REACTOR CONTAINMENT BUILDING
INTEGRATED LEAK RATE TEST
TYPE A, B, AND C

PREOPERATIONAL TEST

April, 1979

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA NUCLEAR POWER STATION
UNIT NO. 2

TABLE OF CONTENTS

1 PURPOSE

SECTION 1

PURPOSE

The purpose of this report is to present an analysis and interpretation of the Preoperational, Type A, B, and C Containment Leak Rate Test (CILRT) results conducted on the Virginia Electric and Power Company's North Anna Nuclear Power Station, Unit No. 2.

This report is submitted as required by 10CFR50 Appendix J, paragraph V.B.

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SECTION 2

SUMMARY

2.1 TYPE "A" TEST

The initial Type "A" Reactor Containment Building Integrated Leak Rate Test (CILRT) for Unit No. 2 was performed subsequent to the completion of the Structural Acceptance Test.

Pressurization for the CILRT was initiated at 1315 hours April 27, 1979 after satisfactory completion of the test prerequisites.

When Containment test pressurization and stabilization were successfully completed, the CILRT was initiated at 1630 hours on April 28, 1979. After approximately nine hours into the test, it was determined that the measured leakage rate was within acceptable limits as specified in the Preoperational Test Procedure, 2-PO-13 acceptance criteria.

During surveillance of the test boundaries, several minor leaks were discovered around plugs in both the Outside Recirculation Spray Pump and Safety Injection Pump casings. Tightening these plugs to stop the leaks later proved only partially successful; however, leakage from them was determined to be insignificant.

At 1630 hours on April 29, after having run 24 hours, the CILRT was terminated with an acceptable leak rate. The Mass Pump Back Verification Test was successfully completed at 1810 hours. After a careful review of test data and results, depressurization was initiated.

2.2 LOCAL LEAK RATE TESTS (TYPE "B" AND "C")

The program of local leak rate testing of Containment Isolation Valves and other Primary Containment penetrations was conducted as required by 10CFR50 Appendix J, commencing in August of 1978. Testing was performed in accordance with the procedures listed below. Those penetrations tested and their leak rates are listed in Section IV of this report. The Testing Program was completed in April of 1979.

1. 2-PO-14.1-5, Containment Type "B" Testing Procedures

2. 2-PO-16, Containment Isolation Valve Type "C" Testing

NOTE: 1. The change from Eastern Standard Time (EST) to Daylight Savings Time (DST) occurred between April 28 and April 29, 1979. To ensure consistency all times used in this report are recorded in Eastern Standard Time.

3.1 TYPE "A" TEST – EDITED
LOG OF EVENTS

SECTION 3

TYPE "A" TEST

3.1 EDITED LOG OF EVENTS

April 27, 1979

The North Anna Containment Integrated Leak Rate Test (CILRT) 2-PO-13, began following completion of the Reactor Containment Building Structural Acceptance Test (2-PO-74). At approximately 1315 hours, all procedure prerequisites had been signed and Containment Pressurization began. Initial Containment pressurization was accomplished using four of the ten available station air compressors (approximately 5,000 scfm). Containment atmosphere was being controlled using all three Containment Recirculation Fans operating with chilled water throttled to approximately 600 gallons per minute (gpm). Surveillance of penetration areas and test boundaries continued throughout the initial stages of pressurization with no leaks being detected. At approximately 1530 hours, a fifth and sixth compressor were started and pressurization continued throughout the night and early morning hours of the following day. Two casing plug leaks were found and repaired on outside Recirculation Spray and Safety Injection pumps 2-RS-P-2B/2-SI-P-1B, respectively.

April 28, 1979

At approximately 0725 hours, after 18 hours of pressurization, Containment pressure approached 59 psia. Preparations were made to secure Containment pressurization and at 0733 hours, the air charging line isolation valve was shut with Containment pressure indicating 59.22 psia.

At 0735 hours, with charging secured, Containment Isolation Valve MOV-HV-200A (inside Containment Isolation Valve) was shut and the charging line depressurized and vented via 2-LM-61 and MOV-HV-202. With the charging line at atmospheric pressure, MOV-HV-202 (outside charging line isolation bypass valve) was shut and the charging line left vented through 2-LM-61.

At 0817 hours, Chilled Water to the Containment Recirculation Fan Cooling Coils was inadvertently secured. By 0940 hours, flow was returned and throttled to 500 gpm.

At 1030 hours, the Containment stabilization period began. The rate of change of Containment temperature was monitored over the next several hours and by 1440 hours, the Containment temperature stability criteria had been met; however, Containment mass was found to be unstable and the Containment stabilization period was extended to 1630 hours.

At 1630 hours, the official Integrated Leak Rate 24-hour monitoring period began. Vital Containment atmospheric

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information was reviewed every 10 minutes and, after several hours, values for Leakage (percent/day), Confidence, and Upper Confidence Limit (UCL) indicated that Containment Leakage would be within the allowable as specified in the Reference Criteria. At 2230 hours, a very small packing leak was detected and adjusted on MOV-2890B.

April 29, 1979

Monitoring of containment leakage continued throughout the night and next morning. By 0830 hours, Containment UCL was 0.0598 percent/day; well within the acceptable limits of the acceptance criteria.

At 1630 hours, the 24 hour Leakrate Test was terminated. Upper Confidence Limit (UCL) recorded at this time was 0.0411 percent/day.

At 1640 hours, the Mass Pump-Back Verification Test was initiated. Verification air flow was throttled to approximately 75 standard cubic feet per minute (scfm).

At 1740 hours, the Mass Pump-Back Verification flow was secured. At 1810, readings taken from the flow totalizer were compared with the calculated mass change and the results were within the acceptance limit.

Subsequent to the completion of the Mass Pump-Back Verification Data, the CILRT results were documented as being complete and depressurization of the Containment commenced.

April 30, 1979

At 0800, depressurization of the Reactor Containment Building was completed.

3.2 GENERAL TEST DESCRIPTION

3.2.1 Prerequisites

In accordance with 2-PO-13, the following is a partial listing of the prerequisites, completed and documented prior to Containment pressurization.

1. General inspection of the accessible interior and exterior surfaces of the Containment structure was performed.

2. Type "B" and "C" testing was completed (2-PO-14.1 through 14.5, 2-PO-15, and 2-PO-16).

3. Structural acceptance test was completed (2-PO-74).

4. All equipment and instrumentation that could be damaged or destroyed by test pressure was removed or protected.

5. All instrumentation used for test was cleaned and calibrated.

6. Valve line-ups, as required, were completed including closure of Containment Isolation Valves.

7. Containment Air Recirculation System was operable and maintained the Reactor Containment at a stable temperature for at least two days before the test.

8. Component Cooling and Chilled Water Systems were operable.

9. Computer was operational and programmed for the CILRT.

10. Instrument Location Verification Tests were completed.

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

12. Site meteorology data were taken for 7 days prior to and throughout the performance of the CILRT.

3.2.2 Equipment and Instrumentation

Pressurization of the Containment was achieved by utilization of the site construction air system consisting of 10 air compressors feeding a 12,000 cubic foot receiver. Air was piped from the receiver tank to a test skid consisting of an in-line chilled water-cooled heat exchanger and a cartridge filter. Instrumentation and valving was installed to maintain proper

monitoring and control during pressurization. The total capacity of the pressurization system was in excess of 11,000 scfm.

During the test, the necessary variables used to determine Containment leakage were continually monitored using permanently installed plant instrumentation. This instrumentation consisted of multiple resistance temperature detectors (RTD's), dew cells, and an absolute quartz manometer (see Appendix 3D).

Flow instrumentation in the Service Air System was used during the Mass Pump-back Verification. All test instrumentation, except that used for the Mass Pump-back Verification data, is input into the Plant Computer for data acquisition and averaging.

3.2.3 Data Acquisition System

The North Anna Unit 2 CILRT utilized a Westinghouse Prodac P250 to scan, calculate, average, and log data received from the Containment instrumentation.

The P250 analog scan package reads all the analog inputs in a pre-established manner, converts these readings into Engineering units, and then stores these values in a predefined location for use by the Plant Operators and by the Plant Application Programs.

For the CILRT, the P250 Plant Computer monitored the following instrumentation:

Type	Scan Rate
18 RTD's	32 seconds
5 dew cells	32 seconds
1 absolute quartz manometer	2 seconds
1 flowmeter	32 seconds

Instantaneous values of all CILRT instruments were recorded every 5 minutes during the test period using the P250 digital trend function on the operator's console. A 10 minute average, calculated by the P250 Average and Integrate (A&I) package was used as input to the Plant Computer CILRT programs.

The Plant Computer CILRT program consists of ILRTDATA, which runs every 10 minutes, collects A&I data for all the instrumentation, performs sensor validity checks, and calculates average weighted dew point temperature, vapor pressure, average weighted Containment temperature, and absolute mass.

3.2.4 Data Resolution System

After the appropriate data have been acquired and averaged utilizing the Plant Computer system, the result is input to a remote computer system for leak rate calculations utilizing the Absolute Method.

3.2.4.1 Absolute Method Mass Point Analysis

The Absolute Method of leakage-rate testing consists of determining and calculating air losses by Containment structure leakage over a minimum of 24 hours by means of direct pressure, temperature, and moisture content observations during the period of test, with the temperature detectors properly located to provide an average air temperature. The masses are computed using the ideal gas law as follows:

$$M = \frac{(P-Pv)\ Vc}{RT}$$

where the rightmost identity has the units:

M = lb gas
P = (total pressure) - psia
Pv = (vapor pressure) - psia
R = 53.35 ft lbf/lbm ^{o}R (for air)
T = Containment temperature ^{o}R
Vc = Containment free volume, ft^{3}

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

$$\text{Leak rate} = \frac{A}{B}(-2400) \qquad (1)$$

where A is the slope of the least-squares curve and B is the y-intercept. The sign convention is such that an outward leak is positive and the units are in percent/day. The Containment is computed separately and the result is correlated as a function of time by means of a least-squares-curve fit of form:

$$m = At + B$$

The slope A and the y-intercept B are then used in Equation 1 to determine the leak rate.

A 95 percent "Student T" confidence level is associated with each leak rate computation. The leak rate (in percent mass loss per 24 hours) may be described as 95 percent accurate to within the value of the printed confidence level.

The sum of the leakage rate and the 95 percent confidence level is the upper Confidence Limit (UCL).

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3.3 TEST ANALYSIS

Test data obtained from the data aquisition system for the period of 0830 hours on April 28, 1979 to 1630 hours on April 29, 1979 is utilized for the test analysis. The interval between 0830 hours to 1630 hours represents the containment stabilization period and 1630 hours, April 28, 1979, to 1630 hours April 29, 1979, represents the CILRT period.

The leakage rate analysis is performed by Virginia Power and Electric Company's (VEPCO) CILRT program (Section 3.2.4) and the plots are generated by Stone & Webster's LEAKFIT program (refer to the Appendices to Section 3).

The input data and results of the VEPCO CILRT program are shown in Appendices 3G and 3H, respectively. The results show the UCL to be 0.0411 percent/day which is well below the acceptance criteria limit of 0.0747 percent/day (0.075 less the Type C penalty for valves on systems not vented to the Containment).

Six graphs, obtained by LEAKFIT and shown in Appendices 3J through 3P are provided showing the following quantities versus time:

Appendix	Description
3J	Containment Air Mass During Stabilization and CILRT
3K	Containment Leak Rate
3L	Fitted Containment Air Mass
3M	Containment Average Temperature
3N	Containment Air Pressure
3P	Containment Vapor Pressure

The Containment air mass plot (see Appendix 3J) shows a depression of the air mass at minus six hours and recovering at minus four hours, with zero hours representing the start of the CILRT. This instability is attributed to the securing and subsequent reinitiation of the cooling water supply to the Containment Air Recirculation Fan Coolers.

Appendices 3K through 3P represent the Containment leakage rate and air properties during the CILRT.

The Leakage Rate Test calculations were verified by the Metered Pump-Back test method. Approximately 75 percent of the maximum allowable 24-hour leakage (La) was inserted during one hour of elapsed time. The calculated air mass was within .25 La of the metered value (refer to Section 3.4.2).

3.4 TYPE "A" TEST – TEST RESULTS

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3.4 TEST RESULTS

3.4.1 59 psia CILRT Results

1.	Leakage rate calculated, L	0.0333 percent/day
2.	95 percent confidence level	0.0078 percent/day
3.	Upper Confidence Limit, UCL, Lam leakage rate with 95 percent confidence level (1 + 2)	0.0411 percent/day
4.	Correction for "B" and "C" type leakage	0.0003 percent/day
5.	Total reportable type "A" leak rate (3 + 4)	0.0414 percent/day

The 59 psia CILRT was acceptable in accordance with 10CFR50, Appendix J.

3.4.2 Verification Test Results

1.	Verification air inserted, Mass	337.9 lbm
2.	Difference between initial computer air mass reading and final computer air mass reading	388.4 lbm
3.	.25 La verification limit	128.4 lbm
4.	Difference between computer air mass reading and verification air readings (2 - 1)	50.5 lbm

The calculated CILRT air mass increase agreed with the Mass Pump-Back Verification Instrumentation within .25 La in accordance with 10CFR50 Appendix J.

3.4.3 Type "C" and "B" Penetration Leakage To Be Added To Containment Calculated Leakage (UCL)

Penetration No./Type C Leakage (SCFD)(1)

1	0	26	0	70	0
2	0	27	0	71	0
4	1.08	28	3.36	79	0
5	0	32	0	80	0
7	1.56	39	0	81	0
8	11.04	40	0	82	0
9	0	41	0	83	0
10	0	46	0	84	0
11	0	55B	0	85	0
12	0	56A	0	86	0
13	0	56B	0	97A	0
14	0	56D	0	97C	0
15	1.2	57A	0	100	0
16	0	60	0	105A	0
17	0	61	0	105B	0
18	0	62	0	105C	0
19	0	63	0	108	0
22	.24	64	0	113	0
24	0	66	0	114	0
25	0	67	0		

Total type "C" leakage to be added 18.48 SCFD

Total type "B" leakage to be added 0 SCFD

Total type "B" and "C" leakage to be added 18.48 SCFD

0.0003 percent/day

NOTE: 1. The above listed penetrations were in a non-vented valve lineup configuration for this test, with their respective leak rates per 2-PO-16 Testing.

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APPENDIX 3A

APPENDIX 3A

INSTRUMENT LOCATION VERIFICATION DATA SUMMARY

I. Test No. 1

a. Mean average temperature from test verification points 79.8 F

b. Weighted average temperature from RTD's 79.8 F

Note: Acceptance Criteria

The mean average temperature from the verification test points is within ±2 F of the weighted average temperature by RTD's (Ia – Ib≤±2 F)

c. Mean average dew point temperature by psychrometer 53.4 F

d. Mean average dew point temperature by moisture analyzers 54.1 F

Note: Acceptance Criteria

The mean average dew point temperature by psychrometer is within ±5 F of the weighted dew point average temperature by moisture analyzers. (Ic-Id≤±5F)

II. Test No. 2

a. Mean average temperature from test verification points 70.7 F

b. Weighted average temperature from RTD's 70.3 F

Note: Acceptance Criteria

The mean average temperature from the verification test points is within ±2 F of the weighted average temperature by RTD's (IIa-IIb≤±2 F)

c. Mean average dew point temperature by psychometer 47.6 F

d. Weighted average dew point temperature by moisture analyzers 47.6 F

Note: Acceptance Criteria

The mean average dew point temperature by psychometer is within ±5 F of the weighted average dew point temperature by moisture analyzers. (IIc-IId≤±5 F)

APPENDIX 3B

SITE METEOROLOGY PRIOR TO CILRT

Date	Time	Barometric Pressure (Psia)	Humidity Dew Pt. (°F)	Dry Bulb (°F)
4/20/79	0000	14.746	37	51
	0400	14.760	26	46
	0800	14.780	24	48
	1200	14.760	23	58
	1600	14.721	26	64
	2000	14.751	36	55
4/21/79	0000	14.765	35	50
	0400	14.770	38	43
	0800	14.775	33	52
	1200	14.751	36	65
	1600	14.716	38	72
	2000	14.746	44	64
4/22/79	0000	14.756	44	56
	0400	14.756	45	51
	0800	14.760	45	53
	1200	14.736	51	67
	1600	14.702	53	76
	2000	14.741	59	70
4/23/79	0000	14.741	60	60
	0400	14.746	58	59
	0800	14.770	56	61
	1200	14.780	49	66
	1600	14.775	52	64
	2000	14.765	53	61
4/24/79	0000	14.770	55	57
	0400	14.750	55	55
	0800	14.755	56	57
	1200	14.745	57	62
	1600	14.715	59	67
	2000	14.718	60	63
4/25/79	0000	14.720	58	58
	0400	14.701	58	58
	0800	14.705	57	64
	1200	14.681	52	71
	1600	14.642	52	72
	2000	14.647	60	66
4/26/79	0000	14.637	58	62
	0400	14.597	58	60
	0800	14.573	58	59

Date	Time	Barometric Pressure (Psig)	Humidity Dew Pt. (°F)	Dry Bulb (°F)
4/26/79	1200	14.519	58	60
(Cont'd)	1600	14.455	58	61
	2000	14.455	58	58
4/27/79	0000	14.440	58	58
	0400	14.416	59	55
	0800	14.423	59	56
	1200	14.440	55	66

APPENDIX 3C

APPENDIX 3C

SITE METEOROLOGY DURING THE CILRT

Date	Time	Dry Bulb Temp (°F)	Barometric Pressure (Psia)	Wind Vel. (Mph)	(°T)[1] Wind Dir.	Humidity Dew Pt. (°F)
4/27/79	1300	68	14.440	5	358	54
	1400	68	14.440	4	6	55
	1500	65	14.445	3	264	55
	1600	66	14.445	3	84	56
	1700	64	14.460	4	126	58
	1800	64	14.475	6	54	55
	1900	63	14.485	6	48	55
	2000	61	14.504	6	60	53
	2100	59	14.519	6	6	50
	2200	58	14.534	4	18	48
	2300	56	14.543	8	54	45
	2400	54	14.543	6	48	45
4/28/79	0100	53	14.543	4	24	45
	0200	52	14.543	5	72	45
	0300	52	14.553	6	64	44
	0400	51	14.553	4	88	44
	0500	51	14.563	4	54	44
	0600	51	14.573	5	72	44
	0700	53	14.583	6	60	44
	0800	55	14.578	6	54	42
	0900	57	14.573	9	18	41
	1000	58	14.573	6	72	41
	1100	62	14.553	2	30	44
	1200	63	14.534	3	138	42
	1300	61	14.534	4	156	43
	1400	60	14.529	3	120	45
	1500	61	14.524	5	116	45
	1600	62	14.524	1	120	45
	1700	61	14.537	5	228	47
	1800	55	14.568	15	342	49
	1900	53	14.583	11	342	46
	2000	52	14.597	9	18	47
	2100	50	14.602	10	6	43
	2200	49	14.617	8	6	42
	2300	48	14.622	5	12	38
	2400	47	14.622	5	6	38
4/29/79	0100	46	14.627	3	360	37
	0200	46	14.622	3	348	38
	0300	44	14.632	1	296	39
	0400	42	14.637	1	276	38
	0500	40	14.647	4	300	41
	0600	41	14.666	6	336	39

NOTE: 1. Wind Direction = Degrees True

APPENDIX 3C (CONT'D)

Date	Time	Dry Bulb Temp (°F)	Barometric Pressure (Psia)	Wind Vel. (Mph)	Wind (°T)[1] Dir.	Humidity Dew Pt. (°F)
4/29/79 (Cont'd)	0700	45	14.666	5	360	36
	0800	50	14.671	8	6	35
	0900	51	14.671	7	12	32
	1000	53	14.671	7	360	32
	1100	56	14.666	5	300	32
	1200	56	14.666	5	354	32
	1300	57	14.651	2	88	35
	1400	60	14.647	3	54	33
	1500	59	14.632	4	102	34
	1600	60	14.632	3	168	36
	1700	62	14.632	2	12	34
	1800	61	14.637	3	18	36
	1900	56	14.642	1	72	42

NOTE: 1. Wind Direction = Degrees True

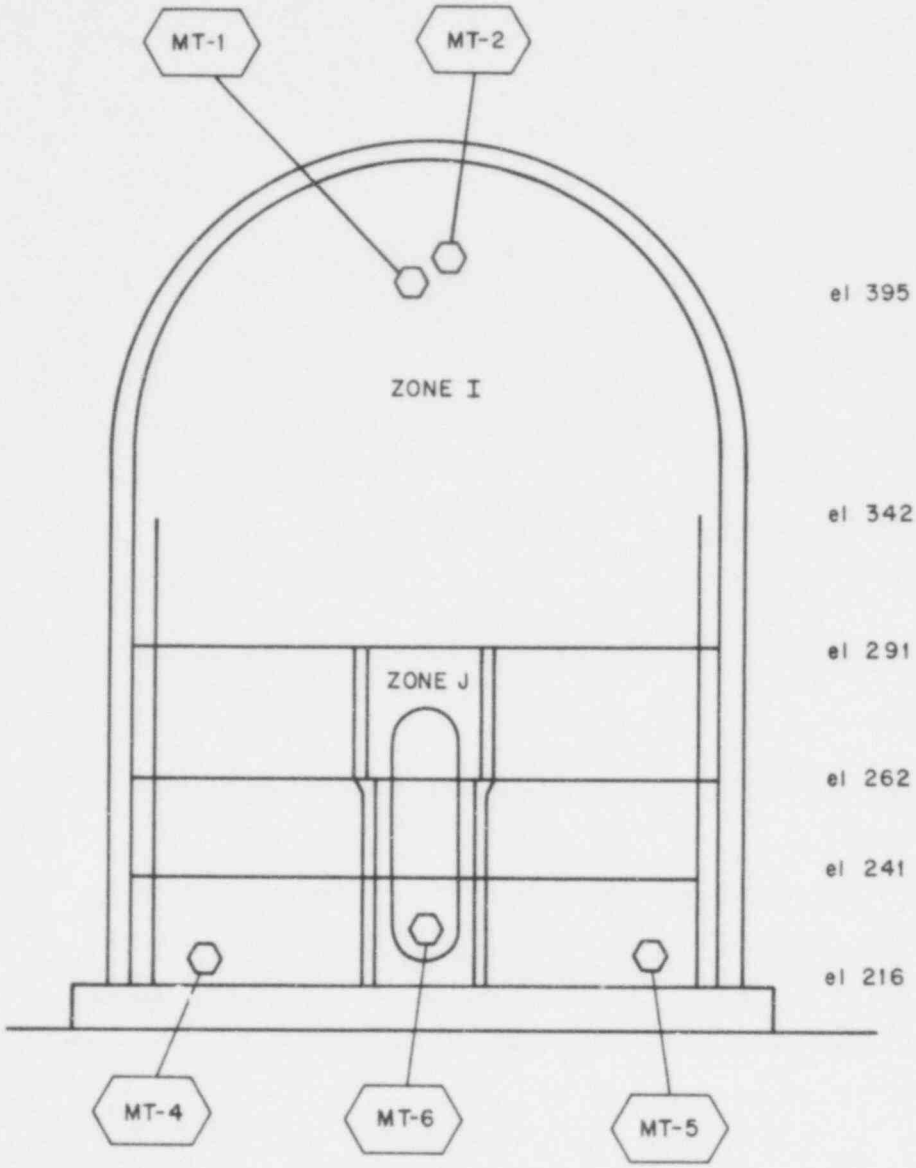
APPENDIX 3D

APPENDIX 3D

INSTRUMENTATION TABLE

The following instrumentation was cleaned, calibrated, and functionally tested no greater than six 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.

Instrument	Weight Factor	Computer Point	Range	Zone	Accuracy	Sensitivity
TE-LM-200-3	.03619	T1002A	0-200 F	F	±.1 F	±0.1 F
TE-LM-200-4	.02935	T1003A	0-200 F	E	±.1 F	±0.1 F
TE-LM-200-5	.09373	T1004A	0-200 F	B	±.1 F	±0.1 F
TE-LM-200-6	.09373	T1005A	0-200 F	C	±.1 F	±0.1 F
TE-LM-200-7	.09373	T1006A	0-200 F	B	±.1 F	±0.1 F
TE-LM-200-8	.09373	T1007A	0-200 F	C	±.1 F	±0.1 F
TE-LM-200-9	.04789	T1008A	0-200 F	A	±.1 F	±0.1 F
TE-LM-200-10	.04789	T1009A	0-200 F	A	±.1 F	±0.1 F
TE-LM-200-11	.04789	T1010A	0-200 F	A	±.1 F	±0.1 F
TE-LM-200-12	.02283	T1011A	0-200 F	D	±.1 F	±0.1 F
TE-LM-200-13	.02283	T1012A	0-200 F	D	±.1 F	±0.1 F
TE-LM-200-14	.02283	T1013A	0-200 F	E	±.1 F	±0.1 F
TE-LM-200-15	.02283	T1014A	0-200 F	E	±.1 F	±0.1 F
TE-LM-200-16	.08309	T1015A	0-200 F	G	±.1 F	±0.1 F
TE-LM-200-17	.08309	T1016A	0-200 F	G	±.1 F	±0.1 F
TE-LM-200-18	.08309	T1017A	0-200 F	G	±.1 F	±0.1 F
TE-LM-200-19	.03932	T1036A	0-200 F	F	±.1 F	±0.1 F
TE-LM-200-20	.03597	T1040A	0-200 F	F	±.1 F	±0.1 F
MT-LM-200-1	0.12569	Y2020A	30-110 F	H	±2 F	±0.5 F
MT-LM-200-2	0.12569	T1042A	30-110 F	H	±2 F	±0.5 F
MT-LM-200-4	0.24954	T1044A	30-110 F	I	±2 F	±0.5 F
MT-LM-200-5	0.24954	T1045A	30-110 F	I	±2 F	±0.5 F
MT-LM-200-6	0.24954	T1041A	30-110 F	I	±2 F	±0.5 F
PI-LM-202	N/A	U2174	0-100 psia		0.02 psi	.0002 psi
FIT-LM-200-1	N/A	F1001A	0-100 scfm		.2% range	N/A



PROFILE VIEW

NOTE:
MT-1 MT-LM-200-1 (typ)

APPENDIX 3E
INSTRUMENTATION LOCATION
MOISTURE DETECTORS
NORTH ANNA POWER STATION-UNIT 2
INTEGRATED LEAK RATE TEST

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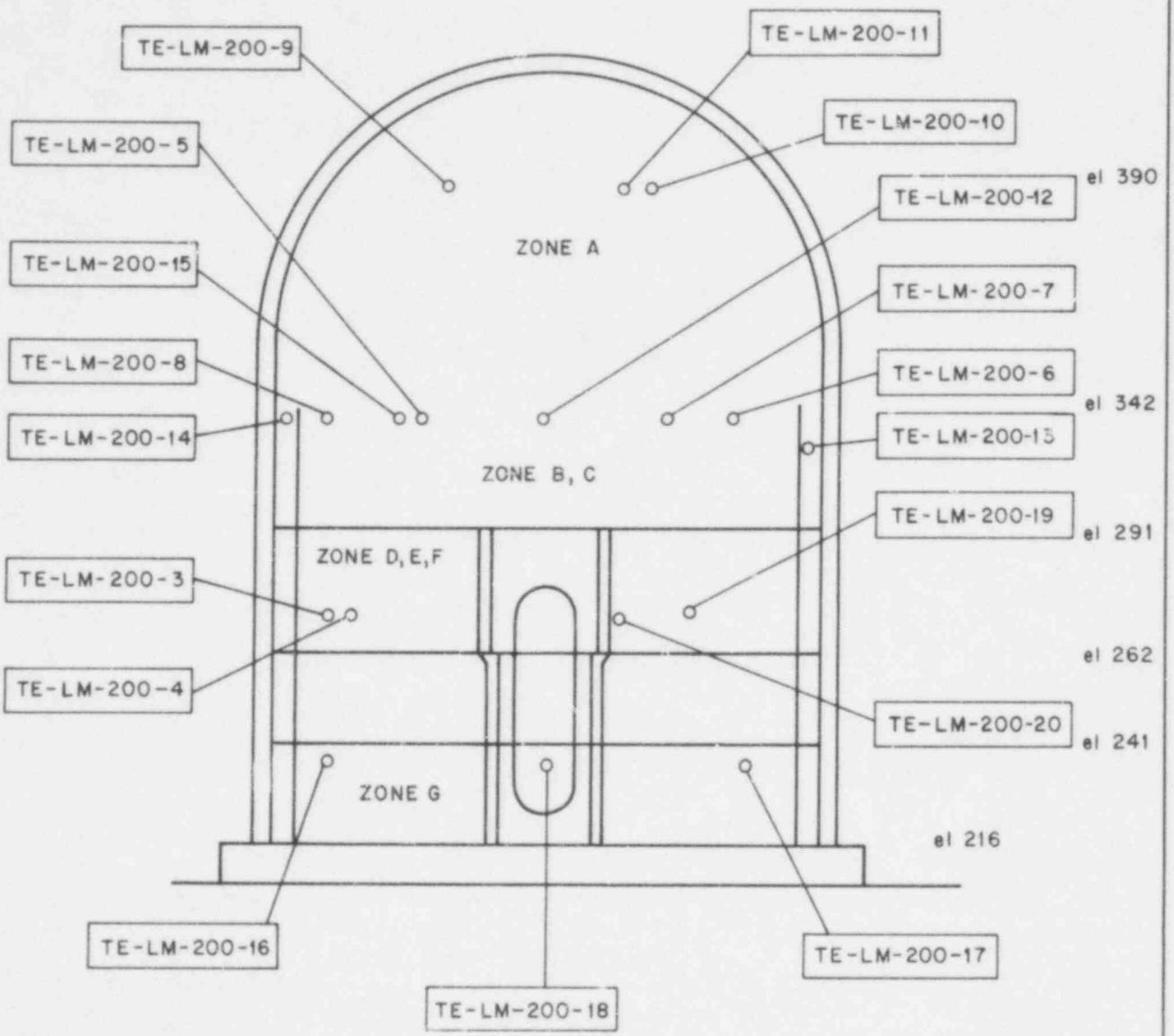

PROFILE VIEW

APPENDIX 3E
INSTRUMENTATION LOCATION
RESISTANCE TEMPERATURE
DETECTORS (RTD)
NORTH ANNA POWER STATION-UNIT 2
INTEGRATED LEAK RATE TEST

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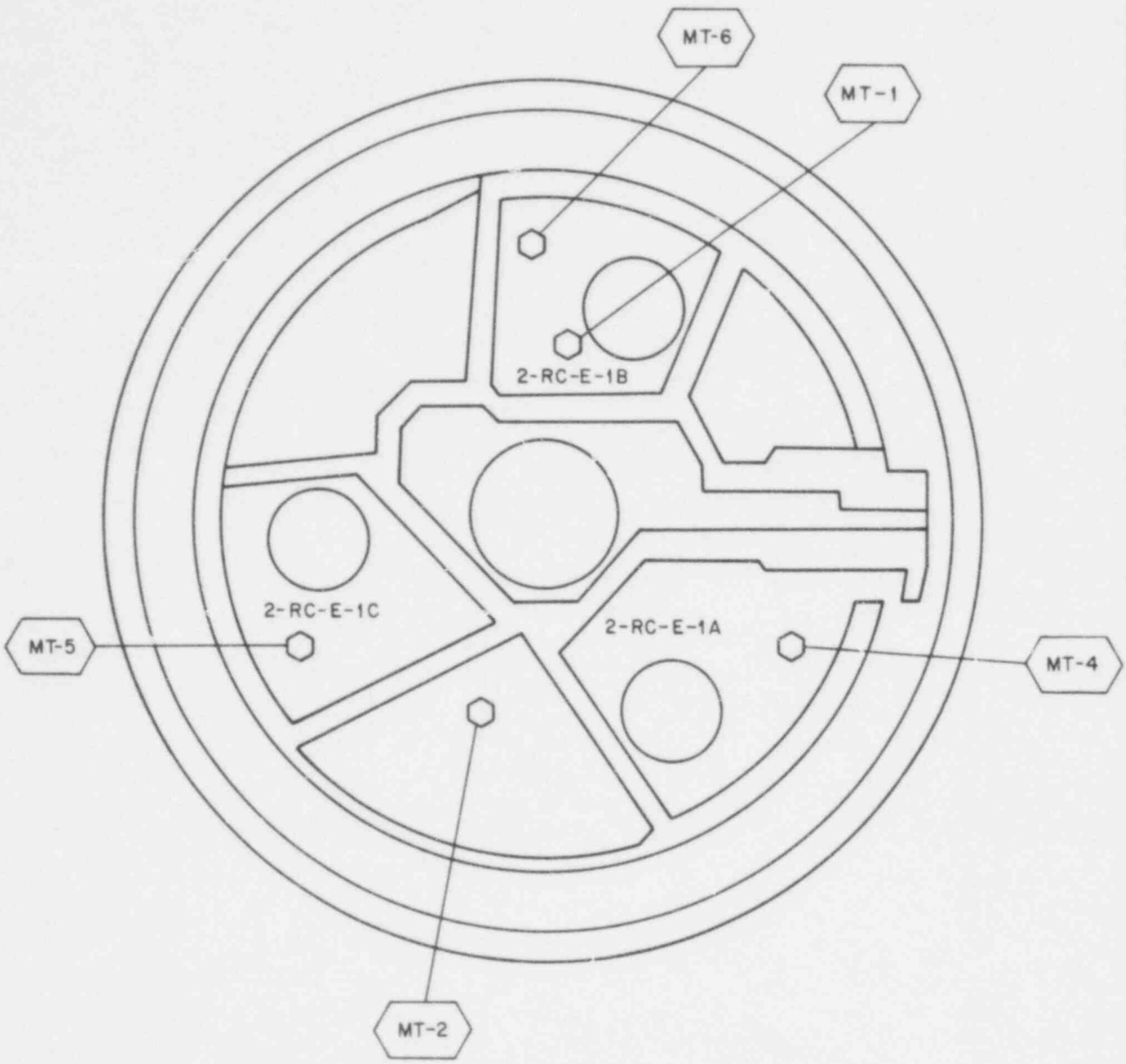
APPENDIX 3F

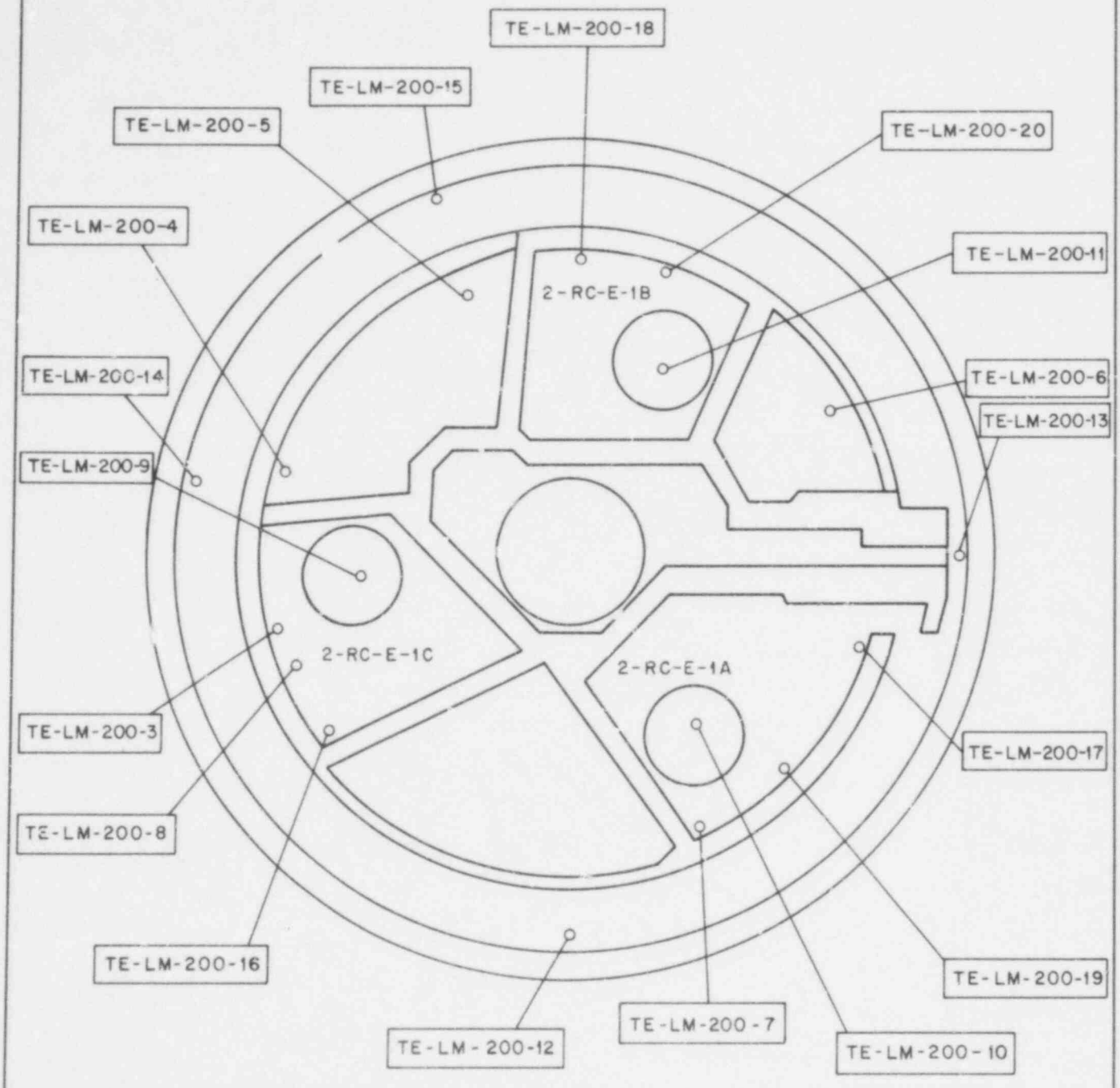


PLAN VIEW

NOTE:
MT-1 MT-LM-200-1(typ)

APPENDIX 3F
INSTRUMENTATION LOCATION
MOISTURE DETECTORS
NORTH ANNA POWER STATION-UNIT 2
INTEGRATED LEAK RATE TEST

570 128



PLAN VIEW

APPENDIX 3F
INSTRUMENTATION LOCATION
RESISTANCE TEMPERATURE
DETECTORS (RTD)
NORTH ANNA POWER STATION-UNIT 2
INTEGRATED LEAK RATE TEST

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APPENDIX 3G

APPENDIX 3G

CONTAINMENT INPUT VARIABLES

09.34.24. VEPCO NORTH ANNA POWER STATION UNIT 2 05/08/79
CONTAINMENT INTEGRATED LEAK RATE TEST FROM 1630 ON 4/28/79 TO 1630 ON 4/29/79
25 DATA SETS ARE CURRENTLY IN

Time Hours	ABS Press Psia	Dewpt Degrees F	Vap Press Psia	Temp Degrees R
0.000	58.694	68.15	.3406	529.87
1.000	58.680	68.02	.3391	529.78
2.000	58.668	67.84	.3370	529.70
3.000	58.656	67.70	.3354	529.62
4.000	58.641	67.52	.3333	529.53
5.000	58.630	67.45	.3325	529.45
6.000	58.621	67.37	.3316	529.39
7.000	58.612	67.25	.3302	529.33
8.000	58.606	67.23	.3300	529.29
9.000	58.600	67.14	.3290	529.26
10.000	58.593	67.16	.3292	529.21
11.000	58.588	67.08	.3283	529.17
12.000	58.580	66.98	.3272	529.13
13.000	58.573	66.94	.3267	529.06
14.000	58.567	66.84	.3256	529.04
15.000	58.561	66.79	.3250	528.98
16.000	58.554	66.67	.3237	528.95
17.000	58.549	66.60	.3229	528.90
18.000	58.543	66.56	.3225	528.86
19.000	58.537	66.52	.3220	528.81
20.000	58.532	66.41	.3208	528.79
21.000	58.527	66.38	.3205	528.72
22.000	58.522	66.27	.3192	528.68
23.000	58.517	66.25	.3191	528.65
24.000	58.512	66.13	.3177	528.57

Volume = 1825000.0 cubic feet

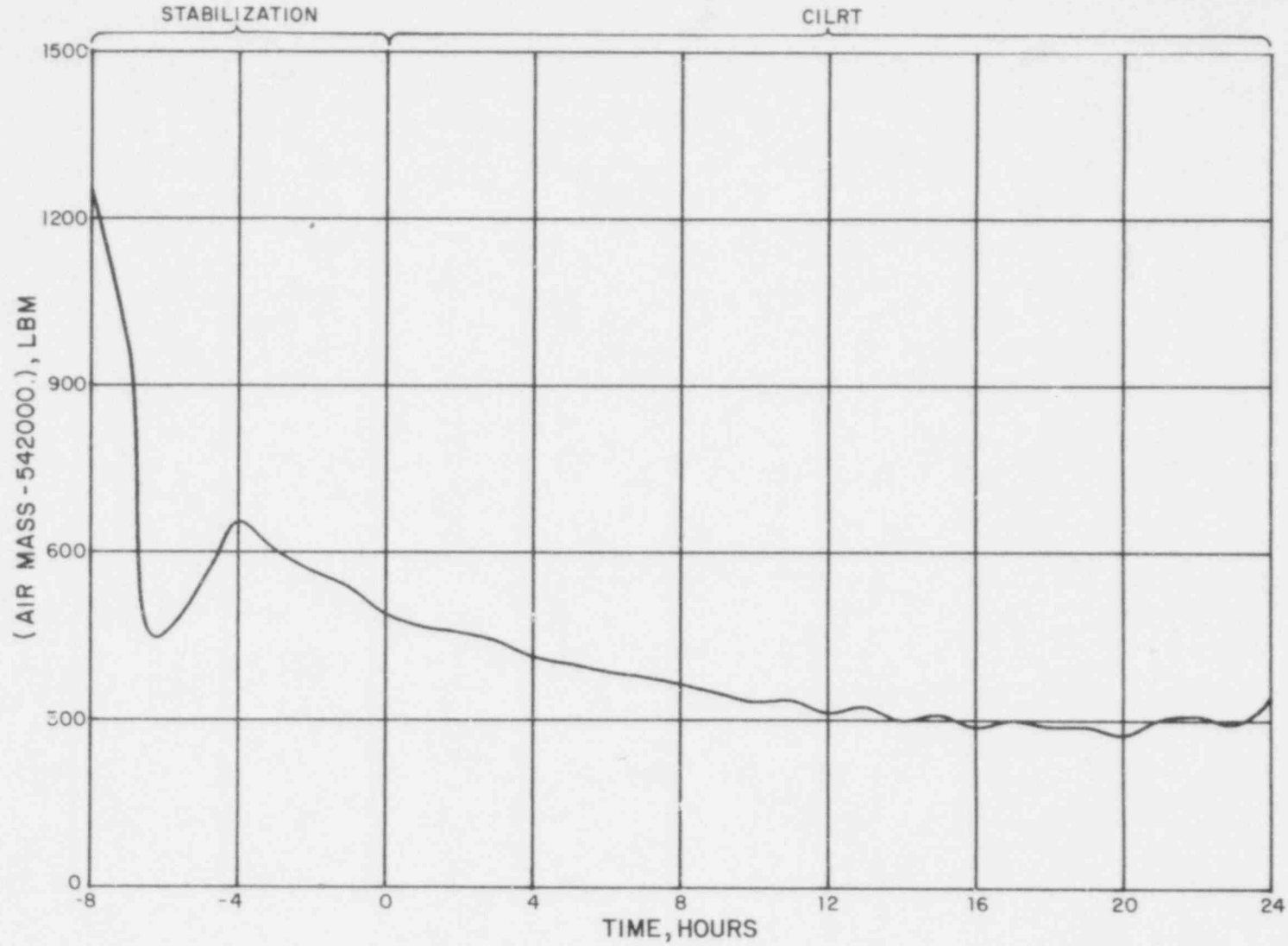
APPENDIX 3H

LEAK RATE DATA - ABSOLUTE METHOD
09.34.24. VEPCO NORTH ANNA POWER STATION UNIT 2 05/08/79
CONTAINMENT INTEGRATED LEAK RATE TEST FROM 1630 ON 4/28/79 TO 1630 ON 4/29/79

Time Hours	Mass lbm	Leakage pct/day	Conf pct/day	UCL pct/day
0.000	542490.26	0.000000	0.000000	0.000000
1.000	542466.38	0.000000	0.000000	0.000000
2.000	542456.18	.075377	.125137	.200514
3.000	542441.59	.069105	.033199	.102304
4.000	542413.54	.078847	.023013	.101861
5.000	542400.63	.078525	.013429	.091954
6.000	542386.89	.076512	.009344	.085855
7.000	542377.37	.072807	.008448	.081255
8.000	542364.64	.069980	.007413	.077392
9.000	542349.06	.068481	.006107	.074588
10.000	542333.03	.067774	.004981	.072755
11.000	542335.94	064266	.006083	.070349
12.000	542313.00	.063372	.005205	.068577
13.000	542323.79	.059636	.006445	.066081
14.000	542298.92	.058468	.005723	.064191
15.000	542309.80	.055335	.006304	.061638
16.000	542287.90	.053999	.005764	.059763
17.000	542299.90	.051183	.006150	.057333
18.000	542289.19	.049108	.006030	.055138
19.000	542288.73	.046923	.006018	.052941
20.000	542274.07	.045539	.005675	.051214
21.000	542302.38	.042474	.006328	.048803
22.000	542308.19	.039402	.006840	.046242
23.000	542293.40	.037296	.006741	.044037
24.000	542342.26	.033317	.007800	.041117

INITIAL ESTIMATED MASS = 542440.24 FINAL ESTIMATED MASS = 542259.52

APPENDIX 3J



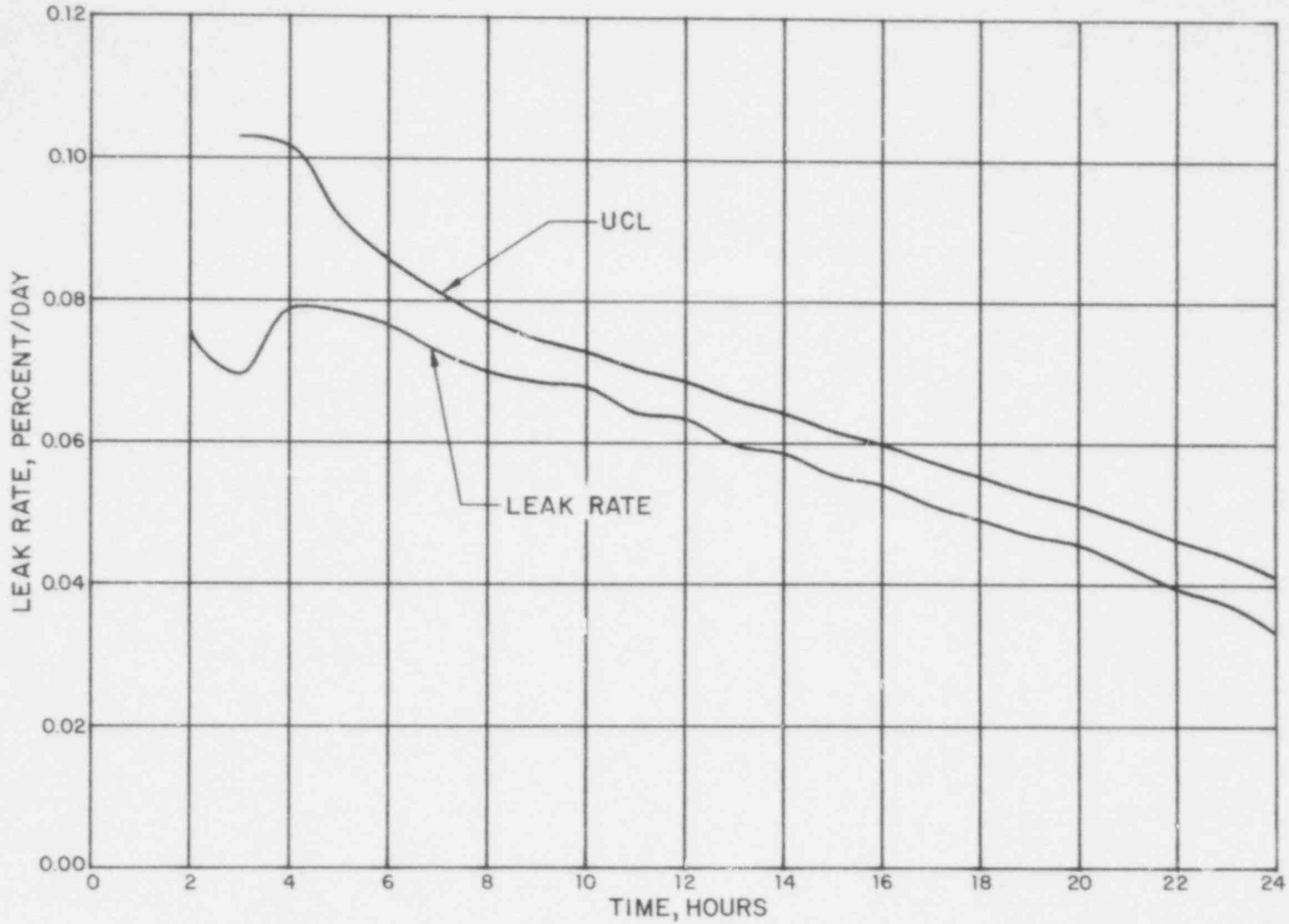
0830 4/28/79 TO 1630 4/29/79

APPENDIX 3J

GRAPH 1 - STABILIZATION & CILRT CONTAINMENT AIR MASS VS. TIME

NORTH ANNA POWER STATION - UNIT 2
INTEGRATED LEAK RATE TEST

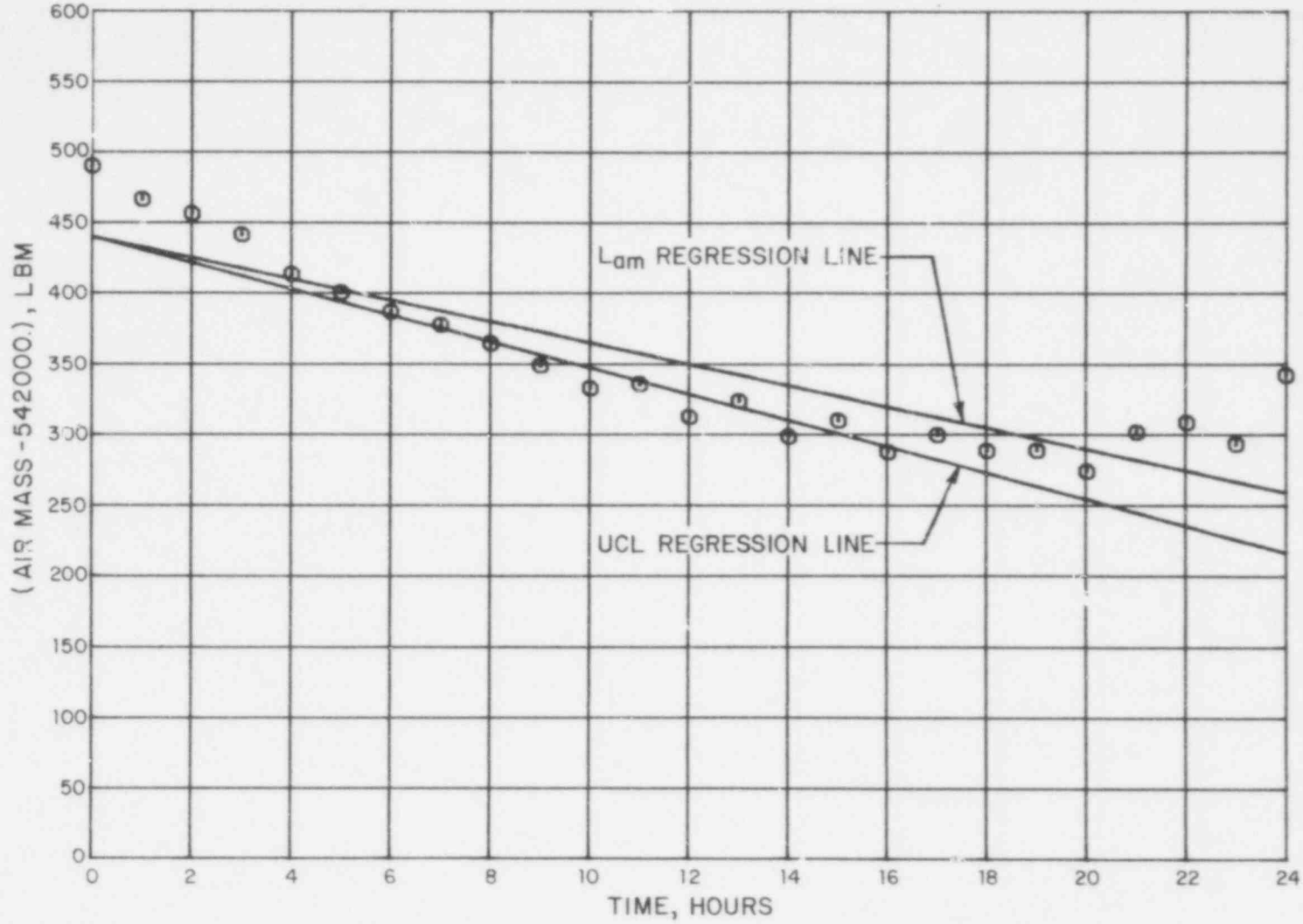
APPENDIX 3K



1630 4/28/79 TO 1630 4/29/79

APPENDIX 3K
GRAPH 2 - CILRT
CONTAINMENT LEAK RATE &
UCL VS. TIME
NORTH ANNA POWER STATION - UNIT 2
INTEGRATED LEAK RATE TEST

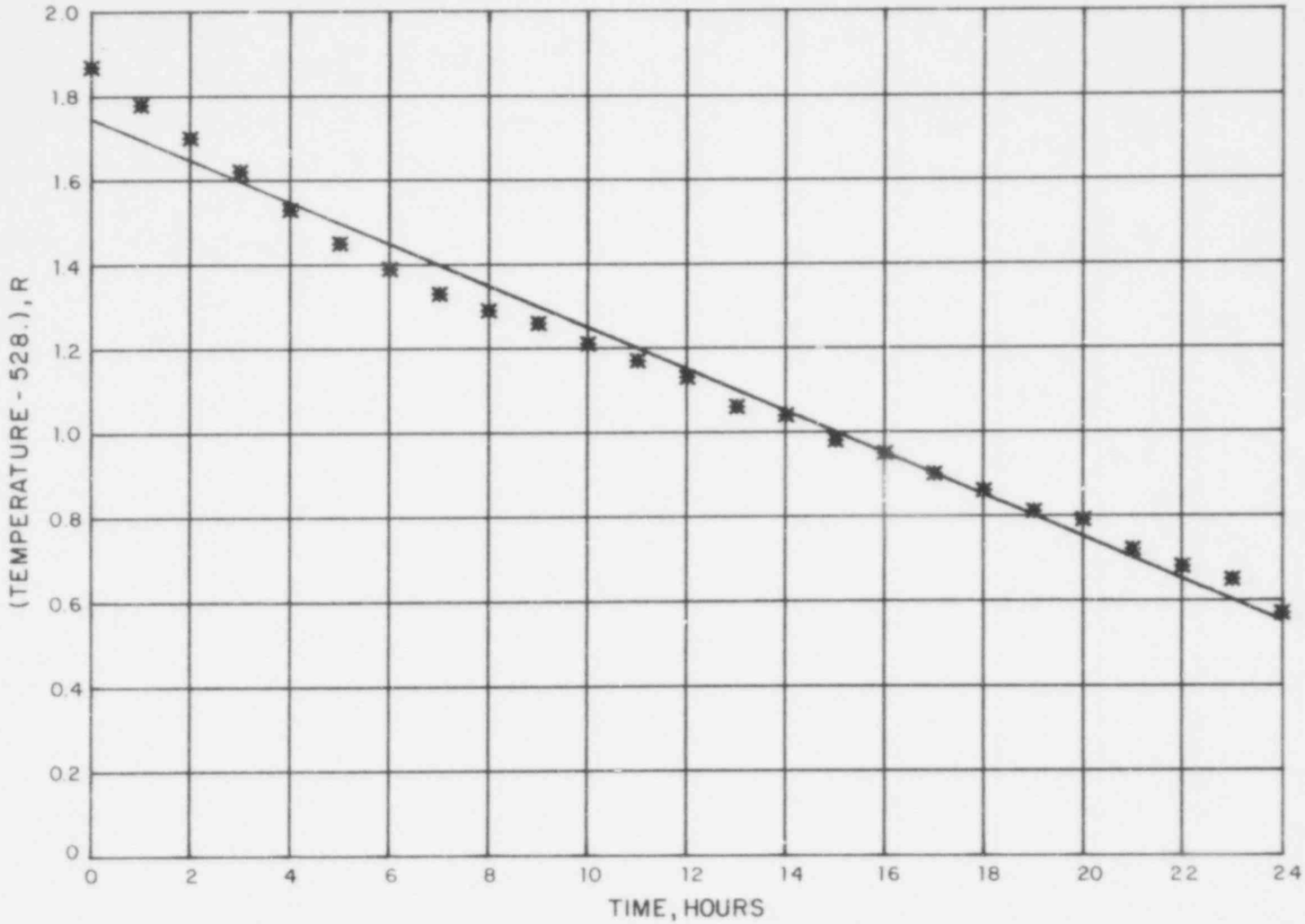
570 111



1630 4/28/79 TO 1630 4/29/79

APPENDIX 3L
GRAPH 3 - CILRT
CONTAINMENT AIR MASS VS. TIME
NORTH ANNA POWER STATION - UNIT 2
INTEGRATED LEAK RATE TEST

APPENDIX 3M



1630 4/28/79 TO 1630 4/29/79

APPENDIX 3M

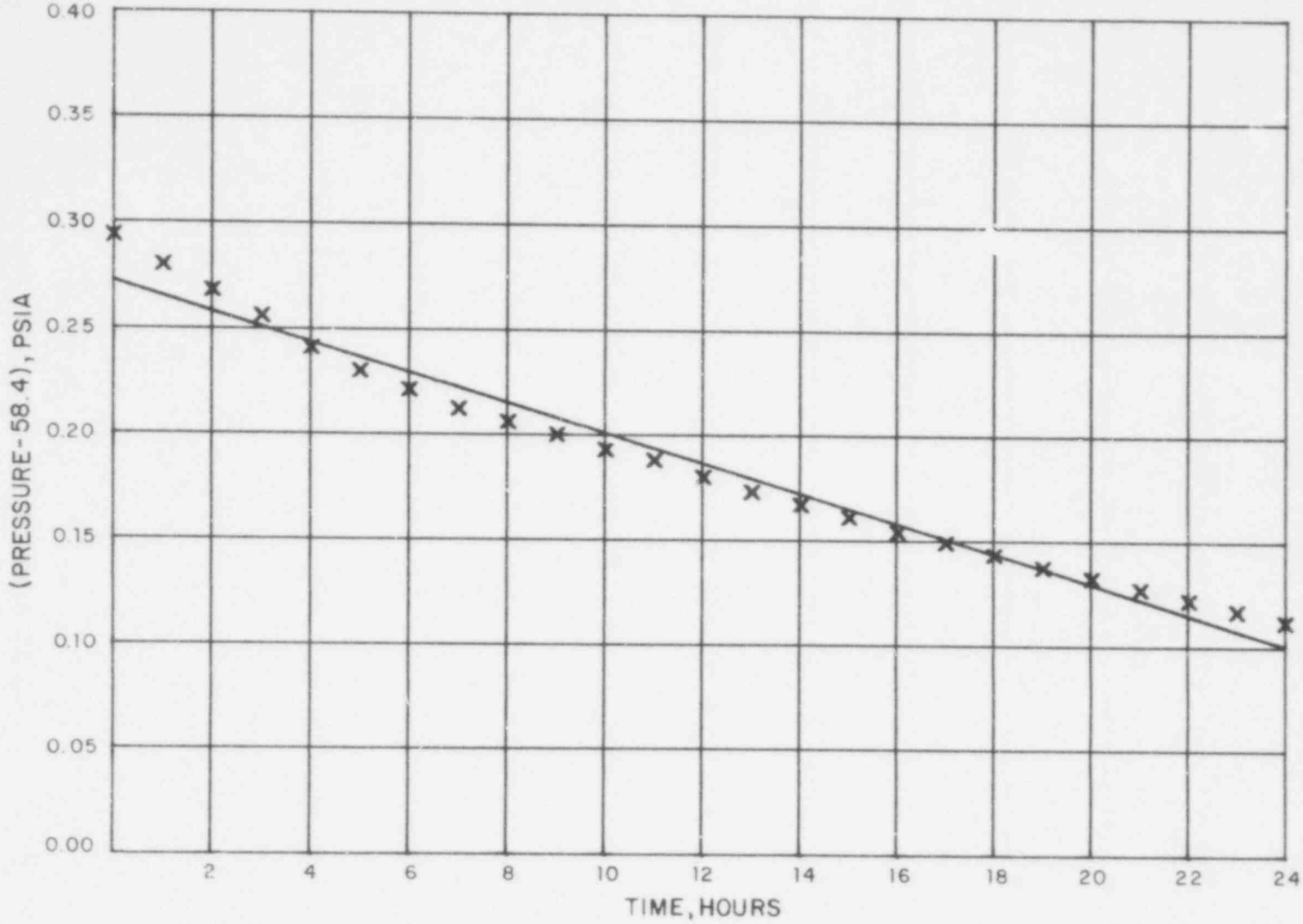
GRAPH 4 - CILRT CONTAINMENT AVERAGE TEMPERATURE VS. TIME

NORTH ANNA POWER STATION - UNIT 2
INTEGRATED LEAK RATE TEST

3M-1

570 147

APPENDIX 3N

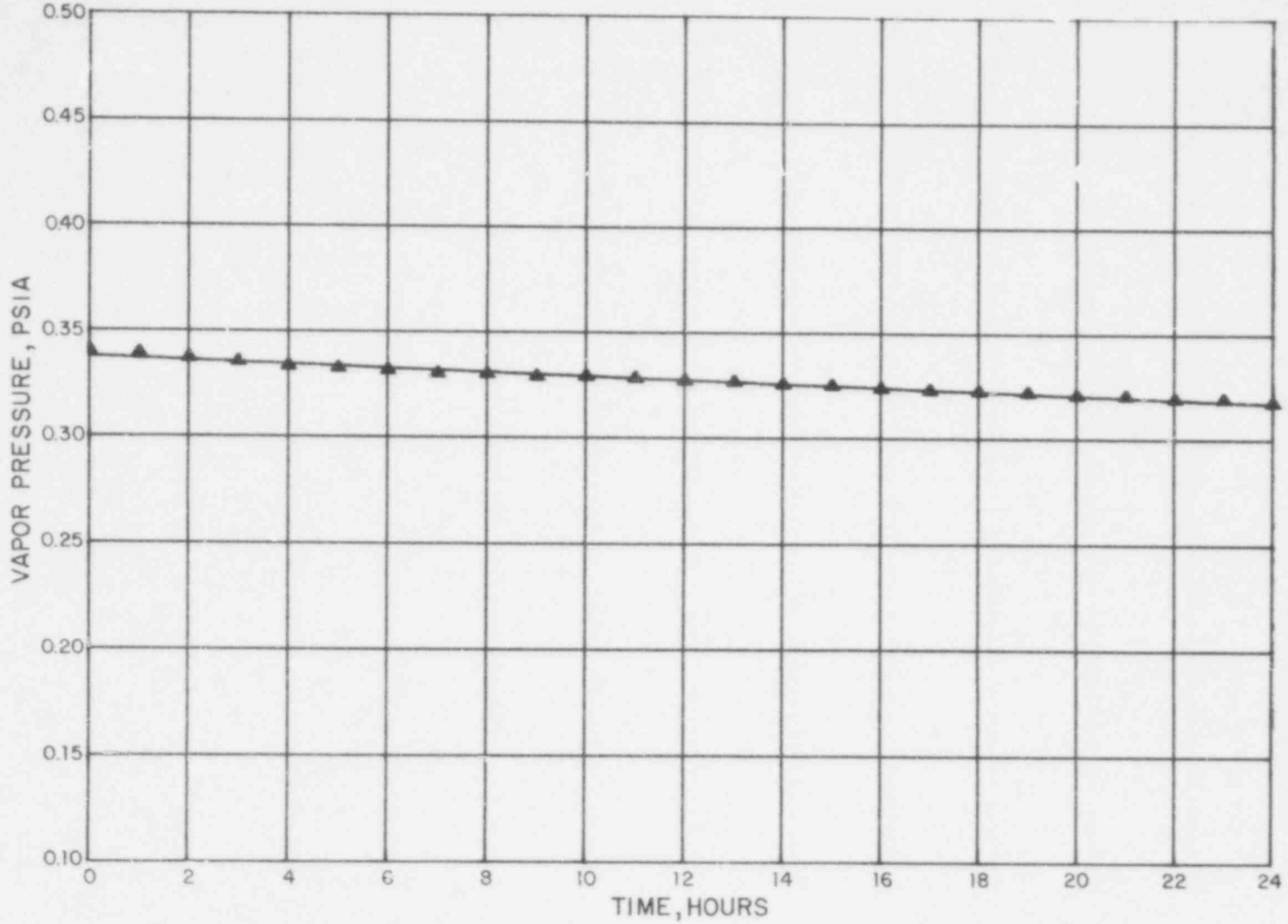


1630 4/28/79 TO 1630 4/29/79

APPENDIX 3N

GRAPH 5 - CILRT
CONTAINMENT PRESSURE VS. TIME

NORTH ANNA POWER STATION - UNIT 2
INTEGRATED LEAK RATE TEST



1630 4/28/79 TO 1630 4/29/79

APPENDIX 3P
GRAPH 6 - CILRT
CONTAINMENT VAPOR PRESSURE VS. TIME
NORTH ANNA POWER STATION - UNIT 2
INTEGRATED LEAK RATE TEST

4 LOCAL LEAK RATE
TESTS "B" & "C"

SECTION 4

LOCAL LEAK RATE TESTS (TYPE "B" AND "C")

Local leak rate tests were performed by pressurizing with air the penetrations listed in the following tables and either measuring leakage across Containment Isolation Valves (Type C) or across resilient seals (Type B).

Totals from the following pages:

Type "B" Total 22.32 SCFD
Type "C" Total 24.48 SCFD
Total Type "B" and "C" 46.8 SCFD
0.06 La Limit 4,120 SCFD

The total Type "B" and Type "C" leakage documented was verified to be in accordance with 10CFR50 Appendix J. The following pages list those penetrations tested and the documented leakage of each.

APPENDIX 4A

APPENDIX 4A

TYPE B LEAK TEST DATA SHEETS

Item		Leakage, SCFH	Date
1.	Personnel Air Lock	0.93	3/29/79
2.	Equipment Hatch	0	4/21/79
3.	Fuel Transfer Tube	0	3/19/79
4.	Emergency Air Lock	0	4/22/79
5.	Electrical Penetration No.		
	1A (Cannister)	0	3/13/79
	1A (O-Ring)	0	3/13/79
	1B (Cannister)	0	3/13/79
	1B (O-Ring)	0	3/13/79
	1C (Cannister)	0	3/13/79
	1C (O-Ring)	0	3/13/79
	1D (Cannister)	0	3/14/79
	1D (O-Ring)	0	3/14/79
	1E (Cannister)	0	3/14/79
	1E (O-Ring)	0	3/14/79
	2A (Blind Flange)	0	3/7/79
	2B (Blind Flange)	0	3/7/79
	2C	0	3/7/79
	2D	0	3/7/79
	2E	0	3/7/79
	3A	0	3/7/79
	3B	0	3/7/79
	3C	0	3/7/79
	3D	0	3/7/79
	3E	0	3/7/79
	4A	0	3/7/79
	4B	0	3/8/79
	4C	0	3/8/79
	4D	0	3/8/79
	4E	0	3/8/79
	5A (Blind Flange)	0	3/8/79
	5B	0	3/8/79
	5C	0	3/8/79
	5D	0	3/8/79
	5E	0	3/8/79
	6A (Blind Flange)	0	3/8/79
	6B	0	3/8/79
	6C	0	3/8/79
	6D	0	3/8/79
	6E	0	3/8/79
	7A	0	3/18/79
	7B	0	3/18/79
	7C (Blind Flange)	0	3/8/79
	7D	0	3/17/79
	7E	0	3/9/79
	8A (Blind Flange)	0	3/9/79
	8B	0	3/9/79

Item	Leakage, SCFH	Date
8C	0	3/9/79
8D	0	3/9/79
8E	0	3/9/79
9A (Blind Flange)	0	3/9/79
9B	0	3/9/79
9C	0	3/9/79
9D	0	3/9/79
9E	0	3/9/79
10A	0	3/18/79
10B	0	3/9/79
10C (Blind Flange)	0	3/9/79
10D	0	3/9/79
10E	0	3/9/79
11A	0	3/10/79
11B	0	3/10/79
11C	0	3/10/79
11D	0	3/10/79
11E	0	3/10/79
12A (Blind Flange)	0	3/10/79
12B	0	3/10/79
12C	0	3/16/79
12D	0	3/10/79
12E	0	3/10/79
13A	0	3/10/79
13B	0	3/10/79
13C	0	3/10/79
13D	0	3/10/79
13E	0	3/10/79
14A (Blind Flange,	0	3/10/79
14B (Blind Flange)	0	3/10/79
14C (Blind Flange)	0	3/10/79
14D (Blind Flange)	0	3/10/79
14E	0	3/10/79
15A	0	3/18/79
15B	0	3/17/79
15C	0	3/11/79
15D	0	3/11/79
15E	0	3/11/79
16A	0	3/15/79
16B	0	3/11/79
16C	0	3/11/79
16D	0	3/11/79
16E	0	3/11/79
17A (Blind Flange)	0	3/11/79
17B (Blind Flange)	0	3/11/79
17C (Blind Flange)	0	3/11/79
17D (Blind Flange)	0	3/11/79

Item	Leakage, SCFH	Date
17E	0	3/11/79
18A	0	3/15/79
18B	0	3/17/79
18C (Blind Flange)	0	3/11/79
18D	0	3/11/79
18E	0	3/11/79
19A	0	3/15/79
19B (Blind Flange)	0	3/11/79
19C	0	3/11/79
19D	0	3/11/79
19E (Blind Flange)	0	3/11/79
20A (Blind Flange)	0	3/12/79
20B	0	3/12/79
20C	0	3/12/79
20D	0	3/12/79
20E	0	3/12/79
21A (Blind Flange)	0	3/12/79
21B	0	3/12/79
21C (Blind Flange)	0	3/12/79
21D	0	3/12/79
21E	0	3/12/79
22A	0	3/12/79
22B	0	3/12/79
22C	0	3/12/79
22D	0	3/12/79
22E	0	3/12/79
23A (Blind Flange)	0	3/16/79
23B (Blind Flange)	0	3/12/79
23C	0	3/12/79
23D	0	3/12/79
23E	0	3/13/79
24A (Cannister)	0	3/13/79
24A (O-Ring)	0	3/13/79
24B (Cannister)	0	3/13/79
24B (O-Ring)	0	3/13/79
24C (O-Ring) (Blind Flange)	0	3/13/79
24D (O-Ring) (Blind Flange)	0	3/13/79
24E (Cannister)	0	3/13/79
24E (O-Ring)	0	3/13/79

ELECTRICAL PENETRATION TOTAL 0 SCFH

TYPE B TOTAL 0.93 SCFH = 22.32 SCFD

APPENDIX 4B

TYPE C PENETRATION LEAK RATE SUMMARY SHEET

Pen. No.	Leak Rate, SCFH	Date
1	0	10/3/78
2	0	9/13/78
4	.045	9/8/78
5	0	9/13/78
7	.065	10/3/78
8	.46	12/2/78
9	0	8/23/78
10	0	8/23/78
11	0	8/12/78
12	0	8/26/78
13	0	8/26/78
14	0	8/26/78
15	.05	3/7/79
16	0	10/20/78
17	0	9/8/78
18	0	9/7/78
19	0	8/25/78
20	0	10/6/78
22	.01	9/22/78
24	0	10/18/78
25	0	10/3/78
26	0	10/3/78
27	0	10/4/78
28	.14	3/6/79
31	0	8/19/78
32	0	12/20/78
33	0	11/10/78
38	0	3/12/79
39	0	2/13/79
40	0	2/13/79
41	0	11/22/78
42	0	8/22/78
43	0	3/15/79
44	0	3/16/79
45	0	3/31/79
46	0	8/31/78
47	.05	4/9/79
48	.2	5/17/79
50	0	8/16/78
53	0	8/28/78
54	0	8/31/78
55A	0	8/9/78
55B	0	1/4/79
56A	0	8/9/78
56B	0	8/9/78
56C	0	8/9/78

APPENDIX 4B (CONT'D)

Pen. No.	Leak Rate, SCFH	Date
56D	0	8/28/78
57A	0	1/4/79
57B	0	8/9/78
60	0	3/24/79
61	0	3/24/79
62	0	3/25/79
63	0	12/18/78
64	0	12/14/78
66	0	4/22/79
67	0	4/13/79
70	0	2/26/79
71	0	2/26/79
79	0	12/19/78
80	0	12/2/78
81	0	12/16/78
82	0	12/2/78
83	0	12/2/78
84	0	12/14/78
85	0	12/2/78
86	0	12/4/78
89	0	11/21/78
90	0	12/11/78
91	0	12/8/78
92	0	12/26/78
93	0	12/21/78
94	0	12/29/78
97A	0	8/9/78
97B	0	10/19/78
97C	0	12/29/78
100	0	12/21/78
103	0	2/1/79
104	0	2/1/79
105A	0	12/29/78
105B	0	1/9/79
105C	0	4/16/79
106	0	10/17/78
108	0	12/20/78
109	0	8/19/78
112	0	3/28/79
113	0	9/30/78
114	0	9/30/78

TOTAL 1.02 SCFH
24.48 SCFD

570 164