Upper Confidence Limit value of  $L_{am}$  for a 24 hour period.

### 4.3 Temperature Stabilization Periods

Prior to the start of each ILRT a Temperature Stabilization Period of a minimum duration of 4 hours was employed. The criterion for temperature stabilization was as follows: The latest rate of change of the weighted average containment air temperature averaged over the last hour does not deviate by more than  $0.5^\circ\text{F/hr}$  from the average rate of change of the weighted average containment air temperature averaged over the last 4 hours.

### 4.4 Supplemental Verification Test

Following the Full Pressure ILRT, a deliberate leak of known magnitude was superimposed on the existing containment leakage through a calibrated thermal mass flowmeter. The superimposed leak was maintained between  $0.75 L_a$  and  $1.25 L_a$  (5.71 and 9.51 SCFM).

The duration of the test was defined as a minimum of 4 hours and 10 sets of data. The acceptance criterion for the test was follows: The statistically averaged Composite Leakage Rate ( $L_c$ ) is within  $0.25 L_a$  (1.90 SCFM) of the sum of the statistically averaged Full Pressure ILRT leakage rate ( $L_{am}$ ) and the average flowmeter induced leakage rate ( $L_o$ ).

#### 4.5

#### Method of Leakage Rate Determination

The leakage rate is assumed to be constant during the testing period, ideally yielding a straight-line plot with a negative slope. However, sampling techniques and test conditions are not perfect; consequently, the measured values will deviate from the ideal straight-line situation.

A least squares fit statistical analysis was performed to determine a regression line for mass versus time after each set of data was acquired. The slope of this regression line was designated to be the statistically averaged leakage rate ( $L_{am}$ ) for the Full Pressure ILRT.

Associated with the statistically averaged leak rate was the 95% upper confidence limit leakage rate ( $L_{ucla}$ ). The calculation of this upper limit was based upon the standard deviations from the regression line and the one-sided T Distribution function. An expanded discussion of the Least Squares Fit Statistical techniques used can be found in Attachment 10.6.



## 5.0 Sequence of Events

### 5.1 Pretest SIT/ILRT Preparations

09/02/83

0850 Began ILRT/SIT valve lineups on the CV, FW, AF, MS, FC, PR and SD systems.

1730 Exited procedure for day.

09/03/83

0200 Performed WO system lineup.

0800 Performed valve lineup on the WM system and started the PS system.

1800 Exited procedure for day.

09/04/83

0715 A small amount of valve lineup work in progress. Volumetrics Inc. representative onsite. Reviewing performed valve lineups and wringing out instrumentation cabling. Calibrating the ambient pressure sensor.

1500 Exited procedure for day.

09/05/83

0715 Valve lineups continuing.

1805 Exited procedure for day.

09/06/83

0715 Began 24 hour/day coverage of test. Continued valve and equipment lineups.

1430 Steam Generators (manways & handholes on secondary) verified intact. ESP Output Mode Test switches placed in the bypass position.

09/07/83

0715 Briefed shift personnel on remaining items to be completed prior to pressurization of the containment for the Structural Integrity Test (SIT).

1030 Verified the pressurizer was vented via a removed manway.

1110 Completed a walk-thru of containment by operations, ILRT and SIT supervisors. Posted warning signs at the entrances to the containment.



09/07/83      Continued

1145    Officially exited the ILRT procedure and turned control over to the SIT Test Engineer. All future work will be done following the SIT procedure until the SIT is complete. Necessary valve lineups for isolation of the containment for the SIT are complete.

5.2    Structural Integrity Test Pressurization

1150    Air Compressors started and pressurization begun.  
1535    Containment pressure @ 10.6 psig and pressurization stopped for SIT pressure plateau.  
1810    Started increasing pressure from 10.7 psig.  
1931    Pressurization continuing, containment pressure equal to 15 psig.  
2134    Pressurization stopped at 20.9 psig.  
2345    Recontinuing pressurization from 20.7 psig.

09/08/83

0313    Stopped pressurization @ 31.1 psig  
0510    Restarted pressurization @ 30.8 psig  
0855    Stopped pressurization @ 40.8 psig  
1100    Started pressurization @ 40.5 psig  
1548    Stopped pressurization @ 50.9 psig  
1740    Started pressurization @ 50.6 psig  
2257    Reached 57.5 psig. Pressurization essentially complete. One compressor left on and pressurization line kept open slightly to maintain pressure for 1 hour plateau - peak pressure reached was 57.7 psig.

5.3    Structural Integrity Test Depressurization

09/09/83

0055    Began depressurization from 57.6 psig.  
0213    Stopped depressurization at 52.0 psig.  
0620    Started depressurization from 51.9 psig.  
0924    Stopped depressurization at 41.0 psig.  
1037    Started depressurization @ 41.3 psig.

09/09/83 Continued

- 1142 Opened the Equalizer valve on Emergency Personnel Lock to increase the depressurization rate.
- 1200 Opened an additional 2" valve in pressurization/depressurization line.
- 1324 Stopped depressurization by closing all vent paths @ 31.5 psig.
- 1400 Valve 1A0VRY8033 was stroked closed by its Main Control Board handswitch (Step on P.67 of ILRT).
- 1442 Started depressurization by opening vent paths @ 31.9 psig.
- 1700 The Out of Service on valve 1IA083 was Temporarily Lifted so that Project Construction Dept. may work on leaky valve. Leakage found while pressurized for SIT.
- 1752 Slowed down rate of depressurization to take data @ 21.7 psig.
- 1853 Continuing depressurization. Pressure @ 21.1 psig.
- 2114 Containment pressure @ 14.9 psig.
- 2251 Containment pressure @ 11.4 psig. Depressurization slowed by closing some vent paths.
- 2356 Opened additional vent paths to increase depressurization rate. Containment pressure @ 11.0 psig.

09/10/83

- 0256 Containment pressure @ 5.0 psig.
- 0625 Containment pressure @ 0.8 psig.

5.4 24 Hour Post-SIT Waiting Period & Pre-ILRT Preparations.

- 0755 Air lock door on Emergency Personnel Lock opened and containment completely depressurized to 0 psig. SIT personnel will not allow entry to the containment until either 90% relaxation of the containment walls has occurred or 24 hours has passed. They don't want anyone disturbing the extensometer wires.
- 1600 Reviewed Out of Services and Temporary Lifts of Out of Services authorized during the SIT for effect on ILRT Lineup. Beginning Local leakage Rate testing of Electrical Penetration Zones. Emergency Personnel Lock Test will also be performed tonight.

09/11/83

- 0830 Chicago Bridge & Iron, Volumetrics and Instrument Maintenance personnel all working to get Dew Cells (3&4) Channels 32 & 33 operable. Tech Staff working on RHR Train 1A lineup to support ILRT.
- 1300 Both Pressurizer PORV's 455A & 456 are now blocked open. The SIT Log has been reviewed to identify any items which might have occurred that have an impact on the ILRT equipment lineup. Received a letter stating containment is structurally sound based on their post-SIT inspections. Continuing Local Leakage Rate testing.
- 2340 Summary of the "BLOCKED PENETRATIONS" during the ILRT.

<u>PENE#</u>	<u>SYSTEM</u>	<u>CONDITION</u>	<u>REASON</u>
1	CS	Sealed	Chk-1CS008A leaks
16	CS	Sealed	Chk-1CS008B leaks
6	WO	Blind Flanged	Chk-1WO007A leaks
10	WO	P'nd Flanged	Chk-1WO007B leaks
27	RY	Sealed	Chk-1RY8047 leaks
24	CC	Sealed	Chk-1CC9518 leaks
28	CV	Sealed	Chk-1CV8113 leaks
31	PS	Sealed	Chk-1PS231B leaks
52	PR	Sealed	Chk-1PR032 leaks
65	RE	Sealed	AOV-1RE9160A leaks
80	SD	Flooded	No method to drn W/O drning S/G
81	SD	Flooded	No method to drn W/O drning S/G
82	SD	Flooded	No method to drn W/O drning S/G
83	SD	Flooded	No method to drn W/O drning S/G
88	SD	Flooded	No method to drn W/O drning S/G
89	SD	Flooded	No method to drn W/O drning S/G
90	SD	Flooded	No method to drn W/O drning S/G
91	SD	Flooded	No method to drn W/O drning S/G
P4	VQ	Open/inside, sealed/out	Cont. Press/ Depressurization line
I-3(2)	VQ	Both open-Inuse	Monitor Cont. Press/Flow
P19(2)	RC	Welded Pipe Cap	Design incomplete - no isolation valves

09/13/83

- 0300 Checked weather - High pressure and stable conditions over the next few days.

5.5 Pressurization to Reduced Pressure ILRT Pressure

- 0403 Informed operations personnel that all Prerequisites and Initial Conditions including equipment lineups were complete and we were ready to enter section 9.1 (Containment Pressurization).
- 0425 Started the air compressors and began pressurizing containment for the ILRT.

09/13/83

Continued

- 0710 Stopped the air compressors @ containment pressure equal to 7.3 psig, for last minute corrections and adjustments to data link to prime computer.
- 1150 RCS water level (LLI-449) reads 15% level after adding 9%.
- 1205 Began re-pressurizing containment.
- 1250 Declared the DAS ambient pressure gauge "Inoperable". We will use the 0-100 psig Heise gauge readings and DAS PI-1 to calculate ambient.
- 1500 15.5 psig in containment
- 1505 15.7 psig in containment, 9% level on LLI-449.
- 1540 Stopped pressurization and exited test momentarily to add additional % level in the RCS. Pressure in containment = 17.5 psig.
- 1600 Level of 18% establishing and pressurization begun.
- 1700 Started the four Reactor Containment Fan Coolers on Low-Speed.
- 1710 Re-verified pressurization rate is less than high limit of 10 psig/hour. Actual rate approx. 3 psig/hour.
- 1751 Containment pressure is between 23.0 and 24.0 psig.
- 1815 Stopped pressurization at approximately 24.35 psig.

5.6 Reduced Pressure ILRT Temperature Stabilization

- 1900 Began the Temperature Stabilization Period for the Reduced Pressure ILRT.

5.7 Reduced Pressure ILRT

- 2300 Temperature Stabilization verified after 4 hours. Beginning the Reduced Pressure ILRT now. Containment Pressure @ 24.10 psig. All RTD's, Dew Cells and Absolute Pressure gauges working.

09/14/83

- 0715 We decided we might be causing the saw tooth of data (dew point temp., partial vapor pressure & dry air pressure) by letting RHR temperature swing too much. Briefed shift personnel to attempt to maintain RHR temperature  $\pm 1^{\circ}\text{F}$  rather than  $\pm 5^{\circ}\text{F}$ .
- 1130 Allowed Operational Analysis Dept Personnel to work on VQ dampers & fans. The work will not affect ILRT venting.



09/14/83 Continued

- 1730 Individual dew point sensor temperatures were plotted by hand to check for abnormal temperature swings.
- 1800 Lost RHR Discharge Temp. recorder LRT-612 for 20 minutes. Indication was restored.
- 2030 Quality Assurance completed a partial review of executed procedure.
- 2310 Declared the Reduced Pressure ILRT complete. No leakage data sensors were lost for the duration of the test. Pressure = 24.20 psig.

5.8 Pressurization to Full Pressure ILRT pressure

- 2400 Started the air compressors and have begun pressurizing for the Full Pressure ILRT. Containment Pressure = 24.30 psig.

09/15/83

- 0100 Heise gauge reading = 27.50 psig.
- 0200 Heise gauge reading = 30.7 psig.
- 0300 Heise gauge reading = 33.7 psig.
- 0400 Heise gauge reading = 36.8 psig.
- 0420 RCFC's overloading - 1D tripped out - the shift shutdown the remaining RCFC's 1A, 1B & 1C to let them cool off. Test Deficiency written.
- 0500 Heise gauge reading = 39.4 psig.
- 0505 Tried to start RCFC 1B - It ran 10 amps higher than when shutdown at 0420.
- 0600 Heise gauge reading = 42.5 psig.
- 0700 Heise gauge reading = 45.25 psig.
- 0705 Shutting down the compressors containment pressure is approximately 45.2 psig.

09/15/83

- 0756 Exited the ILRT procedure. In the next couple of hours we must decide the impact of the loss of the RCFC's on full pressure test and what changes must be made to the ILRT procedure before continuing.



09/15/83

Continued

- 0840 Re-initialized the computer data base containing the correction factors for the two quartz - bourdon tube absolute pressure gauges. The pressure counts will properly be corrected for the range of pressure expected during the Full Pressure ILRT.
- 1057 Discovered condensation in polyflex tubing leading to the Heise gauge (approx 1/4" of water). No appreciable effect on pressure readings. Condensation blown out.
- 1130 Completed the evaluation of the Temperature Survey done without RCFC's running with Chicago Bridge and Iron personnel - No problem to run Full Pressure Test without RCFC's. A test procedure change was made to allow this.

5.9 Full Pressure ILRT Temperature Stabilization

- 1215 Re-entered procedure. Plan to start Temperature Stabilization Period with the 1215 data set.
- 1300 CECO. Quality Assurance reviewing procedure status with Test Engineers.
- 1615 Temperature Stabilization for the Full Pressure ILRT verified.

5.10 Full Pressure ILRT.

- 1630 Started taking data for the Full Pressure ILRT. All RTD's Dew Cells and pressure gauges for collecting leakage data are operable. Heise gauge containment pressure reading = 44.70 psig.
- 2330 Full Pressure ILRT continuing Heise gauge reading = 44.70 psig.

09/16/83

- 0630 Full Pressure ILRT continuing Heise gauge reading = 44.61 psig.
- 0830 CECO. Quality Assurance reviewed written test deficiencies.
- 1630 24 hr. Full Pressure ILRT complete. Heise gauge reading = 44.50 psig which is greater than 43.6 psig (minimum pressure). All RTD's, dew Cells and pressure gauges remained operable for the duration of the test. The 95% Upper Confidence Limit Leakage Rate was 0.0058%/day. This was well below the allowable leakage rate of 0.75  $L_a$  = 0.075%/day. The Statistically Averaged Leakage Rate was 0.0037%/day.

5.11 Full Pressure ILRT Induced Leakage Test

- 1645 Exited procedure temporarily. The poly-flow tubing leading to the thermal mass flowmeter has too small an inner diameter. Maximum flow possible is 2.7 SCFM for the 1/4 inch poly-flow. Need approx. 7.6 SCFM.

09/16/83

- 1710 1/4 inch poly-flow was replaced with 1/2 inch poly-flow and the test was re-entered.
- 1715 Opened flowmeter throttle valve to achieve a 7.61 SCFM flowrate. We will allow this to stabilize 1 hour prior to starting the Induced Leakage Verification Test.
- 1815 Induced Leakage Test started.
- 2215 Induced Leakage Test Completed.

$L_0$  (Superimposed Leakage Rate) = 7.530 SCFM

$L_{am}$  (Statistically averaged Leakage Rate) = 0.282 SCFM

$L_c$  (Composite Leakage Rate during Induced Test) = 6.103 SCFM.

The Statistically averaged Composite Leakage Rate was verified within  $0.25 L_a$  (1.90 SCFM) of the sum of the Statistically averaged leakage rate ( $L_{am}$ ) for the full pressure test, and the average flowmeter induced leakage rate ( $L_0$ ). Heise gauge reading = 44.45 psig.

#### 5.12 Depressurization

09/17/83

- 0015 RHR Train 1A was shut down - no longer necessary to support test.
- 0200 Started depressurization from 44.40 psig.
- 0415 Heise gauge reading = 37.15 psig.
- 0615 Heise gauge reading = 31.60 psig.
- 0715 Heise gauge reading = 29.10 psig.
- 0815 Closed valves 0VQ001 and 0VQ003 and stopped depressurization.
- 0828 The Reactor Containment Fan Cooler Fans are now being tested at this pressure plateau (approx 27 psig) for "LOW-SPEED" operation.
- 0915 Valves 1RH8701A & B and suction drain isolation valve for RH Pump 1A opened to reduce RCS water inventory from present 13% to approx. 1%. As containment pressure decreases water in the one non-isolated steam generator will return to the vessel.
- 1345 Draining through RHR complete, 1-2% level in vessel.
- 1745 Stroke times for the 1MOVSI8811A/B valves were taken above 25.3 psig for containment pressure.
- 1810 Began depressurizing again. Valves 0VQ001 and 0VQ003 and the Emerg. Personnel Hatch Equalizer valve are open as vent paths.
- 1915 Heise gauge reading = 20.9 psig.

09/17/83 Continued

2130 Opened some Hydrogen Recombiner pipelines as additional vent paths.

2300 Heise gauge reading = 10.9 psig.

09/18/83

0000 RCS level back up to 13%.

0020 Equipment Personnel Lock equalizer valve opened as vent path.

0100 Heise gauge reading = 5.9 psig, RCS water level up to 16%.

0500 Containment pressure at ambient conditions after opening both the Emergency & Equipment Personnel Locks to containment. RCS water level @ 17.5%. Containment Air sample showed 0% combustibles and 20% Oxygen concentrations.

#### 5.13 Containment Restoration

0600 Conducted a walkdown of containment. Only damage in containment attributed to pressurization was two Area Radiation Monitoring gauge glasses broken.

0935 Began the restoration section of the procedure.

09/26/83

1715 Completed restoration portion of ILRT procedure.

## 6.0 Type A Test Data



\*\*\*\* SUMMARY OF DATA SETS 1 THRU 97 \*\*\*\*

## 24 HOUR PHASE

DATA SET	TAPE TIME	TEST DURATION (HRS)	TEMP (R)	DRY AIR PRESSURE (PSIA)	MEASURED MASS	CALCULATED MASS T = 0	MEAS LEAK RATE TOTAL % / DAY	POINT % / DAY	CALC LEAK RATE % / DAY	95% UPPER CONFIDENCE LIMIT
1	256 23:00:00	0.000000	551.33008	38.13210	5.15875E+05	0.00000E-01	0.0000	0.0000	0.0000	0.0000
2	256 23:15:00	0.250000	551.33301	38.13270	5.15881E+05	0.00000E-01	-0.1000	-0.1000	0.0000	0.0000
3	256 23:30:00	0.500000	551.35144	38.13707	5.15923E+05	5.15869E+05	-0.4402	-0.7804	-0.4402	0.5154
4	256 23:45:00	0.750000	551.35840	38.13632	5.15906E+05	5.15876E+05	-0.1911	0.3070	-0.2501	0.1474
5	257 00:00:00	1.000000	551.36865	38.13715	5.15908E+05	5.15880E+05	-0.1509	-0.0302	-0.1681	0.0516
6	257 00:15:00	1.250000	551.38647	38.13832	5.15907E+05	5.15884E+05	-0.1175	0.0163	-0.1183	0.0262
7	257 00:30:00	1.500000	551.39282	38.13892	5.15909E+05	5.15886E+05	-0.1043	-0.0384	-0.0920	0.0095
8	257 00:45:00	1.750000	551.41650	38.13881	5.15885E+05	5.15892E+05	-0.0264	0.4408	-0.0366	0.0592
9	257 01:00:00	2.000000	551.42920	38.13895	5.15875E+05	5.15897E+05	-0.0001	0.1838	0.0039	0.0888
10	257 01:15:00	2.250000	551.44299	38.14141	5.15896E+05	5.15897E+05	-0.0424	-0.3803	0.0036	0.0701
11	257 01:30:00	2.500000	551.45776	38.14010	5.15864E+05	5.15901E+05	0.0207	0.5885	0.0300	0.0904
12	257 01:45:00	2.750000	551.46777	38.14258	5.15888E+05	5.15901E+05	-0.0221	-0.4501	0.0268	0.0766
13	257 02:00:00	3.000000	551.47998	38.14079	5.15853E+05	5.15904E+05	0.0348	0.6606	0.0457	0.0918
14	257 02:15:00	3.250000	551.49072	38.14216	5.15861E+05	5.15906E+05	0.0202	-0.1547	0.0519	0.0916
15	257 02:30:00	3.500000	551.49731	38.14529	5.15898E+05	5.15902E+05	-0.0295	-0.6758	0.0377	0.0748
16	257 02:45:00	3.750000	551.51184	38.14544	5.15886E+05	5.15901E+05	-0.0131	0.2163	0.0322	0.0649
17	257 03:00:00	4.000000	551.52185	38.14505	5.15871E+05	5.15901E+05	0.0047	0.2722	0.0331	0.0618
18	257 03:15:00	4.250000	551.53894	38.14605	5.15869E+05	5.15901E+05	0.0072	0.0465	0.0340	0.0594
19	257 03:30:00	4.500000	551.54114	38.14884	5.15905E+05	5.15898E+05	-0.0301	-0.6641	0.0236	0.0485
20	257 03:45:00	4.750000	551.54712	38.14671	5.15870E+05	5.15899E+05	0.0053	0.6420	0.0248	0.0472
21	257 04:00:00	5.000000	551.55774	38.14915	5.15893E+05	5.15897E+05	-0.0164	-0.4280	0.0199	0.0407
22	257 04:15:00	5.250000	551.57422	38.14943	5.15868E+05	5.15897E+05	0.0065	0.4640	0.0214	0.0404
23	257 04:30:00	5.500000	551.58252	38.14795	5.15854E+05	5.15899E+05	0.0183	0.2675	0.0253	0.0429
24	257 04:45:00	5.750000	551.59131	38.15086	5.15885E+05	5.15898E+05	-0.0077	-0.5804	0.0222	0.0386
25	257 05:00:00	6.000000	551.60327	38.15303	5.15903E+05	5.15895E+05	-0.0214	-0.3361	0.0165	0.0326
26	257 05:15:00	6.250000	551.61084	38.15498	5.15922E+05	5.15892E+05	-0.0349	-0.3605	0.0088	0.0255
27	257 05:30:00	6.500000	551.62915	38.15490	5.15904E+05	5.15890E+05	-0.0206	0.3373	0.0052	0.0211
28	257 05:45:00	6.750000	551.64233	38.15121	5.15842E+05	5.15893E+05	0.0230	1.1584	0.0109	0.0267
29	257 06:00:00	7.000000	551.66016	38.15449	5.15870E+05	5.15893E+05	0.0039	-0.5129	0.0119	0.0266
30	257 06:15:00	7.250000	551.66992	38.15627	5.15884E+05	5.15893E+05	-0.0058	-0.2780	0.0109	0.0246
31	257 06:30:00	7.500000	551.68183	38.15478	5.15853E+05	5.15894E+05	0.0138	0.5827	0.0135	0.0265
32	257 06:45:00	7.750000	551.70410	38.15894	5.15889E+05	5.15893E+05	-0.0079	-0.6595	0.0118	0.0261
33	257 07:00:00	8.000000	551.71350	38.16013	5.15896E+05	5.15892E+05	-0.0119	-0.1349	0.0096	0.0213
34	257 07:15:00	8.250000	551.72681	38.16125	5.15899E+05	5.15891E+05	-0.0131	-0.0512	0.0075	0.0187
35	257 07:30:00	8.500000	551.75171	38.16232	5.15690E+05	5.15890E+05	-0.0079	0.1640	0.0064	0.0171
36	257 07:45:00	8.750000	551.76282	38.16187	5.15873E+05	5.15890E+05	0.0011	0.3059	0.0069	0.0169
37	257 08:00:00	9.000000	551.77515	38.16409	5.15892E+05	5.15889E+05	-0.0086	-0.3466	0.0058	0.0153
38	257 08:15:00	9.250000	551.78625	38.16476	5.15891E+05	5.15888E+05	-0.0076	0.0267	0.0069	0.0160
39	257 08:30:00	9.500000	551.80115	38.16759	5.15915E+05	5.15886E+05	-0.0193	-0.4513	0.0024	0.0114
40	257 08:45:00	9.750000	551.81409	38.16820	5.15911E+05	5.15885E+05	-0.0170	0.0698	0.0006	0.0092
41	257 09:00:00	10.000000	551.81982	38.17010	5.15931E+05	5.15883E+05	-0.0260	-0.3768	-0.0024	0.0064
42	257 09:15:00	10.250000	551.82751	38.17213	5.15952E+05	5.15880E+05	-0.0346	-0.3768	-0.0062	0.0029
43	257 09:30:00	10.500000	551.84180	38.16817	5.15885E+05	5.15880E+05	-0.0042	1.2420	-0.0055	0.0032
44	257 09:45:00	10.750000	551.84949	38.17189	5.15928E+05	5.15879E+05	-0.0227	-0.8002	-0.0073	0.0012
45	257 10:00:00	11.000000	551.87256	38.17043	5.15886E+05	5.15879E+05	-0.0047	0.7687	-0.0066	0.0015
46	257 10:15:00	11.250000	551.87878	38.17471	5.15939E+05	5.15877E+05	-0.0261	-0.9700	-0.0087	-0.0007
47	257 10:30:00	11.500000	551.89148	38.17479	5.15928E+05	5.15876E+05	-0.0212	0.2023	-0.0100	-0.0022
48	257 10:45:00	11.750000	551.90137	38.17590	5.15933E+05	5.15875E+05	-0.0230	-0.1070	-0.0114	-0.0038
49	257 11:00:00	12.000000	551.91846	38.17524	5.15909E+05	5.15875E+05	-0.0129	0.4629	-0.0114	-0.0042
50	257 11:15:00	12.250000	551.92786	38.17668	5.15919E+05	5.15875E+05	-0.0167	-0.2000	-0.0119	-0.0049
51	257 11:30:00	12.500000	551.94666	38.17447	5.15872E+05	5.15876E+05	0.0013	0.8850	-0.0103	-0.0034
52	257 11:45:00	12.750000	551.95422	38.17736	5.15904E+05	5.15876E+05	-0.0104	-0.5955	-0.0101	-0.0035
53	257 12:00:00	13.000000	551.96875	38.17463	5.15853E+05	5.15878E+05	0.0079	0.9397	-0.0080	-0.0013



## 24 HOUR PHASE

54	257 12:15:00	13.250000	551.99231	38.17872	5.15887E+05	5.15878E+05	-0.0039	-0.6188	-0.0074	-0.0009
55	257 12:30:00	13.500000	551.99329	38.17924	5.15893E+05	5.15879E+05	-0.0060	-0.1151	-0.0070	-0.0007
56	257 12:45:00	13.750000	551.99866	38.18209	5.15926E+05	5.15878E+05	-0.0177	-0.6222	-0.0078	-0.0017
57	257 13:00:00	14.000000	552.01892	38.18194	5.15905E+05	5.15878E+05	-0.0099	0.3884	-0.0078	-0.0020
58	257 13:15:00	14.250000	552.01880	38.17939	5.15871E+05	5.15879E+05	0.0015	0.6420	-0.0067	-0.0009
59	257 13:30:00	14.500000	552.03613	38.18275	5.15900E+05	5.15879E+05	-0.0079	-0.5455	-0.0066	-0.0010
60	257 13:45:00	14.750000	552.05237	38.18465	5.15910E+05	5.15879E+05	-0.0111	-0.1931	-0.0068	-0.0014
61	257 14:00:00	15.000000	552.07202	38.18642	5.15916E+05	5.15879E+05	-0.0126	-0.1047	-0.0071	-0.0019
62	257 14:15:00	15.250000	552.07593	38.18509	5.15894E+05	5.15879E+05	-0.0058	0.4024	-0.0068	-0.0018
63	257 14:30:00	15.500000	552.09192	38.18660	5.15900E+05	5.15879E+05	-0.0074	-0.1012	-0.0067	-0.0018
64	257 14:45:00	15.750000	552.09753	38.18449	5.15866E+05	5.15880E+05	0.0027	0.6257	-0.0056	-0.0008
65	257 15:00:00	16.000000	552.11218	38.18542	5.15865E+05	5.15881E+05	0.0030	0.0209	-0.0046	0.0001
66	257 15:15:00	16.250000	552.13037	38.18875	5.15893E+05	5.15882E+05	-0.0051	-0.5199	-0.0044	0.0002
67	257 15:30:00	16.500000	552.13440	38.18925	5.15896E+05	5.15882E+05	-0.0058	-0.0547	-0.0043	0.0002
68	257 15:45:00	16.750000	552.15112	38.18590	5.15835E+05	5.15884E+05	0.0112	1.1328	-0.0028	0.0019
69	257 16:00:00	17.000000	552.17688	38.19078	5.15877E+05	5.15885E+05	-0.0004	-0.7793	-0.0023	0.0022
70	257 16:15:00	17.250000	552.17932	38.19157	5.15885E+05	5.15885E+05	-0.0027	-0.1547	-0.0020	0.0023
71	257 16:30:00	17.500000	552.18681	38.19011	5.15861E+05	5.15886E+05	0.0039	0.4594	-0.0013	0.0030
72	257 16:45:00	17.750000	552.19324	38.19024	5.15854E+05	5.15886E+05	0.0055	0.1151	-0.0004	0.0038
73	257 17:00:00	18.000000	552.20984	38.19247	5.15869E+05	5.15887E+05	0.0016	-0.2722	0.0000	0.0042
74	257 17:15:00	18.250000	552.22937	38.19495	5.15884E+05	5.15887E+05	-0.0023	-0.2826	0.0001	0.0042
75	257 17:30:00	18.500000	552.23157	38.19148	5.15835E+05	5.15888E+05	0.0101	0.9095	0.0012	0.0053
76	257 17:45:00	18.750000	552.23730	38.19637	5.15896E+05	5.15888E+05	-0.0051	-1.1294	0.0010	0.0050
77	257 18:00:00	19.000000	552.24902	38.19324	5.15863E+05	5.15890E+05	0.0080	0.9897	0.0019	0.0058
78	257 18:15:00	19.250000	552.27039	38.19572	5.15856E+05	5.15890E+05	0.0046	-0.2501	0.0024	0.0063
79	257 18:30:00	19.500000	552.28577	38.19803	5.15873E+05	5.15891E+05	0.0005	-0.3140	0.0026	0.0064
80	257 18:45:00	19.750000	552.30664	38.19699	5.15840E+05	5.15891E+05	0.0084	0.6222	0.0033	0.0071
81	257 19:00:00	20.000000	552.31213	38.19760	5.15843E+05	5.15892E+05	0.0076	-0.0570	0.0040	0.0077
82	257 19:15:00	20.250000	552.32166	38.20120	5.15883E+05	5.15892E+05	-0.0017	-0.7398	0.0039	0.0075
83	257 19:30:00	20.500000	552.33362	38.20102	5.15869E+05	5.15892E+05	0.0015	0.2547	0.0041	0.0076
84	257 19:45:00	20.750000	552.34741	38.20068	5.15851E+05	5.15893E+05	0.0054	0.3245	0.0045	0.0080
85	257 20:00:00	21.000000	552.35742	38.20197	5.15860E+05	5.15894E+05	0.0035	-0.1500	0.0047	0.0082
86	257 20:15:00	21.250000	552.35999	38.20340	5.15878E+05	5.15893E+05	-0.0005	-0.3350	0.0047	0.0080
87	257 20:30:00	21.500000	552.37610	38.20150	5.15836E+05	5.15894E+05	0.0086	0.7793	0.0053	0.0086
88	257 20:45:00	21.750000	552.38916	38.20252	5.15837E+05	5.15894E+05	0.0081	-0.0314	0.0058	0.0091
89	257 21:00:00	22.000000	552.39661	38.20420	5.15853E+05	5.15895E+05	0.0047	-0.2920	0.0060	0.0092
90	257 21:15:00	22.250000	552.41101	38.20623	5.15867E+05	5.15895E+05	0.0018	-0.2605	0.0061	0.0092
91	257 21:30:00	22.500000	552.42114	38.20741	5.15874E+05	5.15895E+05	0.0004	-0.1221	0.0060	0.0091
92	257 21:45:00	22.750000	552.44153	38.20607	5.15836E+05	5.15895E+05	0.0080	0.6920	0.0065	0.0095
93	257 22:00:00	23.000000	552.44507	38.21152	5.15907E+05	5.15895E+05	-0.0063	-1.3062	0.0060	0.0090
94	257 22:15:00	23.250000	552.44934	38.20841	5.15861E+05	5.15895E+05	0.0029	0.8525	0.0061	0.0090
95	257 22:30:00	23.500000	552.47803	38.21075	5.15865E+05	5.15895E+05	0.0020	-0.0872	0.0061	0.0090
96	257 22:45:00	23.750000	552.47510	38.20945	5.15851E+05	5.15896E+05	0.0049	0.2780	0.0063	0.0091
97	257 23:00:00	24.000000	552.49792	38.21355	5.15885E+05	5.15895E+05	-0.0018	-0.6351	0.0061	0.0089

BYRON UNIT 1 16:16:16 THU, 15 SEP 1983

\*\*\*\* SUMMARY OF DATA SETS 1 THRU 34 \*\*\*\*

## TEMPERATURE STABILIZATION DATA

DATA SET	TAPE TIME	TEST DURATION (HRS)	TEMP (R)	DRY AIR PRESSURE (PSIA)	MEASURED MASS	CALCULATED MASS T = 0	MEAS LEAK RATE TOTAL X / DAY	RATE POINT X / DAY	CALC LEAK RATE X / DAY	95% UPPER CONFIDENCE LIMIT
1	258 08:00:00	0.000000	554.77405	58.82159	7.90836E+05	0.00000E-01	0.0000	0.0000	0.0000	0.0000
2	258 08:15:00	0.250000	554.40857	58.78704	7.90893E+05	0.00000E-01	-0.6859	-0.6859	0.0000	0.0000
3	258 08:30:00	0.500000	554.12036	58.75185	7.90830E+05	7.90856E+05	0.0357	0.7571	0.0357	2.0624
4	258 08:45:00	0.750000	553.89294	58.73340	7.90907E+05	7.90844E+05	-0.2848	-0.9256	-0.1806	0.4534
5	258 09:00:00	1.000000	553.69055	58.71249	7.90914E+05	7.90842E+05	-0.2360	-0.0895	-0.2056	0.0989
6	258 09:15:00	1.250000	553.52576	58.70183	7.91006E+05	7.90827E+05	-0.4118	-1.1152	-0.3427	-0.0950
7	258 09:30:00	1.500000	553.37695	58.68729	7.91023E+05	7.90822E+05	-0.3773	-0.2048	-0.3769	-0.2064
8	258 09:45:00	1.750000	553.25049	58.67421	7.91027E+05	7.90824E+05	-0.3308	-0.0516	-0.3641	-0.2406
9	258 10:00:00	2.000000	553.13403	58.65785	7.90973E+05	7.90838E+05	-0.2077	0.6538	-0.2902	-0.1668
10	258 10:15:00	2.250000	553.03003	58.64742	7.90981E+05	7.90848E+05	-0.1954	-0.0971	-0.2420	-0.1325
11	258 10:30:00	2.500000	552.95093	58.64149	7.91014E+05	7.90853E+05	-0.2162	-0.4035	-0.2231	-0.1327
12	258 10:45:00	2.750000	552.85840	58.63158	7.91013E+05	7.90859E+05	-0.1951	0.0167	-0.2030	-0.1257
13	258 11:00:00	3.000000	552.78113	58.62176	7.90991E+05	7.90667E+05	-0.1567	0.2655	-0.1754	-0.1046
14	258 11:15:00	3.250000	552.70984	58.61355	7.90982E+05	7.90876E+05	-0.1362	0.1092	-0.1499	-0.0842
15	258 11:30:00	3.500000	552.63171	58.60304	7.90952E+05	7.90886E+05	-0.1006	0.3626	-0.1205	-0.0565
16	258 11:45:00	3.750000	552.57861	58.60053	7.90994E+05	7.90890E+05	-0.1280	-0.5113	-0.1095	-0.0527
17	258 12:00:00	4.000000	552.51099	58.59339	7.90995E+05	7.90894E+05	-0.1202	-0.0030	-0.0998	-0.0490
18	258 12:15:00	4.250000	552.44775	58.58799	7.91012E+05	7.90897E+05	-0.1258	-0.2154	-0.0950	-0.0499
19	258 12:30:00	4.500000	552.38647	58.58267	7.91028E+05	7.90898E+05	-0.1297	-0.1957	-0.0932	-0.0529
20	258 12:45:00	4.750000	552.33435	58.57230	7.90963E+05	7.90904E+05	-0.0810	0.7949	-0.0792	-0.0405
21	258 13:00:00	5.000000	552.27747	58.56972	7.91010E+05	7.90906E+05	-0.1052	-0.5659	-0.0752	-0.0400
22	258 13:15:00	5.250000	552.22705	58.56281	7.90988E+05	7.90910E+05	-0.0880	0.2564	-0.0682	-0.0355
23	258 13:30:00	5.500000	552.18335	58.55576	7.90956E+05	7.90915E+05	-0.0660	0.3960	-0.0578	-0.0264
24	258 13:45:00	5.750000	552.12781	58.55736	7.91057E+05	7.90913E+05	-0.1165	-1.2274	-0.0616	-0.0326
25	258 14:00:00	6.000000	552.08655	58.54958	7.91011E+05	7.90914E+05	-0.0883	0.5598	-0.0587	-0.0319
26	258 14:15:00	6.250000	552.05493	58.54446	7.90987E+05	7.90917E+05	-0.0734	0.2852	-0.0536	-0.0284
27	258 14:30:00	6.500000	551.99451	58.53852	7.90993E+05	7.90920E+05	-0.0734	-0.0728	-0.0496	-0.0260
28	258 14:45:00	6.750000	551.96313	58.53760	7.91026E+05	7.90900E+05	-0.0853	-0.3960	-0.0490	-0.0271
29	258 15:00:00	7.000000	551.92944	58.52966	7.90967E+05	7.90924E+05	-0.0567	0.7160	-0.0433	-0.0221
30	258 15:15:00	7.250000	551.89307	58.53019	7.91026E+05	7.90925E+05	-0.0795	-0.7191	-0.0429	-0.0232
31	258 15:30:00	7.500000	551.86182	58.52151	7.90954E+05	7.90930E+05	-0.0475	0.8799	-0.0371	-0.0178
32	258 15:45:00	7.750000	551.83130	58.56097	7.91531E+05	7.90900E+05	-0.2720	-7.0047	-0.0719	-0.0333
33	258 16:00:00	8.000000	551.79333	58.51493	7.90963E+05	7.90907E+05	-0.0481	6.8874	-0.0634	-0.0263
34	258 16:15:00	8.250000	551.75342	58.51514	7.91023E+05	7.90910E+05	-0.0688	-0.7313	-0.0598	-0.0247



\*\*\*\* SUMMARY OF DATA SETS 1 THRU 97 \*\*\*\*

## 24 HOUR PHASE

DATA SET	TAPE TIME	TEST DURATION (HRS)	TEMP (R)	DRY AIR PRESSURE (PSIA)	MEASURED MASS	CALCULATED MASS T = 0	MEAS LEAK RATE TOTAL X / DAY	MEAS LEAK RATE POINT X / DAY	CALC LEAK RATE X / DAY	95% UPPER CONFIDENCE LIMIT
1	258 16:30:00	0.000000	551.71582	58.50704	7.90967E+05	0.00000E-01	0.0000	0.0000	0.0000	0.0000
2	258 16:45:00	0.250000	551.68774	58.50602	7.90997E+05	0.00000E-01	-0.3201	-0.3201	0.0000	0.0000
3	258 17:00:00	0.500000	551.65295	58.50058	7.90970E+05	7.90975E+05	-0.0167	0.2867	-0.0167	0.8356
4	258 17:15:00	0.750000	551.62170	58.49782	7.90978E+05	7.90978E+05	-0.0415	-0.0910	-0.0086	0.2132
5	258 17:30:00	1.000000	551.59241	58.49367	7.90964E+05	7.90979E+05	0.0118	0.1714	0.0290	0.1464
6	258 17:45:00	1.250000	551.55518	58.48882	7.90951E+05	7.90982E+05	0.0394	0.1502	0.0570	0.1351
7	258 18:00:00	1.500000	551.53015	58.48608	7.90950E+05	7.90983E+05	0.0354	0.0152	0.0626	0.1152
8	258 18:15:00	1.750000	551.49353	58.48076	7.90931E+05	7.90986E+05	0.0635	0.2321	0.0790	0.1211
9	258 18:30:00	2.000000	551.46387	58.47857	7.90944E+05	7.90984E+05	0.0360	-0.1563	0.0710	0.1040
10	258 18:45:00	2.250000	551.44263	58.48128	7.91011E+05	7.90972E+05	-0.0585	-0.8147	0.0186	0.0805
11	258 19:00:00	2.500000	551.40210	58.47417	7.90975E+05	7.90969E+05	-0.0067	0.4597	0.0101	0.0607
12	258 19:15:00	2.750000	551.37903	58.47326	7.90993E+05	7.90965E+05	-0.0287	-0.2488	-0.0048	0.0397
13	258 19:30:00	3.000000	551.35120	58.46558	7.90930E+05	7.90970E+05	0.0383	0.7752	0.0119	0.0530
14	258 19:45:00	3.250000	551.31885	58.47002	7.91036E+05	7.90960E+05	-0.0640	-1.2911	-0.0148	0.0297
15	258 20:00:00	3.500000	551.30200	58.46707	7.91020E+05	7.90957E+05	-0.0458	0.1696	-0.0270	0.0132
16	258 20:15:00	3.750000	551.26831	58.46256	7.91008E+05	7.90955E+05	-0.0326	0.1532	-0.0313	0.0040
17	258 20:30:00	4.000000	551.25708	58.45944	7.90982E+05	7.90956E+05	-0.0107	0.3171	-0.0273	0.0039
18	258 20:45:00	4.250000	551.22388	58.45390	7.90954E+05	7.90961E+05	0.0095	0.3322	-0.0183	0.0108
19	258 21:00:00	4.500000	551.21130	58.45138	7.90938E+05	7.90966E+05	0.0197	0.1942	-0.0084	0.0193
20	258 21:15:00	4.750000	551.18115	58.45213	7.90992E+05	7.90964E+05	-0.0155	-0.6494	-0.0104	0.0146
21	258 21:30:00	5.000000	551.16028	58.44833	7.90970E+05	7.90966E+05	-0.0017	0.2609	-0.0083	0.0143
22	258 21:45:00	5.250000	551.13000	58.44463	7.90964E+05	7.90967E+05	0.0022	0.0804	-0.0058	0.0149
23	258 22:00:00	5.500000	551.10864	58.44691	7.91025E+05	7.90964E+05	-0.0317	-0.7449	-0.0118	0.0079
24	258 22:15:00	5.750000	551.09009	58.43906	7.90946E+05	7.90966E+05	0.0115	0.9633	-0.0067	0.0120
25	258 22:30:00	6.000000	551.06628	58.43623	7.90941E+05	7.90970E+05	0.0133	0.0531	-0.0022	0.0156
26	258 22:45:00	6.250000	551.04419	58.43490	7.90955E+05	7.90971E+05	0.0060	-0.1684	-0.0001	0.0164
27	258 23:00:00	6.500000	551.02087	58.43341	7.90968E+05	7.90971E+05	-0.0005	-0.1623	0.0003	0.0156
28	258 23:15:00	6.750000	550.99817	58.42899	7.90941E+05	7.90974E+05	0.0119	0.3338	0.0031	0.0175
29	258 23:30:00	7.000000	550.97546	58.42728	7.90951E+05	7.90974E+05	0.0073	-0.1168	0.0045	0.0180
30	258 23:45:00	7.250000	550.94995	58.42697	7.90983E+05	7.90973E+05	-0.0065	-0.3929	0.0031	0.0158
31	259 00:00:00	7.500000	550.94373	58.42745	7.90998E+05	7.90971E+05	-0.0125	-0.1881	0.0008	0.0128
32	259 00:15:00	7.750000	550.90686	58.41955	7.90944E+05	7.90972E+05	0.0091	0.6584	0.0026	0.0140
33	259 00:30:00	8.000000	550.89160	58.41969	7.90968E+05	7.90973E+05	-0.0002	-0.2898	0.0026	0.0133
34	259 00:45:00	8.250000	550.86951	58.42094	7.91017E+05	7.90969E+05	-0.0182	-0.5917	-0.0004	0.0100
35	259 01:00:00	8.500000	550.85168	58.41925	7.91019E+05	7.90967E+05	-0.0186	-0.0319	-0.0031	0.0071
36	259 01:15:00	8.750000	550.82141	58.41286	7.90976E+05	7.90967E+05	-0.0031	0.5234	-0.0030	0.0066
37	259 01:30:00	9.000000	550.79724	58.40831	7.90949E+05	7.90968E+05	0.0061	0.3262	-0.0015	0.0077
38	259 01:45:00	9.250000	550.78186	58.40866	7.90976E+05	7.90969E+05	-0.0030	-0.3277	-0.0016	0.0072
39	259 02:00:00	9.500000	550.75610	58.40605	7.90978E+05	7.90968E+05	-0.0034	-0.0182	-0.0017	0.0066
40	259 02:15:00	9.750000	550.74792	58.40230	7.90939E+05	7.90970E+05	0.0088	0.4718	-0.0001	0.0080
41	259 02:30:00	10.000000	550.72266	58.40060	7.90952E+05	7.90971E+05	0.0047	-0.1578	0.0008	0.0085
42	259 02:45:00	10.250000	550.69946	58.39722	7.90940E+05	7.90973E+05	0.0082	0.1502	0.0020	0.0095
43	259 03:00:00	10.500000	550.68005	58.39508	7.90939E+05	7.90974E+05	0.0083	0.0137	0.0032	0.0103
44	259 03:15:00	10.750000	550.66748	58.39828	7.91000E+05	7.90972E+05	-0.0092	-0.7449	0.0019	0.0088
45	259 03:30:00	11.000000	550.64575	58.39420	7.90976E+05	7.90972E+05	-0.0024	0.2898	0.0016	0.0082
46	259 03:45:00	11.250000	550.63660	58.38805	7.90906E+05	7.90975E+05	0.0166	0.8511	0.0037	0.0103
47	259 04:00:00	11.500000	550.60999	58.38716	7.90932E+05	7.90975E+05	0.0094	-0.3156	0.0046	0.0111
48	259 04:15:00	11.750000	550.58594	58.38661	7.90959E+05	7.90975E+05	0.0021	-0.3307	0.0047	0.0108
49	259 04:30:00	12.000000	550.56750	58.38712	7.90993E+05	7.90974E+05	-0.0064	-0.4066	0.0037	0.0097
50	259 04:45:00	12.250000	550.55969	58.38406	7.90962E+05	7.90973E+05	0.0012	0.3671	0.0036	0.0094
51	259 05:00:00	12.500000	550.53625	58.38602	7.91022E+05	7.90971E+05	-0.0134	-0.7282	0.0020	0.0077
52	259 05:15:00	12.750000	550.52417	58.38063	7.90967E+05	7.90971E+05	0.0001	0.6731	0.0019	0.0075
53	259 05:30:00	13.000000	550.50024	58.38133	7.91011E+05	7.90969E+05	-0.0101	-0.5325	0.0008	0.0062

## 24 HOUR PAHSE

54	259	05:45:00	13.250000	550.48743	58.37930	7.91002E+05	7.90967E+05	-0.0078	0.1092	0.0000	0.0033
55	259	06:00:00	13.500000	550.46704	58.37294	7.90945E+05	7.90969E+05	0.0051	0.4918	0.0006	0.0058
56	259	06:15:00	13.750000	550.44702	58.37374	7.90984E+05	7.90968E+05	-0.0037	-0.4909	0.0003	0.0032
57	259	06:30:00	14.000000	550.43079	58.37430	7.91015E+05	7.90966E+05	-0.0104	-0.3762	-0.0007	0.0042
58	259	06:45:00	14.250000	550.41003	58.36992	7.90986E+05	7.90967E+05	-0.0039	-0.3580	-0.0010	0.0038
59	259	07:00:00	14.500000	550.39893	58.36503	7.90935E+05	7.90967E+05	0.0067	0.6114	-0.0002	0.0045
60	259	07:15:00	14.750000	550.37842	58.36411	7.90953E+05	7.90968E+05	0.0031	-0.2079	0.0002	0.0047
61	259	07:30:00	15.000000	550.36292	58.36147	7.90939E+05	7.90968E+05	0.0057	0.1639	0.0008	0.0052
62	259	07:45:00	15.250000	550.34375	58.36121	7.90963E+05	7.90970E+05	0.0009	-0.2883	0.0009	0.0052
63	259	08:00:00	15.500000	550.32947	58.35547	7.90906E+05	7.90971E+05	0.0121	0.6933	0.0021	0.0063
64	259	08:15:00	15.750000	550.30750	58.35925	7.90988E+05	7.90971E+05	-0.0040	-1.0044	0.0016	0.0058
65	259	08:30:00	16.000000	550.29443	58.35256	7.90917E+05	7.90972E+05	0.0096	0.8223	0.0025	0.0065
66	259	08:45:00	16.250000	550.27698	58.35596	7.90988E+05	7.90971E+05	-0.0038	-0.8663	0.0021	0.0060
67	259	09:00:00	16.500000	550.26245	58.35162	7.90950E+05	7.90971E+05	0.0033	0.4642	0.0023	0.0061
68	259	09:15:00	16.750000	550.24512	58.34902	7.90940E+05	7.90972E+05	0.0050	0.1229	0.0024	0.0064
69	259	09:30:00	17.000000	550.22974	58.34892	7.90960E+05	7.90972E+05	0.0013	-0.2519	0.0026	0.0063
70	259	09:45:00	17.250000	550.21838	58.34886	7.90949E+05	7.90972E+05	0.0033	0.1411	0.0028	0.0064
71	259	10:00:00	17.500000	550.19434	58.34804	7.90945E+05	7.90973E+05	0.0038	0.4610	0.0030	0.0065
72	259	10:15:00	17.750000	550.17798	58.34700	7.91009E+05	7.90971E+05	-0.0071	-0.7692	0.0023	0.0058
73	259	10:30:00	18.000000	550.16492	58.34594	7.90986E+05	7.90971E+05	-0.0031	0.2761	0.0020	0.0054
74	259	10:45:00	18.250000	550.16668	58.34745	7.90981E+05	7.90970E+05	-0.0023	0.0546	0.0018	0.0050
75	259	11:00:00	18.500000	550.12964	58.33790	7.90955E+05	7.90971E+05	0.0021	0.3247	0.0019	0.0050
76	259	11:15:00	18.750000	550.10925	58.33903	7.90999E+05	7.90969E+05	-0.0052	-0.5416	0.0014	0.0045
77	259	11:30:00	19.000000	550.10193	58.33782	7.90993E+05	7.90968E+05	-0.0042	0.0713	0.0011	0.0041
78	259	11:45:00	19.250000	550.08313	58.33347	7.90961E+05	7.90968E+05	0.0009	0.3884	0.0011	0.0041
79	259	12:00:00	19.500000	550.07715	58.33055	7.90931E+05	7.90969E+05	0.0057	0.3747	0.0015	0.0045
80	259	12:15:00	19.750000	550.06492	58.32996	7.90969E+05	7.90969E+05	-0.0002	-0.4643	0.0015	0.0043
81	259	12:30:00	20.000000	550.04199	58.33168	7.90996E+05	7.90969E+05	-0.0044	-0.3353	0.0011	0.0039
82	259	12:45:00	20.250000	550.02197	58.32642	7.90934E+05	7.90968E+05	0.0021	0.5188	0.0012	0.0040
83	259	13:00:00	20.500000	550.00293	58.32537	7.90967E+05	7.90969E+05	0.0001	-0.1623	0.0012	0.0039
84	259	13:15:00	20.750000	549.98047	58.32256	7.90961E+05	7.90968E+05	0.0009	0.0713	0.0012	0.0039
85	259	13:30:00	21.000000	549.97180	58.32298	7.90979E+05	7.90968E+05	-0.0017	-0.2200	0.0011	0.0036
86	259	13:45:00	21.250000	549.95642	58.31745	7.90927E+05	7.90968E+05	0.0038	0.6387	0.0015	0.0040
87	259	14:00:00	21.500000	549.93787	58.31527	7.90924E+05	7.90969E+05	0.0062	0.0379	0.0018	0.0043
88	259	14:15:00	21.750000	549.92439	58.31590	7.90949E+05	7.90969E+05	0.0026	-0.3050	0.0020	0.0044
89	259	14:30:00	22.000000	549.90479	58.31201	7.90927E+05	7.90969E+05	0.0036	0.2640	0.0023	0.0047
90	259	14:45:00	22.250000	549.89294	58.31062	7.90925E+05	7.90969E+05	0.0038	0.0212	0.0026	0.0049
91	259	15:00:00	22.500000	549.88013	58.31134	7.90953E+05	7.90969E+05	0.0019	-0.3414	0.0026	0.0049
92	259	15:15:00	22.750000	549.87000	58.30798	7.90922E+05	7.90969E+05	0.0060	-0.3747	0.0029	0.0052
93	259	15:30:00	23.000000	549.85388	58.30905	7.90960E+05	7.90970E+05	0.0010	-0.4567	0.0029	0.0051
94	259	15:45:00	23.250000	549.84399	58.30848	7.90967E+05	7.90970E+05	0.0001	-0.0789	0.0028	0.0049
95	259	16:00:00	23.500000	549.83118	58.30096	7.90931E+05	7.90971E+05	0.0109	1.0134	0.0033	0.0055
96	259	16:15:00	23.750000	549.81946	58.30329	7.90931E+05	7.90972E+05	0.0046	-0.5872	0.0035	0.0057
97	259	16:30:00	24.000000	549.78687	58.29967	7.90929E+05	7.90972E+05	0.0048	0.0243	0.0037	0.0058



BYRON UNIT 1 11:20:53 TUE, 27 SEP 1983

\*\*\*\* SUMMARY OF DATA SETS 104 THRU 124 \*\*\*\*

## FOUR HOUR MINIMUM DURATION

DATA SET	TAPE TIME	TEST DURATION (HRS)	TEMP (R)	DRY AIR PRESSURE (PSIA)	MEASURED MASS	CALCULATED MASS T = 0	MEAS LEAK RATE TOTAL % / DAY	LEAK RATE POINT % / DAY	CALC LEAK RATE % / DAY	95% UPPER CONFIDENCE LIMIT
104	259 18:15:00	0.000000	549.70313	58.29105	7.90933E+05	0.00000E-01	0.0000	0.0000	0.0000	0.0000
105	259 18:30:00	0.250000	549.68396	58.28658	7.90900E+05	0.00000E-01	0.4021	0.4021	0.0000	0.0000
106	259 18:45:00	0.500000	549.67798	58.28517	7.90889E+05	7.90929E+05	0.2640	0.1259	0.2640	0.6518
107	259 19:00:00	0.750000	549.65552	58.27960	7.90846E+05	7.90932E+05	0.3515	0.5265	0.3289	0.4752
108	259 19:15:00	1.000000	549.64514	58.28185	7.90891E+05	7.90919E+05	0.1252	-0.5538	0.1654	0.3969
109	259 19:30:00	1.250000	549.63306	58.28116	7.90891E+05	7.90911E+05	0.1004	0.0015	0.0952	0.2580
110	259 19:45:00	1.500000	549.60962	58.27534	7.90854E+05	7.90913E+05	0.1588	0.4506	0.1083	0.2182
111	259 20:00:00	1.750000	549.59863	58.27571	7.90875E+05	7.90908E+05	0.1004	-0.2504	0.0838	0.1675
112	259 20:15:00	2.000000	549.58374	58.27361	7.90868E+05	7.90906E+05	0.0982	0.0835	0.0724	0.1368
113	259 20:30:00	2.250000	549.58093	58.26804	7.90796E+05	7.90914E+05	0.1839	0.8694	0.1100	0.1747
114	259 20:45:00	2.500000	549.55847	58.26703	7.90815E+05	7.90915E+05	0.1431	-0.2246	0.1154	0.1677
115	259 21:00:00	2.750000	549.54126	58.26773	7.90849E+05	7.90911E+05	0.0921	-0.4173	0.0979	0.1447
116	259 21:15:00	3.000000	549.53369	58.26450	7.90816E+05	7.90910E+05	0.1177	0.3991	0.0973	0.1365
117	259 21:30:00	3.250000	549.52002	58.26179	7.90799E+05	7.90911E+05	0.1248	0.2094	0.1002	0.1336
118	259 21:45:00	3.500000	549.49597	58.26025	7.90813E+05	7.90909E+05	0.1039	-0.1669	0.0953	0.1245
119	259 22:00:00	3.750000	549.49219	58.26165	7.90837E+05	7.90904E+05	0.0772	-0.2974	0.0834	0.1115
120	259 22:15:00	4.000000	549.48926	58.25932	7.90810E+05	7.90903E+05	0.0932	0.3338	0.0802	0.1051
121	259 22:30:00	4.250000	549.46875	58.25529	7.90785E+05	7.90904E+05	0.1058	0.3065	0.0819	0.1039
122	259 22:45:00	4.500000	549.45337	58.25351	7.90783E+05	7.90904E+05	0.1011	0.0212	0.0821	0.1018
123	259 23:00:00	4.750000	549.43860	58.24818	7.90732E+05	7.90908E+05	0.1284	0.6207	0.0900	0.1093
124	259 23:15:00	5.000000	549.43079	58.24859	7.90748E+05	7.90910E+05	0.1119	-0.2018	0.0920	0.1096

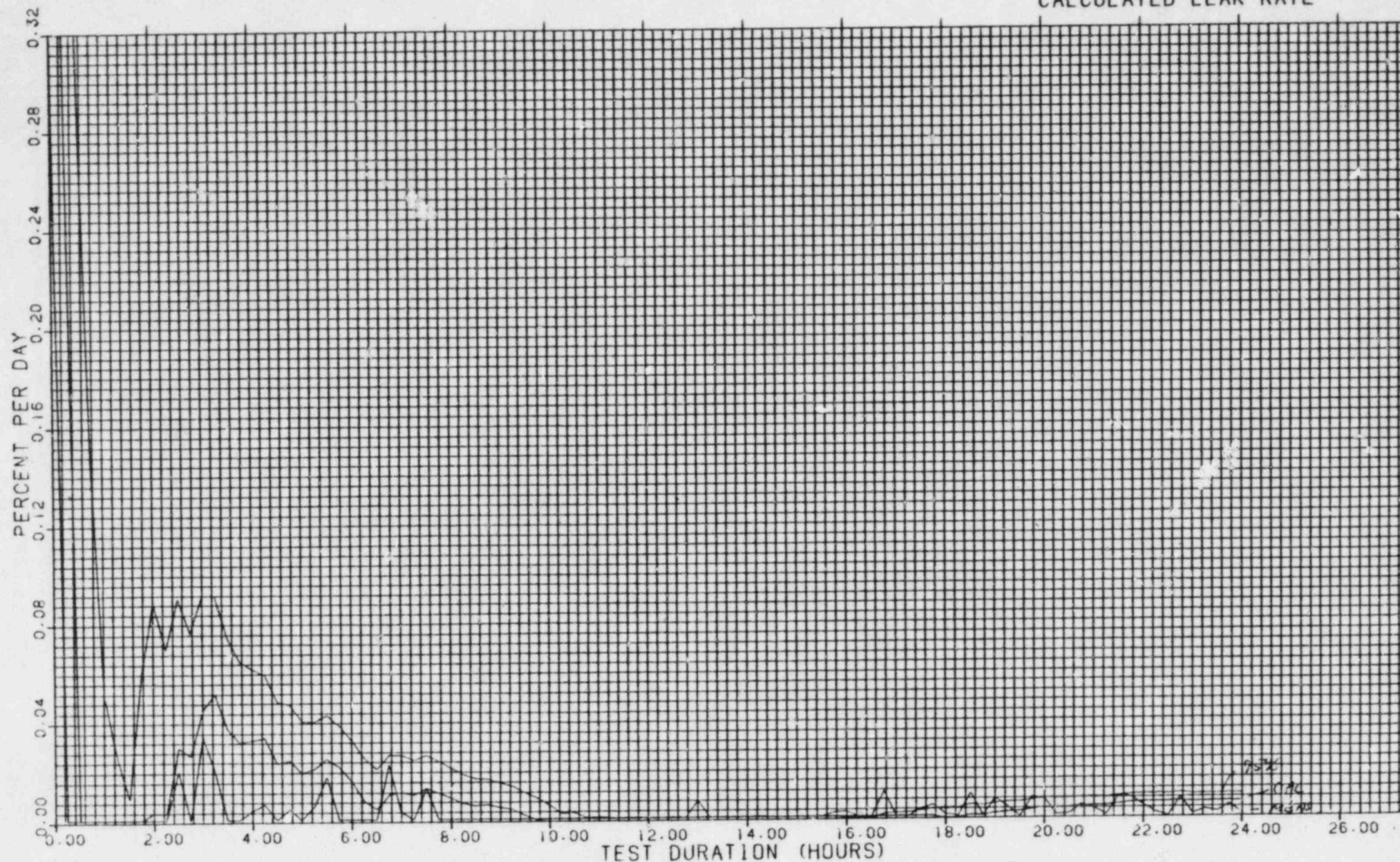
## 7.0 Type A Test Plots

BYRON

UNIT 1

CECO LEAK RATE VS TIME

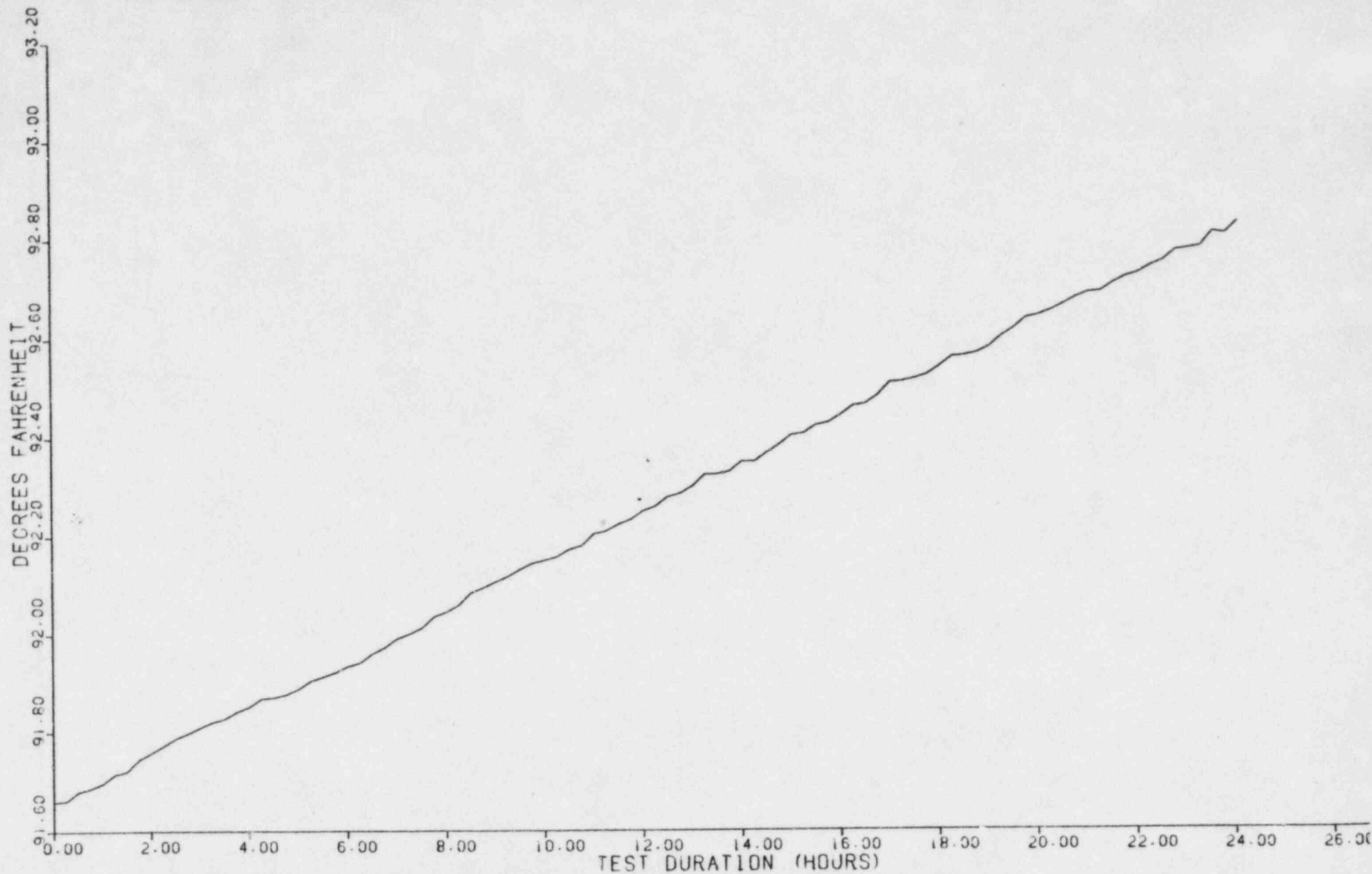
95% UPPER CONFIDENCE LIMIT  
MEASURED LEAK RATE  
CALCULATED LEAK RATE



BYRON

UNIT 1

DRY-BULB TEMPERATURE VS TIME

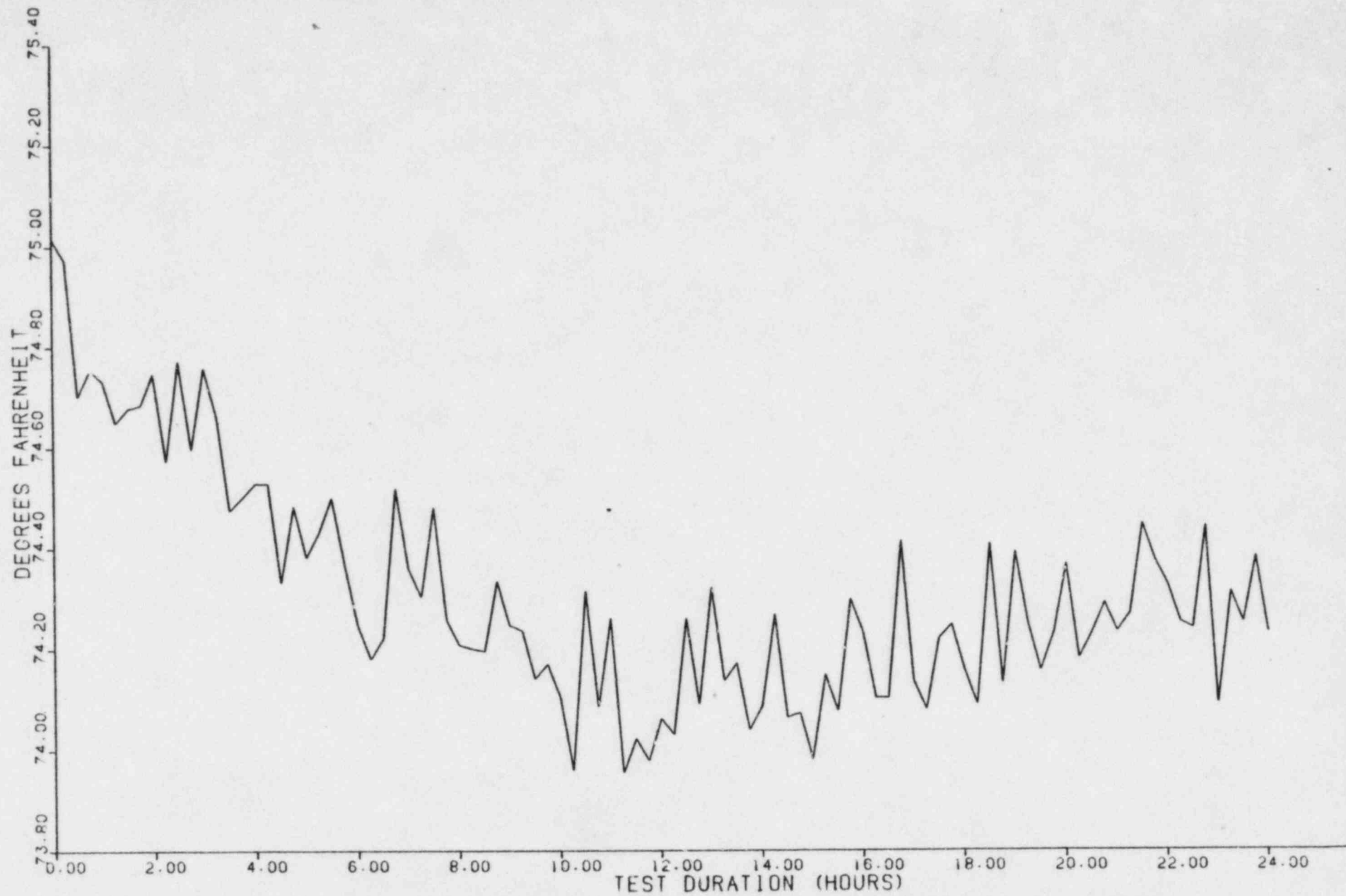




BYRON

UNIT 1

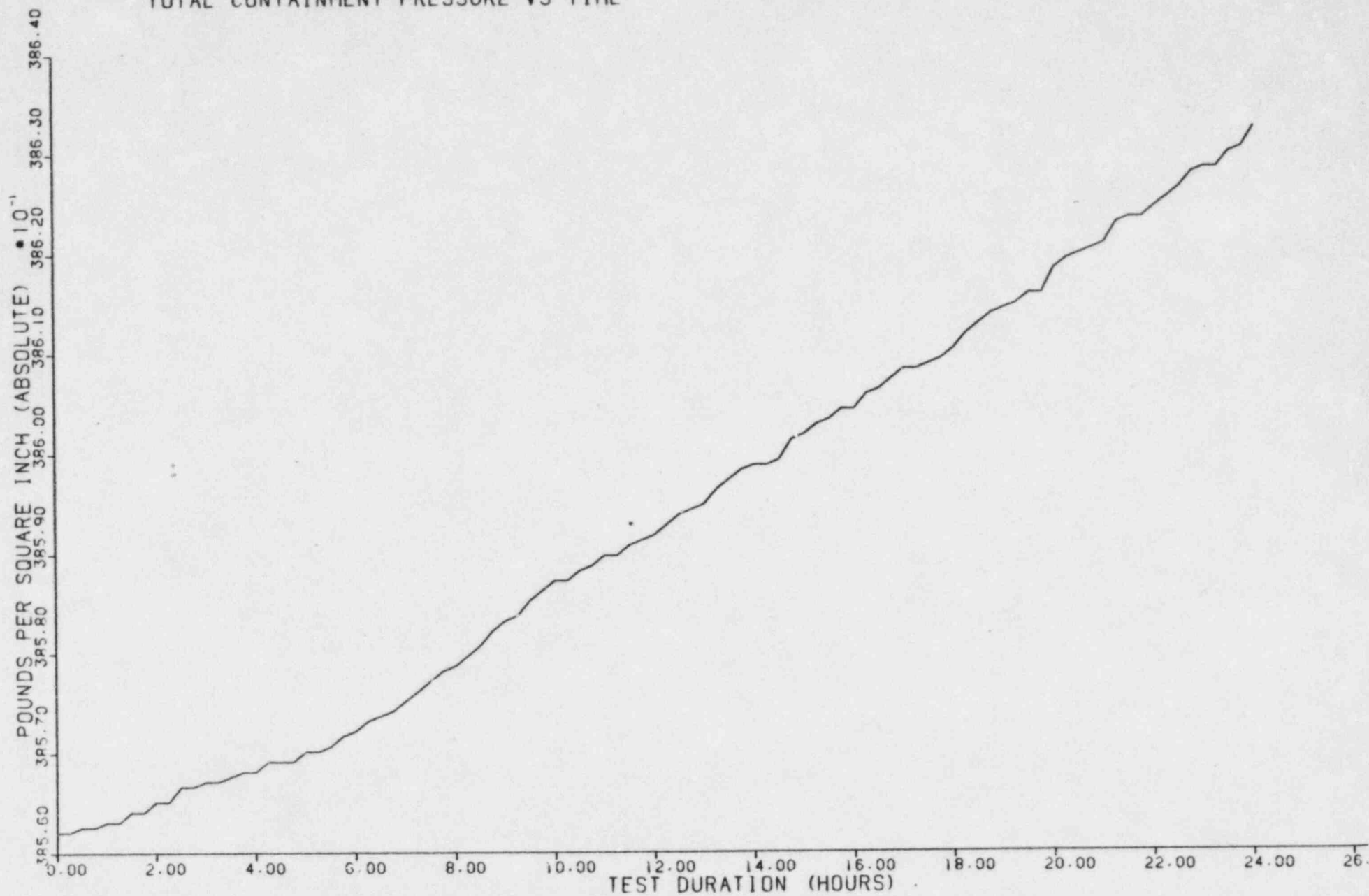
DEW POINT TEMPERATURE VS TIME



BYRON

UNIT 1

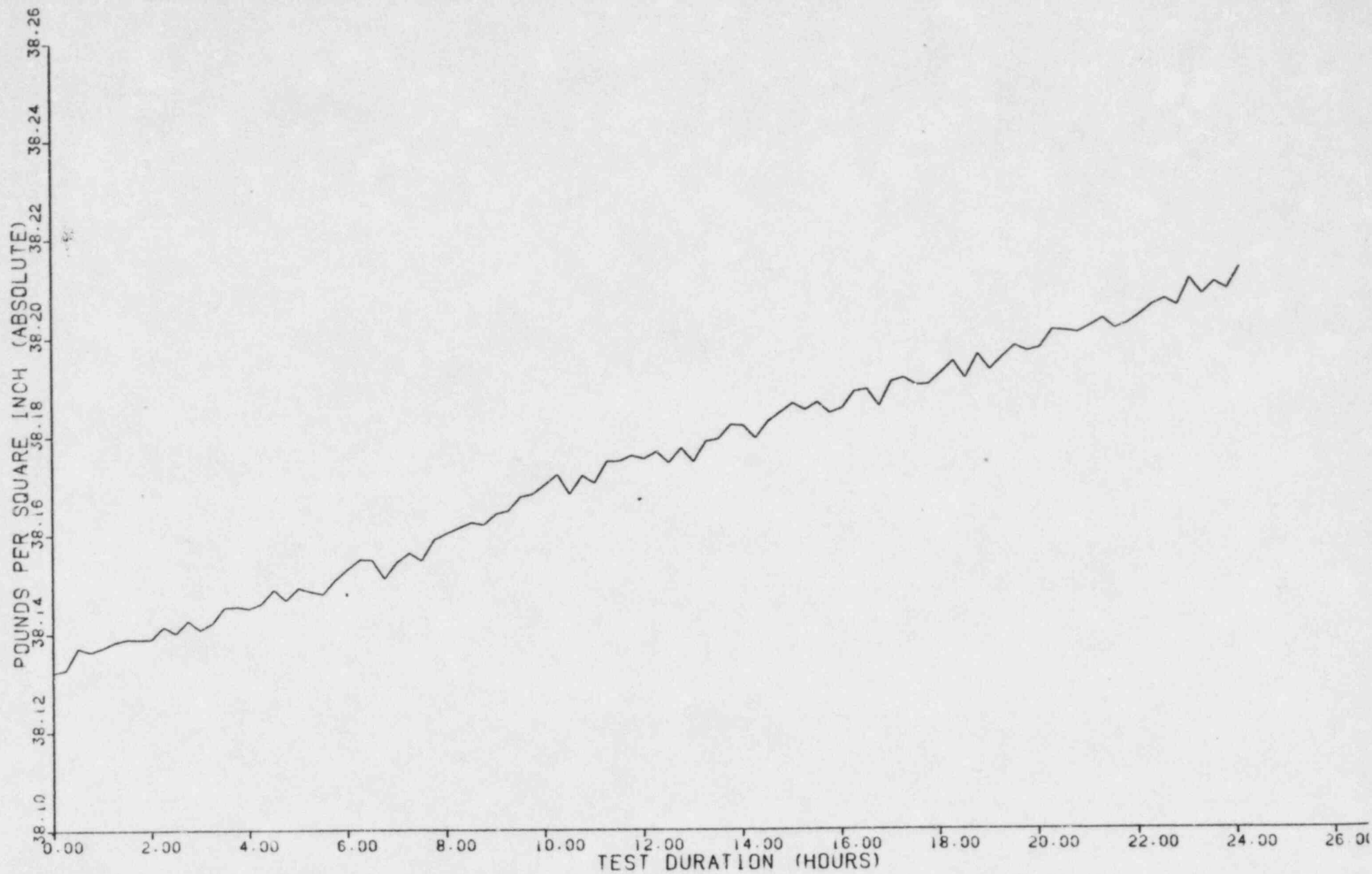
TOTAL CONTAINMENT PRESSURE VS TIME



BYRON

UNIT 1

CONTAINMENT DRY AIR PRESSURE VS TIME

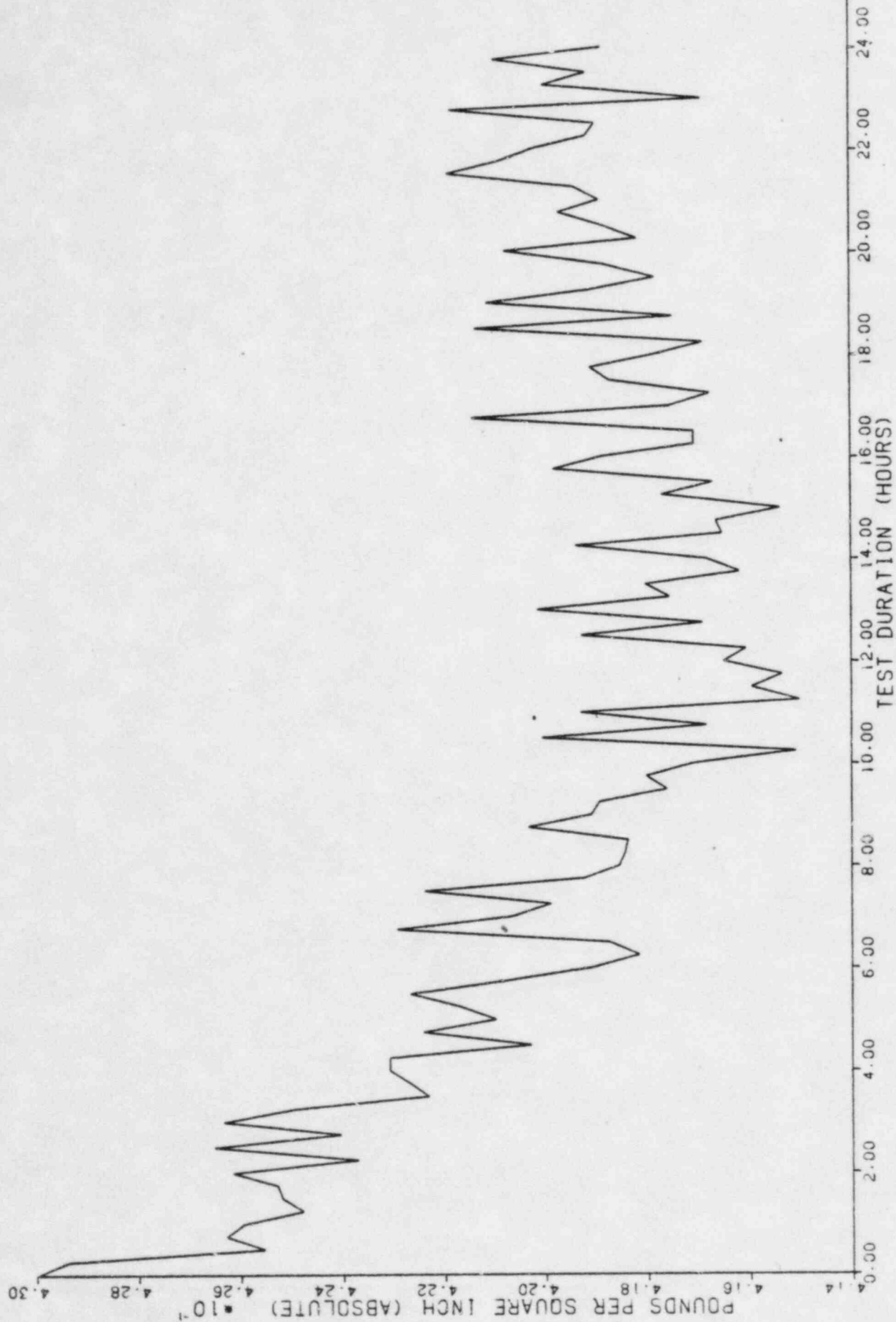


7.1 Reduced Pressure ILRT cont'd

BYRON

UNIT 1

CONTAINMENT VAPOR PRESSURE VS TIME

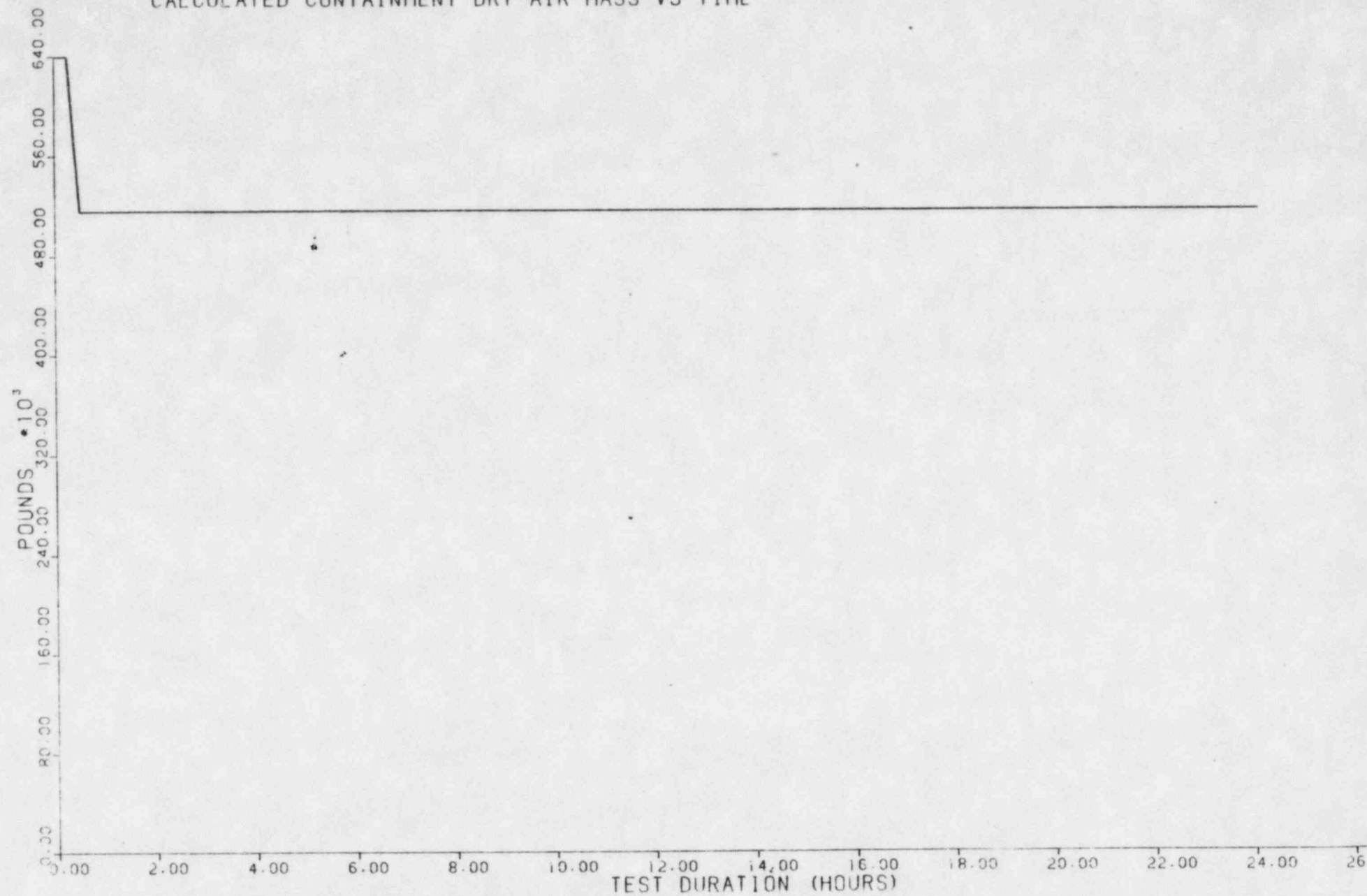




BYRON

UNIT 1

CALCULATED CONTAINMENT DRY AIR MASS VS TIME

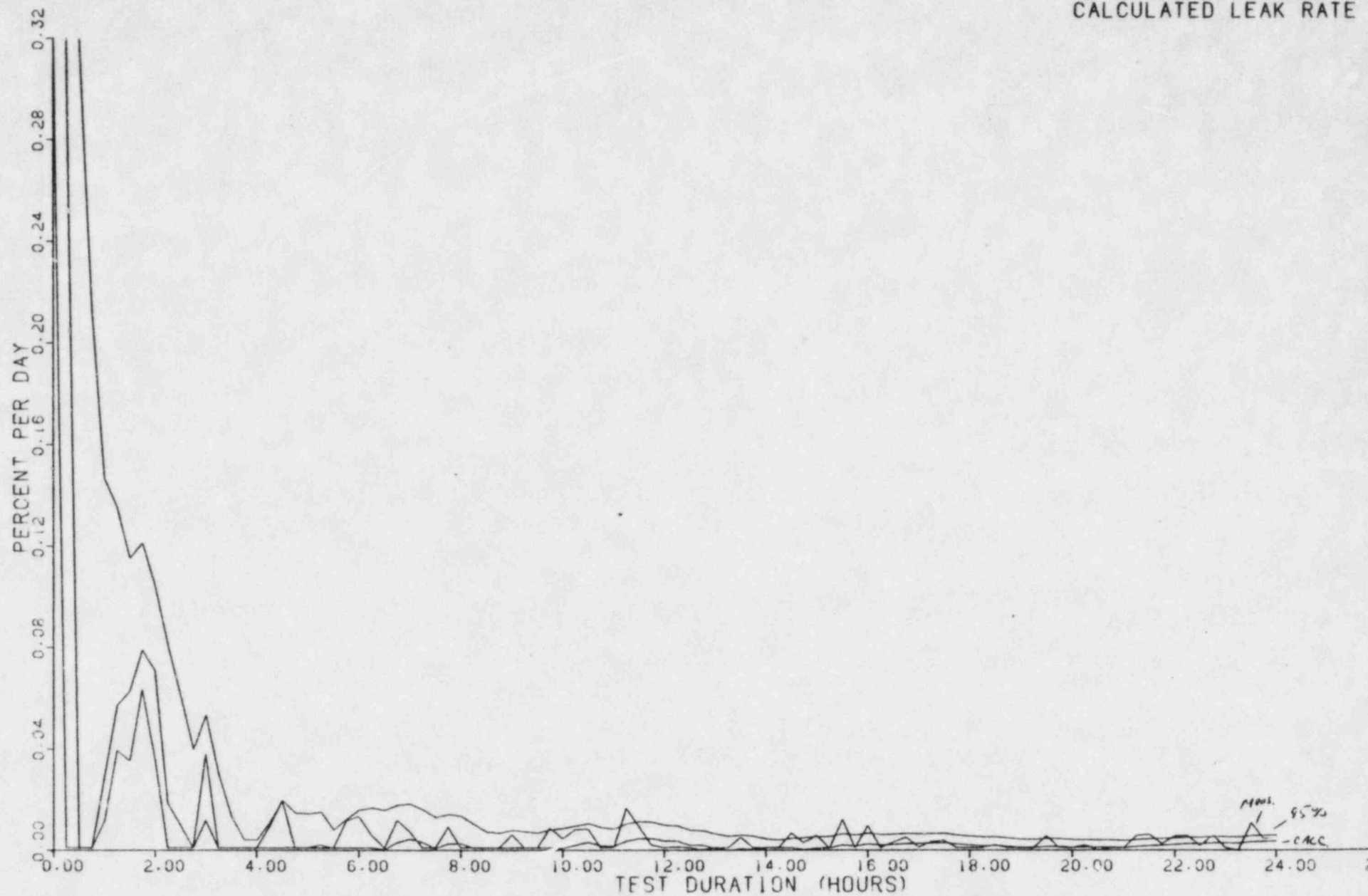


BYRON

UNIT 1

CECD LEAK RATE VS TIME

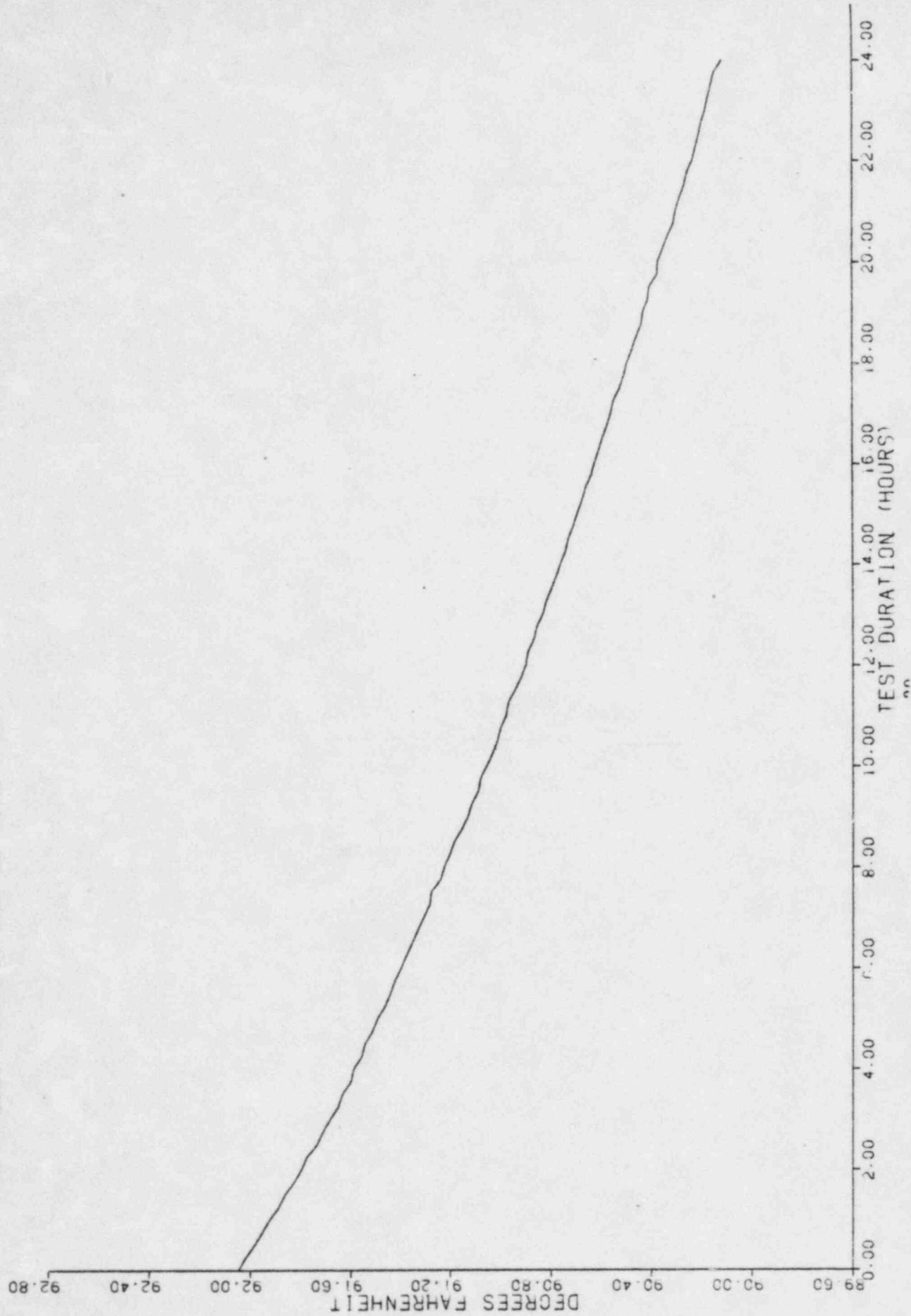
95% UPPER CONFIDENCE  
MEASURED LEAK RATE  
CALCULATED LEAK RATE



# BYRON

UNIT 1

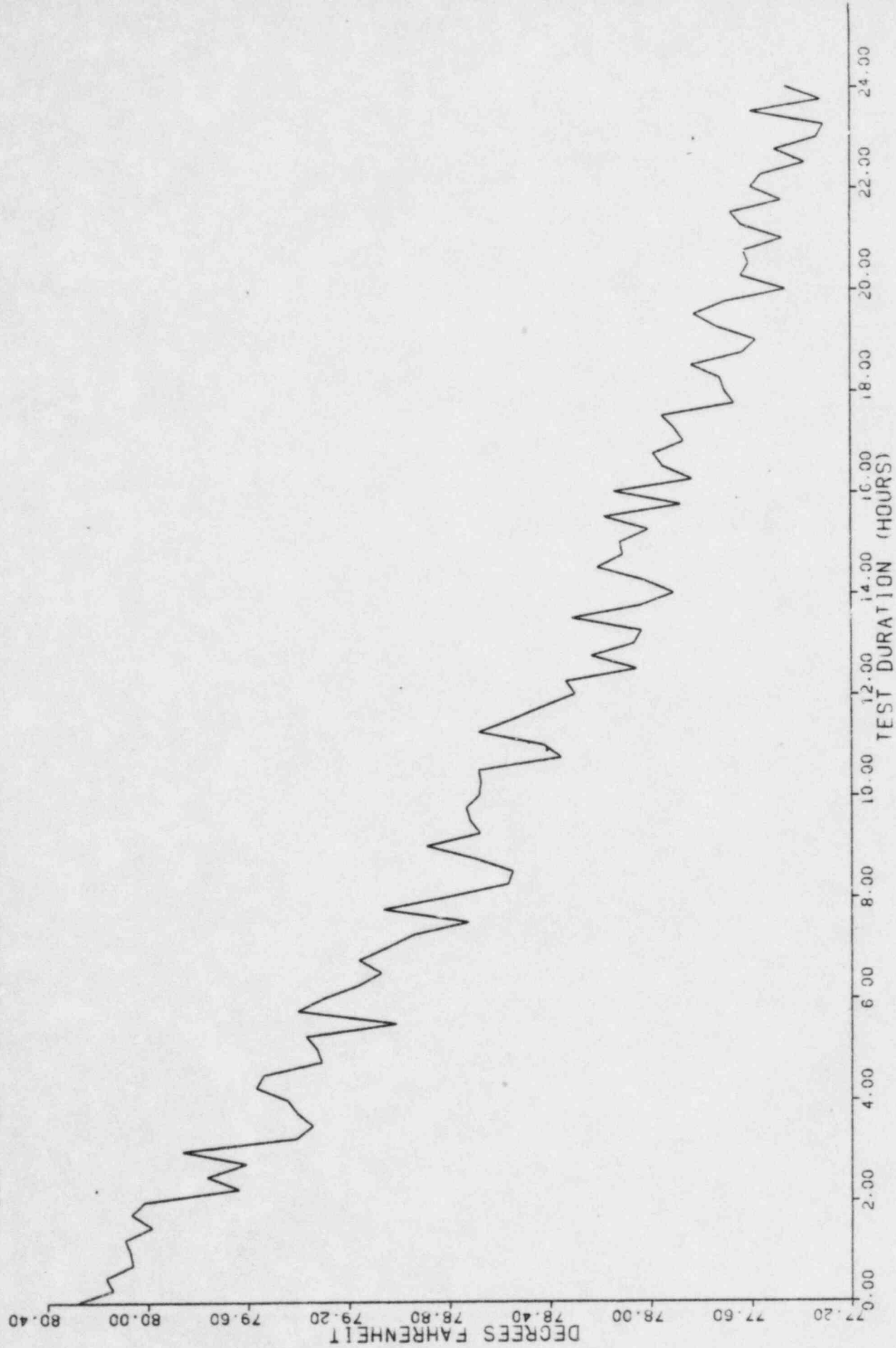
DRY-BULB TEMPERATURE VS TIME



BYRON

UNIT 1

DEW POINT TEMPERATURE VS TIME

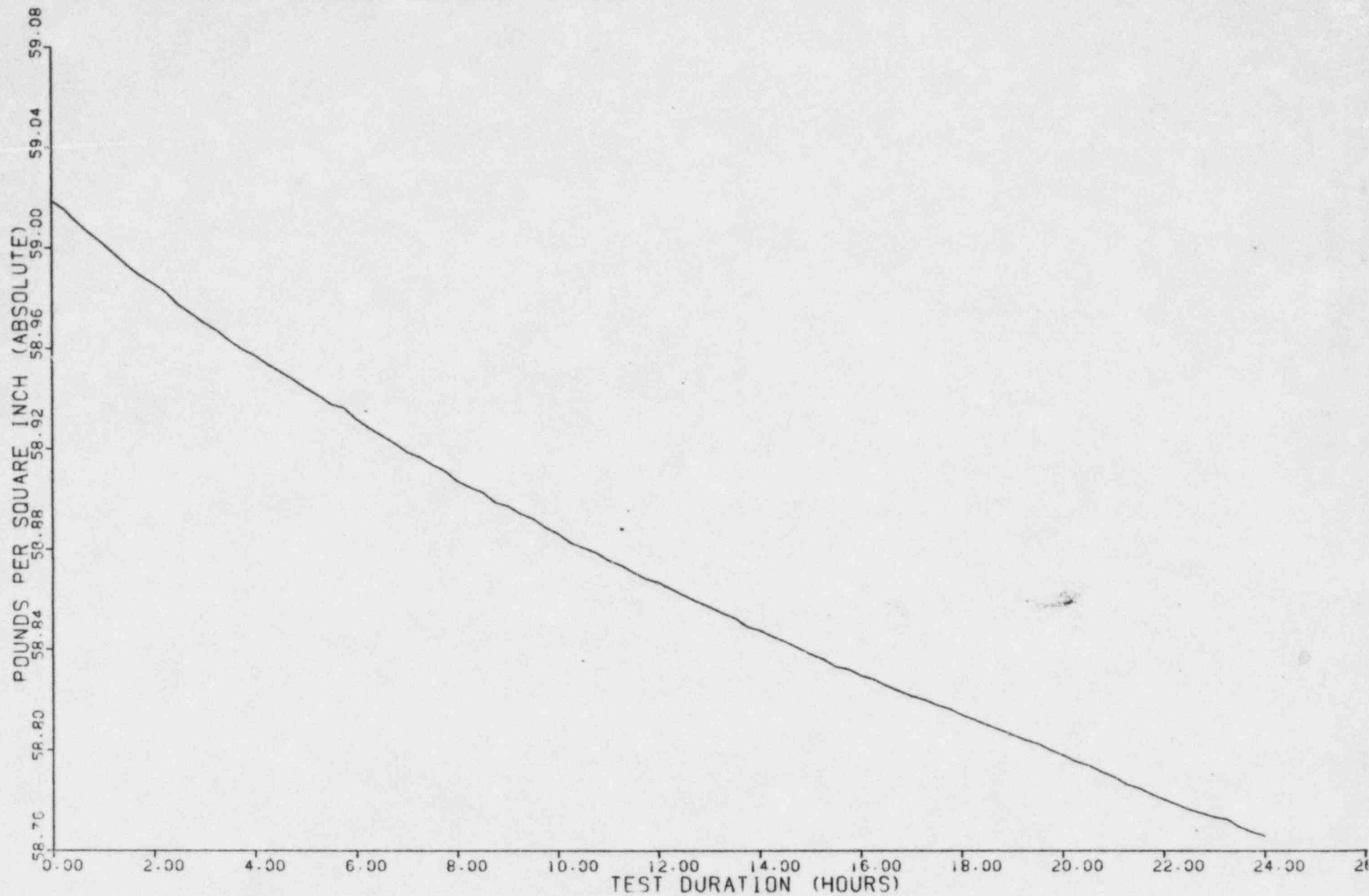




BYRON

UNIT 1

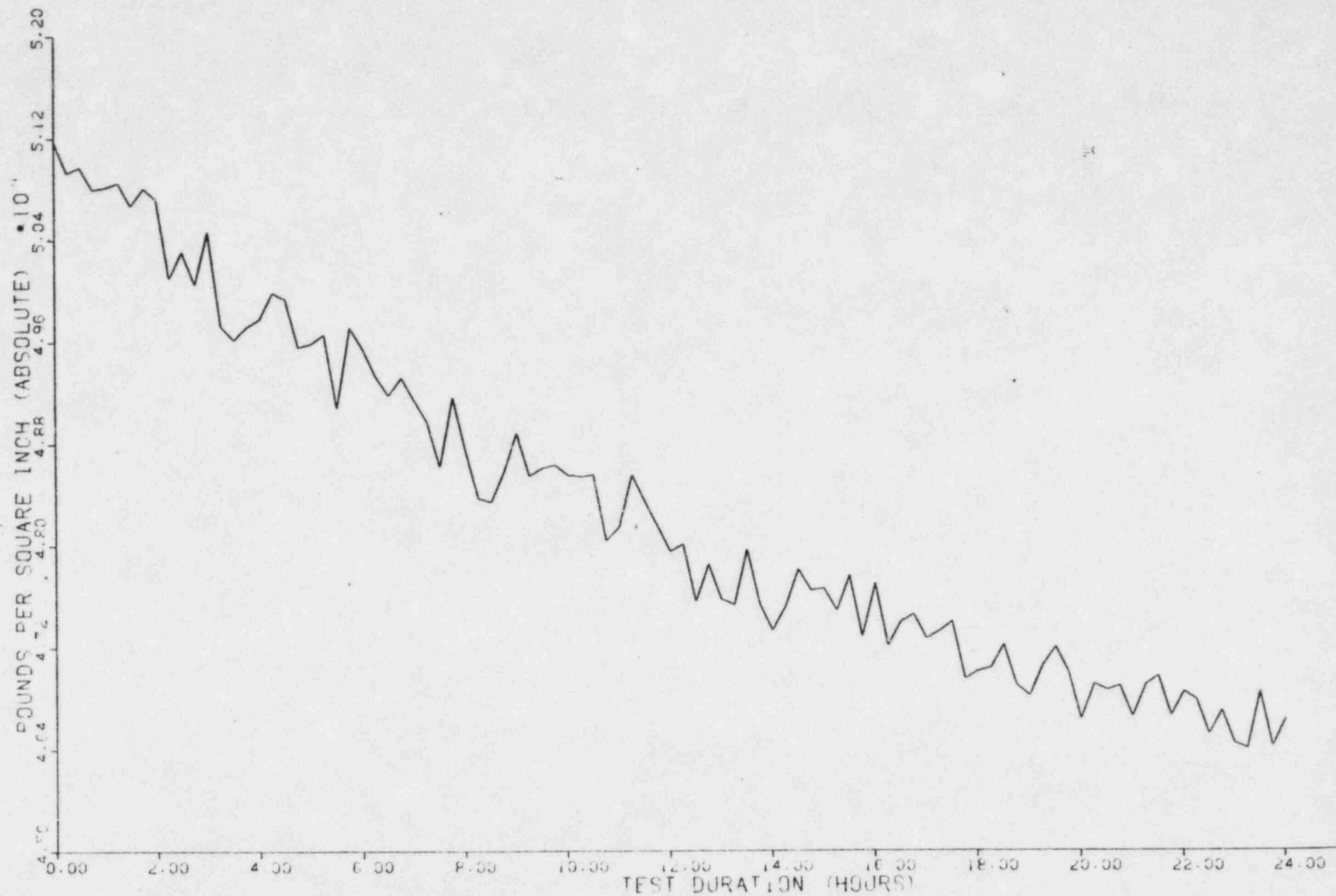
TOTAL CONTAINMENT PRESSURE VS TIME



BYRON

UNIT 1

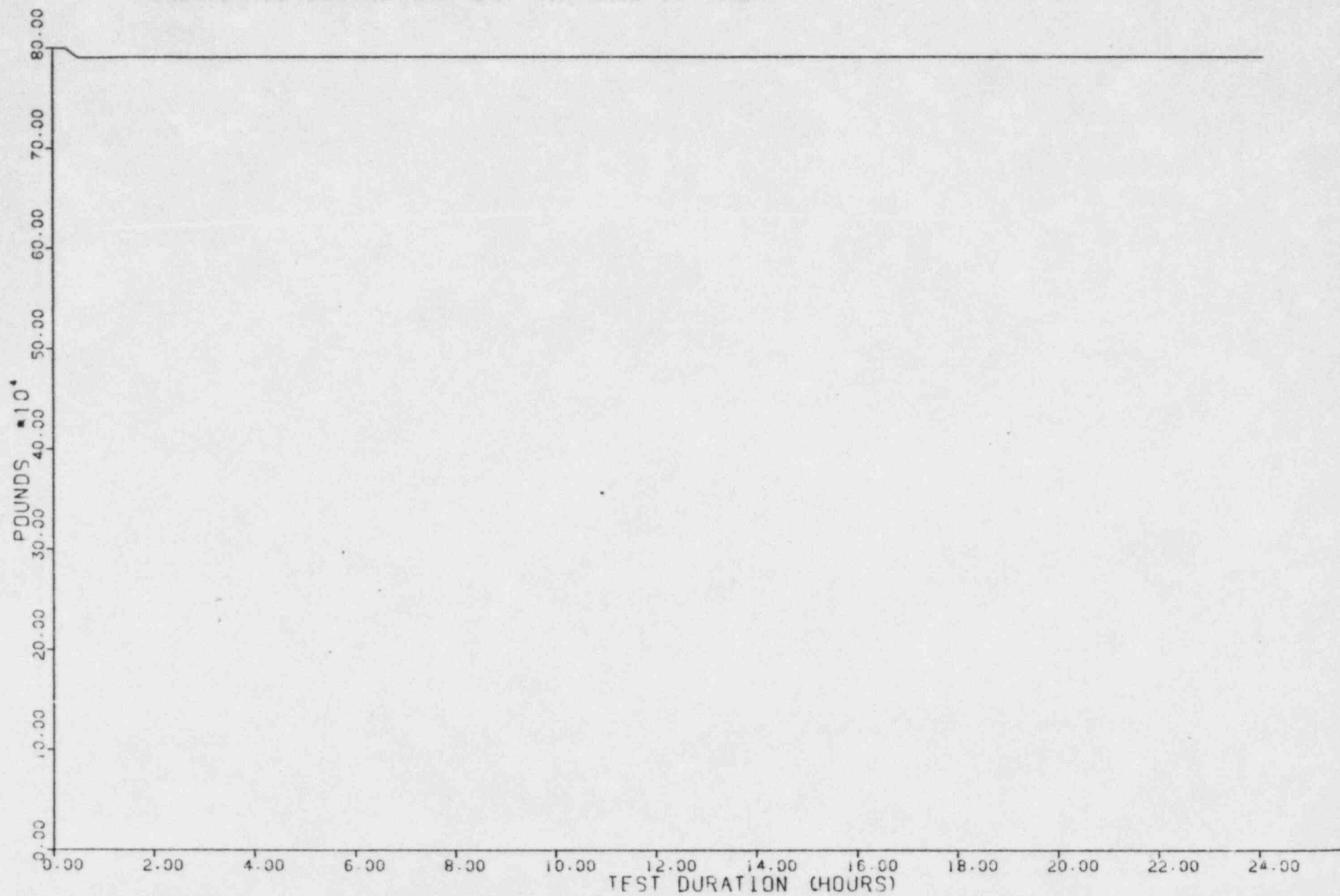
CONTAINMENT VAPOR PRESSURE VS TIME



BYRON

UNIT 1

CALCULATED CONTAINMENT DRY AIR MASS VS TIME



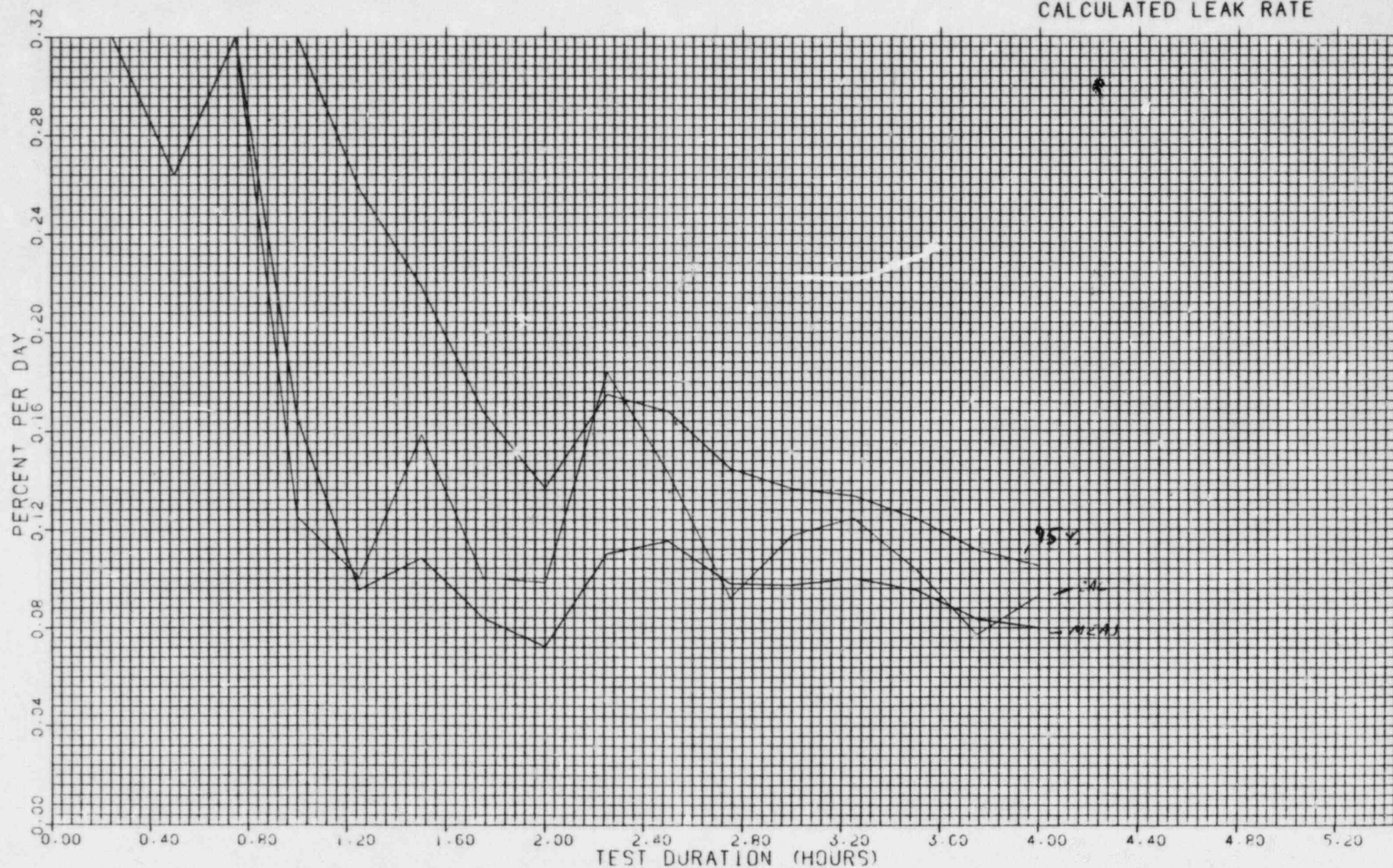
7.3 Full Pressure Supplemental ILRT

BYRON

UNIT 1

CECO LEAK RATE VS TIME

95% UPPER CONFIDENCE LIMIT  
MEASURED LEAK RATE  
CALCULATED LEAK RATE

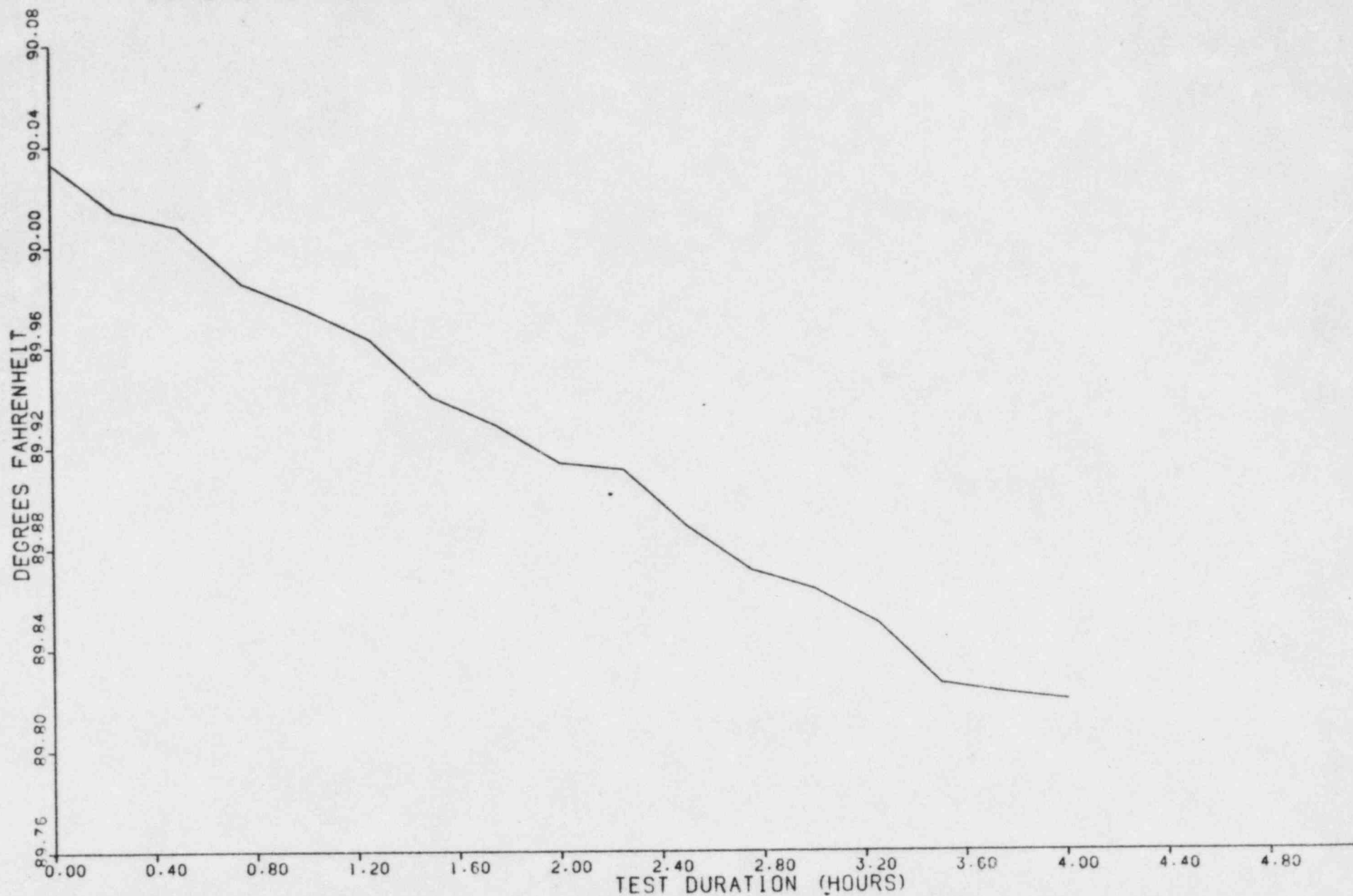




BYRON

UNIT 1

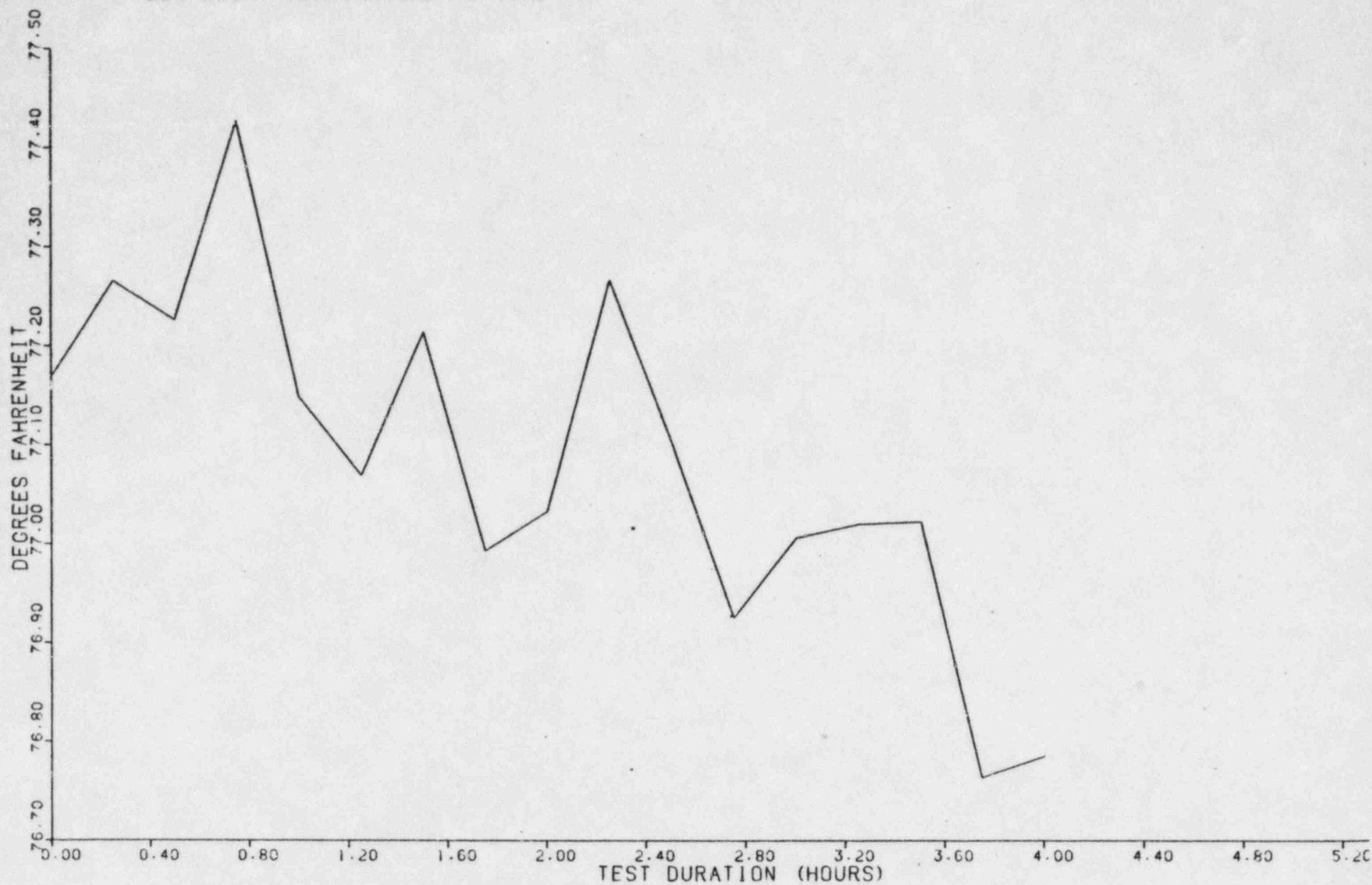
DRY-BULB TEMPERATURE VS TIME



BYRON

UNIT 1

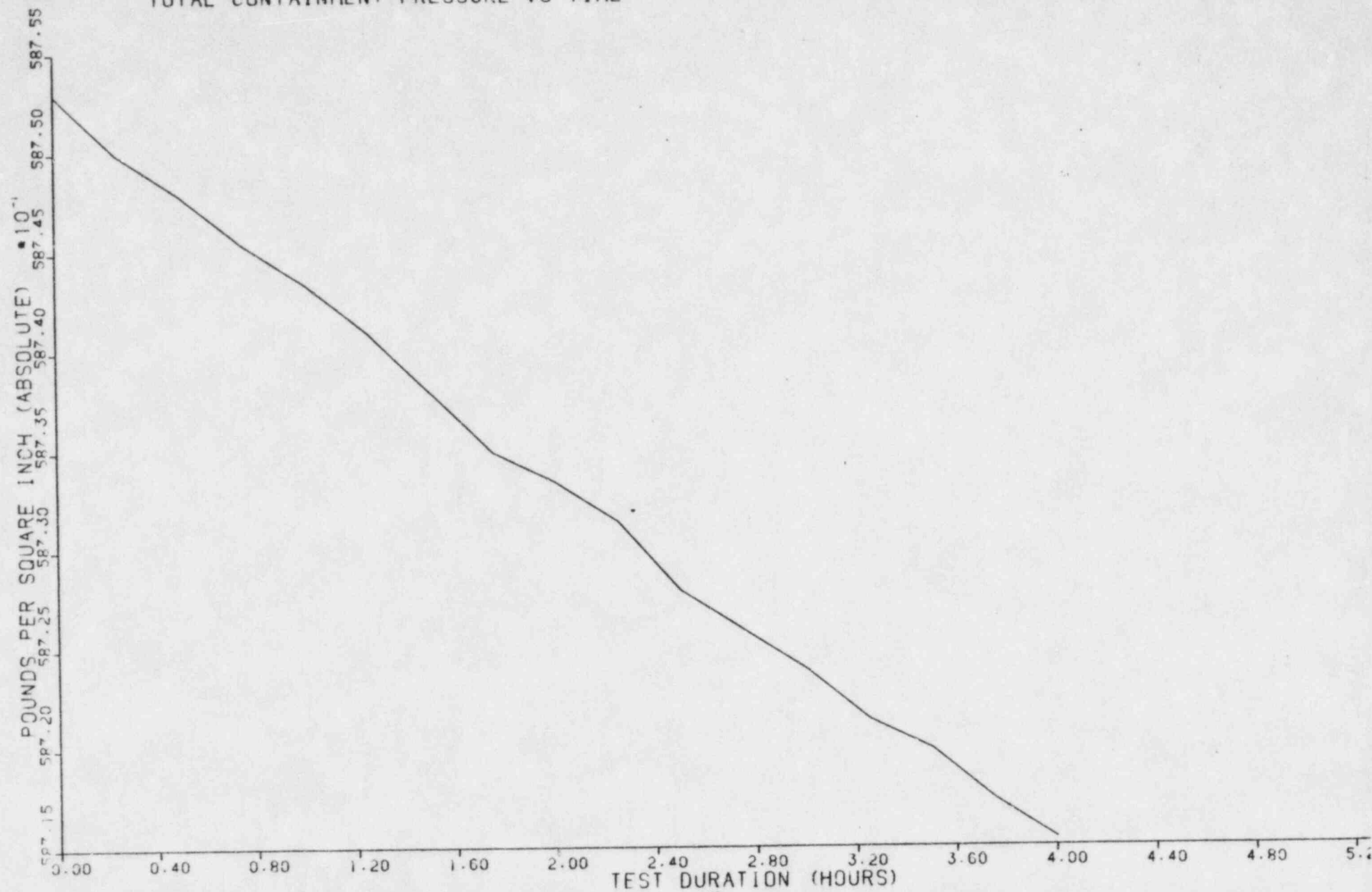
DEW POINT TEMPERATURE VS TIME



BYRON

UNIT 1

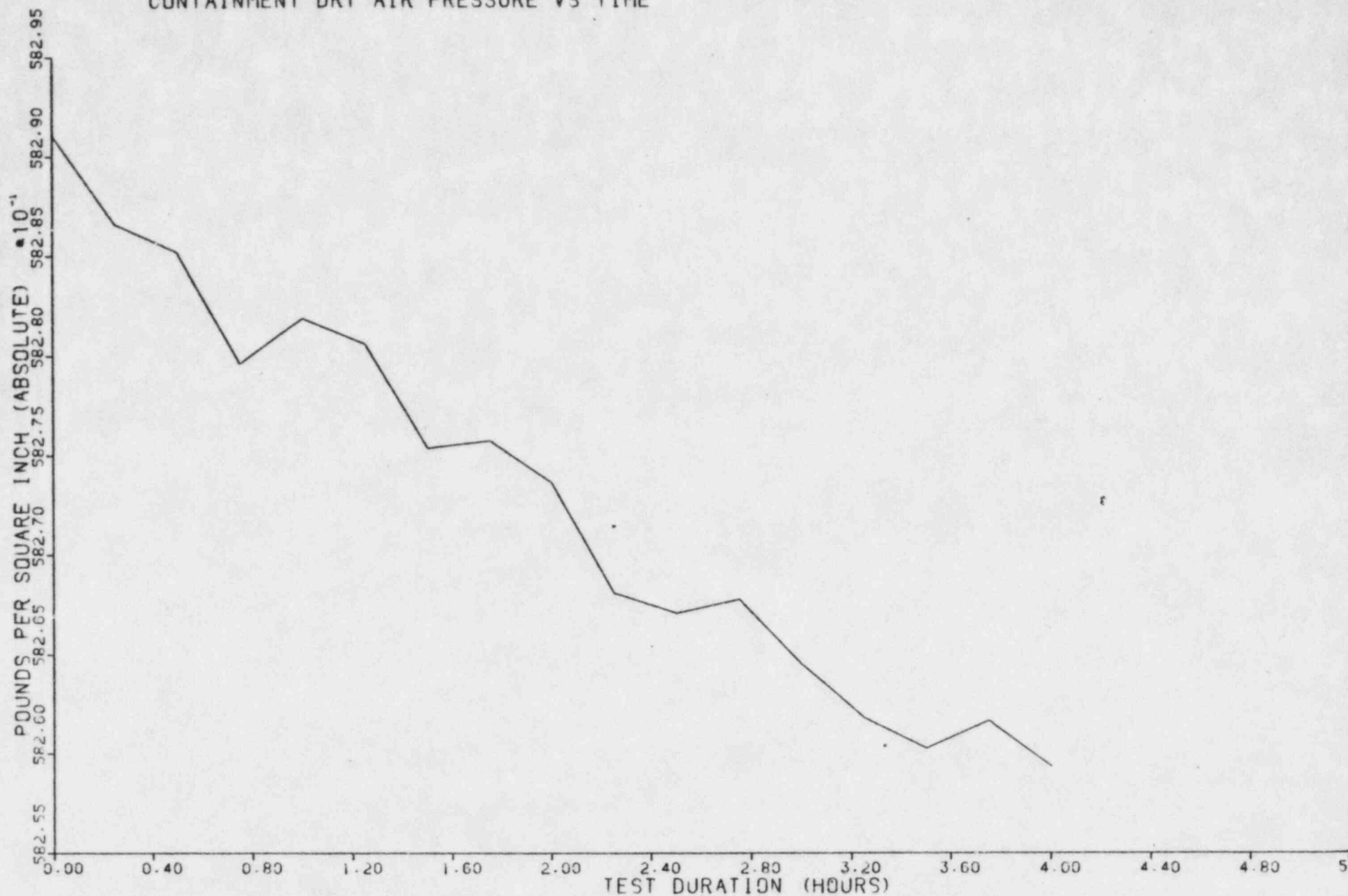
TOTAL CONTAINMENT PRESSURE VS TIME



BYRON

UNIT 1

CONTAINMENT DRY AIR PRESSURE VS TIME

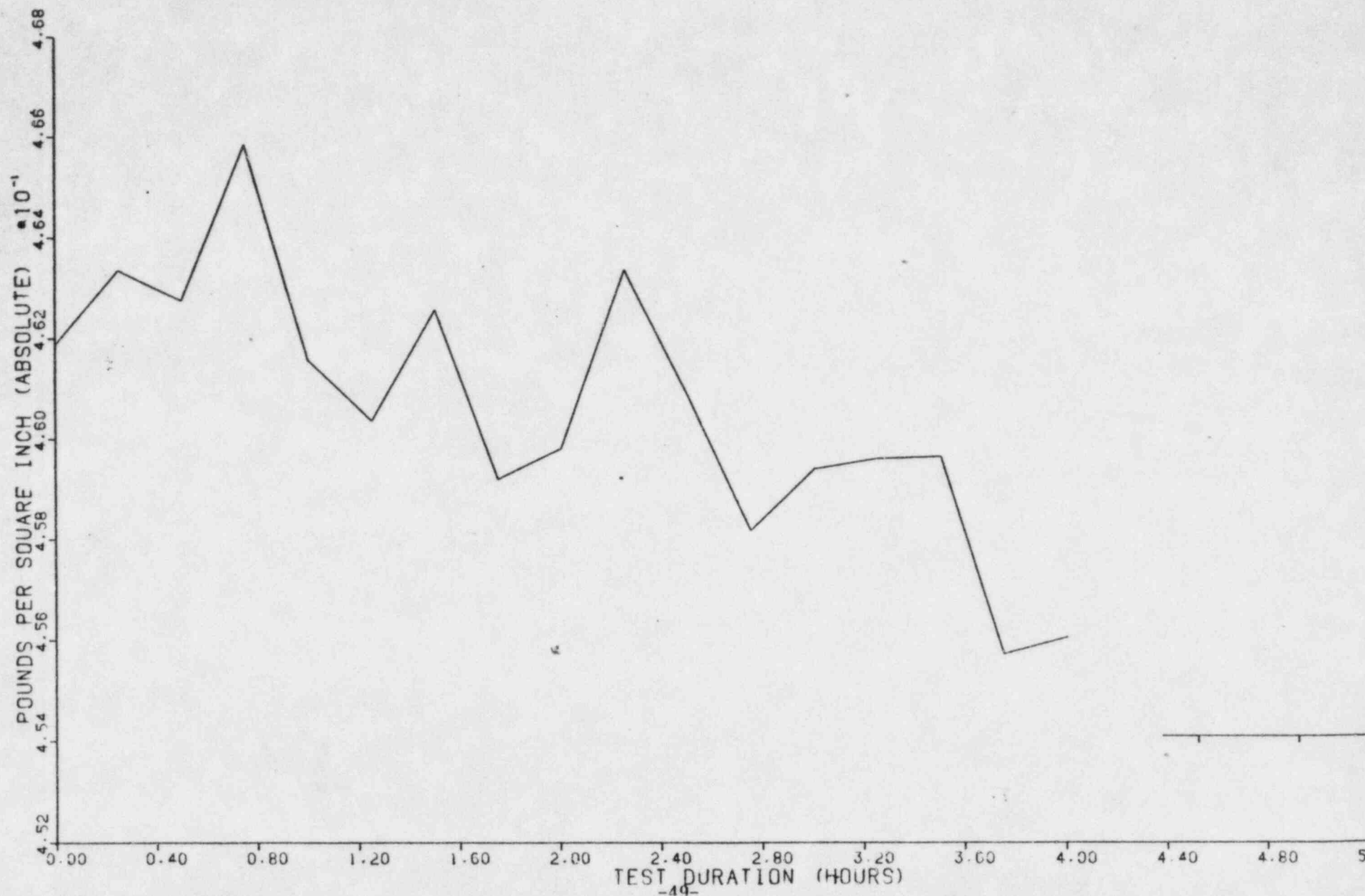




BYRON

UNIT 1

CONTAINMENT VAPOR PRESSURE VS TIME



## 8.0 Interpretation of Test Results

### 8.1 Reduced Pressure Test

The statistically averaged containment leakage rate  $L_{tm}$  (weight percent/24 hours) was 0.0061%/day after 24 hours and 97 data sets. The 95% Upper Confidence Limit of  $L_{tm}$  ( $L_{uclr}$ ) was 0.0089%/day. The certainty of these results is substantiated by the fact the statistically averaged containment leakage rate  $L_{tm}$  held relatively steady for the last two hours of data. The 95% Upper Confidence Limit value during this same period was steady or decreasing slightly.

The statistically averaged leakage rate values at the end of the test were as anticipated, however there was a series of unanticipated negative leakage values during the 0900-1630 time frame. It is expected that these negative values were caused by a change in the rate of change of containment dry air pressure without a corresponding change in the rate of change of containment average dry-bulb temperature (0800 test time). Dry-bulb temperature remained at a steady rate of increase throughout the test due to the running Reactor Containment Fan Coolers. Because the dry air pressure is calculated by subtracting water vapor pressure from the total containment pressure, the abrupt change from a decreasing vapor pressure to a steady or slightly increasing vapor pressure at 1000 test time lagging an increase in the rate of positive change of total containment pressure at 0600 test time caused the discontinuity of dry air pressure rate of change. Since dry air mass was calculated using the ideal gas law, the dry air mass values steadily increased from 0800 to 1200 test time and were, in general, larger than mass values calculated from 0000 to 0800. This led to the negative values of  $L_{tm}$  from 0900 to 1630 test time. Prior to 0800 test time, values for  $L_{tm}$  and  $L_{uclr}$  were subject to the statistical uncertainty of fewer data sets and the competing effects of a stabilizing containment (cooling) and the heat input of the Reactor Containment Fan Coolers. Even with these two factors the value of  $L_{uclr}$  at 0700 test time was approximately one third that of  $L_a$ .

## 8.2 Full Pressure Test

The statistically averaged containment leakage rate  $L_{am}$  (weight percent/24 hours) was 0.0037%/day after 24 hours and 97 data sets. The 95% Upper Confidence Limit of  $L_{am}$  ( $L_{uc1a}$ ) was 0.0058%/day. The addition of required Local leakage Rate values and comparison to acceptance criteria is done in section 2.1. The validity of the results is demonstrated by observing the cyclic behavior of  $L_{am}$  and  $L_{uc1a}$  between 1400 and 2400 test time. The period of the cycle appears to be 6 to 7 hours with high and low values of 0.0065%/day and 0.0038%/day respectively for  $L_{uc1a}$ . The final value of  $L_{uc1a}$  was at or near the peak of the cycle.

Containment dry-bulb temperature, total containment pressure and vapor pressure all trended downward. These are all effects of a cooling containment with no major heat source, i.e. the Reactor Containment Fan Coolers were off. The data of this test in comparison to the Reduced Pressure test fluctuated less. Two major factors can be identified. 1) Longer period of stabilization after pressurization - 8 hours for Full Pressure vs. 4 hours for Reduced Pressure test. 2) Stabilizing containment (cooling) was not counteracted by a major heat source such as Reactor Containment Fan Coolers.

## 8.3 Full Pressure Supplemental Test

After 4 hours, 2215 real time on September 27, 1983, the statistically averaged composite leakage rate ( $L_c$ ) was verified within 0.25  $L_a$  (1.90 SCFM) of the sum of the statistically averaged Full Pressure leakage rate  $L_{am}$  and the average flowmeter induced leakage rate ( $L_o$ ). A detailed comparison to acceptance criteria may be found in section 2.1. Complete data is available for three additional 15 minute data sets beyond 2215. This additional data shows only improving agreement between the composite leakage rate ( $L_c$ ) and the sum of  $L_{am}$  and  $L_o$ .

## 9.0 Type B & C Test Results

9.1 Local leak rate methodology - Type B and C tests were conducted in accordance with Appendix J to 10CFR50 and ANSI N45.4-1972. The test volume was pressurized and regulated with air or nitrogen to nominally 45 psig\*. The flowrate necessary to maintain the test volume at 45 psig was measured after a proper stabilization period. This value with the necessary corrections for non-standard temperature was used as the test volume leakage rate.

\* Personnel lock door gaskets were pressurized to 10 psig.

### 9.2 Leakage Rate Summary:

<u>TYPE</u>	<u>PENETRATION (P)</u>	<u>LEAKAGE RATE (SCFH)</u>
B	Zone 1 Electrical penetrations	1.0 $\pm$ 0.1
B	Zone 2 Electrical penetrations	0.5 $\pm$ 0.1
B	Zone 3 Electrical penetrations	0.4 $\pm$ 0.1
B	Zone 4 Electrical penetrations	0.4 $\pm$ 0.1
B	Fuel Transfer Tube Flange	0.0 $\pm$ 0.1
B	Equipment door Personnel Lock	0.4 $\pm$ 0.1
B	Blind flange #1 on Equip. door	0.0 $\pm$ 0.1
B	Blind flange #2 on Equip. door	0.0 $\pm$ 0.1
B	Equip. door double gasket	0.0 $\pm$ 0.1
B	Emergency Personnel Lock	6.5 $\pm$ 0.7
B	Blind flange #1 on Emerg. door	0.0 $\pm$ 0.1
B	Blind flange #2 on Emerg. door	0.0 $\pm$ 0.1
B	P-4 Cnmt pressurization line - Blind flanges	0.0 $\pm$ 0.1
C	P-97 Cnmt Normal Purge (1)	3.2 $\pm$ 0.1
C	P-97 Cnmt Normal Purge (2)	0.0 $\pm$ 0.1
C	P-95 Cnmt Normal Purge (1)	4.8 $\pm$ 0.1
C	P-95 Cnmt Normal Purge (2)	0.0 $\pm$ 0.1
C	P-96 Cnmt Miniflow Purge (1)	16.0 $\pm$ 0.7
C	P-96 Cnmt Miniflow Purge (2)	0.0 $\pm$ 0.1
C	P-94 Cnmt Miniflow Purge (1)	1.4 $\pm$ 0.1
C	P-94 Cnmt Miniflow Purge (2)	0.0 $\pm$ 0.1
C	P-13 Inst. Isolation Valves (1)	0.4 $\pm$ 0.1
C	P-13 Inst. Isolation Valves (2)	0.0 $\pm$ 0.1
C	P-70 Pressurizer Stm Sample	0.0 $\pm$ 0.1
C	P-70 Pressurizer Liq. Sample	0.0 $\pm$ 0.1
C	P-70 Reactor Coolant Sample	0.5 $\pm$ 0.1
C	P-70 Accumulator Tank Sample	0.0 $\pm$ 0.1
C	P-12 Hydrogen Monitoring (SUC)	3.4 $\pm$ 0.1
C	P-12 Hydrogen Monitoring (Ret)	9.0 $\pm$ 0.7
C	P-31 Hydrogen Monitoring (SUC)	0.4 $\pm$ 0.1
C	P-31 Hydrogen Monitoring (Ret)	18.36 $\pm$ 0.7
C	P-41 Chemical and Volume Control Letdown line	0.4 $\pm$ 0.1
C	P-11 Reactor Coolant Drain Tank (RCDT) Pump disch.	2.0 $\pm$ 0.1
C	P-65 RCDT to Auto Gas Analyzer	0.7 $\pm$ 0.1
C	P-65 Waste Gas from RCDT	2.83 $\pm$ 0.1
C	P-27 Pressurizer Relief Tanks(PRT) to Auto Gas Analyzer	4.5 $\pm$ 0.1

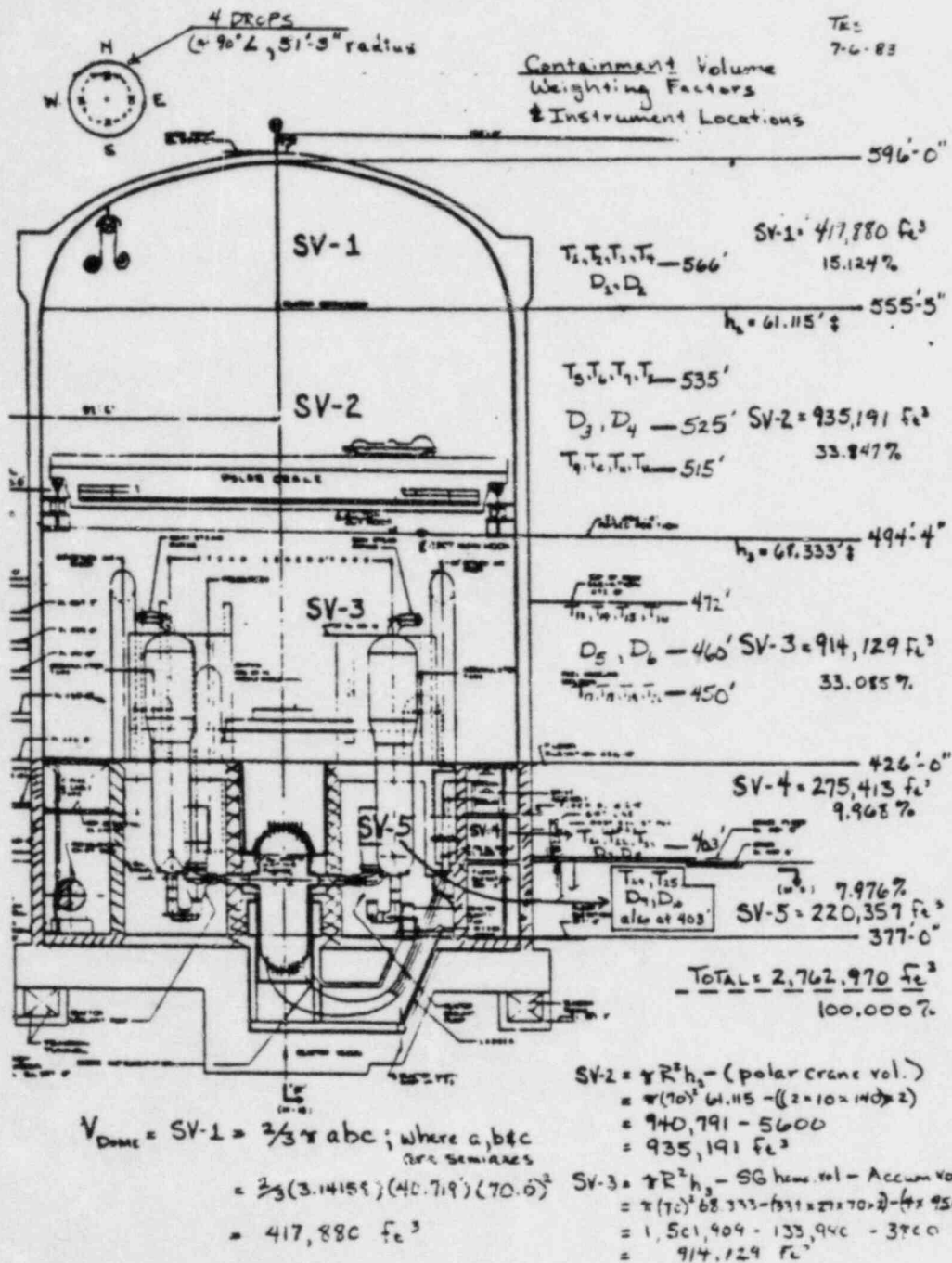


<u>TYPE</u>	<u>PENETRATION (P)</u>	<u>LEAKAGE RATE (SCFH)</u>
C	P-27 PRT Nitrogen Supply	11.11 $\pm$ 0.7
C	P-28 CV Seal Water Ret.	0.4 $\pm$ 0.1
C	P-24 CC Seal Water Ret.	3.57 $\pm$ 0.1
C	P-44 Primary Water to PRT	1.8 $\pm$ 0.1
C	P-15 Pressurizer pressure indicator	0.0 $\pm$ 0.1
C	P-21 Component Cooling Ret.	0.0 $\pm$ 0.1
C	P-25 Reactor Coolant Pump Seal Water Supply	6.5 $\pm$ 0.7
C	Refueling Cavity Return Header	1.45 $\pm$ 0.1
C	P-57 Refueling Cavity to Refueling Water Pump	0.4 $\pm$ 0.1
C	P-1 Cnmt Spray Supply	9.0 $\pm$ 0.7
C	P-16 Cnmt Spray Supply	16.5 $\pm$ 0.7
C	P-39 Instrument Air Supply	8.0 $\pm$ 0.7
C	P-56 Service Air Supply	1.55 $\pm$ 0.1
C	P-30 Demin Water Supply	7.5 $\pm$ 0.7
C	P-47 Reactor Bldg Floor drains	1.1 $\pm$ 0.1
C	P-13 Hydrogen Recombiner Ret.	0.0 $\pm$ 0.1
C	P-13 Hydrogen Recombiner Suc.	0.4 $\pm$ 0.1
C	P-69 Hydrogen Recombiner Ret.	0.4 $\pm$ 0.1
C	P-23 Hydrogen Recombiner Suc.	0.0 $\pm$ 0.1
C	P-52 Process Rad. Air Sample Suc.	4.1 $\pm$ 0.1
C	P-52 Process Rad. Air Sample Ret.	16.0 $\pm$ 0.7
C	Process Rad - Equip. door Suc.	0.4 $\pm$ 0.1
C	Process Rad - Equip. door Ret.	7.5 $\pm$ 0.7
C	Process Rad - Emerg Door Suc.	0.4 $\pm$ 0.1
C	Process Rad - Emerg Door Ret	11.5 $\pm$ 0.7
C	P-5 Cnmt Chilled Water Ret	0.4 $\pm$ 0.1
C	P-8 Cnmt Chilled Water Ret	2.2 $\pm$ 0.1
C	P-55 Nitrogen Supply	1.2 $\pm$ 0.1
C	P-55 Accumulator fill line	1.0 $\pm$ 0.1
C	P-82 Stm Generator 1A Blowdown	0.4 $\pm$ 0.1
C	P-83 Stm Generator 1A Blowdown	3.7 $\pm$ 0.1
C	P-80 Stm Generator 1D Blowdown	0.0 $\pm$ 0.1
C	P-81 Stm Generator 1D Blowdown	0.95 $\pm$ 0.1
C	P-88 Stm Generator 1B Blowdown	0.4 $\pm$ 0.1
C	P-89 Stm Generator 1B Blowdown	0.4 $\pm$ 0.1
C	P-90 Stm Generator 1C Blowdown	1.25 $\pm$ 0.1
C	P-91 Stm Generator 1C Blowdown	1.45 $\pm$ 0.1
C	P-4 Cnmt pressurization line test conn.	0.0 $\pm$ 0.1
C	P-6 Cnmt. Chilled Water Supply	11.11 $\pm$ 0.7
C	P-10 Cnmt. Chilled Water Supply	14.14 $\pm$ 0.7
Total		225.28 $\pm$ 2.82 SCFH

## 10.0 - ATTACHMENTS

### 10.1 ILRT Sensor Placement

North Drop, 426' † - RTD's 1, 5, 9, 13 & 17, DEW's 1, 3, 5  
 East Drop, 426' † - RTD's 2, 6, 10, 14 & 18, DEW's - None  
 South Drop, 426' † - RTD's 3, 7, 11, 15 & 19, DEW's 2, 4, 6  
 West Drop, 426' † - RTD's 4, 8, 12, 16 & 20, DEW's - None



#### Sensors below the 426' level

RTD 21 & DEW 7 @ R1, 405', OMB  
 RTD 22 @ R7, 403', OMB  
 RTD 23 & DEW 8 @ R13, 403', OMB  
 RTD 24 & DEW 9 @ East Rx Wall, 404' IMB  
 RTD 25 & DEW 10 @ West Rx Wall, 404' IMB

## 10.0 ATTACHMENTS

### 10.2 ILRMS SPECIFICATIONS

#### 1. DRYBULB TWENTY-FIVE CHANNEL TEMPERATURE SYSTEM:

The drybulb temperature sensors shall conform to the following:

Number of sensors:	25
Configuration:	3 wire
Type of sensor:	Resistance Temperature Detector (RTD)
Element:	Platinum
Resistance:	100 OHMS @ 32°F

The drybulb temperature system readouts, including sensors, shall conform to the following:

Accuracy:	60° - 120°F Range	$\pm 0.1^{\circ}\text{F}$
	0° - 150°F Range	$\pm 0.25^{\circ}\text{F}$
Repeatability:		$\pm 0.01^{\circ}\text{F}$
Sensitivity:		$\pm 0.01^{\circ}\text{F}$
Resolution:		0.01°F

#### 2. DEWPOINT TEN CHANNEL TEMPERATURE SYSTEM:

The dew point temperature sensors shall conform to the following:

Number of sensors:	10
Configuration:	5 wire
Type of sensor:	Lithium Chloride
Special:	Nylon sock cover for element
Range:	32° to 120°F

The dewpoint temperature system readouts, including sensors, shall conform to the following:

Accuracy:	45° to 90°F Range	$\pm 1.5^{\circ}\text{F}$
Repeatability:		$\pm 0.50^{\circ}\text{F}$
Sensitivity:		$\pm 0.1^{\circ}\text{F}$
Resolution:		0.01°F

## 10.2 ILRMS SPECIFICATIONS CONTINUED

### 3. PRESSURE TWO CHANNEL SYSTEM:

The pressure sensors shall conform to the following:

Number of sensors:	2
Type of sensors:	Quartz Bourdon tube
Range:	0 to 100 PSIA
Manufacturer:	Mensor Corp.

The pressure system readouts, including sensors, shall conform to the following:

Accuracy:	$\pm .01\%$ of reading $\pm .002\%$ of full scale $\pm 5$ microns of abs. press.
Repeatability:	$\pm .001\%$ of full scale
Sensitivity:	$\pm .001$ PSIA
Resolution:	.001% of full scale

### 4. VACUUM SYSTEM FOR ZERO PRESSURE READING VERIFICATION CHECK:

Vacuum pump:	Two stage
Free air displacement:	50 liters/min.
Power required:	110 VAC 60 HZ
Vacuum gauges:	Two thermocouple type gauges
Hardware:	Two channels and connection for transfer standard

### 5. VERIFICATION FLOW SYSTEM:

Number of sensors:	1
Type of sensor:	Thermal Mass Flowmeter
Range:	0 to 10 SCFM
Accuracy:	$\pm 1\%$ F.S.
Repeatability:	$\pm 0.25\%$ F.S.
Resolution:	$\pm .1\%$ F.S.
Sensitivity:	$\pm .1\%$ F.S. ( $\pm .01$ SCFM)
Hardware:	Metering valve



## 10.2 ILRMS SPECIFICATIONS CONTINUED

### 6. AMBIENT PRESSURE:

Number of sensors:	1
Type of sensor:	Strain gauge
Range:	12 to 17 PSIA
Accuracy:	$\pm .1\%$ F.S.
Repeatability:	$\pm .1\%$ F.S.
Stability:	$\pm .15\%$ 6 Months

### 7. AMBIENT TEMPERATURE:

Number of sensors:	1
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The specifications are identical to that of the other 25 RTDs of item 1.

### 8. TIME:

The built-in clock shall maintain real time by Julian date, hours minutes and seconds on a 24 hour time basis.

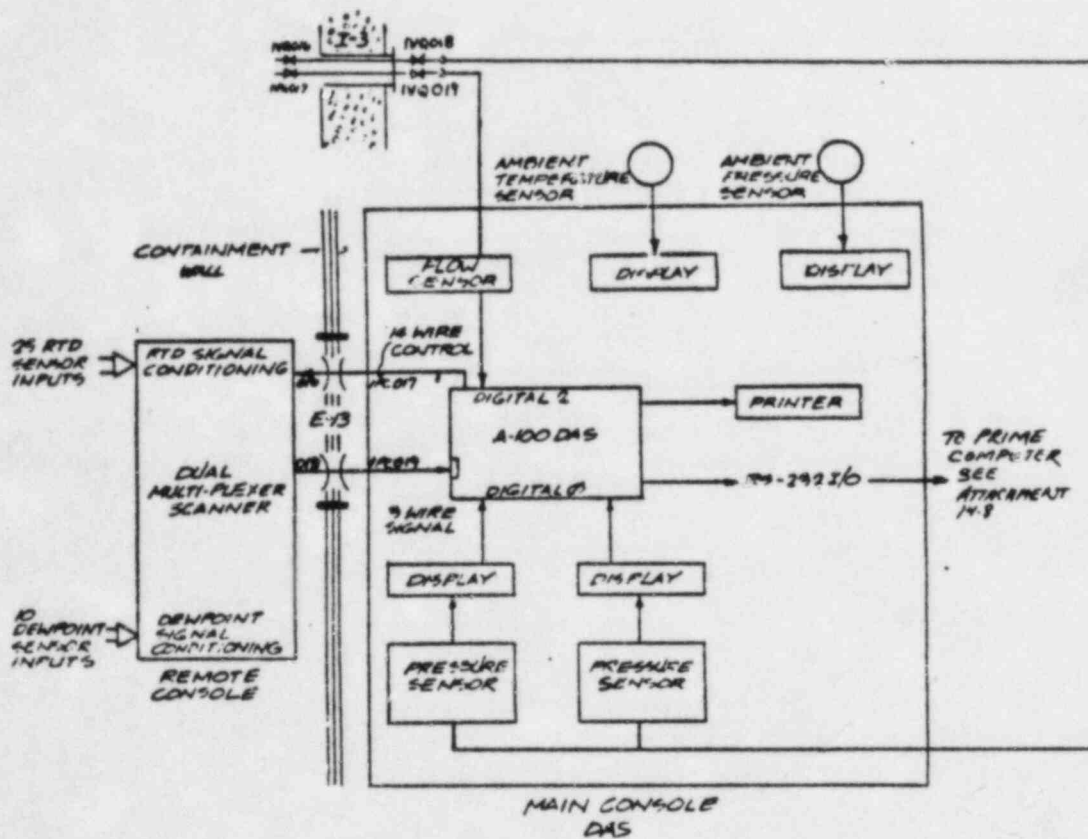
Accuracy:	$\pm 1$ minute/24 hrs.
Resolution:	1.0 second

### 9. DATA ACQUISITION SYSTEM:

A/D Conversion	Dual slope integration
Display:	V, F, constant scan rate 5 + Digit, Polarity, Decimal & Legend
Sampling Rate:	10 Channels/Second
Common Mode Rejection:	DC-140db, 1000 OHM Unbalance AC-140db AT 50-60 HZ
Normal Mode Rejection:	80db
Input Impedance:	1,000 MEGOHMS/Volt
Ambient Temp. Range:	32-125°F
Zero Offset:	Recalibrate before each reading automatically
Full Scale Temp. Compensation	$\pm 5$ PPM/°C or 0.0005%/°C
Accuracy:	$\pm .005\%$ F.S., $\pm .005\%$ of Reading at 25°C with $\pm 10\%$ A.C. Power variation.

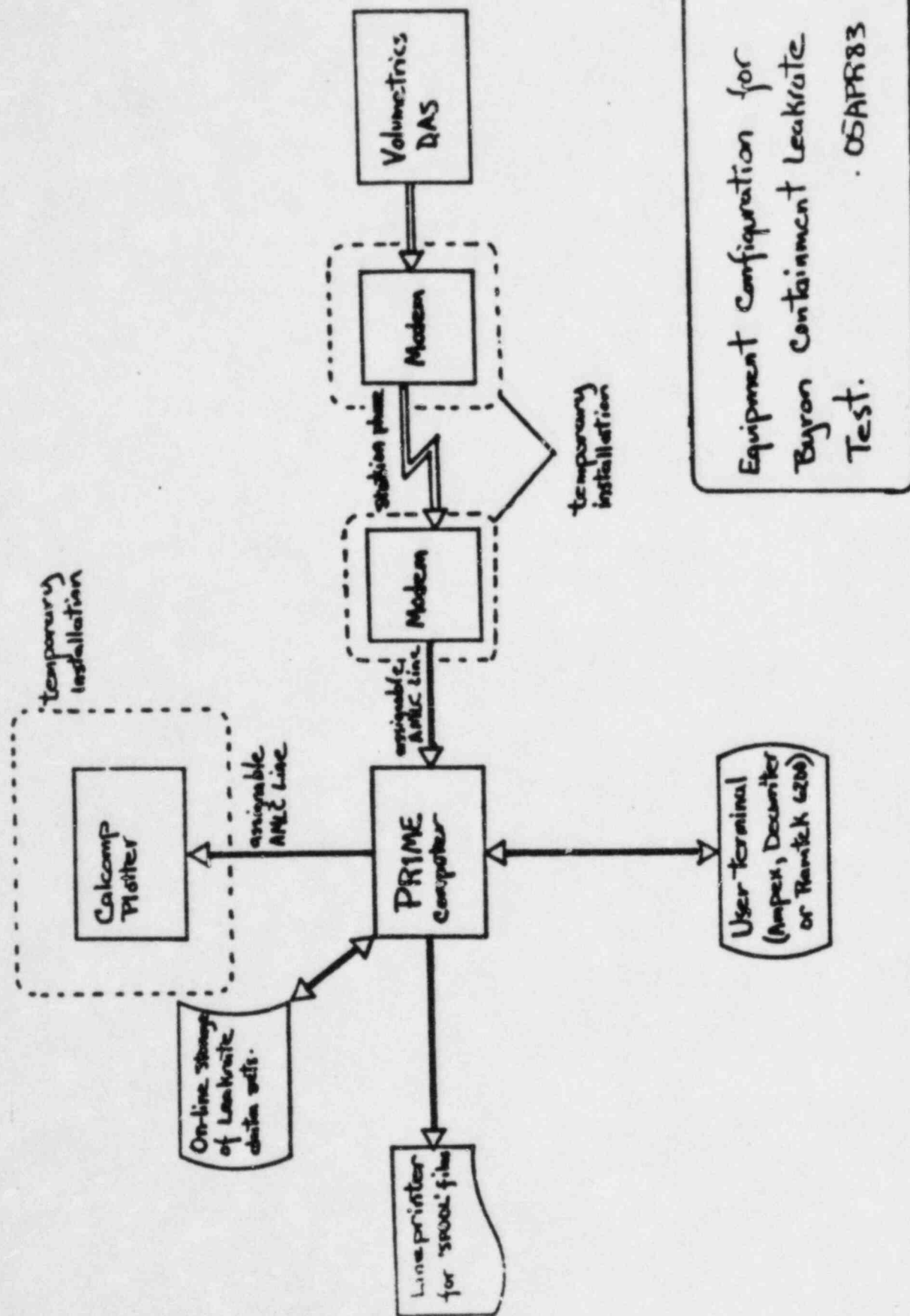
## 10.0 - ATTACHMENTS

### 10.3 ILRMS

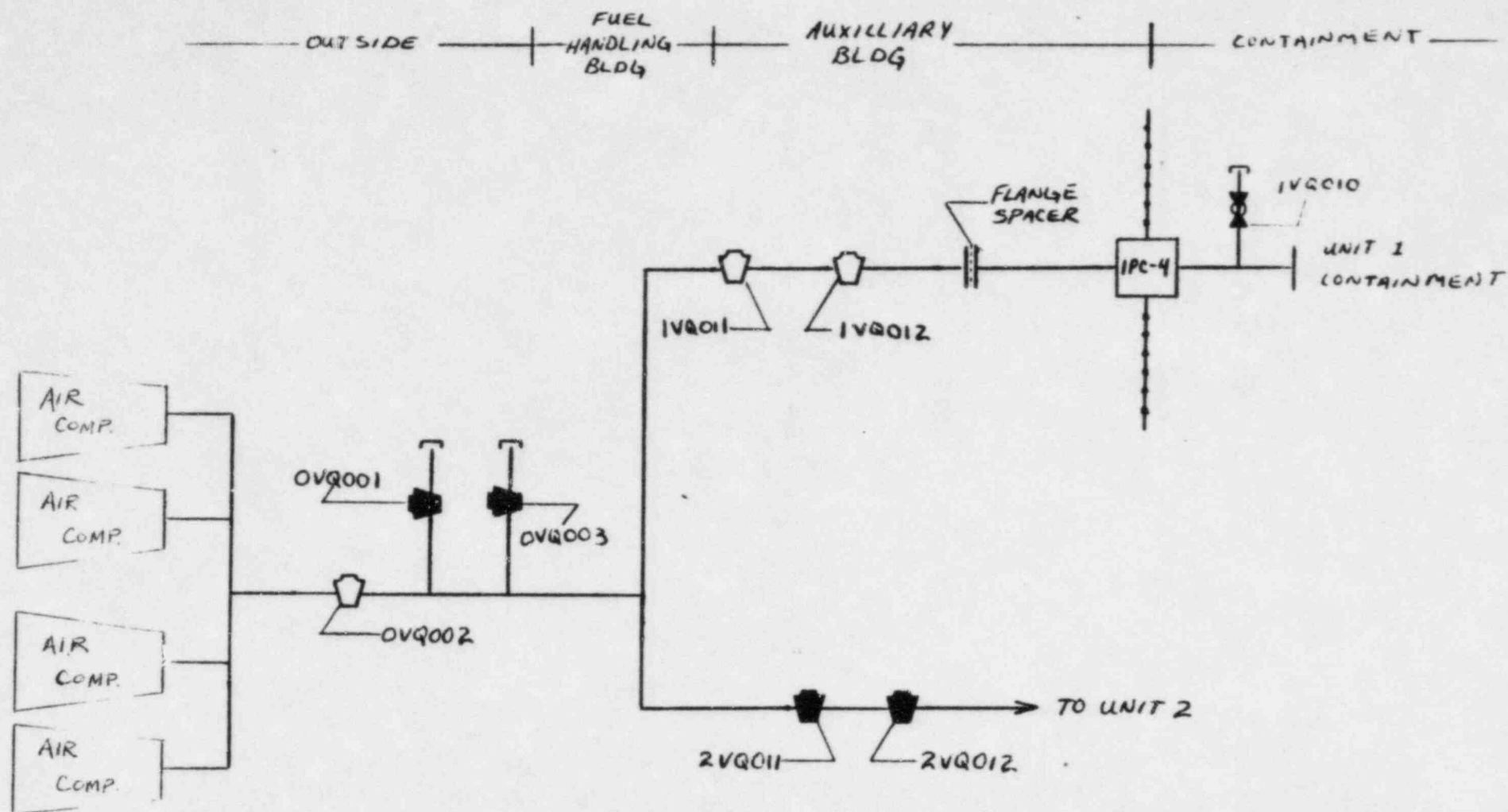


INTEGRATED LEAKAGE RATE MONITORING SYSTEM

#### 10.4 PRIME COMPUTER EQUIPMENT CONFIGURATION



# 10.5 CONTAINMENT PRESSURIZATION FLOWPATH





## 10.0 ATTACHMENTS

### 10.6 Least Squares Fit Statistical Technique

In order to comply with the calculation techniques of ANSI N45.4-1972 and 10CFR50, Appendix J, it was necessary to perform a least squares fit of the ILRT data. The method for "Least Squares" is a statistical procedure for finding the best fitting regression line for a set of measured data. The criterion for the best fitting line to a set of data points is that the sum of the squares of the deviations of the observed points from the line must be a minimum. When this criterion is met, a unique best fitting line is obtained based on all of the data points. The value of the leak rate based on the regression is called the statistically averaged leak rate.

Based on this statistical process, the calculated statistical leak rate is obtained from the equation

$$W = At + B$$

Where  $W$  = contained dry air mass at time  $t$   
 $B$  = calculated contained dry air mass at time  $t = 0$   
 $A$  = calculated leak rate  
 $t$  = test duration

Contained Dry Air Mass (lbs)  $B$

Test Duration (hrs)

The values of the constants  $A$  and  $B$  such that the regression line is best fitting to the IPCLRT data are:

$$A = \frac{\{N\sum(t_1)(W_1)\} - \{(\sum t_1)(\sum W_1)\}}{\{N\sum(t_1)^2 - (\sum t_1)^2\}} = \frac{\sum\{(t_1 - \bar{t})(W_1 - \bar{W})\}}{\sum(t_1 - \bar{t})^2}$$

$$B = \frac{\sum W_1 - A\sum t_1}{N} = \frac{(\sum t_1^2)(\sum W_1) - (\sum t_1)(\sum W_1 t_1)}{N\sum(t_1)^2 - (\sum t_1)^2}$$

By definition, leakage out of the primary containment is considered positive leakage; therefore, the statistically averaged leak rate in weight percent per day is given by:

$$L_S = -2400 (A)/(B) \text{ (weight \% / day)}$$

# ATTACHMENT 10.6 CONTINUED

In order to calculate the 95% confidence limits of the statistically averaged leak rate, the standard deviation of the least squares slope and the T-Distribution function are used as follows:

$$\sigma = \left[ \frac{1}{(N-2)} \frac{\{N\sum(W_1)^2\} - (\sum W_1)^2}{N\sum(t_1)^2 - (\sum t_1)^2} - A^2 \right]^{1/2}$$

$$UCL = L_S + \frac{\sigma(TE)(2400)}{B}$$

$$\text{Where } TE = 1.645 + \frac{1.5068}{(N-2)} + \frac{11.7136}{(N-2)^2}$$

- N = number of data sets
- t<sub>1</sub> = test duration at the ith data set
- W<sub>1</sub> = contained dry air mass at the ith data set
- σ = standard deviation of least squares slope
- TE = value of the single-sided T-distribution function with 2 degrees of freedom (conservative numerical values of computer program)
- L<sub>S</sub> = statistically averaged leak rate in %/day
- UCL = 95% upper confidence limit
- W<sub>BASE</sub> = contained dry air mass at time t=0

Point-to-Point Measured Leak Rate (%/day)

$$L_{mpp} = \left( \frac{W_1 - W_{1+1}}{t_{1+1} - t} \right) \left( \frac{2400}{W_1} \right)$$

Total Time Measured Leak Rate (%/day)

$$L_{mtt} = \left( \frac{W_{BASE} - W_1}{t_1} \right) \left( \frac{2400}{W_{BASE}} \right)$$

$$= \frac{2400}{t_1} \left( 1 - \frac{W_1}{W_{BASE}} \right)$$

The use of the above two measured leak rate expressions is limited to observing transient conditions in the primary containment environment.