Alabama Power Company

J.M. Farley Nuclear Plant Unit 1

Primary Reactor Containment
Integrated Leakage Rate Test

Final Report
November 1986

Bechtel Western Power Corporation

ALABAMA POWER COMPANY

J. M. FARLEY NUCLEAR PLANT

UNIT 1

THIRD PERIODIC

REACTOR CONTAINMENT BUILDING

INTEGRATED LEAKAGE RATE TEST

NOVEMBER 1986

FINAL REPORT

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SUM054

TABLE OF CONTENTS

1. INTRODUCTION

The Farley Nuclear Plant (FNP) Unit 1 Third Periodic Integrated Leakage Rate Test (ILRT) was performed on November 10-11, 1986. The test was conducted to demonstrate that leakage from the containment at design accident pressure does not exceed the limit specified in the Technical Specifications (Ref. 1). The ILRT was done under Procedure FNP-1-STP-117.0 (Ref. 2) which follows the requirements of Appendix J to 10 CFR 50 (Ref. 3) and the FSAR (Ref. 4). The leakage rate was calculated using the methods described in BN-TOP-1 (Ref. 5) and ANSI/ANS-56.8-1981 (Ref. 6). The total time calculations of Ref. 5, which are based on the methodology outlined in ANSI.N45.4-1972 (Ref.7), were used to establish acceptance as required by Ref. 4. The mass point calculations of Ref. 6 were included in the test program to provide technically complete documentation of containment leakage integrity.

The following sections of this report describe the test program and document the results. These sections are ordered as listed below.

- The Summary provides a synopsis of test results.
- Test Measurements and Calculation Methods describes the instrumentation used to measure containment atmospheric conditions and the algorithms used to determine leakage rate.
- Test Chronology defines the scope and time frame for the sequential test activities.
- Test Results provides a discussion of ILRT data and calculated leak rate.
- Tables and Figures contains all numerical data and plots cited in the preceding sections.
- References lists all supporting documents cited in this report.
- The Appendices contain a description of the Bechtel ILRT computer program and tables which list local (Type B and C) leakage rate test results since the second periodic ILRT.

2. SUMMARY

A 24 hour integrated leakage rate (Type A) test and a four hour verification test were conducted on Nov. 10-11, 1986. Test results met all acceptance criteria as tabulated below.

Total Time 95% UCL Leakage Rate	0.054 wt. %/Day
Penalty Addition	0 wt. %/Day
Net Leakage Rate	0.054 wt. %/Day
Acceptance Limit	0.113 wt. %/Day
Verification Test Lower Acceptance Limit	0.144 wt. %/Day
Verification Test Calculated Leakage Rate	0.157 wt. %/Day
Verification Test Upper Acceptance Limit	0.218 wt. %/Day

The penalty addition is the sum of the minimum pathway leakages determined for those containment penetrations which were isolated by other than normal post-LOCA barriers. The penetrations with non-standard isolation barriers, reasons for the non-standard barriers and measured minimum pathway leakages are listed below.

Penetration	Function/Reason for Non-Standard Barrier	As-Left Leakage
23	Letdown/Check Valve Removed	25 SCCM
28	Seal Injection/In Service	4 SCCM
46	CCW/Not Vented	1 SCCM
56	Pressurizer Steam Sample/Additional Valve Closed During ILRT*	4 SCCM
57	Pressurizer Liquid Sample/Additional Valve Closed During ILRT*	5 SCCM
61A	ILRT Pressure Sense Line	3 SCCM
71	ILRT Pressurization Line	19 SCCM
72	ILRT Pressurization Line	175 SCCM

Total Leakage in Std. Cubic Centimeters/Minute	234 SCCM
Equivalent in Std. Cubic Feet/Day	11.9 SCFD
Quantity of Air in Containment at 64.4 PSIA and 543.6 °R**	8.38×10^6 SCF
Equivalent Leakage Rate = $11.9/8.38 \times 10^6$	.0001 wt. %/Day

* Instrument air to containment was isolated during the ILRT. Valve fails closed on loss of air.

** Containment Air Quantity = $\frac{\text{Volume} \times \text{Absolute Pressure} \times \text{Std. Temp}}{\text{Std. Pressure} \times \text{Mean Temp.}}$

$$= \frac{2{,}000{,}000\ \text{Ft}^3 \times 64.4\ \text{PSI} \times 520\ ^\circ\text{R}}{14.7\ \text{PSI} \times 543.6\ ^\circ\text{R}}$$

3. TEST MEASUREMENTS AND CALCULATION METHODS

3.1 Test Measurements

The calculation of containment leakage rate is based on the variation of containment atmosphere pressure and temperature with time. Data for the calculation are obtained by measuring containment absolute pressure, temperature and dewpoint temperature at 15 minute intervals. The measurement system is described below.

The change in pressure during an IIRT is quite small relative to absolute pressure. A precision quartz tube manometer having sensitivity and repeatability of 0.001 lb/in^2 was used to accurately measure the small change.

Some part of the pressure variation may be due to evaporation and/or condensation of water within the containment boundary. Pressure variation caused by water phase change is independent of containment leakage and must be accounted for in the leakage rate calculation. Dewpoint temperature was measured using 6 chilled mirror hygrometers installed in the containment at the locations shown in Table 1. The saturation pressure corresponding to each dewpoint temperature was extracted from a steam table. The volume weighted mean (per the assigned volume fractions listed in Table 1) saturation pressure was subtracted from total pressure to obtain the partial pressure of dry air. Dry air partial pressure was used in the leakage rate calculation.

Containment atmosphere temperature was measured using 18 platinum RTD's installed at the locations shown in Table 1. Volume weighted mean temperature is calculated using the assigned volume fractions listed in the Table.

Calculated leakage rate is verified by imposing a known additional leak on the containment and computing the combined leakage. The imposed leak was measured with a float type flowmeter.

The RTD signal conditioning and hygrometer control unit outputs were wired to a data acquisition system (scanner, analog to digital converter) which was, in turn, interfaced to a desk top computer. The computer performed all leakage rate calculations. Precision manometer data was manually entered at the computer keyboard.

All instrumentation was calibrated prior to the ILRT. Pertinent instrumentation characteristics and calibration dates are listed in Table 2. Calibration documents are maintained in permanent plant records.

3.2 Calculation Methods

Leakage rate was calculated using both the total time (Ref. 5) and mass point (Ref. 6) methods. The total time method was used to demonstrate containment acceptance. Mass point calculations were performed to provide additional information. Appendix A describes the computer program used to calculate the leakage rates.

The total time method is based on the premise that leakage rate varies linearly with time. The end of test rate is determined by fitting a straight line to a series of measured leakage rates and calculating the ordinate of the line at a time corresponding to the end of the test. A measured leakage rate is a rate determined using only the initial and a subsequent data set. It is computed as follows.

$$Lmi = (1 - PiT1/P1Ti)/ti$$

Where:
- Lmi = measured leakage rate at ti
- Pi = pressure at ti
- P1 = initial pressure (t=0)
- T1 = initial temperature
- Ti = temperature at ti
- ti = elapsed time from the start of the test

The 95% upper confidence limit (UCL) on calculated leakage rate rather than the calculated rate itself is the number used to determine acceptance. The 95% UCL is larger than the calculated rate by a factor which increases with the magnitude of scatter of the measured rates about the fitted straight line.

The mass point method is based on the premise that leakage rate is constant. The calculated rate is the slope of a straight line fitted to the PiT1/P1Ti vs. time data. The 95% UCL on calculated slope is the number used to determine acceptance. As in the total time case above, the 95% UCL is larger than the calculated rate by a factor which depends on scatter.

4. TEST CHRONOLOGY

4.1 Prerequisite Activities

The following test prerequisites were completed prior to the start of containment pressurization.

- Isolation valves, except those in systems required to maintain the plant in a safe condition and those in systems used in the conduct of the ILRT, were placed in the specified (Ref. 2) post-LOCA positions.
- Piping penetrating containment was vented and drained as specified in Ref. 2.
- Sources of high pressure (greater than test pressure) gas were removed from the containment or vented. External sources connecting to containment penetrations were isolated and vented.
- The accessible exterior and interior surfaces of the containment were examined to verify surface integrity. The examined surfaces were found to be in sound condition.
- Test instrumentation was installed and verified operational.
- The equipment opening, fuel transfer tube, personnel airlock and emergency airlock were sealed.

The completion of the above prerequisites and others not related to ILRT outcome is documented in the Official Test Copy of Ref. 2.

4.2 Pressurization

The containment was pressurized using oil free air compressors discharging through an after cooler/moisture separator and refrigerated air dryer. Aggregate compressor capacity was 12,000 SCFM. Pressurization commenced at 4:30 p.m. on Nov. 9, 1986. Pressurization line valves were shut at 3:55 a.m. on Nov. 10 when containment pressure had reached 50.5 PSIG. The allowable range for containment pressure is specified in Ref. 2 at 48 to 51 PSIG. Since containment air temperature rises during pressurization, pressure was taken close to the upper limit to compensate for subsequent air cooling and pressure drop.

Containment ventilation fans were run to circulate the pressurizing air. The fans were shut off when pressure reached 42 PSIG. Containment lighting was turned off prior to the start of the test to eliminate radiant heating of the temperature sensors.

4.3 Stabilization

As the containment is pressurized with relatively cool air, temperature falls in the well ventilated lower levels. The higher levels experience less air circulation and, therefore, temperature in the upper zone rises due to adiabatic compression. As a result, the temperature gradient at the end of pressurization is substantially different from that which prevails under equilibrium conditions. Temperatures change rapidly during the initial hours at test pressure and, under these conditions, it is not possible to determine a reasonably accurate mean air temperature with 18 RTD's. Deviation between calculated and actual mean temperature is manifested by non-linearity of the air mass* vs. time graph. Figure 1 shows the relationship between air mass and time for the entire period at test pressure. The graph was determined to have attained linearity by 4:00 p.m. on Nov. 10 and the 24 hours leakage rate test was started at this time. The numerical temperature stabilization criteria specified in Ref. 2 had been satisfied much earlier as shown in Table 3. Figure 2 is a plot of calculated mean temperature vs. time for the entire period at test pressure. This plot attains linearity at about the same time as the mass plot.

4.4 Type A Test

Results are discussed in the following section. Containment gage pressure during the Type A test did not vary outside the limits of 49.5 and 50.0 lb/in^2. The 24 hour Type A test commenced at 4:00 p.m. on Nov. 10 and was successfully completed (without incident) at 4:00 p.m. on the following day.

4.5 Verification Test

A 9.1 SCFM verification flow was established immediately following the completion of the Type A test. The containment atmosphere was allowed to stabilize for one hour following the initiation of the verification flow as required by Ref. 4. The four hour verification test commenced at 5:00 p.m. and was successfully completed (without incident) at 9:00 p.m. Results are discussed in the following section.

* The mass of the air within the containment is calculated as $m = PV/RT$ where:

m = air mass, LBM.
P = absolute pressure, lb/ft^2
V = containment volume = 2,000,000 ft^3
R = Gas constant for air = 53.35 ft-lb/LBM- °R
T = mean absolute temperature, °R

5. TEST RESULTS

5.1 Synopsis

Leakage rates calculated using data recorded during the 24 hour Type A test period and those calculated using the verification test data are listed with penalty additions and acceptance limits in Table 4. As shown in the Table, all acceptance criteria are satisfied. The 0.113 wt. %/day acceptance limit on Type A leakage rate is 75% of the 0.15 wt. %/day maximum allowed by Ref. 1. The difference between the acceptance limit and maximum allowable leakage rate provides a margin for decreases in the leak tightness of the various containment boundary components over time. Since the test data contain some scatter, calculated leakage rate provides only a best estimate of the true value. To provide added assurance that the true value does not exceed the acceptance limit, the 95% upper confidence limit on the calculated value is the number which must meet that limit.

5.2 Test Data

Figures 1-4 show, respectively, calculated air mass, calculated mean temperature, calculated mean water vapor pressure and measured absolute pressure for the entire period between the start of stabilization (3:55 a.m. on Nov. 10) and the end of the verification (9:00 p.m. on Nov. 11). As discussed in Section 4, the air mass plot is distinctly non-linear during the first few hours of stabilization. This indicates that calculated mean temperature is not accurately tracking true mean temperature. The temperature plot shows that this is a period of rapid temperature change. Over the 24 hour Type A test period, the air mass varies linearly with time as must be the case for a constant leakage rate. The temperature plot shows a relatively slow change in calculated mean temperature over the same period.

The calculated mean water vapor pressure and the measured absolute pressure closely track the temperature during the stabilization period. This is expected since rapidly changing temperature results in rapid changes in the partial pressures of both the dry air and water vapor constituents of the containment atmosphere. Table 5 lists calculated mean temperature, dry air pressure, calculated mean vapor pressure and calculated air mass for each data set from the start of stabilization to the end of the verification test.

Data for individual temperature and dewpoint temperature sensors show a relatively smooth variation in these quantities with time over the Type A and Verification Test periods. Tabulations and plots of data for the individual sensors are retained in permanent plant records.

5.3 Leakage Rate Calculations

Table 6 lists the parameters used in the calculation of total time leakage rate as well the end of test calculated rate and 95% upper confidence limit. The right hand column of the table lists the measured rates calculated at 15 minute time increments. The initially determined measured rates show considerable fluctuation. This results from data scatter. Air masses (or P/T ratios) calculated for data recorded at closely spaced times may change positively or negatively by amounts which are large relative to the change in the ordinate of the trend line. Consequently, measured leakage rates determined for the initial data sets can attain large positive and negative values. Measured leakage rates determined for the later data sets tend to fluctuate little and are generally quite close to leakage rates calculated by the mass point method.

The total time calculated leakage rate may differ significantly from the mass point calculated rate. The size and sign of the difference depends, principally, on the variation in the measured rates determined for the first few data sets. Because of this, the total time calculated rate is not always a good measure of true rate. However, since the initial scatter of measured rates has a major impact on the calculated confidence limit, the total time 95% UCL is almost always larger, and therefore more conservative, than the mass point 95% UCL.

Table 7 lists the parameters used in the calculation of mass point leakage rate and the calculation results. As is typical for mass point calculations using data with reasonably low scatter, the calculated rate and 95% UCL are quite close together. The linear mass plot along with the close agreement between mass point calculated rate and UCL confirms that the true leakage rate is about 0.04 wt. %/day. The 0.054 wt. %/day total time UCL is then a very conservative number to use for demonstrating test acceptance. Figure 5 contains a plot of air mass vs. time over the 24 hour Type A test period, shows the trend line (fit to the calculated air masses using the method of least squares) with a slope equivalent to 0.040 wt. %/day and shows the line which represents the maximum allowable mass loss (starting with the initially calculated mass) of 0.113 wt. %/day or 75% of the maximum allowable leakage rate.

5.4 Verification Test

Following the completion of the Type A test an additional leak was initiated by venting 9.1 SCFM from the containment through a calibrated flowmeter. The added leakage rate was equal to the maximum allowable leakage rate of 0.15 wt. %/day. The results of the verification test are acceptable if the leakage rate calculated after imposition of the additional leak falls within the limits of Lam + Lo ± 0.25 La, where: Lam is the previously calculated leakage rate; Lo is the imposed leakage; and, La (=Lo) is the maximum allowable leakage rate. Limits for the total time and mass point verification test results are as given below.

Total Time:	New calculated rate	= 0.031 + 0.15 ± 0.150/4
	Acceptance Limits	= 0.144 to 0.218
Mass Point:	New calculated rate	= 0.040 + .150 ± .150/4
	Acceptance Limits	= 0.153 to 0.227

Table 8 and 9 list the parameters and results for the total time and mass point, respectively, verification test leakage rate calculations. The results of both calculations satisfy the criteria. Figure 6 contains a plot of the air masses calculated for the verification test data, the trend line (slope equivalent to the mass point leakage rate) fitted to the air mass data and lines representing the limits of air mass change based on the Type A test mass point leakage rate of 0.040 wt. %/day.

5.5 Local Leakage Rate Test Results

Leakage through containment penetrations is measured during each refueling outage. Penetration leakage measured since the 1983 Type A test is tabulated in the Appendix B.

6. TABLES AND FIGURES

The following Tables and Figures are included in this report:

TABLE 1

TEMPERATURE AND DEWPOINT TEMPERATURE SENSOR LOCATIONS

TEMPERATURE SENSORS

SENSOR NO.	ELEVATION (FT)	AZIMUTH (DEGREE)	DISTANCE FROM CTMT CENTER (FT)	VOLUME FRACTIONS
TE-1	270	300	30	0.0586
TE-2	250	120	30	0.0586
TE-3	185	120	16	0.0586
TE-4	220	120	8	0.0586
TE-5	195	120	39	0.0586
TE-6	200	300	4	0.0586
TE-7	210	300	50	0.0586
TE-8	235	300	30	0.0586
TE-9	190	300	23	0.0586
TE-10	170	30	64	0.0563
TE-11	165	120	64	0.0563
TE-12	175	210	64	0.0563
TE-13	170	320	64	0.0563
TE-14	125	0	60	0.0637
TE-15	130	180	60	0.0637
TE-16	115	20	55	0.0400
TE-17	110	120	44	0.0400
TE-18	115	250	44	0.0400
				1.0000

DEWPOINT TEMPERATURE SENSORS

SENSOR NO.	ELEVATION (FT)	AZIMUTH (DEGREE)	DISTANCE FROM CTMT CENTER (FT)	VOLUME FRACTIONS
ME-1	235	300	30	0.1758
ME-2	210	120	8	0.1758
ME-3	190	300	0	0.1758
ME-4	165	30	64	0.2252
ME-5	135	180	60	0.1274
ME-6	110	250	44	0.1200
				1.0000

TABLE 2

INSTRUMENTATION CALIBRATION SUMMARY

Description	Data	
Absolute Pressure		
Precision Pressure Gauge Texas Instruments Model 145-02	Range:	0-100 psia
	Accuracy:	+/-0.015% of reading
	Sensitivity:	0.001 psia
	Repeatability:	0.0005% FS
	Resolution:	0.001% FS
	Calibr. Date:	9/12/86
Drybulb Temperature		
100 OHM Platinum Resistance Temperature Detectors	Range:	0-150 F
	Accuracy:	+/-0.1 F
	Sensitivity:	0.01 F
	Repeatability:	0.01 F
	Calibr. Date:	9/12/86
Dewpoint Temperature		
Chilled Mirror Hygrometers EG&G Model 660-CI	Range:	40-212 F
	Accuracy:	+/-0.54 F
	Sensitivity:	0.10 F
	Repeatability:	0.10 F
	Calibr. Date:	9/12/86
Flow		
Brooks Rotameter Model 1110	Range:	0-10 scfm
	Accuracy:	+/-1.0% FS
	Calibr. Date:	9/12/86

TABLE 3

FARLEY NUCLEAR PLANT UNIT 1 ILRT
TEMPERATURE STABILIZATION

FROM A STARTING TIME AND DATE OF: 800 1110 1986

TIME (HOURS)	TEMP (°R)	AVE Δ T (4HRS)	ANSI AVE Δ T (1HR)	DIFF	BN-TOP-1 AVE Δ T (2HRS)
.00	545.73				
.25	545.63				
.50	545.54				
.75	545.45				
1.00	545.37				
1.25	545.34				
1.50	545.27				
1.75	545.20				
2.00	545.11				-.306*
2.25	545.07				-.279*
2.50	545.00				-.268*
2.75	544.94				-.255*
3.00	544.93				-.220*
3.25	544.85				-.244*
3.50	544.79				-.237*
3.75	544.74				-.230*
4.00	544.72	-.253	-.212	-.04*	-.199*

* INDICATES TEMPERATURE STABILIZATION HAS BEEN SATISFIED

TABLE 4

TEST RESULTS

Total Time Analysis

Calculated Leakage Rate	0.031 wt. %/day
95% UCL	0.054 wt. %/day
Penalty Additions*	0 wt. %/day
UCL Plus Additions	0.054 wt. %/day
Acceptance Limit	0.113 wt. %/day
Verification Test Lower Limit	0.144 wt. %/day
Verification Test Calculated Rate	0.157 wt. %/day
Verification Test Upper Limit	0.218 wt. %/day

Mass Point Analysis

Calculated Leakage Rate	0.040 wt. %/day
95% UCL	0.042 wt. %/day
Penalty Additions*	0 wt. %/day
UCL Plus Additions	0.042 wt. %/day
Acceptance Limit	0.113 wt. %/day
Verification Test Lower Limit	0.153 wt. %/day
Verification Test Calculated Rate	0.169 wt. %/day
Verification Test Upper Limit	0.227 wt. %/day

* See Section 2

TABLE 5

FARLEY NUCLEAR PLANT UNIT 1 ILRT
SUMMARY DATA

TIME	DATE	°R TEMP	PSIA PRESSURE	PSIA VPRS	LBM AIRMASS
400	1110	549.245	64.6748	.4714	635663.8
415	1110	548.599	64.5948	.4701	635624.6
430	1110	548.119	64.5401	.4660	635642.9
445	1110	547.782	64.4956	.4643	635594.9
500	1110	547.474	64.4572	.4650	635574.6
515	1110	547.199	64.4228	.4648	635555.4
530	1110	547.009	64.3907	.4678	635458.9
545	1110	546.825	64.3699	.4630	635467.8
600	1110	546.644	64.3480	.4633	635461.4
615	1110	546.494	64.3230	.4682	635389.0
630	1110	546.376	64.3029	.4702	635327.4
645	1110	546.241	64.2832	.4708	635289.7
700	1110	546.120	64.2682	.4698	635282.4
715	1110	545.984	64.2530	.4689	635290.6
730	1110	545.905	64.2361	.4708	635214.4
745	1110	545.820	64.2241	.4697	635195.6
800	1110	545.727	64.2111	.4692	635175.1
815	1110	545.631	64.2010	.4677	635186.6
830	1110	545.540	64.1866	.4691	635150.6
845	1110	545.447	64.1771	.4675	635164.6
900	1110	545.369	64.1648	.4678	635133.8
915	1110	545.343	64.1556	.4664	635072.3
930	1110	545.268	64.1450	.4670	635054.6
945	1110	545.198	64.1358	.4662	635045.6
1000	1110	545.114	64.1277	.4657	635062.7
1015	1110	545.072	64.1191	.4653	635026.7
1030	1110	545.003	64.1111	.4652	635028.8
1045	1110	544.937	64.1044	.4639	635039.6
1100	1110	544.928	64.0969	.4644	634975.2
1115	1110	544.855	64.0890	.4637	634981.7
1130	1110	544.794	64.0832	.4636	634994.8
1145	1110	544.738	64.0767	.4635	634996.0
1200	1110	544.716	64.0697	.4640	634952.7
1215	1110	544.672	64.0639	.4637	634946.4
1230	1110	544.647	64.0587	.4634	634923.8
1245	1110	544.588	64.0544	.4622	634949.9
1300	1110	544.571	64.0492	.4623	634918.8
1315	1110	544.544	64.0431	.4625	634889.3
1330	1110	544.486	64.0384	.4621	634910.1
1345	1110	544.474	64.0342	.4613	634882.2
1400	1110	544.434	64.0281	.4624	634868.4
1415	1110	544.395	64.0250	.4615	634883.2
1430	1110	544.388	64.0202	.4617	634844.4
1445	1110	544.342	64.0162	.4612	634858.4
1500	1110	544.297	64.0114	.4620	634862.8
1515	1110	544.282	64.0082	.4612	634848.2
1530	1110	544.254	64.0039	.4615	634838.9
1545	1110	544.243	64.0009	.4605	634822.1

TABLE 5 (Cont'd)

FARLEY NUCLEAR PLANT UNIT 1 ILRT
SUMMARY DATA

TIME	DATE	°R TEMP	PSIA PRESSURE	PSIA VPRS	LBM AIRMASS
1600	1110	544.196	63.9964	.4614	634832.0
1615	1110	544.216	63.9941	.4608	634785.9
1630	1110	544.137	63.9910	.4604	634846.8
1645	1110	544.118	63.9879	.4600	634838.6
1700	1110	544.119	63.9849	.4599	634807.7
1715	1110	544.090	63.9812	.4601	634804.8
1730	1110	544.080	63.9791	.4592	634795.8
1745	1110	544.040	63.9753	.4605	634805.0
1800	1110	544.024	63.9734	.4598	634804.3
1815	1110	544.010	63.9719	.4588	634806.1
1830	1110	544.011	63.9679	.4598	634765.2
1845	1110	543.984	63.9651	.4606	634768.6
1900	1110	543.960	63.9635	.4597	634781.1
1915	1110	543.977	63.9611	.4590	634737.4
1930	1110	543.925	63.9589	.4593	634775.8
1945	1110	543.924	63.9574	.4588	634761.8
2000	1110	543.906	63.9559	.4583	634768.5
2015	1110	543.895	63.9532	.4584	634755.3
2030	1110	543.889	63.9504	.4582	634734.6
2045	1110	543.848	63.9479	.4587	634757.6
2100	1110	543.845	63.9463	.4583	634745.0
2115	1110	543.816	63.9446	.4585	634761.2
2130	1110	543.818	63.9416	.4595	634729.5
2145	1110	543.790	63.9406	.4585	634752.1
2200	1110	543.792	63.9390	.4580	634734.2
2215	1110	543.764	63.9379	.4582	634755.0
2230	1110	543.768	63.9355	.4585	634727.1
2245	1110	543.752	63.9336	.4585	634726.4
2300	1110	543.737	63.9326	.4579	634734.9
2315	1110	543.741	63.9316	.4574	634719.7
2330	1110	543.711	63.9292	.4578	634731.6
2345	1110	543.710	63.9273	.4588	634713.7
0	1111	543.705	63.9271	.4570	634716.8
15	1111	543.659	63.9245	.4576	634745.4
30	1111	543.691	63.9238	.4573	634700.8
45	1111	543.691	63.9218	.4582	634681.3
100	1111	543.691	63.9210	.4576	634672.7
115	1111	543.658	63.9204	.4571	634706.4
130	1111	543.657	63.9181	.4579	634683.6
145	1111	543.643	63.9168	.4577	634687.3
200	1111	543.637	63.9156	.4574	634682.4
215	1111	543.664	63.9161	.4569	634656.1
230	1111	543.616	63.9139	.4575	634690.6
245	1111	543.623	63.9138	.4567	634680.6
300	1111	543.628	63.9128	.4567	634664.4

TABLE 5 (Cont'd)

FARLEY NUCLEAR PLANT UNIT 1 ILRT
SUMMARY DATA

TIME	DATE	°R TEMP	PSIA PRESSURE	PSIA VPRS	LBM AIRMASS
315	1111	543.597	63.9123	.4561	634696.4
330	1111	543.633	63.9112	.4563	634642.8
345	1111	543.609	63.9095	.4569	634654.9
400	1111	543.586	63.9083	.4571	634670.1
415	1111	543.598	63.9086	.4559	634657.8
430	1111	543.614	63.9071	.4563	634625.7
445	1111	543.569	63.9063	.4561	634670.1
500	1111	543.567	63.9054	.4560	634663.6
515	1111	543.570	63.9043	.4566	634648.8
530	1111	543.550	63.9029	.4566	634657.6
545	1111	543.570	63.9035	.4560	634639.8
600	1111	543.552	63.9023	.4562	634649.5
615	1111	543.565	63.9011	.4564	634622.3
630	1111	543.547	63.9005	.4564	634637.0
645	1111	543.541	63.9005	.4554	634644.5
700	1111	543.539	63.8999	.4555	634641.1
715	1111	543.556	63.8979	.4570	634601.1
730	1111	543.515	63.8973	.4561	634643.3
745	1111	543.532	63.8969	.4565	634618.6
800	1111	543.519	63.8973	.4551	634637.8
815	1111	543.534	63.8961	.4553	634609.6
830	1111	543.518	63.8940	.4564	634607.1
845	1111	543.522	63.8948	.4556	634610.6
900	1111	543.513	63.8938	.4556	634609.9
915	1111	543.517	63.8939	.4555	634606.9
930	1111	543.475	63.8939	.4550	634656.4
945	1111	543.498	63.8933	.4551	634623.8
1000	1111	543.497	63.8912	.4562	634602.9
1015	1111	543.489	63.8924	.4545	634624.8
1030	1111	543.484	63.8921	.4548	634627.3
1045	1111	543.493	63.8895	.4564	634591.3
1100	1111	543.480	63.8913	.4541	634623.5
1115	1111	543.484	63.8892	.4552	634598.4
1130	1111	543.485	63.8884	.4555	634589.6
1145	1111	543.479	63.8880	.4554	634592.6
1200	1111	543.490	63.8869	.4560	634568.8
1215	1111	543.490	63.8874	.4549	634573.6
1230	1111	543.481	63.8865	.4549	634575.3
1245	1111	543.470	63.8862	.4547	634585.1
1300	1111	543.472	63.8863	.4540	634584.2
1315	1111	543.450	63.8853	.4546	634599.8
1330	1111	543.439	63.8848	.4545	634607.6
1345	1111	543.455	63.8841	.4542	634582.2
1400	1111	543.462	63.8831	.4547	634564.8

TABLE 5 (Cont'd)

FARLEY NUCLEAR PLANT UNIT 1 ILRT
SUMMARY DATA

TIME	DATE	°R TEMP	PSIA PRESSURE	PSIA VPRS	LBM AIRMASS
1415	1111	543.452	63.8825	.4543	634569.7
1430	1111	543.449	63.8821	.4548	634568.4
1445	1111	543.445	63.8814	.4545	634567.3
1500	1111	543.422	63.8799	.4549	634579.6
1515	1111	543.434	63.8804	.4539	634569.6
1530	1111	543.402	63.8788	.4550	634591.7
1545	1111	543.407	63.8795	.4543	634592.4
1600	1111	543.438	63.8786	.4547	634547.8
1615	1111	543.422	63.8786	.4537	634565.9
1630	1111	543.433	63.8755	.4543	634522.0
1645	1111	543.437	63.8745	.4543	634508.3
1700	1111	543.423	63.8742	.4541	634521.2
1715	1111	543.433	63.8727	.4536	634494.9
1730	1111	543.416	63.8721	.4532	634507.8
1745	1111	543.422	63.8699	.4539	634478.8
1800	1111	543.407	63.8694	.4534	634491.6
1815	1111	543.409	63.8662	.4546	634457.6
1830	1111	543.405	63.8654	.4548	634455.6
1845	1111	543.432	63.8653	.4534	634423.0
1900	1111	543.411	63.8634	.4528	634427.9
1915	1111	543.395	63.8606	.4546	634418.6
1930	1111	543.411	63.8596	.4542	634389.5
1945	1111	543.414	63.8598	.4530	634388.1
2000	1111	543.405	63.8579	.4533	634379.6
2015	1111	543.389	63.8560	.4522	634379.6
2030	1111	543.373	63.8531	.4531	634370.4
2045	1111	543.374	63.8518	.4529	634356.4
2100	1111	543.377	63.8501	.4531	634335.1

TABLE 6

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 1600 1110 1986
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
1600	544.196	63.9964	
1615	544.216	63.9941	.697
1630	544.137	63.9910	-.112
1645	544.118	63.9879	-.033
1700	544.119	63.9849	.092
1715	544.090	63.9812	.082
1730	544.080	63.9791	.091
1745	544.040	63.9753	.058
1800	544.024	63.9734	.053
1815	544.010	63.9719	.043
1830	544.011	63.9679	.101
1845	543.984	63.9651	.087
1900	543.960	63.9635	.064
1915	543.977	63.9611	.110
1930	543.925	63.9589	.061
1945	543.924	63.9574	.071
2000	543.906	63.9559	.060
2015	543.895	63.9532	.068
2030	543.889	63.9504	.082
2045	543.848	63.9479	.059
2100	543.845	63.9463	.066
2115	543.816	63.9446	.051
2130	543.818	63.9416	.070
2145	543.790	63.9406	.053
2200	543.792	63.9390	.062
2215	543.764	63.9379	.047
2230	543.768	63.9355	.061
2245	543.752	63.9336	.059
2300	543.737	63.9326	.052
2315	543.741	63.9316	.059
2330	543.711	63.9292	.051
2345	543.710	63.9273	.058
0	543.705	63.9271	.054
15	543.659	63.9245	.040
30	543.691	63.9238	.058
45	543.691	63.9218	.065
100	543.691	63.9210	.067
115	543.658	63.9204	.051
130	543.657	63.9181	.059
145	543.643	63.9168	.056
200	543.637	63.9156	.057
215	543.664	63.9161	.065
230	543.616	63.9139	.051
245	543.623	63.9138	.053
300	543.628	63.9128	.058

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 1600 1110 1986
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
315	543.597	63.9123	.046
330	543.633	63.9112	.062
345	543.609	63.9095	.057
400	543.586	63.9083	.051
415	543.598	63.9086	.054
430	543.614	63.9071	.062
445	543.569	63.9063	.048
500	543.567	63.9054	.049
515	543.570	63.9043	.052
530	543.550	63.9029	.049
545	543.570	63.9035	.053
600	543.552	63.9023	.049
615	543.565	63.9011	.056
630	543.547	63.9005	.051
645	543.541	63.9005	.048
700	543.539	63.8999	.048
715	543.556	63.8979	.057
730	543.515	63.8973	.046
745	543.532	63.8969	.051
800	543.519	63.8973	.046
815	543.534	63.8961	.052
830	543.518	63.8940	.052
845	543.522	63.8948	.050
900	543.513	63.8938	.049
915	543.517	63.8939	.049
930	543.475	63.8939	.038
945	543.498	63.8933	.044
1000	543.497	63.8912	.048
1015	543.489	63.8924	.043
1030	543.484	63.8921	.042
1045	543.493	63.8895	.049
1100	543.480	63.8913	.041
1115	543.484	63.8892	.046
1130	543.485	63.8884	.047
1145	543.479	63.8880	.046
1200	543.490	63.8869	.050
1215	543.490	63.8874	.048
1230	543.481	63.8865	.047
1245	543.470	63.8862	.045
1300	543.472	63.8863	.045
1315	543.450	63.8853	.041
1330	543.439	63.8848	.039
1345	543.455	63.8841	.043
1400	543.462	63.8331	.046

TABLE 6 (Cont'd)

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 1600 1110 1986
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
1415	543.452	63.8825	.045
1430	543.449	63.8821	.044
1445	543.445	63.8814	.044
1500	543.422	63.8799	.041
1515	543.434	63.8804	.043
1530	543.402	63.8788	.039
1545	543.407	63.8795	.038
1600	543.438	63.8786	.045

MEAN OF THE MEASURED LEAKAGE RATES	=	.059
MAXIMUM ALLOWABLE LEAKAGE RATE	=	.150
75% OF MAXIMUM ALLOWABLE LEAKAGE RATE	=	.113
THE UPPER 95% CONFIDENCE LIMIT	=	.054
THE CALCULATED LEAKAGE RATE	=	.031

TABLE 7

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TEST: 1600 1110 1986
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
1600	544.196	63.9964	634832.0		
1615	544.216	63.9941	634785.9	46.1	184.5
1630	544.137	63.9910	634846.8	-60.9	-29.5
1645	544.118	63.9879	634838.6	8.3	-8.7
1700	544.119	63.9849	634807.7	30.9	24.3
1715	544.090	63.9812	634804.8	2.9	21.8
1730	544.080	63.9791	634795.8	9.0	24.1
1745	544.040	63.9753	634805.0	-9.2	15.5
1800	544.024	63.9734	634804.3	.8	13.9
1815	544.010	63.9719	634806.1	-1.9	11.5
1830	544.011	63.9679	634765.2	41.0	26.7
1845	543.984	63.9651	634768.6	-3.4	23.1
1900	543.960	63.9635	634781.1	-12.4	17.0
1915	543.977	63.9611	634737.4	43.6	29.1
1930	543.925	63.9589	634775.8	-38.3	16.1
1945	543.924	63.9574	634761.8	13.9	18.7
2000	543.906	63.9559	634768.5	-6.7	15.9
2015	543.895	63.9532	634755.3	13.3	18.1
2030	543.889	63.9504	634734.6	20.7	21.7
2045	543.848	63.9479	634757.6	-23.0	15.7
2100	543.845	63.9463	634745.0	12.5	17.4
2115	543.816	63.9446	634761.2	-16.2	13.5
2130	543.818	63.9416	634729.5	31.7	18.6
2145	543.790	63.9406	634752.1	-22.6	13.9
2200	543.792	63.9390	634734.2	17.9	16.3
2215	543.764	63.9379	634755.0	-20.9	12.3
2230	543.768	63.9355	634727.1	28.0	16.2
2245	543.752	63.9336	634726.4	.7	15.6
2300	543.737	63.9326	634734.9	-8.5	13.9
2315	543.741	63.9316	634719.7	15.2	15.5
2330	543.711	63.9292	634731.6	-11.9	13.4
2345	543.710	63.9273	634713.7	17.9	15.3
0	543.705	63.9271	634716.8	-3.1	14.4
15	543.659	63.9245	634745.4	-28.6	10.5
30	543.691	63.9238	634700.8	44.6	15.4
45	543.691	63.9218	634681.3	19.4	17.2
100	543.691	63.9210	634672.7	8.6	17.7
115	543.658	63.9204	634706.4	-33.7	13.6
130	543.657	63.9181	634683.6	22.8	15.6
145	543.643	63.9168	634687.3	-3.8	14.8
200	543.637	63.9156	634682.4	4.9	15.0
215	543.664	63.9161	634656.1	26.3	17.2
230	543.616	63.9139	634690.6	-34.6	13.5
245	543.623	63.9138	634680.6	10.1	14.1
300	543.628	63.9128	634664.4	16.1	15.2

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TEST: 1600 1110 1986
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
315	543.597	63.9123	634696.4	-32.0	12.1
330	543.633	63.9112	634642.8	53.6	16.5
345	543.609	63.9095	634654.9	-12.1	15.1
400	543.586	63.9083	634670.1	-15.2	13.5
415	543.598	63.9086	634657.8	12.3	14.2
430	543.614	63.9071	634625.7	32.2	16.5
445	543.569	63.9063	634670.1	-44.4	12.7
500	543.567	63.9054	634663.6	6.4	13.0
515	543.570	63.9043	634648.8	14.8	13.8
530	543.550	63.9029	634657.6	-8.8	12.9
545	543.570	63.9035	634639.8	17.9	14.0
600	543.552	63.9023	634649.5	-9.8	13.0
615	543.565	63.9011	634622.3	27.3	14.7
630	543.547	63.9005	634637.0	-14.8	13.4
645	543.541	63.9005	634644.5	-7.4	12.7
700	543.539	63.8999	634641.1	3.4	12.7
715	543.556	63.8979	634601.1	40.1	15.1
730	543.515	63.8973	634643.3	-42.3	12.2
745	543.532	63.8969	634618.6	24.7	13.6
800	543.519	63.8973	634637.8	-19.2	12.1
815	543.534	63.8961	634609.6	28.2	13.7
830	543.518	63.8940	634607.1	2.5	13.6
845	543.522	63.8948	634610.6	-3.5	13.2
900	543.513	63.8938	634609.9	.6	13.1
915	543.517	63.8939	634606.9	3.1	13.1
930	543.475	63.8939	634656.4	-49.6	10.0
945	543.498	63.8933	634623.8	32.7	11.7
1000	543.497	63.8912	634602.9	20.9	12.7
1015	543.489	63.8924	634624.8	-21.9	11.4
1030	543.484	63.8921	634627.3	-2.5	11.1
1045	543.493	63.8895	634591.3	36.0	12.8
1100	543.480	63.8913	634623.5	-32.2	11.0
1115	543.484	63.8892	634598.4	25.2	12.1
1130	543.485	63.8884	634589.6	8.7	12.4
1145	543.479	63.8880	634592.6	-3.0	12.1
1200	543.490	63.8869	634568.8	23.8	13.2
1215	543.490	63.8874	634573.6	-4.8	12.8
1230	543.481	63.8865	634575.3	-1.6	12.5
1245	543.470	63.8862	634585.1	-9.9	11.9
1300	543.472	63.8863	634584.2	1.0	11.8
1315	543.450	63.8853	634599.8	-15.6	10.9
1330	543.439	63.8848	634607.6	-7.8	10.4
1345	543.455	63.8841	634582.2	25.4	11.5
1400	543.462	63.8831	634564.8	17.4	12.1

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TFST: 1600 1110 1986
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
1415	543.452	63.8825	634569.7	-4.9	11.8
1430	543.449	63.8821	634568.4	1.3	11.7
1445	543.445	63.8814	634567.3	1.2	11.6
1500	543.422	63.8799	634579.6	-12.3	11.0
1515	543.434	63.8804	634569.6	10.0	11.3
1530	543.402	63.8788	634591.7	-22.1	10.2
1545	543.407	63.8795	634592.4	-.6	10.1
1600	543.438	63.8786	634547.8	44.6	11.8

FREE AIR VOLUME USED (CU. FT.) =2000000.0
REGRESSION LINE
  INTERCEPT (LBM) = 634802.3
  SLOPE (LBM/HR) = -10.7
MAXIMUM ALLOWABLE LEAKAGE RATE = .150
75% OF MAXIMUM ALLOWABLE LEAKAGE RATE = .113
THE UPPER 95% CONFIDENCE LIMIT = .042
THE CALCULATED LEAKAGE RATE = .040

TABLE 8

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 1700 1111 1986
TEST DURATION: 4.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
1700	543.423	63.8742	
1715	543.433	63.8727	.397
1730	543.416	63.8721	.101
1745	543.422	63.8699	.214
1800	543.407	63.8694	.112
1815	543.409	63.8662	.192
1830	543.405	63.8654	.165
1845	543.432	63.8653	.212
1900	543.411	63.8634	.176
1915	543.395	63.8606	.172
1930	543.411	63.8596	.199
1945	543.414	63.8598	.183
2000	543.405	63.8579	.178
2015	543.389	63.8560	.165
2030	543.373	63.8531	.163
2045	543.374	63.8518	.166
2100	543.377	63.8501	.176

MEAN OF THE MEASURED LEAKAGE RATES = .186
VERIFICATION TEST LEAKAGE RATE UPPER LIMIT = .218
VERIFICATION TEST LEAKAGE RATE LOWER LIMIT = .144
THE CALCULATED LEAKAGE RATE = .157

TABLE 9

FARLEY NUCLEAR PLANT UNIT 1 ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TEST: 1700 1111 1986
TEST DURATION: 4.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
1700	543.423	63.8742	634521.2		
1715	543.433	63.8727	634494.9	26.3	105.0
1730	543.416	63.8721	634507.8	-12.9	26.7
1745	543.422	63.8699	634478.8	29.0	56.5
1800	543.407	63.8694	634491.6	-12.7	29.6
1815	543.409	63.8662	634457.6	33.9	50.8
1830	543.405	63.8654	634455.6	2.0	43.7
1845	543.432	63.8653	634423.0	32.6	56.1
1900	543.411	63.8634	634427.9	-4.9	46.6
1915	543.395	63.8606	634418.6	9.2	45.6
1930	543.411	63.8596	634389.5	29.1	52.7
1945	543.414	63.8598	634388.1	1.4	48.4
2000	543.405	63.8579	634379.6	8.5	47.2
2015	543.389	63.8560	634379.6	.1	43.6
2030	543.373	63.8531	634370.4	9.1	43.1
2045	543.374	63.8518	634356.4	14.0	43.9
2100	543.377	63.8501	634335.1	21.4	46.5

FREE AIR VOLUME USED (CU. FT.) =2000000.0
REGRESSION LINE
  INTERCEPT (LBM) = 634516.9
  SLOPE (LBM/HR) = -44.8
VERIFICATION TEST LEAKAGE RATE UPPER LIMIT = .227
VERIFICATION TEST LEAKAGE RATE LOWER LIMIT = .153
THE CALCULATED LEAKAGE RATE = .169

FARLEY NUCLEAR PLANT UNIT 1 ILRT
AIRMASS LBM X 1000

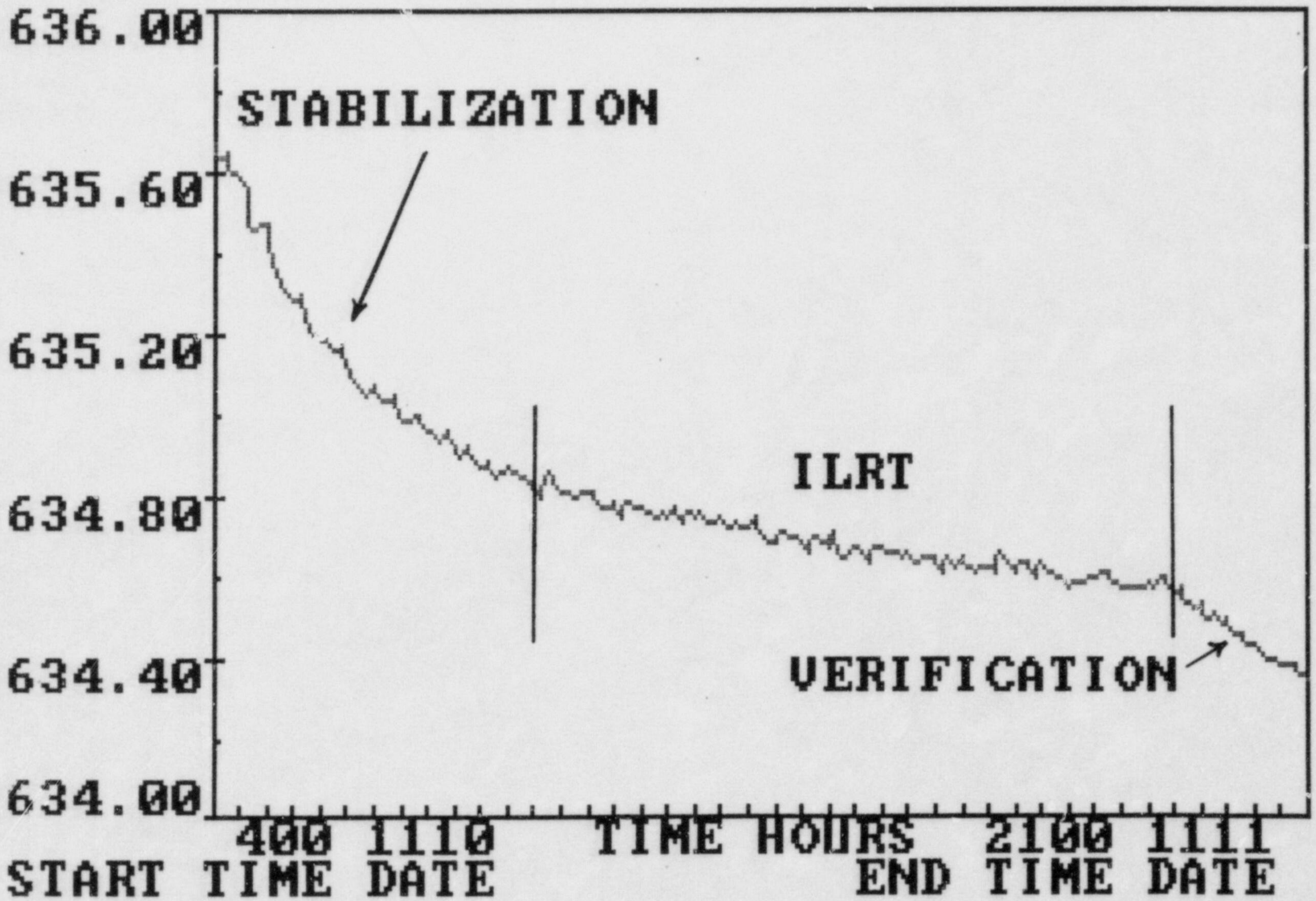

FIGURE 1

FARLEY NUCLEAR PLANT UNIT 1 ILRT
TEMPERATURE DEGREES F (AVERAGE)

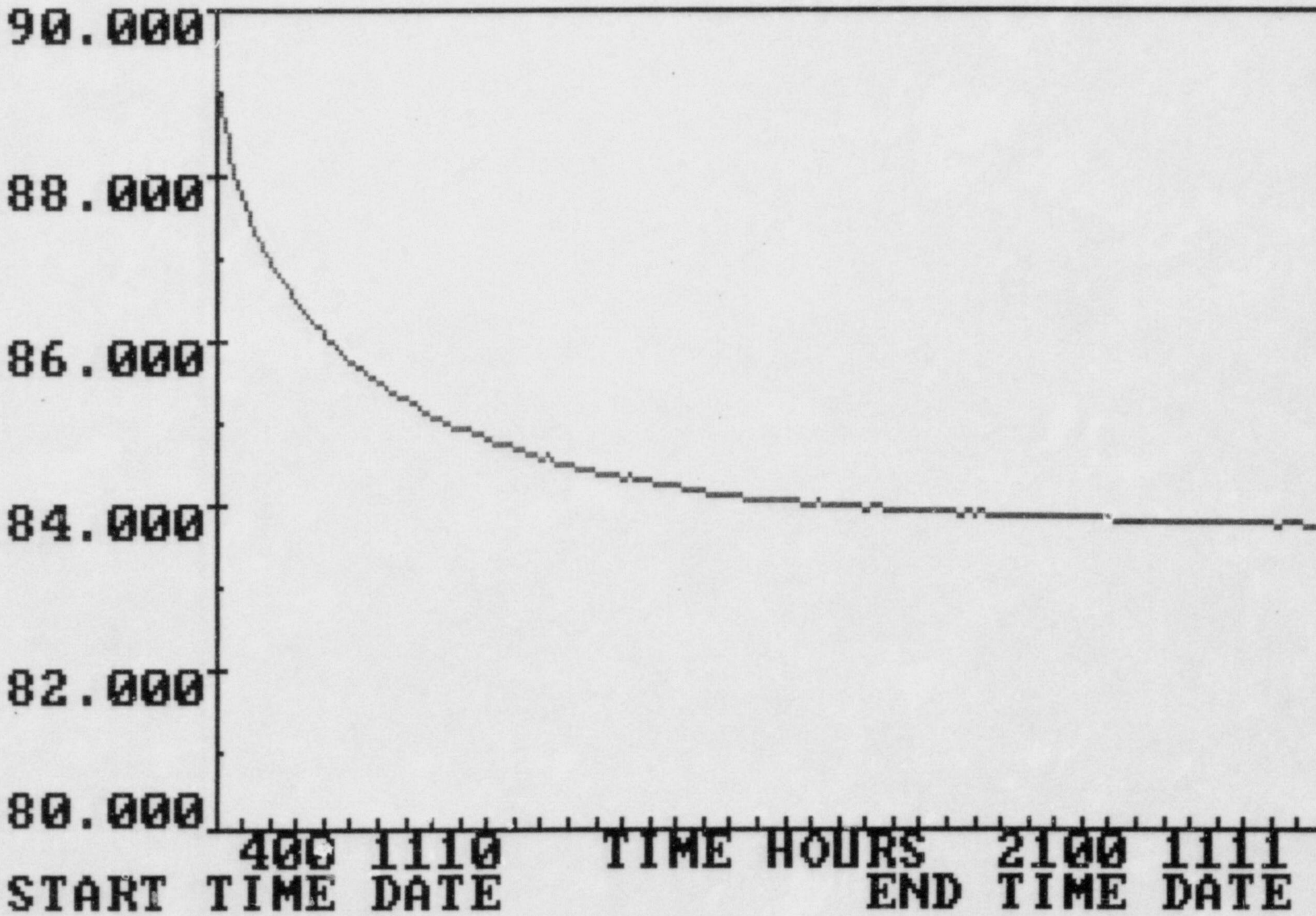

FIGURE 2

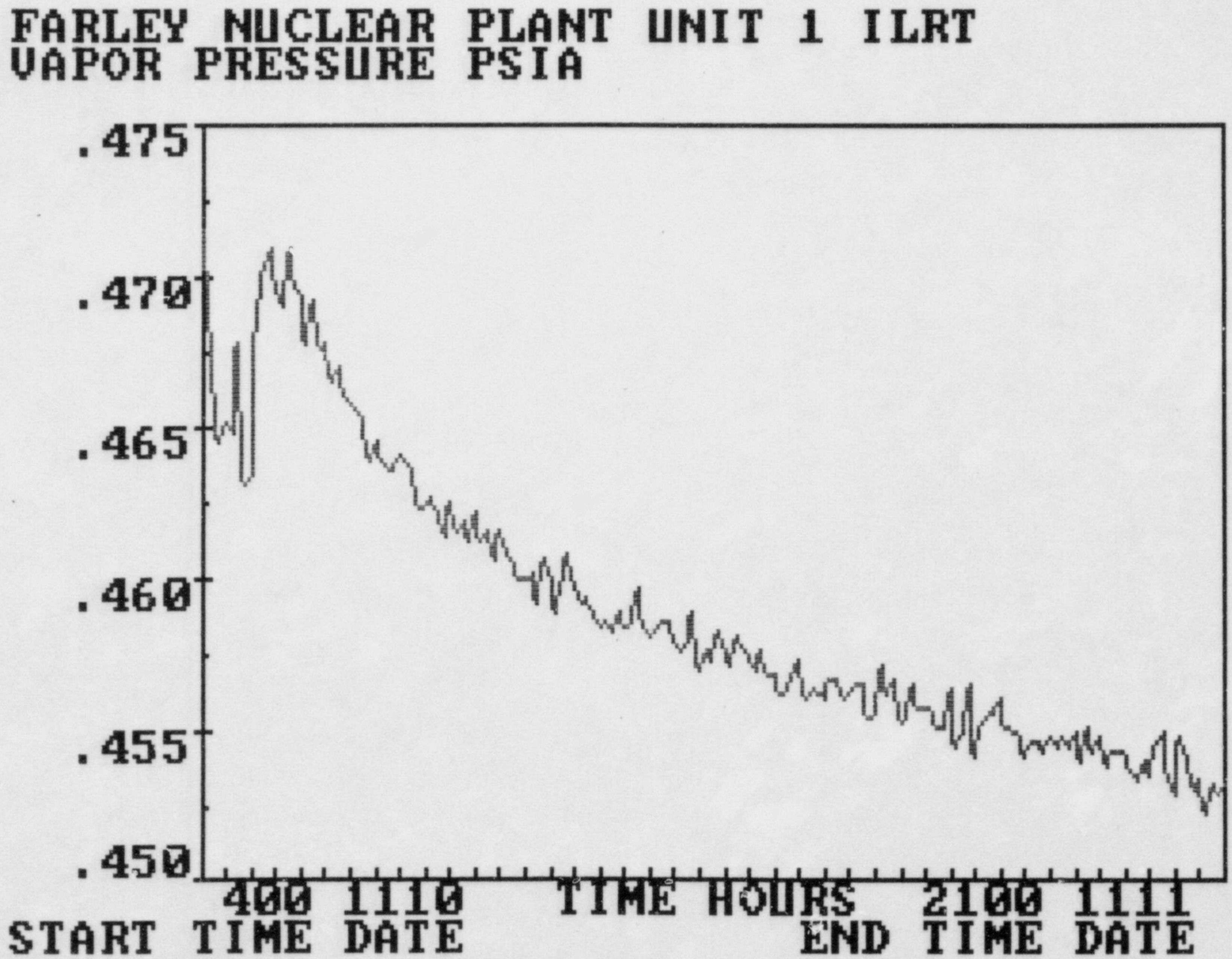
FARLEY NUCLEAR PLANT UNIT 1 ILRT
VAPOR PRESSURE PSIA
.475
.470
.465
.460
.455
.450
400 1110
TIME HOURS
2100 1111
START TIME DATE
END TIME DATE

FIGURE 3

FARLEY NUCLEAR PLANT UNIT 1 ILRT
PRESSURE PSIA (DRY AIR)

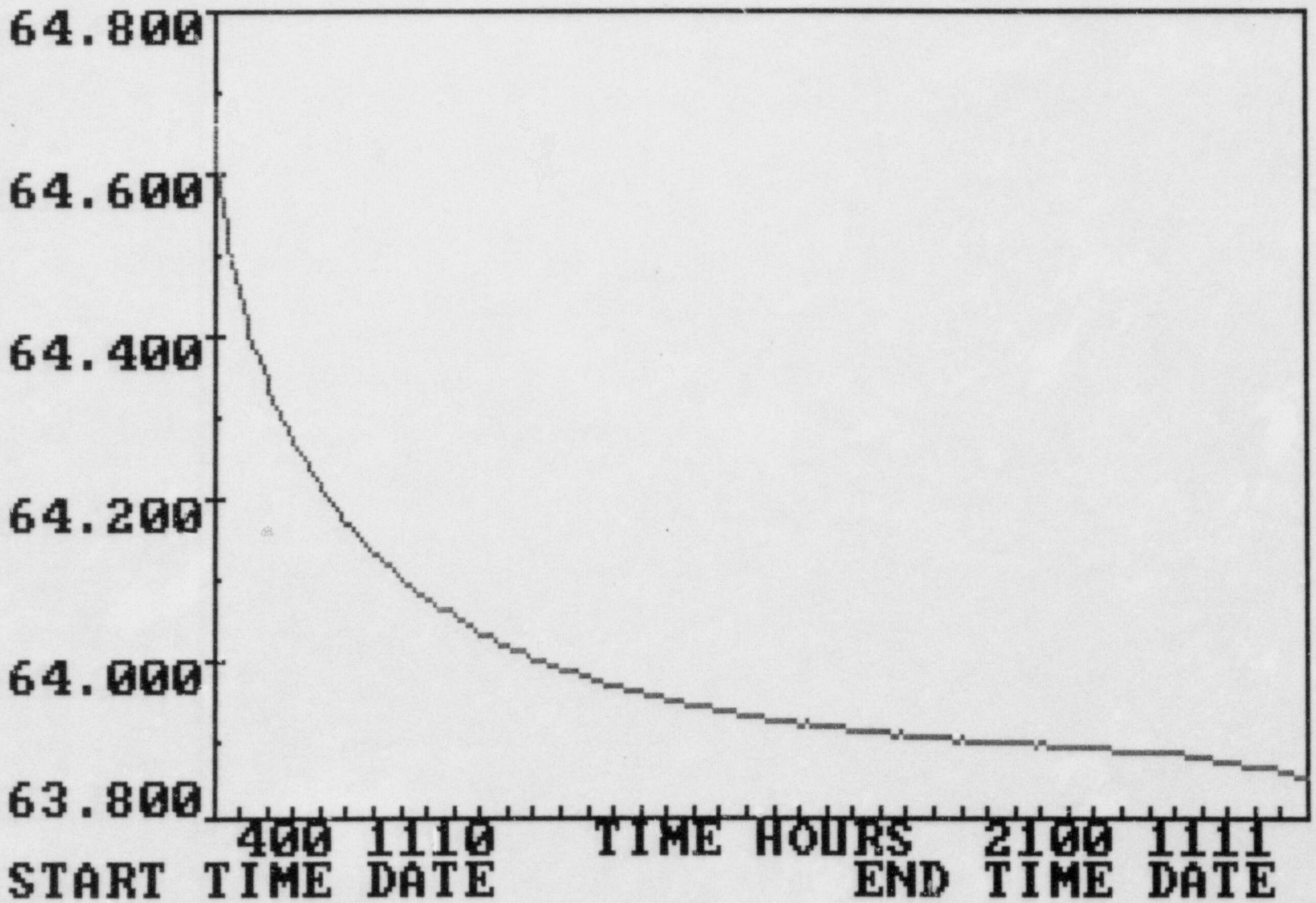

FIGURE 4

FARLEY NUCLEAR PLANT UNIT 1 ILRT
AIRMASS LBM X 1000 AND REGRESSION LINE

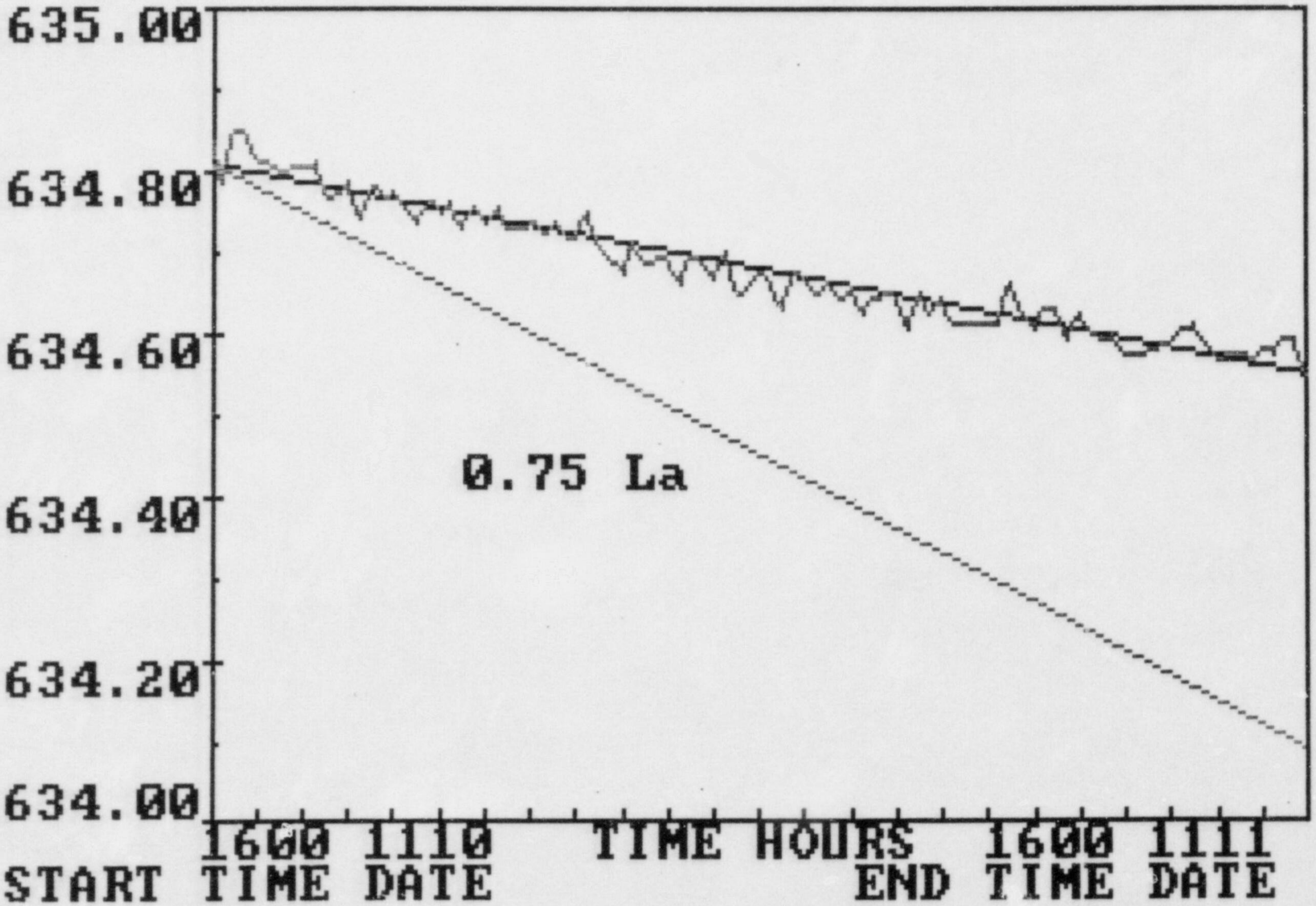

FIGURE 5

FARLEY NUCLEAR PLANT UNIT 1 ILRT
AIRMASS LBM X 1000 AND REGRESSION LINE
VERIFICATION TEST

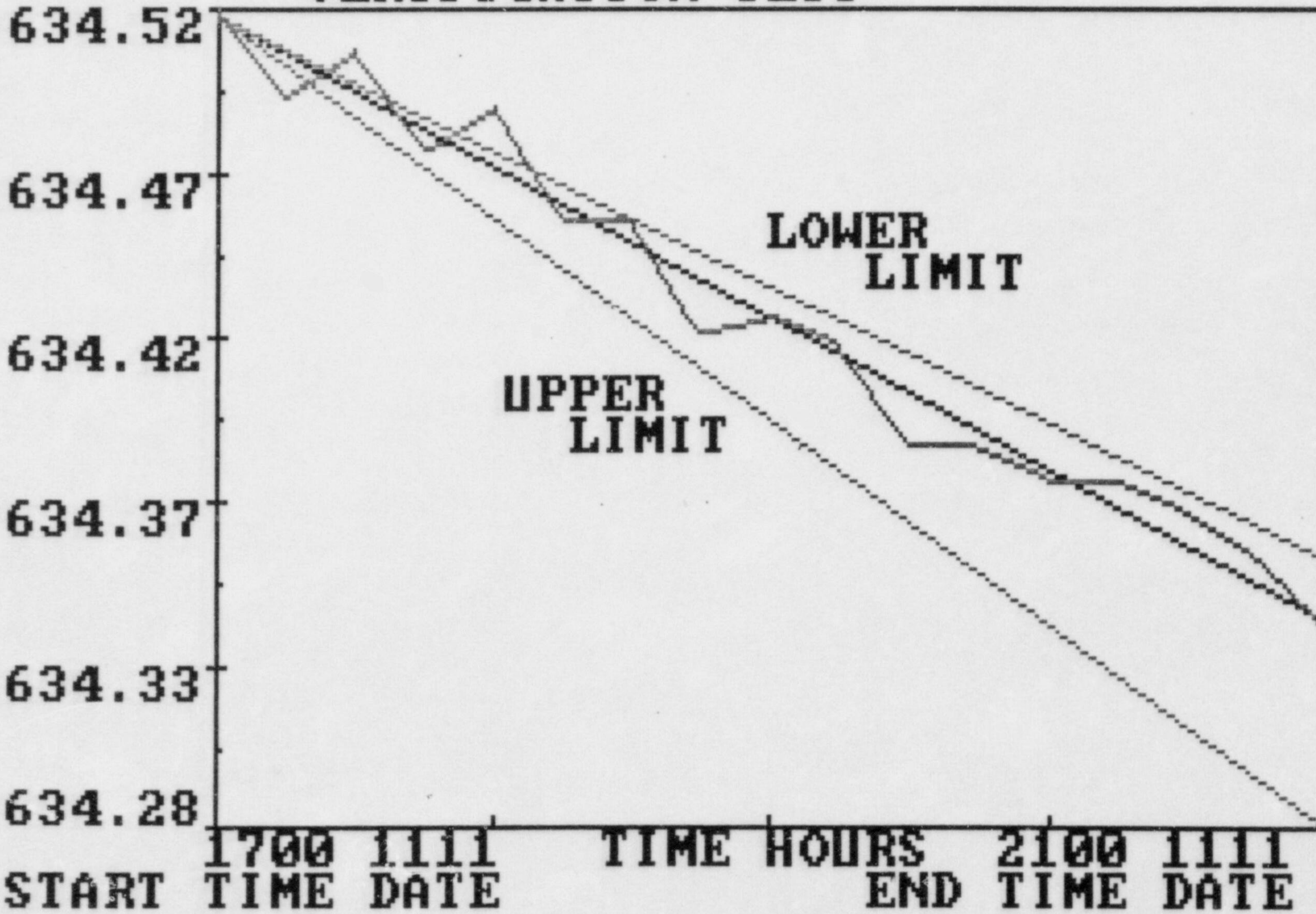

FIGURE 6

7. REFERENCES

1. Joseph M. Farley Nuclear Plant, Unit One, Technical Specification 3/4.6.1.

2. Farley Nuclear Plant, Surveillance Test Procedure FNP-1-STP-117.0, Containment Integrated Leakage Rate Test, Revision 6.

3. Appendix J to 10CFR50, Reactor Containment Leakage Testing for Water Cooled Power Reactors.

4. Farley Nuclear Plant, Units 1 and 2, Final Safety Analysis Report.

5. Bechtel Topical Report BN-TOP-1, Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants, Revision 1.

6. ANSI/ANS - 56.8-1981, Containment System Leakage Testing Requirements.

7. ANSI-N45.4-1972, Leakage Rate Testing of Containment Structures for Nuclear Reactors.

APPENDIX A

Bechtel ILRT Computer Program Summary

APPENDIX A

DESCRIPTION OF BECHTEL ILRT COMPUTER PROGRAM

A. Program and Report Description

1. The Bechtel ILRT computer program is used to determine the integrated leakage rate of a nuclear primary containment structure. The program is used to compute leakage rate based on input values of time, free air volume, containment atmosphere total pressure, drybulb temperature, and dewpoint temperature (water vapor pressure). Leakage rate is computed using the Absolute Method as defined in ANSI/ANS 56.8-1981, "Containment System Leakage Testing Requirements" and BN-TOP-1, Rev 1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants". The program is designed to allow the user to evaluate containment leakage rate test results at the jobsite during containment leakage testing. Current leakage rate values may be obtained at any time during the testing period using one of two computational methods, yielding three different report printouts.

2. In the first printout, the Total Time Report, leakage rate is computed from initial values of free air volume, containment atmosphere drybulb temperature and partial pressure of dry air, the latest values of the same parameters, and elapsed time. These individually computed leakage rates are statistically averaged using linear regression by the method of least squares. The Total Time Method is the computational technique upon which the short duration test criteria of BN-TOP-1, Rev 1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plant," are based.

3. The second printout is the Mass Point Report and is based on the Mass Point Analysis Technique described in ANSI/ANS 56.8-1981, "Containment System Leakage Testing Requirements". The mass of dry air in the containment is computed at each data point (time) using the Equation of State, from current values of containment atmosphere drybulb temperature and partial pressure of dry air. Contained mass is "plotted" versus time and a regression line is fit to the data using the method of least squares. Leakage rate is determined from the statistically derived slope and intercept of the regression line.

4. The third printout, the Trend Report, is a summary of leakage rate values based on Total Time and Mass Point computations presented as a function of number of data points and elapsed time (test duration). The Trend Report provides all leakage rate values required for comparison to the acceptance criteria of BN-TOP-1 for conduct of a short duration test.

5. The program generates a predictor report based on "Suggested Criteria for a Short Duration ILRT", Ted Brown and Louis Estenssoro, Proceedings of the First Workshop on Containment Testing, January 18, 1982. The "predictor" is an estimate of the upper bound on the change in mass point calculated leakage rate which will occur during the next four hours. The estimate is based on the mass point calculated leakage rates and 95% UCLs during the previous four hours.

6. The program is written in a high level language and is designed for use on a micro-computer with direct data input from the data acquisition system. Brief descriptions of program use, formulae used for leakage rate computations, and program logic are provided in the following paragraphs.

B. Explanation of Program

1. The Bechtel ILRT computer program is written, for use by experienced ILRT personnel, to determine containment integrated leakage rates based on the Absolute Method described in ANSI/ANS 56.8-1981 and BN-TOP-1.

2. Information loaded into the program prior to or at the start of the test:

   a. Number of containment atmosphere drybulb temperature sensors, dewpoint temperature (water vapor pressure) sensors and pressure gages to be used in leakage rate computations for the specific test

   b. Volume fractions assigned to each of the above sensors

   c. Calibration data for above sensors

   d. Test title

   e. Maximum allowable leakage rate at test pressure

3. Data received from the data acquisition system during the test, and used to compute leakage rates:

   a. Time and date

   b. Containment atmosphere drybulb temperatures

   c. Containment atmosphere pressure(s)

   d. Containment atmosphere dewpoint temperatures

   e. Containment free air volume.

4. After all data at a given time are received, a Summary of Measured Data report (refer to "Program Logic," Paragraph D, "Data" option command) is printed.

5. If drybulb and dewpoint temperature sensors should fail during the test, the data from the sensor(s) are not used. The volume fractions for the remaining sensors are recomputed and reloaded into the program for use in ensuing leakage rate computations.

C. Leakage Rate Formulae

1. Computations Using the Total Time Method:

a. Measured leakage rate from data:

$$P_1V_1 = W_1RT_1 \qquad (1)$$

$$P_iV_i = W_iRT_i \qquad (2)$$

$$L_i = \frac{2400\ (W_1 - W_i)}{\Delta t_i\ W_1} \qquad (3)$$

Solving for W_1 and W_i and substituting equations (1) and (2) into (3) yields:

$$L_i = \frac{2400}{\Delta t_i}\left(1 - \frac{T_1P_iV_i}{T_iP_1V_1}\right) \qquad (4)$$

where

W_1, W_i = Weight of contained mass of dry air at times t_1 and t_i, respectively, lbm.

T_1, T_i = Containment atmosphere drybulb temperature at times t_1 and t_i, respectively, °R.

P_1, P_i = Partial pressure of the dry air component of the containment atmosphere at times t_1 and t_i, respectively, psia.

V_1, V_i = Containment free air volume at times t_1 and t_i, respectively (constant or variable during the test), ft^3.

t_1, t_i = Time at 1^{st} and i^{th} data points respectively, hr.

Δt_i = Elapsed time from t_1 to t_i, hr.

R = Specific gas constant for air = 53.35 ft.lbf/lbm.°R.

L_i = Measured leakage rate computed during time interval t_1 to t_i, wt.%/day.

To reduce truncation error, the computer program uses the following equivalent formulation:

$$L_i = \frac{-2400}{\Delta t_i}\left(\frac{\Delta W_i}{W_1}\right)$$

where

$$\frac{\Delta W_i}{W_1} = \frac{W_i - W_1}{W_1}$$

$$= \frac{\frac{\Delta P_i}{P_1} + \frac{\Delta V_i}{V_1} + \frac{\Delta P_i \, \Delta V_i}{P_1 V_1} - \frac{\Delta T_i}{T_1}}{1 + \frac{\Delta T_i}{T_1}}$$

$\Delta P_i = P_i - P_1$
$\Delta V_i = V_i - V_1$
$\Delta T_i = T_i - T_1$

b. Calculated leakage rate from regression analysis:

$$\bar{L} = a + b \, \Delta t_N \quad (5)$$

where

$\bar{L}$ = Calculated leakage rate, wt.%/day, as determined from the regression line.

$$a = (\Sigma L_i - b \, \Sigma \Delta t_i)/N \quad (6)$$

$$b = \frac{N(\Sigma L_i \Delta t_i) - (\Sigma L_i)(\Sigma \Delta t_i)}{N(\Sigma \Delta t_i^2) - (\Sigma \Delta t_i)^2} \quad (7)$$

N = Number of data points.

$$\Sigma = \sum_{i=1}^{N}$$

c. 95% upper confidence limit on the calculated leakage rate:

$$UCL = a + b \, \Delta t_N + S_{\bar{L}}$$

where

UCL = 95% upper confidence limit wt.%/day, at elapsed time Δt_N.

For $\Delta t_N < 24$

$$S_{\bar{L}} = t_s \left[\left(\Sigma L_i^2 - a\Sigma L_i - b\Sigma L_i \Delta t_i\right)/(N-2)\right]^{1/2}$$

$$\left[1 + \frac{1}{N} + \left(\Delta t_N - \Delta\bar{t}\right)^2/\left(\Sigma\Delta t_i^2 - (\Sigma\Delta t_i)^2/N\right)\right]^{1/2} \quad (9a)$$

where $t_s = 1.95996 + \frac{2.37226}{N-2} + \frac{2.82250}{(N-2)^2}$;

For $\Delta t_N \geq 24$

$$S_{\bar{L}} = t_s \left[\left(\Sigma L_i^2 - a\Sigma L_i - b\Sigma L_i \Delta t_i\right)/(N-2)\right]^{1/2}$$

$$\left[\frac{1}{N} + \left(\Delta t_i - \Delta\bar{t}\right)^2/\left(\Sigma\Delta t_i^2 - (\Sigma t_i)^2/N\right)\right]^{1/2} \quad (9b)$$

$$\text{where } t_s = \frac{1.6449(N-2)^2 + 3.5283(N-2) + 0.85602}{(N-2)^2 + 1.2209(N-2) - 1.5162}$$

$\bar{L}_i$ = Calculated leakage rate computed using equation (5) at total elapsed time Δt_i, %/day.

$$\Delta\bar{t} = \frac{\Sigma\Delta t_i}{N}$$

2. Computation using the Mass Point Method:

a. Contained mass of dry air from data:

$$W_i = 144 \frac{P_i V_i}{RT_i} \quad (10)$$

where

All symbols as previously defined.

b. Calculated leakage rate from regression analysis, $W = a + b\Delta t$

$$\bar{L} = -2400 \frac{b}{a} \qquad (11)$$

where

$\bar{L}$ = Calculated leakage rate, wt.%/day, as determined from the regression line.

$$a = (\Sigma W_i - b\Sigma\Delta t_i)/N \qquad (12)$$

$$b = \frac{N(\Sigma W_i \Delta t_i) - (\Sigma W_i)(\Sigma \Delta t_i)}{N(\Sigma \Delta t_i^2) - (\Sigma \Delta t_i)^2} \qquad (13)$$

Δt_i = Total elapsed time at time of i^{th} data point, hr.

N = Number of data points.

W_i = Contained mass of dry air at i^{th} data point, lbm, as computed from equation (10).

$$\Sigma = \sum_{i=1}^{N}$$

To reduce truncation error, the computer program uses the following equivalent formulation:

$$a = W_1 \left[1 + (\Sigma \frac{\Delta W_i}{W_1} - \frac{b}{W_1} \Sigma \Delta t_i)/N \right] \qquad (14)$$

$$b = W_i \left[\frac{N (\Sigma \frac{\Delta W_i}{W_1} \Delta t_i) - \Sigma \frac{\Delta W_i}{W_1} \Sigma \Delta t_i}{N(\Sigma \Delta t_i^2) - (\Sigma \Delta t_i)^2} \right] \qquad (15)$$

where $\frac{\Delta W_i}{W_1}$ is as previously defined.

c. 95% upper confidence limit.

$$UCL = \frac{-2400}{a} (b - S_b) \qquad (16)$$

where

UCL = 95% upper confidence limit, wt.%/day.

$$S_b = t_s \frac{SN^{1/2}}{[N \Sigma \Delta t_i^2 - (\Sigma \Delta t_i)^2]^{1/2}} \quad (17)$$

$$\text{where } t_s = \frac{1.6449\ (N-2)^2 + 3.5283\ (N-2) + 0.85602}{(N-2)^2 + 1.2209\ (N-2) - 1.5162}$$

$$S = \left[\frac{\Sigma [W_i - (a + b \Delta t_i)]^2}{N-2} \right]^{1/2}$$

$$= W_1 \left\{ \frac{1}{N-2} \left[\Sigma (\Delta W_i/W_1)^2 - [\Sigma (\Delta W_i/W_1)]^2/N - \frac{[\Sigma (\Delta W_i/W_1) \Delta t_i - \Sigma (\Delta W_i/W_1)(\Sigma \Delta t_i)/N]^2}{\Sigma (\Delta t_i^2) - (\Sigma \Delta t_i)^2/N} \right] \right\}^{1/2} \quad (18)$$

d. Predictor:

$$\text{Predictor} = \frac{2[(UCL-L) + 4\ (|A| + 2\ S_A)]}{100\ La}$$

where

UCL = 95% upper confidence limit of mass point calculated leakage rate at end of test.

L = Mass point calculated leakage rate at end of test.

A = Value of linear regression analysis slope of mass point calculated leakage rate vs. time for last 4 hours of test data.

S_A = Linear regression analysis standard deviation of slope.

La = Allowable leakage rate.

In terms of elapsed time, Δ t and mass point calculated leakage rate Lm_i calculated at the end of i^{th} time interval.

$$A = \frac{1}{M}\left[\sum_{4\ hr} Lm_i - B \sum_{4\ hr} \Delta t_i\right] \qquad (19)$$

$$B = \frac{M \sum_{4\ hr} Lm_i \Delta t_i - \sum_{4\ hr} Lm_i \sum_{4\ hr} \Delta t_i}{M \sum_{4\ hr} \Delta t_i^2 - \sum_{4\ hr} \Delta t_i^{\ 2}} \qquad (20)$$

$$S_A = \sqrt{\frac{\sum_{4\ hr} Lm_i - A \sum_{4hr} Lm_i - B \sum_{4hr} Lm_i \Delta t_i}{[M-2]\ [M \sum_{4\ hr} \Delta t_i - (\sum_{4\ hr} \Delta t_i)^2]}} \qquad (21)$$

Lm_i = mass point calculated leakage rate evaluated using data up to time Δt_i.

4 hr = summation over last 4 hours of test data.

$$\Sigma = \sum_{N-M+1}^{N}$$

M = number of data points for last 4 hours of test.

D. Program Logic

1. The Bechtel ILRT computer program logic flow is controlled by a set of user options. The user options and a brief description of their associated function are presented below.

OPTION COMMAND	FUNCTION
	After starting the program execution, the user either enters the name of the file containing previously entered data or initializes a new data file.
DATA	Enables user to enter raw data. When the system requests values of time, volume, temperature, pressure and vapor pressure, the user enters the appropriate data. After completing the data entry, a summary is printed out. The user then verifies that the data were entered correctly. If errors are detected, the user will then be given the opportunity to correct the errors. After the user verifies that the data were entered correctly, a Corrected Data Summary Report of time, data, average temperature, partial pressure of dry air, and water vapor pressure is printed.
TREND	A Trend Report is printed.
TOTAL	A Total Time Report is printed.
MASS	A Mass Point Report is printed.
TERM	Enables user to sign-off temporarily or permanently. All data is saved on a file for restarting.
CORR	Enables user to correct previously entered data.
LIST	A Summary Data Report is printed.
READ	Enable the computer to receive the next set of data from the data acquisition system directly.
PLOT	Enables user to plot summary data, individual sensor data or air mass versus time.
DELETE	Enables user to delete a data point.
INSERT	Enables user to reinstate a previously deleted data point.
VOLFRA	Enable user to change volume fractions.

OPTION COMMAND	FUNCTION
PRED	A predictor report is printed.
TIME	Enable the user to specify the time interval for a report or plot.
VERF	Enable the user to input imposed leakage rate and calculated ILRT leakage rates at start of verification test.

E. Computer Report and Data Printout

MASS POINT REPORT

The Mass Point Report presents leakage rate data (wt%/day) as determined by the Mass Point Method. The "Calculated Leakage Rate" is the value determined from the regression analysis. The "Containment Air Mass" values are the masses of dry air in the containment (lbm). These air masses, determined from the Equation of State, are used in the regression analysis.

TOTAL TIME REPORT

The Total Time Report presents data leakage rate (wt%/day) as determined by the Total Time Method. The "Calculated Leakage Rate" is the value determined from the regression analysis. The "Measured Leakage Rates" are the leakage rate values determined using Total Time calculations. These values of leakage rate are used in the regression analysis.

TREND REPORT

The Trend Report presents leakage rates as determined by the Mass Point and Total Time methods in percent of the initial contained mass of dry air per day (wt%/day), versus elapsed time (hours) and number of data points.

PREDICTOR REPORT

The predictor reports presents a predicted upper bound on the change in calculated mass point leakage rate over the next four hours.

SUMMARY DATA REPORT

The Summary Data report presents the actual data used to calculate leakage rates by the various methods described in the Computer Program" section of this report. The seven columns are TIME, DATE, TEMP, PRESSURE, VPRS, VOLUME, and AIRMASS and contain data defined as follows:

1. TIME: Time in 24-hour notation (hours and minutes).

2. DATE: Calendar date (month and day).

3. TEMP: Containment weighted-average drybulb temperature in absolute units, degrees Rankine (°R).

4. PRESSURE: Partial pressure of the dry air component of the containment atmosphere in absolute units (psia).

5. VPRS: Partial pressure of water vapor of the containment atmosphere in absolute units (psia).

6. VOLUME: Containment free air volume (cu. ft.).

7. AIRMASS: Calculated dry air mass (lbm).

F. Summary of Measured Data and Summary of Corrected Data

The Summary of Measured Data presents the individual containment atmosphere drybulb temperatures, dewpoint temperatures, absolute total pressure and free air volume measured at the time and date.

1. TEMP 1 through TEMP N are the drybulb temperatures, where N = No. of RTD's. The values in the right-hand column are temperatures (°F), multiplied by 100, as read from the data acquisition system (DAS). The values in the left-hand column are the corrected temperatures expressed in absolute units (°R).

2. PRES 1 through PRES N are the total pressures, absolute, were N = No. of pressure sensors. The right-hand value, in parentheses, is a number of counts as read from the DAS. This count value is converted to a value in psia by the computer via the instrument's calibration table, counts versus psia. The left-hand column is the absolute total pressure, psia.

3. VPRS 1 through VPRS N are the dewpoint temperatures (water vapor pressures), where N = No. of dewpoint sensors. The values in the right-hand column are temperatures (°F), multiplied by 100 as read from the DAS. The values in the left-hand column are the water vapor pressures (psia) from the steam tables for saturated steam corresponding to the dewpoint (saturation) temperatures in the center column.

The Summary of Corrected Data presented corrected temperature and pressure values and calculated air mass determined as follows:

1. TEMPERATURE (°R) is the volume weighted average containment atmosphere drybulb temperature derived from TEMP 1 through TEMP N.

2. CORRECTED PRESSURE (psia) is the partial pressure of the dry air component of the containment atmosphere, absolute. The volume weighted average containment atmosphere water vapor pressure is subtracted from the volume weighted average total pressure, yielding the partial pressure of the dry air.

3. VAPOR PRESSURE (psia) is the volume weighted average containment atmosphere water vapor pressure, absolute, derived from VPRS 1 through VPRS N.

4. VOLUME (cu. ft.) is the containment free air volume.

5. CONTAINMENT AIR MASS (lbm) is the calculated mass of dry air in the containment. The mass of dry air is calculated using the containment free air volume and the above TEMPERATURE and CORRECTED PRESSURE of the dry air.

APPENDIX B

LOCAL LEAKAGE TEST DATA

LOCAL LEAK RATE TEST

The following data is a summary of the leakage for Unit 1 6th Refueling Outage.

AS FOUND (Min.)

Electrical Penetration Total	47.343 SCCM
Type B Test (Less Elec. Pene.) Total (Hatches, etc.)	238.500 SCCM
Typc C "As Found" Min. Path Leakage per Penetration	2556.936 SCCM
TOTAL	2842.779 SCCM

"As Found" Min. $\frac{2842.779}{150975} \times 100 = 1.88\%$ of allowable leakage

AS LEFT (Min.)

Electrical Penetration Total	9.176 SCCM
Type B Test (Less Elec. Pene.) Total (Hatches, etc.)	238.500 SCCM
Type C Min. Path Leakage	1963.773 SCCM
TOTAL	2211.449 SCCM

"As Left" Min. $\frac{2211.449}{150975} \times 100 = 1.46\%$ of allowable leakage

AS LEFT (Max.)

Electrical Penetration Total	9.176 SCCM
Type B Test (Less Elec. Pene.) Total (Hatches, etc.)	238.500 SCCM
Type C Max. Path Leakage	3531.680 SCCM
TOTAL	3779.356 SCCM

"As Left" Max. $\frac{3779.356}{150975} \times 100 = 2.50\%$ of allowable leakage

UNIT 1
TYPE B TEST SUMMARY 6th REFUELING

PENE. NO.	TPNS NO.	DATE	AS FOUND LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)
EA01	Q1T52A003-A	04/07/85	0.14	04/07/85	0.14
EA02	Q1T52A004-A	04/07/85	0.54	04/07/85	0.54
EA03	Q1T52B014-A	04/07/85	0.068	04/07/85	0.068
EA05	Q1T52B001-A	04/07/85	1.2	04/09/85	0.14
EA06	Q1T52B005-A	04/07/85	1.088	04/07/85	1.088
EA09	Q1T52B002-A	04/08/85	0.17	04/08/85	0.17
EA10	Q1T52A001-A	04/08/85	0	04/08/85	0
EA11	Q1T52A002-A	04/08/85	0.54	04/08/85	0.54
EB01	Q1T52B019-A	04/07/85	0.068	04/07/85	0.068
EB05	Q1T52B007-A	04/07/85	0	04/07/85	0
EB09	Q1T52B006-A	04/08/85	0	04/08/85	0
EC01	Q1T52B013-1	04/07/85	0.14	04/07/85	0.14
EC03	Q1T52B012-1	04/07/85	0	04/07/85	0
EC07	Q1T52B009-A	04/08/85	0.09	04/08/85	0.09
EC08	Q1T52B010-4	04/08/85	0.209	04/08/85	0.209
EC10	Q1T52B008-4	04/08/85	0.209	04/08/85	0.209
WA02	Q1T52B015-B	04/07/85	0	04/07/85	0
WA03	Q1T52B023-B	04/06/85	0.136	04/06/85	0.136
WA05	Q1T52B046-B	04/07/85	0.204	04/07/85	0.204
WA06	Q1T52B047-B	04/07/85	1.2	04/09/85	0.136
WA07	Q1T52A005-B	04/07/85	0.952	04/07/85	0.952
WA08	Q1T52A006-B	04/06/85	0.272	04/06/85	0.272
WA09	Q1T52B018-B	04/06/85	0.068	04/06/85	0.068
WA10	Q1T52B016-B	04/07/85	0.578	04/07/85	0.578

UNIT 1
TYPE B TEST SUMMARY 6th REFUELING

PENE. NO.	TPNS NO.	DATE	AS FOUND LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)
WA11	Q1T52B017-B	04/06/85	17.48	05/02/85	0.104
WA21	Q1T52B032-N	04/06/85	0	04/06/85	0
WA22	Q1T52B033-N	04/06/85	0.544	04/06/85	0.544
WA23	Q1T52B034-N	04/06/85	0.068	04/06/85	0.068
WA24	Q1T52B035-N	04/06/85	17.07	04/25/85	0.068
WB03	Q1T52B020-B	04/06/85	0	04/06/85	0
WB07	Q1T52B022-B	04/06/85	0.272	05/03/85	0
WB09	Q1T52B025-B	04/06/85	0.748	04/13/85	0.204
WB11	Q1T52B038-3	04/06/85	0.408	05/01/85	0.035
WB21	Q1T52B037-N	04/06/85	0.238	04/06/85	0.238
WB24	Q1T52B039-N	04/06/85	0	04/06/85	0
WC01	Q1T52B026-3	04/07/85	0.068	04/07/85	0.068
WC03	Q1T52B024-3	04/07/85	0.748	04/07/85	0.748
WC05	Q1T52B028-3	04/08/85	0.136	04/08/85	0.136
WC07	Q1T52B030-2	04/06/85	0.068	04/24/85	0
WC08	Q1T52B011-B	04/08/85	0	04/08/85	0
WC09	Q1T52B042-2	04/06/85	0.238	04/06/85	0.238
WC11	Q1T52B031-2	04/06/85	0.272	04/06/85	0.272
WC21	Q1T52B040-N	04/06/85	0.408	04/06/85	0.408
WC23	Q1T52B041-N	04/06/85	0.476	04/12/85	0.068
WC02	Q1T52B053-B	04/07/85	0.034	04/07/85	0.034
EB10	Q1T52B052-4	04/08/85	0.195	04/08/85	0.195

UNIT 1
TYPE B TEST SUMMARY FOR 6TH REFUELING

PENE. NO.	DESCRIPTION	DATE	AS FOUND LEAKAGE RATE (SCCM)	DATE	AS LEFT LEAKAGE RATE (SCCM)
14	Fuel Transfer Tube - Flange Double "O" Ring	04/27/85	7.6	04/27/85	7.6
14	Fuel Transfer Tube - Bellows	04/11/85	46.4	04/11/85	46.4
84	Equipment Hatch - Between O Rings	05/14/85	3.1	05/14/85	3.1
86	Personnel Lock Outer Door - Between O Rings	05/17/85	0	05/17/85	0
86	Personnel Lock Volume Between Doors	05/14/85	2.8	05/14/85	2.8
87	Auxiliary Access Lock Outer Door - Between O Rings		0		0
87	Auxiliary Access Lock Volume Between Doors	05/06/85	178.6	05/06/85	178.6

UNIT 1 TYPE C TEST SUMMARY FOR 6th REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	AS LEFT PER PENE. MAX.
10	Q1E11V025A	04/22/85	54.0*	27.0	04/22/85	54.0*	27.0	54.0
	Q1E11V026A	04/22/85	54.0*		04/22/85	54.0*		
11	Q1E11V025B	04/14/85	5.4*	2.7	04/14/85	5.4*	2.7	5.4
	Q1E11V026B	04/14/85	5.4*		04/14/85	5.4*		
12	Q1P13V282	04/17/85	43.8#	43.8	04/30/85	43.8*	21.9	43.8
	Q1P13V281	04/17/85	43.8#		04/30/85	43.8*		
	Q1P13V301	04/17/85	43.8#		04/30/85	43.8*		
	Q1P13V302	04/17/85	5592#		04/30/85	43.8*		
13	Q1P13V283	04/17/85	386#	386.0	04/18/85	386*	193.0	386.0
	Q1P13V284	04/17/85	386#		04/18/85	386*		
	Q1P13V304	04/17/85	Off Scale#		04/18/85	386*		
	Q1P13V303	04/17/85	386#		04/18/85	386*		
16	Q1E11V001A	04/22/85	765.0	765.0	04/22/85	765.0	765.0	765.0
18	Q1E11V001B	04/16/85	1.8	1.8	04/16/85	1.8	1.8	1.8
23	Q1E21V253A	04/11/85	105*	16.2	04/11/85	105*	17.3	105.0
	Q1E21V253B	04/11/85	105*		04/11/85	105*		
	Q1E21V253C	04/11/85	105*		04/11/85	105*		
	Q1E21V254	04/11/85	16.2		05/22/85	17.3		
24	Q1E21V257	04/22/85	1.4	1.4	04/22/85	1.4	1.4	18.0
	Q1E21V258	04/22/85	18.0		04/22/85	18.0		
	Q1E21V119	04/22/85	14.0		04/22/85	14.0		
25	Q1E21V115B	04/12/85	11.9	11.9	04/12/85	11.9	11.9	11.9
26	Q1E21V115C	04/12/85	2.7	2.7	04/12/85	2.7	2.7	2.7

*Values represent total leakage from group sets of valves as physically tested.

#Valves were tested in group sets. After one valve was worked the "As Found" Minimum Path Leakage was determined.

UNIT 1 TYPE C TEST SUMMARY FOR 6th REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	MAX.
27	Q1E21V115A	04/12/85	14.1	14.1	04/12/85	14.1	14.1	14.1
28	Q1E21V213	04/23/85	4.6*	3.2	04/23/85	4.6*	3.2	4.6
	Q1E21V249A	04/23/85	4.6*		04/23/85	4.6*		
	Q1E21V249B	04/23/85	3.2		04/23/85	3.2		
29	Q1E21V049	04/12/85	2.4	2.4	04/12/85	2.4	2.4	3.0
	Q1E21V050	04/08/85	3.0		04/08/85	3.0		
30	Q1B13V040	04/09/85	14.1	14.1	04/26/85	11.3	11.3	22.3
	Q1B13V038	04/09/85	22.3		04/09/85	22.3		
31	Q1G21V005	04/19/85	62.0	1.5	04/19/85	62.0	1.5	376.0
	Q1G21V006	04/19/85	1.5		04/19/85	1.5		
	Q1G21V064	04/19/85	1515.0		04/25/85	376.0		
32	Q1P16V081	04/09/85	76.3	20.6	04/09/85	76.3	20.6	76.3
	Q1P16V072	04/09/85	20.6		04/09/85	20.6		
33	Q1G21HV3380	04/25/85	2.2	2.2	04/25/85	2.2	2.2	2.6
	Q1G21V204	04/25/85	2.6		04/25/85	2.6		
42	Q1P17V083	04/16/85	48.0	1.4	04/16/85	48.0	1.4	48.0
	Q1P17V082	04/16/85	1.4		04/16/85	1.4		
43	Q1P17HV3045	04/09/85	15.3	13.3	04/09/85	15.3	13.3	15.3
	Q1P17HV3184	04/09/85	13.3		04/09/85	13.3		
44	Q1P17V097	04/09/85	46.0	31.6	04/09/85	46.0	31.6	46.0
	Q1P17V099	04/09/85	31.6		04/09/85	31.6		
45	Q1P17HV3095	04/16/85	36.1	30.1	04/16/85	36.1	30.1	36.1
	Q1P17V159	04/16/85	30.1		04/16/85	30.1		
46	Q1P17HV3443	04/09/85	16.8	11.7	04/09/85	16.8	11.7	16.8
	Q1P17HV3067	04/09/85	11.7		04/09/85	11.7		

UNIT 1 TYPE C TEST SUMMARY FOR 6th REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	AS LEFT PER PENE. MAX.
47	Q1P18V001	04/22/85	146.0	90.0	04/22/85	146.0	90.0	146.0
	Q1P18V002	04/22/85	90.0		04/22/85	90.0		
48	Q1P19HV3611	04/17/85	52.0	52.0	04/17/85	52.0	52.0	101.0
	Q1P19V002	04/17/85	101.0		04/17/85	101.0		
49	Q1E21V052	04/08/85	3.8	1.9	04/08/85	3.8	1.9	3.8
	Q1E21V091	04/08/85	1.9		04/08/85	1.9		
50	Q1P15HV3766	04/10/85	2.7	2.1	04/10/85	2.7	2.1	2.7
	Q1P15HV3334	04/10/85	2.1		04/10/85	2.1		
54	Q1E14V002	04/10/85	5.4	3.4	04/10/85	5.4	3.4	5.4
	Q1E14HV3658	04/10/85	3.4		04/10/85	3.4		
55	Q1E14HV3657	04/10/85	2.97	2.97	04/10/85	2.97	1.9	2.97
	Q1E14V001	04/10/85	406.0		04/13/85	1.9		
56	Q1P15HV3104	04/18/85	22.2	18.4	04/18/85	22.2	18.4	22.2
	Q1P15HV3331	04/18/85	18.4		04/18/85	18.4		
57	Q1P15HV3103	04/18/85	19.8	19.8	04/18/85	19.8	6.4	19.8
	Q1P15HV3332	04/18/85	44.7		05/14/85	6.4		
58	Q1P15HV3765	04/10/85	5.2	5.2	04/10/85	5.2	5.2	5.6
	Q1P15HV3333	04/10/85	5.6		04/10/85	5.6		
59	Q1E11V039B	04/29/85	11.3*	2.9	04/29/85	11.3*	2.9	11.3
	Q1E11V039A	04/29/85	11.3*		04/29/85	11.3*		
	Q1E21V263A	04/29/85	11.3*		04/29/85	11.3*		
	Q1E21V263B	04/29/85	11.3*		04/29/85	11.3*		
	Q1B13V054	04/29/85	2.9		04/29/85	2.9		
	Q1E11V040	04/29/85	11.3*		04/29/85	11.3*		

*Values represent total leakage from group sets of valves as physically tested.

UNIT 1 TYPE C TEST SUMMARY FOR 6th REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	AS LEFT PER PENE. MAX.
60	Q1P16V075	04/12/85	3.8	3.8	04/12/85	3.8	3.8	5.0
	Q1P16V071	04/11/85	5.0		04/11/85	5.0		
61A	Q1E23V022C	04/07/85	165*	82.5	04/13/85	51.5*	25.75	51.5
	Q1E23V022D	04/07/85	165*		04/13/85	51.5*		
	Q1E23V023B	04/07/85	165*		04/13/85	51.5*		
61B	Q1E23V024B	04/12/85	1.6*	0.8	04/12/85	1.6	1.6	2.0
	Q1E23V025B	04/12/85	1.6*		05/16/85	2.0		
62	Q1G21V082	04/12/85	3.6	2.7	04/12/85	3.6	2.7	3.6
	Q1G21V001	04/12/85	2.7		04/12/85	2.7		
63	Q1E21V058	04/08/85	27.2	21.1	04/08/85	27.2	21.1	27.2
	Q1E21V059	04/08/85	21.1		04/08/85	21.1		
64A	Q1B13V037	04/20/85	3.7*	1.85	04/26/85	6.9*	3.45	6.9
	Q1B13V039	04/20/85	3.7*		04/26/85	6.9*		
64B	Q1B13V026A	04/08/85	4.7	3.1	04/08/85	4.7	3.1	4.7
	Q1B13V026B	04/08/85	3.1		04/08/85	3.1		
66	Q1E23V025A	04/07/85	2.7*	1.35	04/07/85	2.7*	1.35	2.7
	Q1E23V024A	04/07/85	2.7*		04/07/85	2.7*		
67	Q1E23V022A	04/07/85	3.2*	1.6	04/07/85	3.2*	1.6	3.2
	Q1E23V022B	04/07/85	3.2*		04/07/85	3.2*		
	Q1E23V023A	04/07/85	3.2*		04/07/85	3.2*		
70	Q1E14V004	04/08/85	4.8	4.8	04/08/85	4.8	4.8	98.0
	Q1E14V003	04/07/85	98.0		04/07/85	98.0		
71	Q1P23V002A	05/12/85	47.7	47.7	05/12/85	47.7	47.7	47.7

*Values represent total leakage from group sets of valves as physically tested.

UNIT 1 TYPE C TEST SUMMARY FOR 6th REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	AS LEFT PER PENE. MAX.
72	Q1P23V002B	05/12/85	60.19	60.19	05/12/85	60.19	60.19	60.19
78	Q1G21HV3377	04/26/85	2.0	0.083	04/26/85	2.0	0.083	2.0
	Q1G21V291	04/26/85	0.083*		04/26/85	0.083*		
	Q1G21HV3376	04/26/85	0.083*		04/26/85	0.083*		
82	Q1P11HV3659	04/17/85	3.72	0.8	04/17/85	3.72	0.8	3.72
	Q1P11V002	04/17/85	0.8		04/17/85	0.8		
93	Q1E13V003A	04/15/85	753.1*	376.55	04/15/85	753.1*	376.55	753.1
	Q1E13V004A	04/15/85	753.1*		04/15/85	753.1*		
94	Q1E13V003B	04/15/85	50.3*	25.15	04/15/85	50.3*	25.15	50.3
	Q1E13V004B	04/15/85	50.3*		04/15/85	50.3*		
95	Q1G31V012	04/11/85	5.6	5.6	04/11/85	5.6	5.6	16.8
	Q1G31V013	04/11/85	16.8		04/11/85	16.8		
97B	Q1P19V004	04/12/85	5.9	5.9	04/12/85	5.9	5.9	17.1
	Q1P19HV2228	04/12/85	17.1		04/12/85	17.1		
103	Q1E23V003	04/07/85	0.5*	0.25	04/07/85	0.5*	0.25	0.5
	Q1E23V002	04/07/85	0.5*		04/07/85	0.5*		

*Values represent total leakage from group sets of valves as physically tested.

LOCAL LEAK RATE TEST

The following data is a summary of the leakage for Unit 1 7th Refueling Outage.

"As Found" (Min)

Electrical Penetration Total	18.624
Type B test (less Elec. Pene.) Total (Hatches, etc.)	991.000
Type C "As Found" Min. Path Leakage	31,313.170
Total	32,322.794

Max. Allowable Leakage (.6 LA) = 150,975 SCCM

"As Found" Min. $\frac{32,322.794}{150,975} \times 100 =$ 21.41% of allowable leakage

"As Left" (Min)

Electrical Penetration Total	18.909
Type B Test (less Elec. Pene.) Total (Hatches, etc.)	1382.700
Type C Min. Path Leakage	2205.460
Total	3,607.069

"As Left" Min. $\frac{3607.069}{150,975} \times 100 =$ 2.39% of Allowable Leakage

"As Left" (Max)

Electrical Penetration Total	18.909
Type B Test (Less Elec. Pene.) Total (Hatches, etc.)	1382.700
Type C Max. Path Leakage	4899.900
Total	6,301.509

"As Left" Max. $\frac{6301.509}{150,975} \times 100 =$ 4.17% of Allowable Leakage

UNIT 1
TYPE B TEST SUMMARY - 7th REFUELING

PENE NO.	TPNS NO.	DATE	AS FOUND LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)
EA01	Q1T52A003-A	10/06/86	1.290	10/29/86	0.374
EA02	Q1T52A004-A	10/06/86	0.612	10/29/86	0.102
EA03	Q1T52B014-A	10/05/86	0.204	10/05/86	0.204
EA05	Q1T52B001-A	10/05/86	0.204	10/05/86	0.204
EA06	Q1T52B005-A	10/06/86	0.810	10/29/86	0.408
EA09	Q1T52B002-A	10/06/86	0.204	10/06/86	0.204
EA10	Q1T52A001-A	10/06/86	0.272	10/06/86	0.272
EA11	Q1T52A002-A	10/06/86	0.714	10/29/86	0.075
EB01	Q1T52B019-A	10/06/86	0.442	10/31/86	0.5
EB05	Q1T52B007-A	10/06/86	0.102	10/06/86	0.102
EB09	Q1T52B006-A	10/06/86	0.075	11/03/86	0.4
EC01	Q1T52B013-1	10/06/86	0.140	10/31/86	0.1
EC03	Q1T52B012-1	10/05/86	0.135	11/03/86	0.2
EC07	Q1T52B009-A	10/06/86	0.071	10/06/86	0.071
EC08	Q1T52B010-4	10/05/86	0.578	11/03/86	0.4
EC10	Q1T52B008-4	10/06/86	0.238	10/06/86	0.238
WA02	Q1T52B015-B	10/06/86	0.510	10/06/86	0.510
WA03	Q1T52B023-B	10/06/86	0.102	10/06/86	0.102
WA05	Q1T52B046-B	10/06/86	0.340	10/06/86	0.340
WA06	Q1T52B047-B	10/05/86	0.238	10/05/86	0.238
WA07	Q1T52A005-B	10/05/86	0.442	10/05/86	0.442
WA08	Q1T52A006-B	10/05/86	0.340	10/05/86	0.340
WA09	Q1T52B018-B	10/05/86	0.102	10/05/86	0.102
WA10	Q1T52B016-B	10/05/86	0.340	10/05/86	0.340

UNIT 1
TYPE B TEST SUMMARY - 7th REFUELING

PENE. NO.	TPNS NO.	DATE	AS FOUND LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)
WA11	Q1T52B017-B	10/06/86	0.17	10/06/86	0.17
WA21	Q1T52B032-N	10/04/86	0.102	11/03/86	0.6
WA22	Q1T52B033-N	10/04/86	0.442	11/03/86	0.4
WA23	Q1T52B034-N	10/04/86	0.17	10/31/86	0.9
WA24	Q1T52B035-N	10/04/86	0.510	11/03/86	0.9
WB03	Q1T52B020-B	10/05/86	0.442	10/05/86	0.442
WB07	Q1T52B022-B	10/06/86	2.041	10/31/86	0.9
WB09	Q1T52B025-B	10/05/86	0.102	10/05/86	0.102
WB11	Q1T52B038-B	10/04/86	0.135	11/03/86	0.7
WB21	Q1T52B037-N	10/04/86	0.204	10/31/86	0.7
WB24	Q1T52B039-N	10/04/86	0.17	10/31/86	0.9
WC01	Q1T52B026-3	10/05/86	0.544	10/05/86	0.544
WC03	Q1T52B024-3	10/05/86	0.510	10/05/86	0.510
WC05	Q1T52B028-3	10/06/86	0.408	10/31/86	0.8
WC07	Q1T52B030-2	10/05/86	0.476	10/05/86	0.476
WC08	Q1T52B011-B	10/05/86	0.035	10/05/86	0.035
WC09	Q1T52B042-2	10/05/86	0.075	10/05/86	0.075
WC11	Q1T52B031-2	10/04/86	0.17	10/31/86	0.6
WC21	Q1T52B040-N	10/05/86	0.476	10/31/86	0.7
WC23	Q1T52B041-N	10/04/86	0.34	10/31/86	1.0
WC02	Q1T52B053-B	10/06/86	0	10/11/86	0
EB10	Q1T52B052-4	10/06/86	1.98	10/10/86	0.57
EB02	Q1T52B055	10/16/86	0.15	10/16/86	0.15
EC05	Q1T52B056	10/17/86	0	10/17/86	0
EB04	Q1T52B054	10/17/86	0.467	10/17/86	0.467

UNIT 1
TYPE B TEST SUMMARY FOR 7TH REFUELING

PENE NO.	DESCRIPTION	DATE	AS FOUND LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)
14	Fuel Transfer Tube - Flange Double O Ring	11- 7-86	7.0	11-07-86	7.0
14	Fuel Transfer Tube - Bellows	10-21-86	43.7	10-21-86	43.7
84	Equip Hatch Between O Rings	11-09-86	5.3	11-28-86	397.0
86	Personnel Lock Outer Door - Between O Rings	11-09-86	0	11-09-86	0
86	Personnel Lock Volume Between Doors	11-05-86	700.0	11-05-86	700.0
87	Aux Access Lock Outer Door - Between O Rings	11-09-86	0	11-09-86	0
87	Aux Access Lock Outer Door - Between O Rings	11-06-86	235.0	11-06-86	235.0
TOTAL					

UNIT 1 - TYPE C TEST SUMMARY FOR 7TH REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	AS LEFT PER PENE. MAX.
10	Q1E11V025B	10-13-86	72.0*	36.0	10-17-86	698.0 *	349.0	698.0
	Q1E11V026B	10-13-86	72.0*		10-17-86	698.0 *		
11	Q1E11V025A	10-17-86	360.4*	180.2	10-26-86	3.97*	1.99	3.97
	Q1E11V026A	10-17-86	360.4*		10-26-86	3.97*		
12	Q1P13V282	10- 5-86	21.3*	10.65	11-14-86	0.6 *	0.3	0.6
	Q1P13V281	10- 5-86	21.3*		11-14-86	0.6 *		
	Q1P13V301	10- 5-86	21.3*		11-14-86	0.6 *		
	Q1P13V302	10- 5-86	21.3*		11-14-86	0.6 *		
13	Q1P13V283	10- 5-86	333.0 *	166.5	11-14-86	0.9 *	0.45	0.9
	Q1P13V284	10- 5-86	333.0 *		11-14-86	0.9 *		
	Q1P13V304	10- 5-86	333.0 *		11-14-86	0.9 *		
	Q1P13V303	10- 5-86	333.0 *		11-14-86	0.9 *		
16	Q1E11V001A	10-17-86	429.0	429.0	10-31-86	148.4	148.4	148.4
18	Q1E11V001B	10-13-86	167.0	167.0	10-13-86	167.0	167.0	167.0
23	Q1E21V253A	10- 9-86	134.0 *	17.7	11-14-86	122.0 *	25.0	122.0
	Q1E21V253B	10- 9-86	134.0 *		11-14-86	122.0 *		
	Q1E21V253C	10- 9-86	134.0 *		11-14-86	122.0 *		
	Q1E21V254	10- 9-86	17.7		11-14-86	25.0		
24	Q1E21V257	10-15-86	4.6	3.6	11-14-86	2.7	2.7	5.5
	Q1E21V258	10-15-86	3.6		11-13-86	5.5		
	Q1E21V119	10-15-86	3.8		10-15-86	3.8		
25	Q1E21V115B	10- 7-86	18.7	18.7	10- 7-86	18.7	18.7	18.7
26	Q1E21V115C	10- 7-86	12.0	12.0	10- 7-86	12.0	12.0	12.0

*Values represent total leakage from group sets of valves as physically tested.

UNIT 1 - TYPE C TEST SUMMARY FOR 7TH REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	MAX.
27	Q1E21V115A	10- 8-86	29000.0	29000.0	10-14-86	70.6	70.6	70.6
28	Q1E21V213	10- 7-86	3.6*	3.6	10- 7-86	3.6*	3.6	4.0
	Q1E21V249A	10- 7-86	3.6*		10- 7-86	3.6*		
	Q1E21V249B	10- 7-86	4.0		10- 7-86	4.0		
29	Q1E21V049	10- 7-86	5.4	4.0	10- 7-86	5.4	3.4	5.4
	Q1E21V050	10- 7-86	4.0		10-28-86	3.4		
30	Q1B13V040	10- 9-86	9.0	9.0	10-28-86	17.2	10.1	17.2
	Q1B13V038	10- 9-86	10.1		10- 9-86	10.1		
31	Q1G21V005	10-10-86	7.3	53.1	10-10-86	7.3	8.9	53.1
	Q1G21V006	10-10-86	53.1		10-10-86	53.1		
	Q1G21V064	10-10-86	73.4		11- 1-86	1.6		
32	Q1P16V081	10- 9-86	79.41	79.41	10- 9-86	79.41	2.6	79.41
	Q1P16V072	10- 9-86	115.9		10-20-86	2.6		
33	Q1G21HV3380	10-30-86	3.5	3.5	10-30-86	3.5	3.5	120.5
	Q1G21V204	10-30-86	6680.0		11- 1-86	120.5		
42	Q1P17V083	10- 8-86	54.0	0.43	10- 8-86	54.0	0.43	54.0
	Q1P17V082	10- 8-86	0.43		10- 8-86	0.43		
43	Q1P17HV3045	10- 8-86	96.8	7.4	10- 8-86	96.8	7.4	96.8
	Q1P17HV3184	10- 8-86	7.4		10- 8-86	7.4		
44	Q1P17V097	10- 9-86	186.8	11.89	10- 9-86	186.8	11.89	186.8
	Q1P17V099	10- 9-86	11.89		10- 9-86	11.89		
45	Q1P17HV3095	10- 8-86	0.17	0.17	10 -8-86	0.17	0.17	24.4
	Q1P17V159	10 -8-86	24.4		10- 8-86	24.4		
46	Q1P17HV3443	10- 7-86	2.2	1.2	10- 7-86	2.2	1.2	2.2
	Q1P17HV3067	10- 7-86	1.2		10- 7-86	1.2		

UNIT 1 - TYPE C TEST SUMMARY FOR 7TH REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	MAX.
47	Q1P18V001	11- 4-86	197.0 *	98.5	11- 4-86	197.0 *	98.5	197.0
	Q1P18V002	11- 4-86	197.0 *		11- 4-86	197.0 *		
48	Q1P19HV3611	10-17-86	72.5	72.5	10-17-86	72.5	72.5	164.3
	Q1P19V002	10-17-86	164.3		10-17-86	164.3		
49	Q1E21V052	10- 8-86	1.5	1.5	10- 8-86	1.5	1.5	4.3
	Q1E21V091	10- 8-86	4.3		10- 8-86	4.3		
50	Q1P15HV3766	10- 7-86	1.5	1.5	10- 2-86	1.5	1.5	11.3
	Q1P15HV3334	10-27-86	11.3		10-27-86	11.3		
54	Q1E14V002	10- 9-86	6.2	3.2	10- 9-86	6.2	3.2	6.2
	Q1E14HV3658	10- 9-86	3.2		10- 9-86	3.2		
55	Q1E14HV3657	10- 9-86	66.52	13.5	10- 9-86	66.52	13.5	66.52
	Q1E14V001	10- 9-86	13.5		10- 9-86	13.5		
56	Q1P15HV3104	10- 7-86	4.3	4.0	10- 7-86	4.3	4.0	4.3
	Q1P15HV3331	10- 7-86	4.0		10- 7-86	4.0		
57	Q1P15HV3103	10- 7-86	5.1	5.0	10- 7-86	5.1	5.0	5.1
	Q1P15HV3332	10- 7-86	5.0		10- 7-86	5.0		
58	Q1P15HV3765	10- 8-86	5.5	3.4	10- 8-86	5.5	3.4	5.5
	Q1P15HV3333	10- 8-86	3.4		10- 8-86	3.4		
59	Q1E11V039B	10-10-86	19.5*	19.5	10-10-86	19.5*	19.5	41.0
	Q1E11V039A	10-10-86	19.5*		10-10-86	19.5*		
	Q1E21V263A	10-10-86	19.5*		10-10-86	19.5*		
	Q1E21V263B	10-10-86	19.5*		10-10-86	19.5*		
	Q1B13V054	10-10-86	41.0		10-10-86	41.0		
	Q1E11V040	10-10-86	19.5*		10-10-86	19.5*		

UNIT 1 - TYPE C TEST SUMMARY FOR 7TH REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	MAX.
60	Q1P16V075	10-06-86	170,000.0	140.0	10-20-86	374.0	140.0	374.0
	Q1P16V071	10-10-86	140.0		10-10-86	140.0		
61A	Q1E23V022C	10-06-86	3.0*	1.5	10-06-86	3.0*	1.5	3.0
	Q1E23V022D	10-06-86	3.0*		10-06-86	3.0*		
	Q1E23V023B	10-06-86	3.0*		10-06-86	3.0*		
61B	Q1E23V024B	10-06-86	0.5*	0.25	10-06-86	0.5*	0.25	0.5
	Q1E23V025B	10-06-86	0.5*		10-06-86	0.5*		
62	Q1G21V082	10-08-86	0.4	0.4	10-08-86	0.4	0.4	7.0
	Q1G21V001	10-08-86	7.0		10-08-86	7.0		
63	Q1E21V058	10-07-86	125.0	12.8	10-07-86	125.0	12.8	125.0
	Q1E21V059	10-07-86	12.8		10-07-86	12.8		
64A	Q1B13V039	10-09-86	91.0	2.4	10-09-86	91.0	2.4	91.0
	Q1B13V037	10-08-86	2.4		10-08-86	2.4		
64B	Q1B13V026A	10-06-86	0.6	0.6	10-06-86	0.6	0.6	1.5
	Q1B13V026B	10-06-86	1.5		10-06-86	1.5		
66	Q1E23V025A	10-08-86	4.3*	2.15	10-08-86	4.3*	2.15	4.3
	Q1E23V024A	10-08-86	4.3*		10-08-86	4.3*		
67	Q1E23V022A	10-08-86	7.7*	7.7	10-08-86	7.7*	7.7	7.7
	Q1E23V022B	10-08-86	7.7*		10-08-86	7.7*		
	Q1E23V023A	10-08-86	7.7*		10-08-86	7.7*		
70	Q1E14V004	10-08-86	13.2	13.2	10-08-86	13.2	13.2	95.9
	Q1E14V003	10-07-86	95.9		10-07-86	95.9		
71	Q1P23V002A	5-12-85	47.7**	47.7	11-16-86	19.4	19.4	19.4

** These valves were tested during the last refueling outage and remained closed and blind flanged until this outage.

UNIT 1 - TYPE C TEST SUMMARY FOR 7TH REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	MAX.
72	Q1P23V002B	5-12-85	60.19**	60.19	11-13-86	175.0	175.0	175.0
78	Q1G21HV3377	10-30-86	3.8	3.8	10-30-86	3.8		
	Q1G21V291	10-30-86	29.0 *		10-30-86	29.0 *	3.8	29.0
	Q1G21HV3376	10-30-86	29.0 *		10-30-86	29.0 *		
82	Q1P11HV3659	10-26-86	46.7	0.7	10-26-86	46.7	0.7	46.7
	Q1P11V002	10-26-86	0.7		10-26-86	0.7		
93	Q1E13V003B	10-06-86	856.0 *	428.0	10-06-86	856.0 *	428.0	856.0
	Q1E13V004B	10-06-86	856.0 *		10-06-86	856.0 *		
94	Q1E13V003A	10-06-86	291.0 *	145.5	10-16-86	634.0 *	317.0	634.0
	Q1E13V004A	10-06-86	291.0 *		10-16-86	634.0 *		
95	Q1G31V012	10-10-86	6.68	6.68	10-10-86	6.68	6.68	25.8
	Q1G31V013	10-10-86	25.8		10-10-86	25.8		
97B	Q1P19V004	10-08-86	0.4	0.4	10-08-86	0.4	0.4	4.0
	Q1P19HV2228	10-08-86	4.0		10-08-86	4.0		
103	Q1E23V003	10-06-86	3.1 *		10-06-86	3.1 *	1.55	3.1
	Q1E23V002	10-06-86	3.1 *	1.55	10-06-86	3.1 *		

UNIT 1 - TYPE C TEST SUMMARY FOR 7TH REFUELING

PENE. NO.	VALVE NO.	DATE	AS FOUND LEAKAGE (SCCM)	AS FOUND MIN. PATH LEAKAGE (SCCM)	DATE	AS LEFT LEAKAGE (SCCM)	AS LEFT PER PENE. MIN.	AS LEFT PER PENE. MAX.
72	Q1P23V002B	5-12-85	60.19**	60.19	11-13-86	175.0	175.0	175.0
78	Q1G21HV3377	10-30-86	3.8	3.8	10-30-86	3.8	3.8	29.0
	Q1G21V291	10-30-86	29.0 *		10-30-86	29.0 *		
	Q1G21HV3376	10-30-86	29.0 *		10-30-86	29.0 *		
82	Q1P11HV3659	10-26-86	46.7	0.7	10-26-86	46.7	0.7	46.7
	Q1P11V002	10-26-86	0.7		10-26-86	0.7		
93	Q1E13V003B	10-06-86	856.0 *	428.0	10-06-86	856.0 *	428.0	856.0
	Q1E13V004B	10-06-86	856.0 *		10-06-86	856.0 *		
94	Q1E13V003A	10-06-86	291.0 *	145.5	10-16-86	634.0 *	317.0	634.0
	Q1E13V004A	10-06-86	291.0 *		10-16-86	634.0 *		
95	Q1G31V012	10-10-86	6.68	6.68	10-10-86	6.68	6.68	25.8
	Q1G31V013	10-10-86	25.8		10-10-86	25.8		
97B	Q1P19V004	10-08-86	0.4	0.4	10-08-86	0.4	0.4	4.0
	Q1P19HV2228	10-08-86	4.0		10-08-86	4.0		
103	Q1E23V003	10-06-86	3.1 *		10-06-86	3.1 *	1.55	3.1
	Q1E23V002	10-06-86	3.1 *	1.55	10-06-86	3.1 *		