REACTOR CONTAINMENT BUILDING

INTEGRATED LEAK RATE TEST

TYPE A, B, AND C

PERIODIC TEST

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT PLANT

UNIT NO. 4

May 1983

PREPARED BY STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASSACHUSETTS

TABLE OF CONTENTS

REFERENCES

1. 10CFR50, Appendix J, Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors, October 22, 1980.

2. Florida Power & Light Turkey Point Plant Operating Procedure 13100.1, Integrated Leak Rate Test - Unit 4.

3. ANSI N45.4, American National Standard Leakage-Rate Testing of Containment Structures for Nuclear Reactors, March 16, 1972.

4. ANSI/ANS-56.8, Containment System Leakage Testing Requirements, February 19, 1981[1].

5. Bechtel Corporation's Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants, BN-TOP-1, Revision 1, November 1, 1972.

[1]This document used only as a guideline and any reference to said document in no way implies compliance.

LIST OF ATTACHMENTS

SECTION 1

PURPOSE

The purpose of this report is to present a description and analysis of the May 1983, Type A Containment Integrated Leak Rate Test (CILRT), and a summary of the Type B and C tests performed since the last CILRT conducted on the Florida Power and Light (FP&L) Turkey Point Plant Unit 4.

This report is submitted as required by 10CFR50, Appendix J, Paragraph V.B (Reference 1).

SECTION 2

SUMMARY

2.1 Type A Test

On May 2, 1983, the pressurization for the CILRT commenced at approximately 0805 hours. One 1200 standard cubic feet per minute (SCFM) compressor was lost, but a 900 SCFM compressor was obtained for a combined compressed air capacity of 8700 SCFM. Containment pressurization was secured at 1955 hours on May 2, 1983, with a peak instantaneous pressure of 67.570 psia.

Temperature, humidity, and pressure data was continuously recorded throughout the entire test period at 20 minute intervals. The temperature stabilization criteria was satisfied at 0400 hours on May 3, 1983. The start of the Type A test was extended to 0820 hours to permit continued stabilization of the monitored parameters as observed by the mass trend (See Attachment 3.3D).

The Type A test was successfully completed at 2020 hours on May 3, 1983, with an upper confidence limit - total time (UCL-TT) method of 0.169798 percent per day. This rate also satisfied the requirements of FP&L's CILRT procedure No. 13100.1.

A mass step change verification test was successfully completed by 0348 hours on May 4, 1983. The air mass equivalent of 0.25 percent per day was removed from the containment over the verification test period. The results of the verification test also satisfied the requirements of FP&L's CILRT procedure No. 13100.1. Reference Section 3.3 for a complete summary of the test results.

Depressurization of the containment commenced at 0400 hours on May 4, 1983. Complete depressurization was achieved at 1330 hours on May 4, 1983. A plant modification that increased the size and moved the location of the depressurization line resulted in an approximate 7 hour improvement in depressurization time over the 1982 Turkey Point Plant Unit No. 3 CILRT.

2.2 Local Leak Rate Tests (Types B and C)

The Local Leak Rate Tests (LLRTs) of containment isolation valves and other containment penetrations were performed by the methods described in FP&L's LLRT procedure No. 13404.1, "Containment Boundary Isolation Valves - Local Leak Rate Tests". Section 4 of this report summarizes the data for two surveillance periods (1981/1982 and 1983) of LLRTs performed since the January 1981, Turkey Point Plant Unit No. 4 CILRT. This summary is provided in accordance with Appendix J to 10CFR50, Paragraph V.B.

SECTION 3

TYPE A TEST

3.1 Edited Log Of Events

May 2, 1983

0805 - Containment pressurization was initiated.

1300 - Inspection for leakage paths was started.

1500 - Containment pressurization rate was 4.8 psi/hr.

1955 - Compressors were secured. Peak instantaneous pressure of 67.57 psia was achieved.

May 3, 1983

0400 - Temperature stabilization was completed.

2310 - Verification test was started.

May 4, 1983

0348 - Verification test was completed.

0400 - Containment depressurization was initiated.

0600 - Containment depressurization rate was 6.55 psi/hr.

1330 - Containment depressurization was completed.

3.2 General Test Description

3.2.1 Prerequisites

In accordance with the test procedure (Reference 2), the following is a partial listing of the prerequisites that were completed and documented prior to containment pressurization:

a. General inspection of accessible interior and exterior surfaces of the containment structures and components completed

b. All equipment and instrumentation, that could be damaged by test pressure, removed or protected

c. All instrumentation required for the test, calibrated or functionally verified

d. All required system valve line-ups completed

e. All Type B and Type C leak rate testing completed

f. The Official Log of Events book established and available prior to commencement of the test

g. Site meteorology data recorded prior to and during CILRT (Attachment 3.2A)

3.2.2 Equipment and Instrumentation

Pressurization of the containment was achieved by utilizing a temporary system consisting of eight air compressors manifolded to aftercoolers and refrigerated air dryers. The total capacity of the air compressors was rated at approximately 8,700 standard cubic feet per minute (SCFM). The system included the necessary valving and instrumentation to maintain proper monitoring and control during pressurization.

The variables required to calculate containment leakage during the test were monitored using instrumentation which consisted of twenty-two resistance temperature detectors (RTDs), ten relative humidity detectors (RHDs), and two absolute pressure quartz manometers. Pertinent data for the test instrumentation is listed in Attachment 3.2B, and the general locations of the RTDs and RHDs are shown in Attachments 3.2C and 3.2D.

A rotameter was used during the mass step change verification.

3.2.3 Data Acquisition System

The Turkey Point Plant Unit No. 4 CILRT sensor data was recorded at approximately 20 minute intervals during the test. A programmable, multi-channel data logger was used to scan and record data from 22 RTDs, 10 RHDs, and manometer signal inputs. Data readings of the flowmeter were manually recorded.

The CILRT utilized a portable programmable calculator to average the test data. Periodically during the test period, weighted average temperature, weighted average relative humidity, absolute pressure, vapor pressure, and mass values were computed.

3.2.4 Data Resolution System

After the appropriate data had been acquired and averaged, the results were manually input to FP&L's offsite computer system for leak rate calculations.

Absolute Method of Mass Point Analysis

The Absolute Method of Mass Point Analysis consists of calculating the air mass within the containment structure, over the test period, using pressure, temperature, and dewpoint observations made during the CILRT. The air mass is computed using the ideal gas law as follows:

$$M = \frac{144V\ (P-Pv)}{RT} \qquad \text{(Eq. 1)}$$

where:
- M = air mass, lbm
- P = total pressure, psia
- Pv = average vapor pressure, psia
- R = 53.35 ft lbf/lbm °R (for air)
- T = average containment temperature, °R
- V = containment free volume, 1.55×10^6 ft^3

The leakage rate is determined by plotting the air mass as a function of time, using a least-squares fit to determine the slope, A = dM/dt. The leakage rate is expressed as a percentage of the air mass lost in 24 hours or symbolically:

$$\text{Leakage rate} = A/B\ (-2400) \qquad \text{(Eq. 2)}$$

where A is the slope of the least-squares curve and B is the y-intercept. The sign convention is such that leakage out of the containment is positive and the units are in percent/day. The air mass is calculated and correlated as a function of time by means of a least-squares curve fit of the form:

$$M = At + B \qquad \text{(Eq. 3)}$$

The slope A and y-intercept B are used in Equation 2 to determine the leakage rate.

A 95 percent confidence interval is calculated using a Student's t distribution. The sum of the leakage rate and the 95 percent confidence interval is the upper confidence limit (UCL). The measured leakage rate may be described as 95 percent accurate to within the value of the upper confidence limit - mass point (UCL-MP).

Absolute Method of Total Time Analysis

The Absolute Method of Total Time Analysis consists of calculating air lost from the containment, using pressure, temperature, and dewpoint observations made during the CILRT.

The containment air mass is computed using Equation 1.

The measured leakage rate at any time (t) is determined by subtracting the mass at that time (Mt) from the initial mass (Mi) and dividing by the initial mass. The measured leakage rate is expressed as a percentage of containment mass lost in 24 hours or symbolically:

$$\text{Measured leakage rate} = \frac{Mi - Mt}{Mi(\Delta t)} (2400) \qquad \text{(Eq. 4)}$$

The sign convention is such that leakage out of the containment is positive and the units are in percent/day.

The calculated leakage rate is determined by plotting the measured leak rate as a function of time and then performing a least-squares curve fit of the measured leak rate values as follows:

$$\text{Calculated leakage rate} = At + B \qquad \text{(Eq. 5)}$$

A is the slope and B is the y-intercept of the least-squares curve.

The 95 percent confidence interval is calculated using a Student's t distribution. The sum of the calculated leakage rate and the 95 percent confidence interval is the upper confidence limit-total time (UCL-TT).

This analysis method was used in conjunction with the procedure.

ATTACHMENT 3.2A

SITE METEOROLOGY

Date	Time (hrs)	Ambient Temperature (°F)	Barometric Pressure (in. Hg)	Wind Speed (mph)	Wind Direction (azimuth)
4/30/83	0400	73	30.31	9	120°
	0900	76	30.40	10	90°
	1300	77	30.42	10	90°
	1700	78	30.37	10	90°
	2100	75	30.40	10	90°
5/1/83	0100	74	30.64	12	90°
	0500	72	30.60	10	92°
	0900	75	30.40	10	82°
	1300	77	30.42	11	88°
	1700	78	30.38	11	90°
	2100	75	30.39	11	75°
5/2/83	0100	75	30.11	12	88°
	0500	68	30.30	11	100°
	0900	77	30.38	12	100°
	1300	80	30.39	10	110°
	1700	80	30.31	10	90°
	2100	76	30.35	10	90°
5/3/83	0100	75	30.30	12	110°
	0500	75	30.30	10	180°
	0820 - Begin CILRT Test Period				
	0900	80	30.30	18	180°
	1300	81	30.30	16	180°
	1700	80	30.25	10	160°

ATTACHMENT 3.2A (Cont.)

Date	Time (hrs)	Ambient Temperature (°F)	Barometric Pressure (in. Hg)	Wind Velocity (mph)	Wind Direction (azimuth)
	2020 - Complete CILRT				
	2100	78	30.25	8	160°
5/4/83	0100	76	29.96	12	180°
	0500	75	29.96	10	175°
	0900	79	30.24	15	185°
	1300	83	30.23	17	240°

ATTACHMENT 3.2B

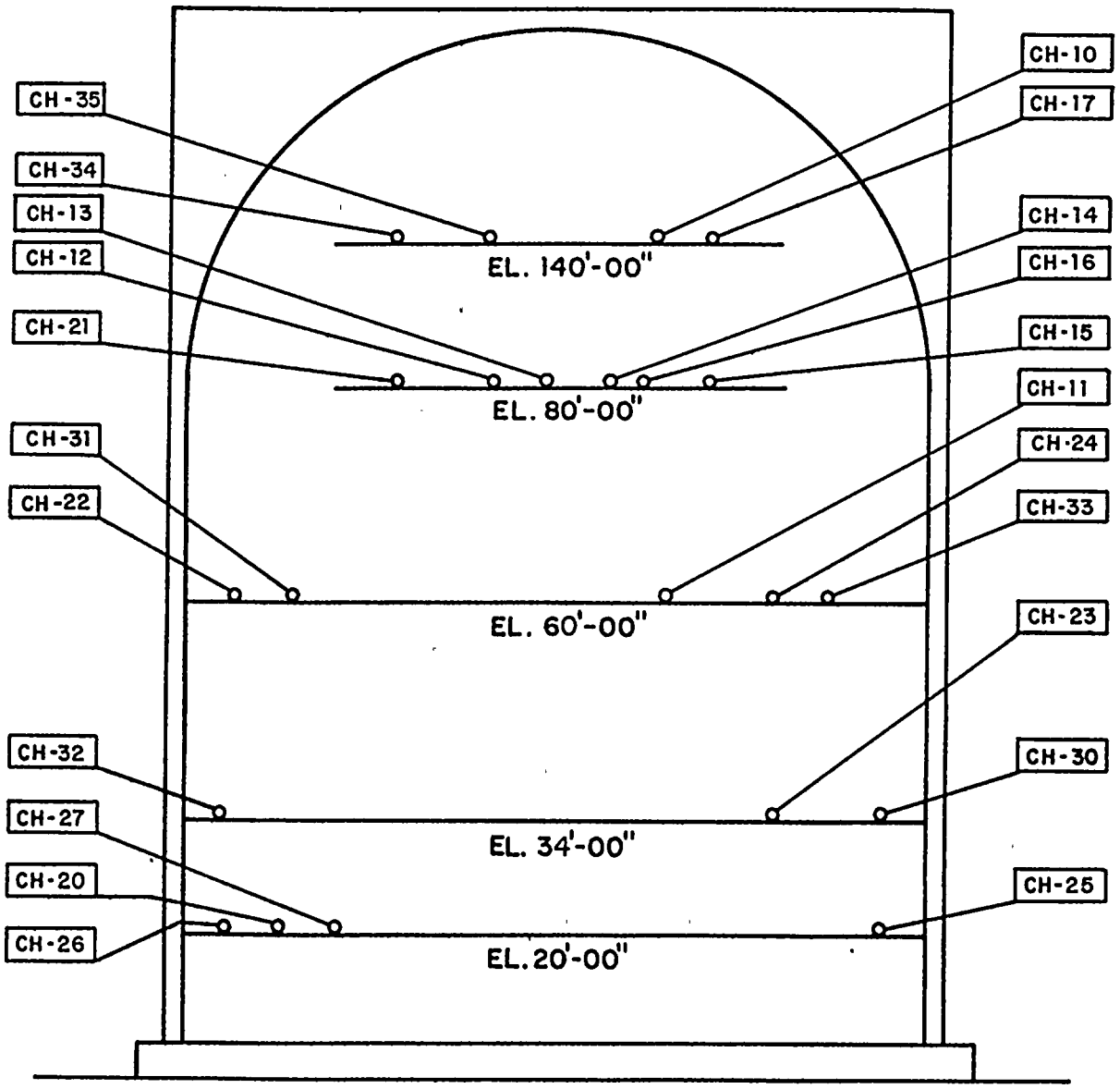
INSTRUMENTATION

The following instruments were calibrated or functionally verified within 6 months prior to the performance of this test and in accordance with 10CFR50, Appendix J, and Field Calibration Procedures, using instrumentation traceable to the National Bureau of Standards.

Channel	Instrument	Weight Factor	Accuracy
CH-0	RHD	0.0495	±2.5%RH
CH-1	RHD	0.0495	±2.5%RH
CH-2	RHD	0.0495	±2.5%RH
CH-3	RHD	0.0495	±2.5%RH
CH-4	RHD	0.06	±2.5%RH
CH-5	RHD	0.06	±2.5%RH
CH-6	RHD	0.181	±2.5%RH
CH-7	RHD	0.181	±2.5%RH
CH-8	RHD	0.16	±2.5%RH
CH-9	RHD	0.16	±2.5%RH
CH-10	RTD	0.08	±0.5°F
CH-11	RTD	0.024	±0.5°F
CH-12	RTD	0.0603	±0.5°F
CH-13	RTD	0.0603	±0.5°F
CH-14	RTD	0.0603	±0.5°F
CH-15	RTD	0.0603	±0.5°F
CH-16	RTD	0.0603	±0.5°F
CH-17	RTD	0.08	±0.5°F
CH-20	RTD	0.0283	±0.5°F
CH-21	RTD	0.0603	±0.5°F

ATTACHMENT 3.2B (Cont'd)

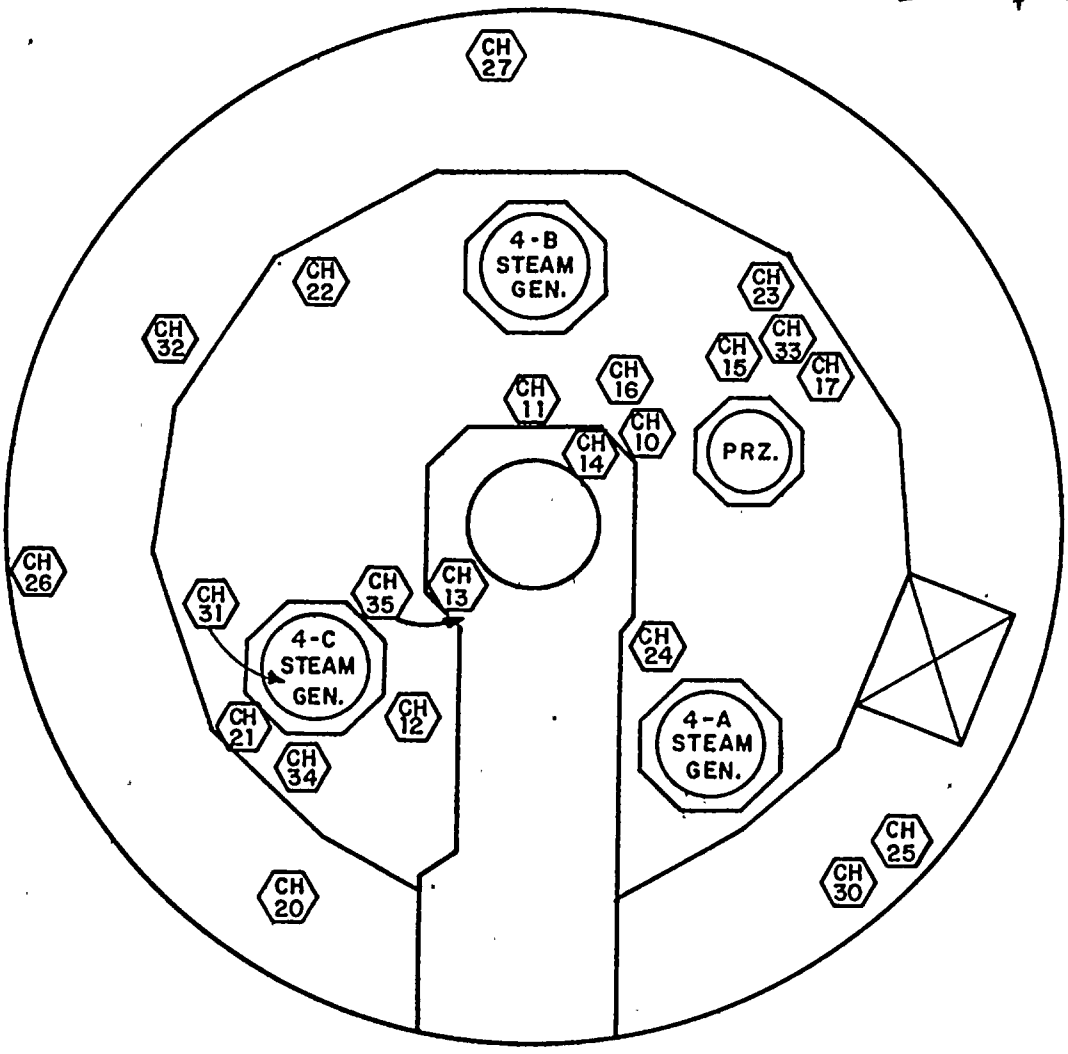
Channel	Instrument	Weight Factor	Accuracy
CH-22	RTD	0.024	±0.5°F
CH-23	RTD	0.0283	±0.5°F
CH-24	RTD	0.024	±0.5°F
CH-25	RTD	0.0283	±0.5°F
CH-26	RTD	0.0283	±0.5°F
CH-27	RTD	0.0283	±0.5°F
CH-30	RTD	0.0283	±0.5°F
CH-31	RTD	0.024	±0.5°F
CH-32	RTD	0.0283	±0.5°F
CH-33	RTD	0.024	±0.5°F
CH-34	RTD	0.08	±0.5°F
CH-35	RTD	0.08	±0.5°F
TI-145 0-100 psia Quartz Manometer 1		N/A	±0.001% F.S.
TI-145 0-100 psia Quartz Manometer 2		N/A	±0.001% F.S.
Rotameter	0-230 SCFM at 50 psig		±1.0% F.S.



PROFILE VIEW

NOTE
INSTRUMENT LOCATIONS SHOWN
ARE ONLY APPROXIMATE.

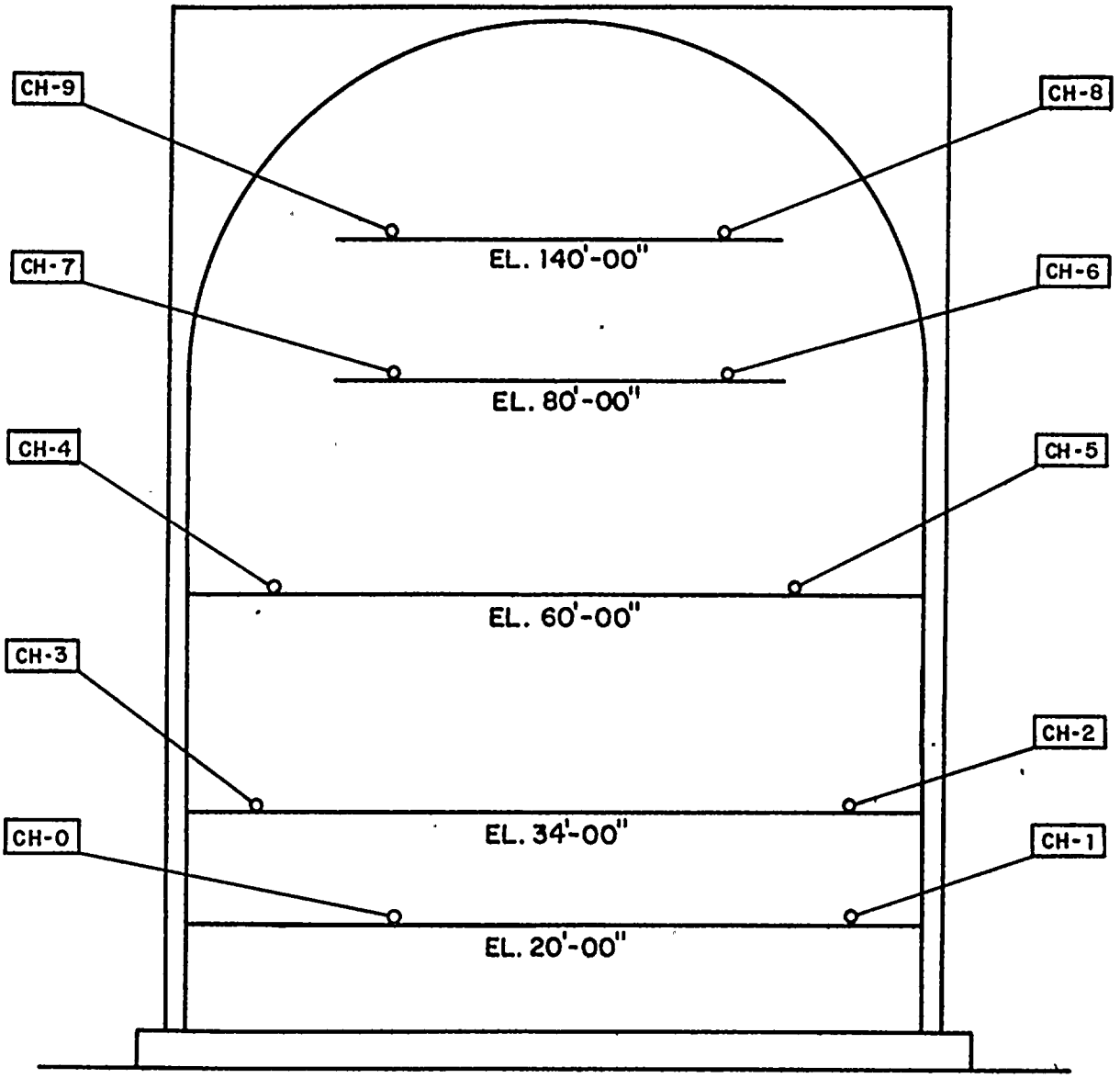
ATTACHMENT 3.2C
CILRT TEMPERATURE
DETECTOR LOCATIONS
TURKEY POINT PLANT - UNIT 4



PLAN VIEW

NOTE
INSTRUMENT LOCATIONS SHOWN ARE ONLY APPROXIMATE.

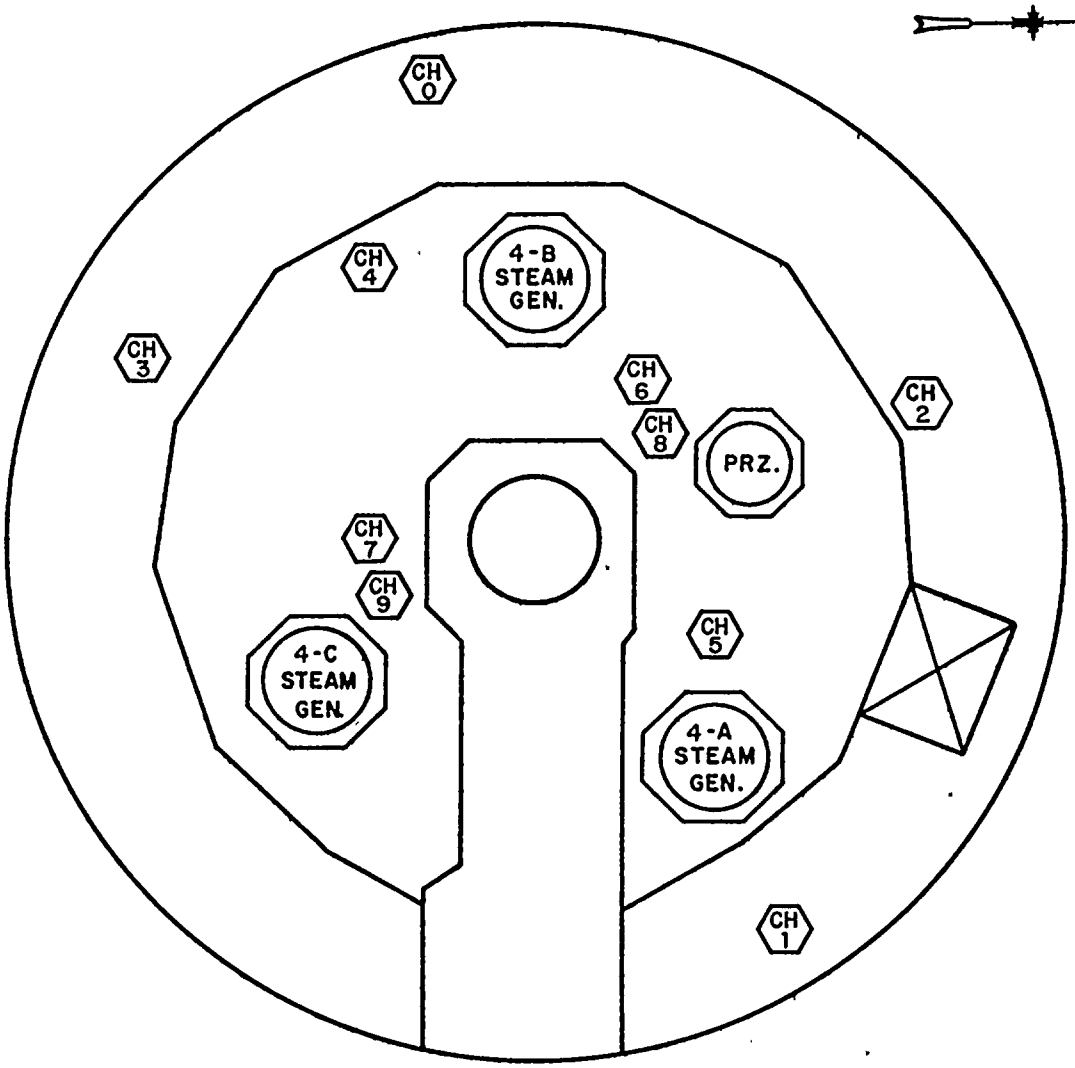
ATTACHMENT 3.2C
CILRT TEMPERATURE DETECTOR LOCATIONS
TURKEY POINT PLANT - UNIT 4



PROFILE VIEW

NOTE
INSTRUMENT LOCATIONS SHOWN
ARE ONLY APPROXIMATE.

ATTACHMENT 3.2D
CILRT RELATIVE HUMIDITY
DETECTOR LOCATIONS
TURKEY POINT PLANT - UNIT 4



PLAN VIEW

NOTE
INSTRUMENT LOCATIONS SHOWN ARE ONLY APPROXIMATE.

ATTACHMENT 3.2D
CILRT RELATIVE HUMIDITY DETECTOR LOCATIONS
TURKEY POINT PLANT - UNIT 4

3.3 Test Results

3.3.1 Analysis of Test Results

Mass data from the end of the temperature stabilization period to the end of the Type A test is shown as a graph in Attachment 3.3D. The graph is divided into two zones:

Zone A - Depicts the extension of the stabilization period from 0400 hours to 0820 hours on May 3, 1983.

Zone B - Depicts the data used for the leakage rate calculation, 0820 hours to 2020 hours on May 3, 1983.

The leakage rate analysis was performed by using FP&L's CILRT Program (Section 3.2.4). The reduced data is shown in Attachment 3.3A.

The temperature stabilization criteria was satisfied at 0400 hours on May 3, 1983. The mass trend data in Zone A exhibits a relatively stable, almost flat, slope from 0500 to 0820 hours. The mass trend data in Zone B exhibits a relatively stable, slightly downward, slope from 0820 to 2020 hours. The start of the CILRT was conservatively extended to 0820 hours on May 3, 1983, based on the steeper slope of the mass trend in Zone B.

The Absolute Method of Mass Point Analysis (Section 3.2.4) containment leakage rate test results are shown in Attachment 3.3B. The results, 0.076215 percent per day, show the upper confidence limit-mass point (UCL-MP) to be well within the acceptable limit of 0.1875 percent per day (0.75 La).

The Absolute Method of Total Time Analysis (Section 3.2.4) is used in conjunction with the Instrument Selection Guide (Reference 4) to determine the duration of the CILRT. The results, 0.169798 percent per day, show the UCL-TT to be well within the acceptable limit of 0.25 percent per day (La).

Graphs of the containment leakage rate for the mass point and for the total time analysis are shown in Attachments 3.3E and 3.3F.

The Mass Step Change Verification Test was performed from 2308 hours on May 3, 1983, to 0050 hours on May 4, 1983, and from 0248 hours to 0348 hours on May 4, 1983. The reason for the two separate intervals was to ensure a full air mass equivalent of La was taken out of the containment. The calibration of the verification test rotameter was based on a test pressure of 64.7 psia, however, the actual inlet pressure to the rotameter was only 6 psig. Correcting for the new inlet conditions required additional mass removal. The results of the verification test satisfied the acceptance criteria of the CILRT

procedure. A complete summary of the test results is outlined in Section 3.3.2.

3.3.2 64.7 psia CILRT Results

A. Mass Point Method

1.	Leakage rate measured, Lam	0.069926 percent/day
2.	95 percent upper confidence	0.006288 percent/day
3.	UCL-MP, Lam leakage rate plus 95 percent confidence interval (1+2)	0.076215 percent/day

Results were within the acceptable limit of 0.1875 percent/day.

B. Total Time Method

1.	Leakage rate calculated, Lam	0.053590 percent/day
2.	95 percent upper confidence	0.116208 percent/day
3.	UCL-TT, Lam leakage rate plus 95 percent confidence interval (1+2)	0.169798 percent/day

Results were within the acceptable limit of 0.25 percent/day.

3.3.3 Verification Test Results

The supplemental verification test was performed using the Mass Step Change Verification Method in accordance with Section 8.0 of Operating Procedure 13100.1.

a.	Calculated change in containment gas mass	1279 lbm
b.	Total measured gas flow out of containment	1324 lbm
c.	Difference between measured gas and calculated gas (b-a)	45 lbm
d.	0.25 La verification limit	317 lbm

Results of the Mass Step Verification Test are acceptable as the difference between the verification test data and the Type A test data is within 0.25 La.

ATTACHMENT 3.3A

CONTAINMENT INTEGRATED LEAK RATE TEST
From 0820 Hours On 5/3/83 To 2020 Hours On 5/3/83

INPUT VARIABLES

Time (hrs)	Abs. Pressure (psia)	Rel. Humidity (pct)	Vap. Pressure (psia)	Dry Bulb Temperature (°F)	Mass (lbm)
0820	66.463	83.31	0.5378	87.48	504 060.5
0840	66.457	83.30	0.5376	87.47	504 028.7
0900	66.451	83.31	0.5367	87.41	504 040.1
0920	66.445	83.31	0.5361	87.38	504 027.2
0940	66.441	83.31	0.5355	87.35	504 034.1
1000	66.436	83.33	0.5354	87.33	504 012.0
1020	66.431	83.30	0.5344	87.28	504 027.6
1040	66.428	83.33	0.5343	87.27	504 015.3
1100	66.422	83.30	0.5340	87.26	503 978.6
1120	66.417	83.31	0.5335	87.23	503 974.7
1140	66.413	83.32	0.5331	87.20	503 973.5
1200	66.410	83.29	0.5328	87.19	503 960.7
1220	66.407	83.28	0.5325	87.18	503 953.6
1240	66.404	83.25	0.5316	87.14	503 972.0
1300	66.401	83.28	0.5316	87.13	503 956.4
1320	66.398	83.21	0.5312	87.13	503 936.7
1340	66.395	83.19	0.5304	87.09	503 954.1
1400	66.393	83.18	0.5303	87.09	503 943.7
1420	66.391	83.16	0.5298	87.07	503 949.7
1440	66.388	83.16	0.5298	87.07	503 928.3

ATTACHMENT 3.3A (Cont.)

Time (hrs)	Abs. Pressure (psia)	Rel. Humidity (pct)	Vap. Pressure (psia)	Dry Bulb Temperature (°F)	Mass (lbm)
1500	66.385	83.14	0.5296	87.06	503 911.0
1520	66.384	83.11	0.5291	87.05	503 922.7
1540	66.382	83.17	0.5294	87.04	503 913.8
1600	66.380	83.03	0.5285	87.04	503 908.4
1620	66.378	83.03	0.5280	87.01	503 921.6
1640	66.376	83.00	0.5275	87.00	503 921.7
1700	66.374	82.99	0.5275	87.00	503 904.8
1720	66.372	82.94	0.5271	86.99	503 900.5
1740	66.371	82.91	0.5269	86.99	503 896.7
1800	66.369	82.88	0.5266	86.98	503 886.3
1820	66.367	82.87	0.5263	86.97	503 889.5
1840	66.366	82.86	0.5263	86.97	503 876.3
1900	66.365	82.79	0.5256	86.96	503 886.1
1920	66.363	82.79	0.5255	86.95	503 878.1
1940	66.362	82.81	0.5254	86.94	503 882.7
2000	66.360	82.75	0.5250	86.94	503 870.2
2020	66.359	82.71	0.5245	86.92	503 885.2

ATTACHMENT 3.3B

CONTAINMENT INTEGRATED LEAK RATE TEST
From 0820 Hours On 5/3/83 To 2020 Hours On 5/3/83

ABSOLUTE TEST METHOD, MASS POINT ANALYSIS

Time (hrs)	Mass (lbm)	Leakage (pct/day)	95 Pct. Conf. (pct/day)	UCL (pct/day)
0820	504 060.5	0.000 000	0.000 000	0.000 000
0840	504 028.7	0.000 000	0.000 000	0.000 000
0900	504 040.1	0.145 361	1.273 837	1.419 198
0920	504 027.2	0.126 193	0.309 726	0.435 919
0940	504 034.1	0.077 570	0.166 315	0.243 886
1000	504 012.0	0.097 741	0.102 031	0.199 772
1020	504 027.6	0.070 466	0.078 382	0.148 848
1040	504 015.3	0.067 868	0.055 943	0.123 811
1100	503 978.6	0.097 128	0.057 827	0.154 955
1120	503 974.7	0.109 733	0.048 049	0.157 782
1140	503 973.5	0.112 438	0.038 675	0.151 113
1200	503 960.7	0.116 680	0.032 173	0.148 854
1220	503 953.2	0.118 956	0.027 023	0.145 979
1240	503 972.0	0.109 303	0.025 930	0.135 233
1300	503 956.4	0.105 876	0.022 674	0.128 550
1320	503 936.7	0.107 451	0.019 784	0.127 235
1340	503 954.1	0.101 557	0.018 796	0.120 353
1400	503 943.7	0.098 230	0.017 103	0.115 333
1420	503 949.7	0.092 949	0.016 528	0.109 477
1440	503 928.3	0.092 149	0.014 841	0.106 990

ATTACHMENT 3.3B (Cont'd)

Time (hrs)	Mass (lbm)	Leakage (pct/day)	95 Pct. Conf. (pct/day)	UCL (pct/day)
1500	503 911.0	0.093 570	0.013 483	0.107 053
1520	503 922.7	0.091 542	0.012 456	0.103 998
1540	503 913.9	0.090 377	0.011 422	0.101 799
1600	503 908.4	0.089 354	0.010 511	0.099 866
1620	503 921.6	0.085 998	0.010 445	0.096 443
1640	503 921.7	0.082 605	0.010 434	0.093 038
1700	503 904.8	0.081 177	0.009 788	0.090 964
1720	503 900.5	0.079 880	0.009 200	0.089 080
1740	503 896.7	0.078 659	0.008 671	0.087 330
1800	503 886.3	0.078 115	0.008 104	0.086 219
1820	503 889.5	0.076 922	0.007 699	0.084 621
1840	503 876.3	0.076 578	0.007 218	0.083 796
1900	503 886.1	0.075 129	0.006 983	0.082 112
1920	503 878.1	0.074 126	0.006 669	0.080 794
1940	503 882.7	0.072 619	0.006 525	0.079 143
2000	503 870.2	0.071 822	0.006 226	0.078 048
2020	503 885.2	0.069 926	0.006 288	0.076 215

Initial estimated mass = 504 033.6
Final estimated mass = 503 857.4

ATTACHMENT 3.3C

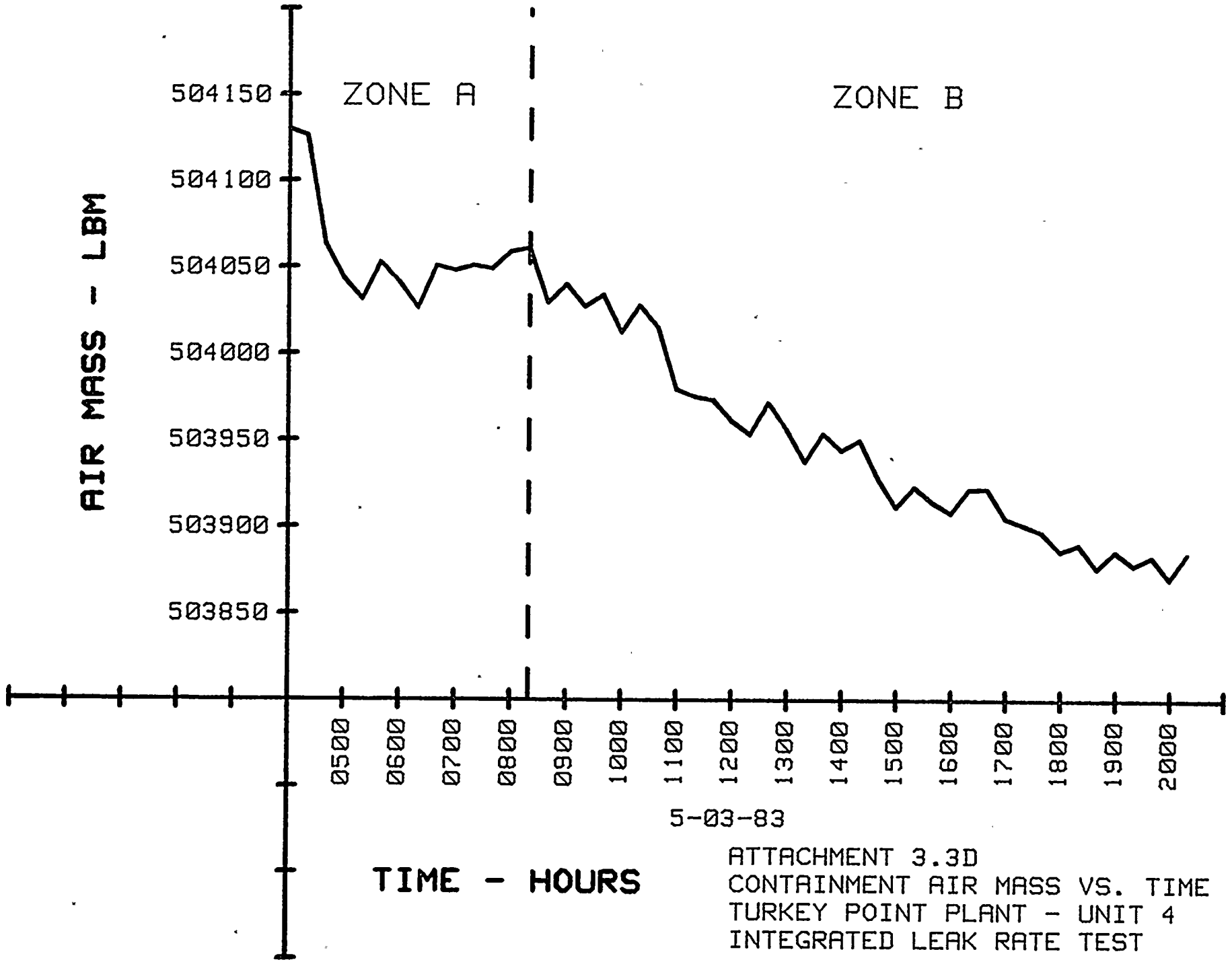
CONTAINMENT INTEGRATED LEAK RATE TEST
From 0820 Hours On 5/3/83 To 2020 Hours On 5/3/83

ABSOLUTE TEST METHOD, TOTAL TIME ANALYSIS

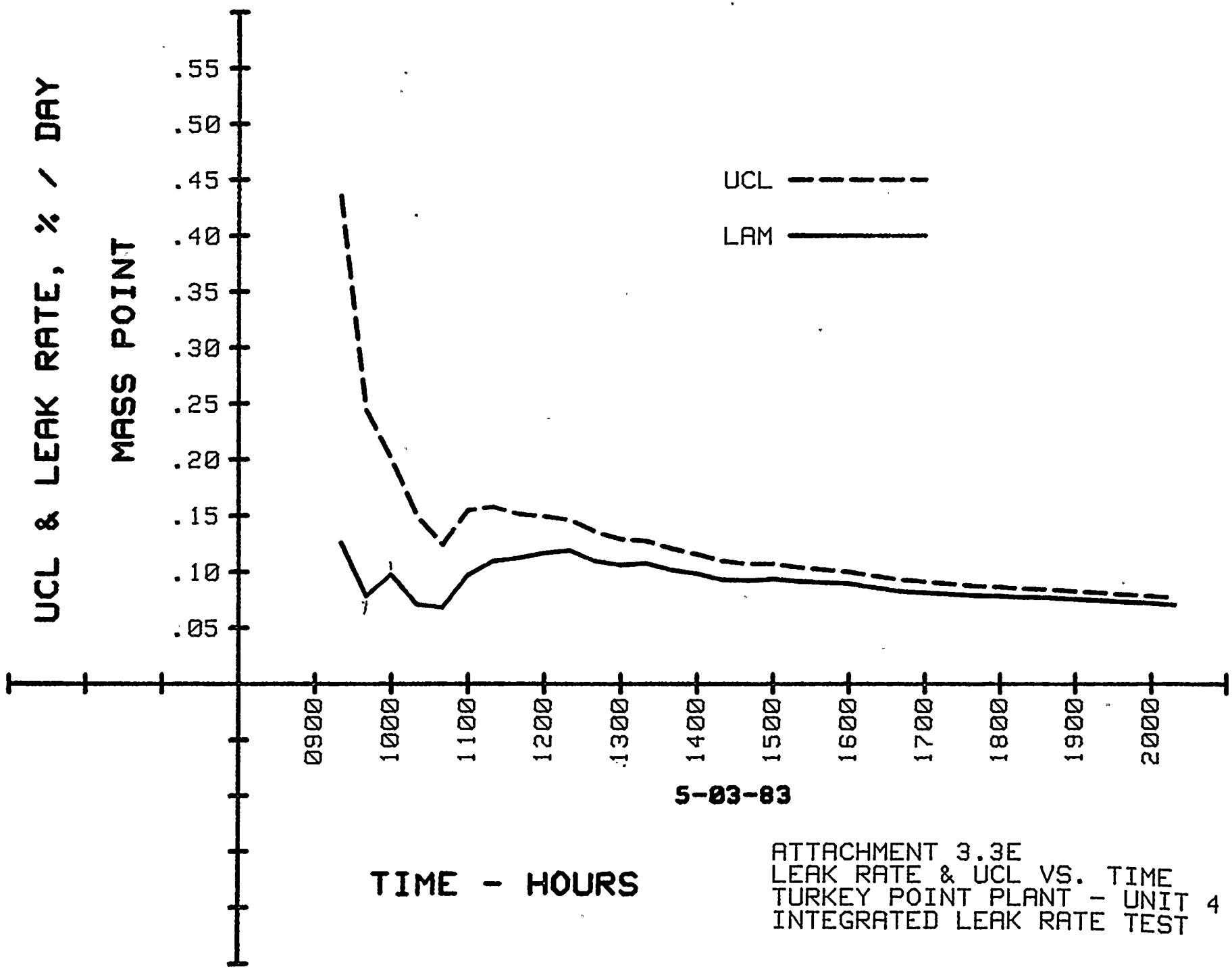
Time (hrs)	Mass (lbm)	Meas. Leakage (pct/day)	Mean of Meas. Leakage	Calc. Leakage (pct/day)	95 Pct. Conf. (pct/day)	UCL (pct/day)
0820	504 060.49	0.000 000	0.000 000	0.000 000	0.000 000	0.000 000
0840	504 028.72	0.454 348	0.000 000	0.000 000	0.000 000	0.000 000
0900	504 040.11	0.145 513	0.000 000	0.000 000	0.000 000	0.000 000
0920	504 027.23	0.158 385	0.252 749	0.104 761	1.270 401	1.375 161
0940	504 034.08	0.094 335	0.213 145	0.053 061	0.537 011	0.590 072
1000	504 011.95	0.138 665	0.198 249	0.061 674	0.434 556	0.496 229
1020	504 027.64	0.078 217	0.178 244	0.037 863	0.341 606	0.379 469
1040	504 015.34	0.092 145	0.165 944	0.032 996	0.300 895	0.333 891
1100	503 978.59	0.146 226	0.163 479	0.054 285	0.294 815	0.349 100
1120	503 974.73	0.136 121	0.160 440	0.065 811	0.276 770	0.342 580
1140	503 973.48	0.124 308	0.156 826	0.070 542	0.257 516	0.328 059
1200	503 960.71	0.129 563	0.154 348	0.076 225	0.242 439	0.318 664
1220	503 953.16	0.127 764	0.152 133	0.080 418	0.229 112	0.309 529
1240	503 972.00	0.097 239	0.147 910	0.075 590	0.215 006	0.290 596
1300	503 956.36	0.106 241	0.144 934	0.074 500	0.204 076	0.278 576
1320	503 936.68	0.117 907	0.143 132	0.076 782	0.195 787	0.272 570
1340	503 954.07	0.095 017	0.140 125	0.073 627	0.186 925	0.260 552
1400	503 943.71	0.098 121	0.137 654	0.071 942	0.179 484	0.251 426
1420	503 949.70	0.087 920	0.134 891	0.068 687	0.172 524	0.241 211
1440	503 928.27	0.099 413	0.133 024	0.068 404	0.167 015	0.235 419

ATTACHMENT 3.3C (Cont'd)

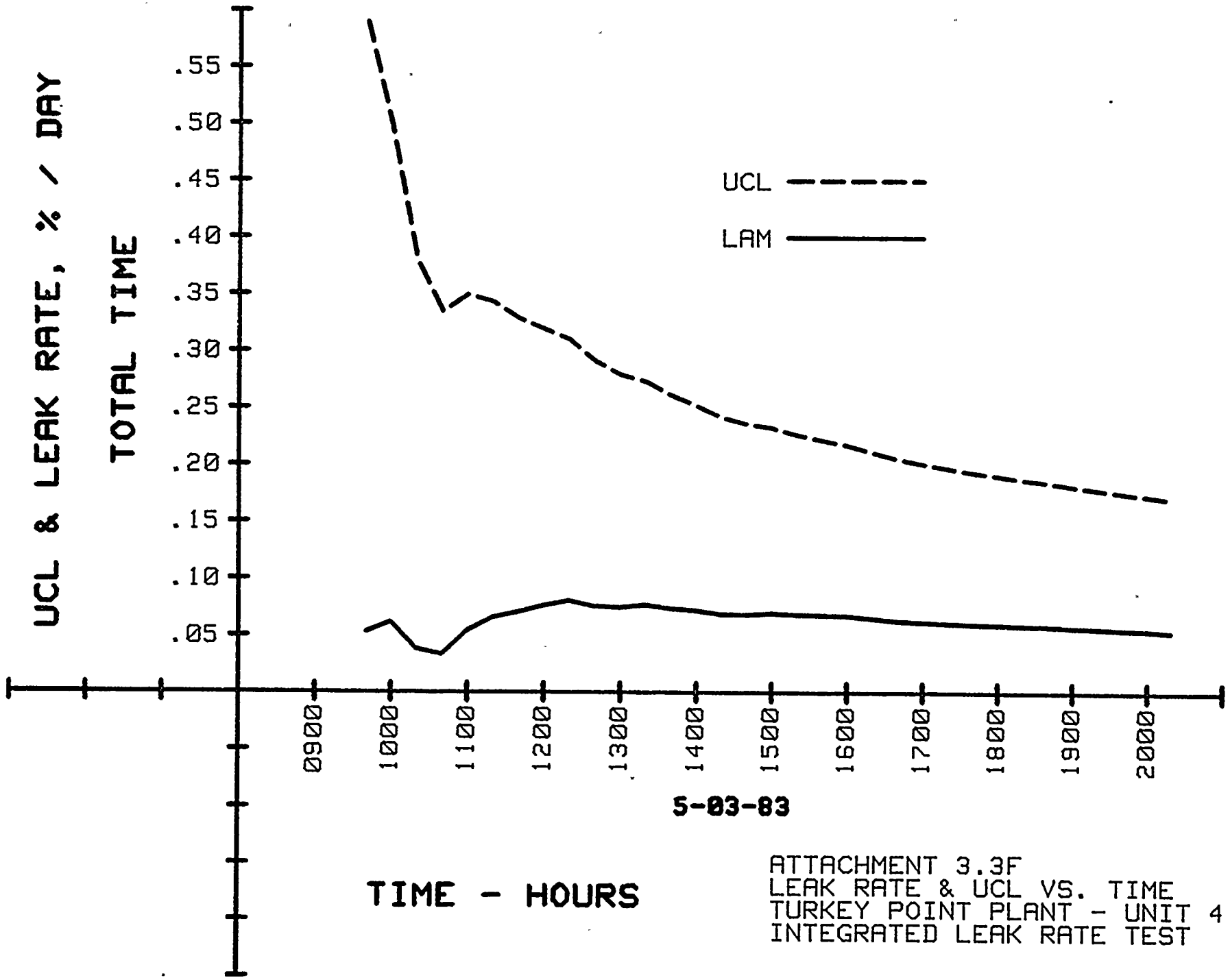
Time (hrs)	Mass (lbm)	Meas. Leakage (pct/day)	Mean of Meas. Leakage	Calc. Leakage (pct/day)	95 Pct Conf. (pct/day)	UCL (pct/day)
1500	503 910.95	0.106 800	0.131 712	0.069 677	0.162 544	0.232 221
1520	503 922.68	0.093 743	0.129 904	0.068 583	0.157 733	0.226 317
1540	503 913.85	0.095 219	0.128 328	0.068 025	0.153 473	0.221 498
1600	503 908.38	0.094 466	0.126 856	0.067 520	0.149 578	0.217 098
1620	503 921.55	0.082 694	0.125 015	0.065 353	0.145 614	0.210 967
1640	503 921.71	0.079 297	0.123 187	0.063 053	0.141 928	0.204 982
1700	503 904.76	0.085 555	0.121 739	0.062 031	0.138 769	0.200 801
1720	503 900.54	0.084 624	0.120 365	0.061 097	0.135 836	0.196 933
1740	503 896.72	0.083 551	0.119 050	0.060 201	0.133 100	0.193 301
1800	503 886.34	0.085 777	0.117 903	0.059 757	0.130 652	0.190 409
1820	503 889.54	0.081 399	0.116 686	0.058 880	0.128 231	0.187 112
1840	503 876.28	0.084 882	0.115 660	0.058 585	0.126 095	0.184 680
1900	503 886.14	0.077 827	0.114 478	0.057 523	0.123 891	0.181 414
1920	503 878.05	0.078 971	0.113 402	0.056 763	0.121 867	0.178 629
1940	503 882.66	0.074 713	0.112 264	0.055 646	0.119 867	0.175 513
2000	503 870.22	0.077 652	0.111 275	0.054 994	0.118 075	0.173 069
2020	503 885.24	0.069 537	0.110 115	0.053 590	0.116 208	0.169 798



ATTACHMENT 3.3D
CONTAINMENT AIR MASS VS. TIME
TURKEY POINT PLANT - UNIT 4
INTEGRATED LEAK RATE TEST



ATTACHMENT 3.3E
LEAK RATE & UCL VS. TIME
TURKEY POINT PLANT - UNIT 4
INTEGRATED LEAK RATE TEST



ATTACHMENT 3.3F
LEAK RATE & UCL VS. TIME
TURKEY POINT PLANT - UNIT 4
INTEGRATED LEAK RATE TEST

SECTION 4

LOCAL LEAK RATE TESTS (TYPE B AND C)

Attachments 4A and 4B, which follow, summarize the LLRT data which has been obtained from periodic testing performed since the last Type A Test. Prerepair data is provided for surveillance testing performed in 1981/1982 and 1983. These LLRTs were performed by pressurizing the listed penetrations with air and either measuring leakage across the containment isolation valves (Type C) or across the resilient seals (Type B).

The acceptance criteria for Type B and C testing is in accordance with 10CFR50, Appendix J. The combined leakage rate for all penetrations and valves, subject to Type B and C tests, is less than 0.6 La. The LLRTs performed in 1981/1982 and 1983 were well below the acceptance limit.

ATTACHMENT 4A

TYPE B DATA SUMMARY

Penetration No.	Equipment Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1983 TYPE B DATA SUMMARY				
38 Electrical Penetration	O-Ring and Body	<40	<40	
39 Fuel Transfer Tube Flange	O-Ring and Body	>50,000	260	Tube tightened down
40 Equipment Hatch	O-Ring and Body	170	290	Retested to verify containment integrity
41 Personnel Air Lock	O-Ring and Body	5,000	5,000	Vent to atmosphere valve replaced, Hatch retested to verify leakage, No work performed after Type B testing
49 Emergency Air Lock	O-Ring and Body	<35	<35	

ATTACHMENT 4A (Cont'd)

TYPE B DATA SUMMARY

Penetration No.	Equipment Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1981-1982 TYPE B DATA SUMMARY				
38 Electrical Penetration	O-Ring and Body	0	0	
39 Fuel Transfer Tube Flange	O-Ring and Body	<35	<35	
40 Equipment Hatch	O-Ring and Body	0	0	
41 Personnel Air Lock	O-Ring and Body	<40	<40	
49 Emergency Air Lock	O-Ring and Body	0	0	

ATTACHMENT 4B

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1983 TYPE C DATA SUMMARY				
1 To RHR from Loop A Hot Leg	MOV-751 (ISC)	<30	<30	
5 PRT to Gas Analyzer	CV-516 (OSC) SV-6385 (OSC)	155 <40	155 <40	
6 Nitrogen to PRT	CK-518 (ISC) ST-CK-519 (ISC)	1500 3600	400 450	Seat lapped and cleaned Seat lapped and cleaned
7 PW to PRT and RCP Standpipes	CV-519A (OSC) CV-519B (ISC) CV-522A (ISC) CV-522B (ISC) CV-522C (ISC)	<40 (combined)	<40	
8 PRZ Steam Samples	CV-951 (ISC) CV-956A (OSC)	100 <40	100 <30	 Retested to verify leakage
9 PRZ Liquid Samples	CV-953 (ISC) CV-956B (OSC)	100 <40	100 <40	
10 RCDT and PRT Vent and Nitrogen to RCDT	CV-4658B (OSC) PCV-4-1014 (OSC)	<40 <40	<40 <40	
11 Alternate Low Head SI to Loops	MOV-872 (OSC)	300	300	
14 Letdown to Nonregenerative Heat Exchanger	CV-200A (ISC) CV-200B (ISC) CV-200C (ISC) CV-204 (OSC)	120 (CV-200A) (CV-200B) (CV-200C) 150	120 (CV-200A) (CV-200B) (CV-200C) 150	
15 Charging to Regenerative Heat Exchanger	CK-312C (ISC) HCV-121 (OSC) V-333 (OSC)	<40 120 (HCV-121) (V-333)	<40 <30 (HCV-121) (V-333)	V-333 repacked, Valves retested to verify leakage
16 PACVs, Hydrogen Removal	HV-4-2 (OSC) PAHM-4-002A (OSC)	<40 (combined)	<40	Retested to verify leakage
17 SI Test Line	V-895V (OSC)	<40	<40	

ATTACHMENT 4B (Cont'd)

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1983 TYPE C DATA SUMMARY				
19A Containment Spray A	CK-890A (OSC) MOV-880A (OSC)	10,000 <40	1,050 <40	CK-890A seat was cleaned and lapped, Retested to verify leakage
19B Containment Spray B	CK-890B (OSC) MOV-880B(OSC)	4,000 <40	150 <40	CK-890B seat was cleaned and lapped, Retested to verify leakage
20 A and B Hot Leg Sample	CV-955A (ISC) CV-955B (ISC) SV-956C (OSC)	<40 <40 <40	<40 <40 <40	
23 Containment Sump to WHT	CV-2822 (OSC) CV-2821 (OSC)	<30 <30	<30 <30	
24A Seal Water Injection to A RCP	CK-298A (ISC) V-297A (OSC)	<40 <40	<40 <40	
24B Seal Water Injection to B RCP	CK-298B (ISC) V-297B (OSC)	<40 <40	<40 <40	
24C Seal Water Injection to C RCP	CK-298C (ISC) V-297C (OSC)	<40 <40	<40 <40	
25 RCP Seal Water Return	MOV-381 (OSC) MOV-6386 (ISC)	<40 800	<40 800	
29 Instrument Air Supply	CK-336 (ISC) CV-2803 (OSC) CK-340A (ISC)	3,000 100 7,200	90 100 1,150	CK-336 and CK-340A cleaned and seats lapped
30 Breathing Air	BA-201 CV-6165	<40 200	<30 200	
31 RCDT to Gas Analyzer	CV-4659B (OSC)	<40	<40	
32 Containment Air Sample Return	CK-11-003 (ISC) SV-2912 (OSC) PAHM-001A,B (OSC)	45,000 >54,000 (SV-2912) (PAHM-001A,B)	300 600	CK-11-003 seat was cleaned, SV-2912 was replaced under PC/M 80-150, Installation was reversed to maintain containment integrity

ATTACHMENT 4B (Cont'd)

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1983 TYPE C DATA SUMMARY				
33 Containment Air Sample	SV-2913 (OSC) SV-2911 (OSC)	180 90	180 90	
34 Service Air	CK-205 (ISC) V-204 (OSC) HV-4-17 (OSC)	>52,000 450 <30	1,100 <30 <30	CK-205 and V-204 valve seats cleaned
35 Containment Purge Inlet	PV-2600 (OSC) PV-2601 (ISC)	>50,000 (combined)	6700	Valve seats adjusted
36 Containment Purge Outlet	PV-2602 (OSC) PV-2603 (ISC)	>52,000 (combined)	4,800	Valve seats adjusted
37 Spare	CAP	<30	<30	
42 Nitrogen to Accumulators	CV-855 (OSC) V-945E (OSC)	<40 <40	<40 <40	
47 Primary Water Supply to Wash Header	CK-10-569 (OSC)	1,500	<40	Valve lapped
51 PACVs	HV-4-4 (OSC) PAHM-4-002B (OSC)	<40 (combined)	<40	
52 RCDT Pump Discharge	CV-4668A (OSC) CV-4668B (OSC)	<40 (combined)	<40	
54A Containment Recirc Sump to RHR Pump A	MOV-861A (OSC)	<40	<40	
54B Containment Recirc Sump to RHR Pump B	MOV-861B (OSC)	<40	<40	
55 Accumulator Sampling	CV-955C (ISC) CV-955D (ISC) CV-955E (ISC) CV-956D (OSC)	<40 <40 <40 <40	<40 <40 <40 <40	
61A Spare	Valve 'A'	<40	<40	
61B Deadweight Tester to PT	Valve 'C' (OSC)	<40	<40	

ATTACHMENT 4B (Cont'd)

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1983 TYPE C DATA SUMMARY				
63 Instrument Air Bleed	CV-2819 (ISC) CV-2826 (OSC)	2,500 150	150 150	CV-2819 limit switch adjusted, CV-2826 retested to verify leakage
65A Containment Air Test Air In-Out	Flanges (OSC)	>52,000	300	Flanges removed to pressurize and depressurize for ILRT, Retested after ILRT
65B Containment Air Test Pressure	Valve 'F' (OSC)	<40	80	Retested after ILRT
65C Containment Air Test Leakage Flow	Valve 'G' (OSC)	<40	<40	Retested after ILRT

ATTACHMENT 4B (Cont'd)

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1981-1982 TYPE C DATA SUMMARY				
1 To RHR from Loop A Hot leg	MOV-751 (ISC)	0	0	
5 PRT to Gas Analyzer	CV-516 (OSC)	0	0	
6 Nitrogen to PRT	CK-518 (ISC) ST-CK-519 (ISC)	50 0	50 0	
7 PW to PRT and RCP Standpipes	CV-519A (OSC) CV-519B (ISC) CV-522A (ISC) CV-522B (ISC) CV-522C (ISC)	0 (combined)	0	
8 PRZ Steam Samples	CV-951 (ISC) CV-956A (OSC)	0 <30	0 <30	
9 PRZ Liquid Samples	CV-953 (ISC) CV-956B (OSC)	0 <30	0 <30	
10 RCDT and PRT Vent and Nitrogen to RCDT	CV-4-4658B (OSC) PCV-4-1014 (OSC).	0 250	0 250	
11 Alternate Low Head SI to Loops	MOV-872 (OSC)	0	0	
14 Letdown to Nonregenerative Heat Exchanger	CV-200A (ISC) CV-200B (ISC) CV-200C (ISC) CV-204 (OSC)	600 (CV-200A) (CV-200B) (CV-200C) 70	600 (CV-200A) (CV-200B) (CV-200C) 70	
15 Charging to Regenerative Heat Exchanger	CK-312C (ISC) HCV-121 (OSC) V-333 (OSC)	30 60 (HCV-121) (V-333)	30 60 (HCV-121) (V-333)	
16 PACVs, Hydrogen Removal	HV-4-2 (OSC)	0	0	
17 SI Test Line	V-895V (OSC)	75	75	
19A Containment Spray A	CK-890A (OSC) MOV-880A (OSC)	42,500 0	1,000 0	CK-890A valve seat cleaned and lapped

ATTACHMENT 4B (Cont'd)

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1981-1982 TYPE C DATA SUMMARY				
19B Containment Spray B	CK-890B (OSC) MOV-880B(OSC)	9,000 0	1,700 0	CK-890B valve seat cleaned and lapped
20 A and B Hot Leg Sample	CV-955A (ISC) CV-955B (ISC) SV-956C (OSC)	0 <30 0	0 <30 0	
23 Containment Sump to WHT	CV-2822 (OSC) CV-2821 (OSC)	>52,000 0	0 0	CV-2822 valve stroke adjusted and seat cleaned and lapped
24A Seal Water Injection to A RCP	CK-298A (ISC) V-297A (OSC)	0 0	0 0	
24B Seal Water Injection to B RCP	CK-298B (ISC) V-297B (OSC)	0 0	0 0	
24C Seal Water Injection to C RCP	CK-298C (ISC) V-297C (OSC)	0 0	0 0	
25 RCP Seal Water Return	MOV-381 (OSC) MOV-6386 (ISC)	0 450	0 450	
29 Instrument Air Supply	CK-336 (ISC) CV-2803 (OSC) CK-340A (ISC)	600 0 450	600 0 450	
30 Breathing Air	Blank Flange and V-BA-201 Blank Flange and CV-6165	0 0	0 0	Tested between flange and valve Tested between flange and valve
31 RCDT to Gas Analyzer	CV-4659B (OSC)	0	0	
32 Containment Air Sample Return	CK-11-003 (ISC) SV-2912 (OSC)	450 >52,000	0 0	CK-11-003 valve seat cleaned; SV-2912 solenoid valve internals were replaced and seat cleaned
33 Containment Air Sample	SV-2913 (OSC) SV-2911 (OSC)	2,500 600	1,020 1,500	SV-2911 and 2913 solenoid valve internals were replaced

ATTACHMENT 4B (Cont'd)

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1981-1982 TYPE C DATA SUMMARY				
34 Service Air	CK-205 (ISC) V-204 (OSC)	>52,000 120	700 120	CK-205 valve seat cleaned
35 Containment Purge Inlet	PV-2600 (OSC) PV-2601 (ISC)	28,000 (combined)	45	Valve seats adjusted
36 Containment Purge Outlet	PV-2602 (OSC) PV-2603 (ISC)	30,000 (combined)	<30	Valve seats adjusted
42 Nitrogen to Accumulators	CV-855 (OSC) V-945E (OSC)	0 0	0 0	
47 Primary Water Supply to Wash Header	CK-10-569 (OSC)	>52,000	0	Valve seat cleaned and lapped
51 PACVs	HV-4-4 (OSC) PAHM-4-002B (OSC)	0 (combined)	0	
52 RCDT Pump Discharge	CV-4668A (OSC) CV-4668B (OSC)	0 (combined)	0	
54A Containment Recirc Sump to RHR Pump A	MOV-861A (OSC)	60	60	
54B Containment Recirc Sump to RHR Pump B	MOV-861B (OSC)	80	80	
55 Accumulator Sampling	CV-955C (ISC) CV-955D (ISC) CV-955E (ISC) CV-956D (OSC)	60 0 0 400	60 0 0 400	
61B Deadweight Tester to PT	Valve 'C' (OSC)	0	0	
63 Instrument Air Bleed	CV-2819 (ISC) CV-2826 (OSC)	0 0	0 0	
65A Containment Air Test Air In-Out	Flanges (OSC)	100	100	
65B Containment Air Test Pressure	Valve 'F' (OSC)	0	0	

ATTACHMENT 4B (Cont'd)

TYPE C DATA SUMMARY

Penetration No.	Equipment/ Valves Tested	As Found Leakage (cc/min)	As Left Leakage (cc/min)	Remarks
1981-1982 TYPE C DATA SUMMARY				
65C Containment Air Test Leakage Flow	Valve 'G' (OSC)	0	0	