

NORTHEAST NUCLEAR ENERGY COMPANY

MILLSTONE UNIT 2

DOCKET NUMBER 50-336

REACTOR CONTAINMENT BUILDING INTEGRATED LEAK RATE TEST

DECEMBER 23-25, 1983

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I. INTRODUCTION

The Type A reactor containment building integrated Leak Rate Test is performed to demonstrate that leakage through the primary reactor containment and systems, and components penetrating the primary containment, do not exceed the allowable leakage rate specified in the Plant Technical Specifications.

The recent successful periodic Type A and supplemental verification tests were performed according to the requirements of the Millstone Technical Specification, Section 4.6.1.2.a and 10 CFR 50, Appendix J. The test method as required by the Technical Specifications is the absolute method as described in ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors." The leakage rate was calculated using formulas from ANSI N45.4-1972 and BN-TOP-1, Rev. 1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants (Total Time)." The durations of the Type A and verification tests were in accordance with the requirements of BN-TOP-1.

The test was performed using the methods employed for the last integrated Leak Rate Test performed in April of 1979. For the 1979 test two separate computer systems were utilized to calculate the leakage rate. One system was used by the Bechtel Power Corporation and the other by Northeast Nuclear Energy. Both computer systems yielded identical results when the precision of the systems were taken into consideration. Since the NNECo program was proven against the Bechtel program for the 1979 test, Bechtel was not employed for the current test. These test results are being reported in accordance with 10CFR50, Appendix J, Section V.B.3.

The 40 month  $\pm$  10 month time period between type A tests as required by Technical Specification 4.6.1.2.a was exceeded for this test. The actual time between Type "A" tests was 55 months. This deviation from Technical Specification surveillance requirements was documented in a letter to the NRC dated October 26, 1982.

## II. CONTAINMENT INTEGRATED LEAK RATE TEST

### A. Plant Information

#### 1. General

a. Owner	Northeast Nuclear Energy Company
b. Plant	Millstone Unit 2
c. Location	Waterford, Connecticut
d. Containment Type	Prestressed, post tensioned concrete
e. Nuclear Steam Supply System	Combustion Engineering PWR
f. Date Test Completed	December 24, 1983

#### 2. Technical Information

a. Containment Net Free	Air Volume 1,920,000 FT <sup>3</sup> .
b. Design Pressure	54 PSIG
c. Design Temperature	120°F
d. Calculated Peak Accident Pressure	
Pa	54 PSIG
e. Containment ILRT Average Temperature	
Limits	50-120°F
f. Calculated Peak Accident Temperature	289°F

### B. Integrated Leakage Rate Measurement System

#### 1. Absolute Pressure (1 Channel)

a. Readout:	0-100,000 counts
b. Accuracy:	0.015% of reading
c. Resolution:	0.001% Full Scale
d. Range:	0-100 PSI

#### 3. Instruments (2)

- Texas Instrument Model 145-01 Precision Pressure Instrument No. 2714 with Bourdon Capsule, serial number 5974.

- Texas Instrument Model 145-01 Precision Pressure Instrument No. 2715 with Bourdon Capsule, serial number 5975.
- 2. Drybulb Temperature (18 sensors)
  - a. Range: 0-350°F
  - b. Accuracy:  $\pm 0.6^{\circ}\text{F}$  at 100°F
  - c. Repeatability:  $\pm 0.1\%$  Full Scale
  - d. Instruments (18):
    - Resistance Temperature Detectors - Rosemont Model 104 AHC
- 3. Dewpoint Temperature (4 sensors)
  - a. Range:\* 20-120°F
  - b. Accuracy:  $\pm 0.1^{\circ}\text{F}$
  - c. Repeatability:  $\pm 0.1\%$  Full Scale
  - d. Instruments:
    - Three Foxboro Model 2701RG Dewcells
    - One Foxboro Model 2717G Dewcell
- 4. Verification Flow (1 channel)
  - a. Range: 4.5-45 SCFM
  - b. Accuracy: 1% Full Scale
  - c. Repeatability  $\pm 0.3\%$  Full Scale
  - d. Instrument:
    - Wallace-Tiernan Flowmeter Model Number 522M22008

- NOTE:
- 1) One drybulb temperature sensor declared inoperative during the test.
  - 2) The Overall Instrument Figure of Merit is used as an acceptance criteria for instrument selection. However, when instruments fail and/or the test duration is less than 24 hours, the figure of merit should be checked to ensure that it is less than 0.25 La or 0.125%/day. For this test the Figure of Merit based on a test duration of 8.0 hours and 17 of 18 dewcells functional was 0.0683%/day, well below the allowed 0.125%/day.

\*Normal range is 50°-150°F, prior to the test the range was lowered due to low dewpoint temperature.

- 3) Sensor locations and volume fractions are listed in Appendix A.

C. SUMMARY OF EVENTS

December 22, 1983

2300 Hours - A tour of containment was conducted. A survey of the containment air temperature and dewpoint at various locations was taken with portable instrumentation to ensure that installed instrumentation was functioning properly. The average of these values was compared to the values of the data acquisition system with the below listed results.

Average Containment Temperature by Survey: 70.40°F

Average Containment Temperature by the Data Acquisition System: 70.35°F

Average Containment Dewpoint Temperature by Survey: 39°F

Average Containment Dewpoint Temperature by the Data Acquisition System: 36.2°F

December 23, 1983

0200 Hours - The air compressors were started for containment pressurization.

0530 Hours - One air compressor was not running properly. It was valved out of service for repairs.

0600 Hours - All air compressors were stopped for a 10 PSIG survey of all external areas of containment. No leakage was found.

0630 Hours - Six air compressors were started for pressurization.

0700 Hours - The seventh air compressor was returned to service.

1300 Hours - One nitrogen overpressure piping header on the electrical penetrations was indicating containment pressure. Both piping systems were disconnected to allow free leakage thru the electrical penetrations.

1415 Hours - The refrigerator air dryer tripped out.

1630 Hours - Water was detected from penetration 14, containment sump discharge header vent valve 2-SSP-75.

1719 Hours - The refrigerator air dryer was returned to service. Loose wires were found in the control panel.

2000 Hours - No water or apparent air leakage was detected from valve 2-SSP-75.

2010 Hours - The tendon end anchor inspection commenced.

2237 Hours - Test pressure (54.3 PSIG) was attained. All air compressors were secured. At this time penetration 14 was isolated for the test and local leak rate tested after the test.

December 24, 1983

0033 Hours - The "B" containment air recirculation fan was taken out of service due to high amperage.

0130 Hours - Containment air pressure decreased to 54.1 PSIG, possibly due to falling outside air temperature. The tendon end anchor inspection was complete.

0200 Hours - The air compressors were re-started to pressurize the containment to 54.7 PSIG.

0300 Hours - Pressure stabilized.

0330 Hours - Pressure in the containment was released through the blowdown muffler and reduced to 54.3 PSIG.

0400 Hours - Containment pressure stabilized at 54.3 PSIG. The stabilization period was started. Started taking data every 15 minutes.

0500 Hours - Containment air drybulb temperature instrument TE  
to 8110 was reading low, 58°F versus 73° average. It was  
0730 Hours taken out of service and the weighting factor of its  
counterpart instrument TE 9767 was changed to reflect  
this condition.

0800 Hours - The containment air temperature stabilization criteria was met. Started the peak pressure test.

1830 Hours - The peak pressure test was terminated.

1835 Hours - Health Physics obtained an air sample prior to initiating a controlled leak for the verification test. No pressure readings were taken at this time due to the sampling.

1900 Hours - Containment air sample was clean.

1915 Hours - Established a controlled leak of 31.5 SCFM, started verification test.

December 25, 1983

0015 Hours - Verification test was ended.



0035 Hours - A continuous air monitor was set up and containment depressurization was initiated through the blowdown muffler.

2035 Hours - Containment was depressurized.

2130 Hours - Initial containment entry.

#### D. Test Results

1. Test Method Absolute
2. Data Analysis Techniques Total Time per ANSI  
N45.4-1972 and BN-TOP-1, Rev. 1.

#### 3. Test Pressure

- a) Pressure at Start of Test = 54.442 PSIG
- b) Pressure at End of Test = 54.380 PSIG
- c) Pressure at Start of Verification Test = 54.365 PSIG
- d) Pressure at End of Verification Test = 54.285 PSIG

4. Maximum Allowable Leakage Rate,  $L_a = .500\%/Day$

$$75\% \text{ of } L_a = .375\%/DAY$$

5. Integrated Leakage Rate Test Results  $\%/DAY$  using total time method.

$$\text{Calculated Leak Rate} = 0.184 = L_{am}$$

$$\text{Upper 95\% Confidence Level}^* = 0.319$$

6. Verification Test, Imposed Leakage Rate =  $0.519 = L_o$

7. Verification Test Result =  $0.646 = L_{amo}$

8. Verification Test Limits

$$| L_{am} - (L_{amo} - L_o) | \leq .25 L_a \quad \text{Where: } L_{am} = 0.184$$

$$| 0.184 - (0.646 - 0.519) | \leq 0.125 \quad L_{amo} = 0.646$$

$$| 0.057 | \leq 0.125 \quad L_o = 0.519$$

$$.25 L_a = 0.125$$

\*The Upper 95% Confidence Level is defined as the calculated leakage determined from the regression line analysis plus the 95% percent confidence interval.

9. In order to conduct an ILRT with a duration less than 24 hours an additional acceptance criteria must be met per Bechtel Topical Report BN-TOP-1, Rev. 1. The Trend Report based on Total Time calculations shall indicate that the magnitude of the calculated leak rate is tending to stabilize at a value less than the maximum allowable leak rate  $L_a$ . The magnitude of the calculated leak rate may be increasing slightly as it tends to stabilize. In this case the average rate of increase of the calculated leak rate shall be determined from the accumulated data over the last five hours or last twenty data points, whichever provides the most points. Using this average rate the calculated leak rate can be linearly extrapolated to the 24th hour data point. If this extrapolated value of the calculated leak rate exceeds 75% of the maximum allowable leak rate ( $L_a$ ), then the test must be continued.

The linearly extrapolated value of the Leak Rate using the last twenty data points from 1315 to 1815 on 12/24/84 is .200%/Day. A plot of leak rate versus time showing the extrapolated leak rate to the 24th hour is shown in Appendix "B".

10. A number of systems were required to remain operational in order to maintain the plant in a safe condition during the ILRT. As a result the containment isolation valves for these systems were not tested by the ILRT. In accordance with Section III A.1.d of Appendix J to 10CFR50 a Type C test was conducted for each of these penetrations. A list of these penetrations and the leak rate determined by the Type C tests are presented below. Also as previously indicated in the summary of events, penetration 14 was isolated just prior to the test. The leak rate determined by type "C" tests was made prior to repairs and is also presented below.

PENETRATION NUMBER	VALVES TESTED	VALVE DESCRIPTION	LEAKAGE RATE (%/day)
2	2CH-089	Letdown Isolation	.00001368
10	2SI-651/709	Shutdown Cooling	.000080051
24	2RB-30.1A	Reactor Building Com- ponent Cooling Water to Containment	.000060378
25	2RB-28.1D 2RB-28.2D 2RB-28.3D	Reactor Building Com- ponent Cooling Supply/ Return to "D" Contain- ment Air Recirc Cooler	.000013568
26	2RB-28.1B 2RB-28.2B 2RB-28.3B	Reactor Building Com- ponent Cooling Supply/ Return to "B" Contain- ment Air Recirc Cooler	.00007327
27	2RB-28.1A 2RB-28.2A 2RB-28.3A	Reactor Building Com- ponent Cooling Supply/ Return to "A" Contain- ment Air Recirc Cooler	.00006716
28	2RB-28.1C 2RB-28.2C 2RB-28.3C	Reactor Building Com- ponent Cooling Supply/ Return to "C" Contain- ment Air Recirc Cooler	.000013568
29	2RB-37.2A	Reactor Building Com- ponent Cooling Water Return from the Contain- ment	.00006716
53	2RB-30.1B	Reactor Building Com- ponent Cooling Water Supply to the Contain- ment	.00002035
49	2-FIRE-108	Fire Main Supply	.00006648

PENETRATION NUMBER	VALVES TESTED	VALVE DESCRIPTION	LEAKAGE RATE (%/day)
54	2RB-37.2B	Reactor Building Component Cooling Water Return from the Containment	.00006716
85	Spectacle Flange	Pressurization Line For the ILRT	.000013568
63	2-AC-114 2-AC-117	ILRT Sample Connections	.00001696
64	2-AC-112 2-AC-116	ILRT Sample Connections	.000013568
14	2-SSP-16.1	Containment Sump Discharge	<u>.058156</u>
		Total Leakage	.058729%/Day

When the total leakage from the above listed penetrations is included in the leakage rate values for step 5 the leak rate becomes:

Calculated Leak Rate	= 0.184%/Day
Plus Penetration Leakage	+ <u>0.058729%/Day</u>
Total	0.242729%/Day

Upper 95% Confidence Level	= 0.319%/Day
Plus Penetration Leakage	+ <u>0.058729%/Day</u>
Total	0.377729%/Day

### III. LOCAL LEAK RATE TESTING

#### A. Description of Program

Type B and C Local Leak Rate Testing of containment penetrations as outlined in Appendix J to 10CFR50 is performed in accordance with Section 4.6.1.2.(d, e and f) of the Technical Specifications except for tests involving the containment air lock. The containment air lock is tested in accordance with Section 4.6.1.3 of the Technical

Specifications. A description of the local leak rate test equipment is described in section III.B and a listing of individual penetrations is contained in Section III.C.

- B. Appendix D shows a diagram of the local leak rate test panel. It should be noted that flow indicators F-1 and F-2 have range scales of 20-250 cc/min. and 200-2000 cc/min. or 0-250 cc/min. and 250-2500 cc/min. depending on the Local Leak Rate Test Equipment used. This resulted in a minimum recorded leak rate value of 20 cc/min or 25 cc/min. The actual leak rate is less than the minimum value shown in Appendix E.
- C. A listing of the containment penetrations which are subject to Local Leak Rate Testing is given below.

PENETRATION NUMBER	FUNCTION
1	Primary Makeup Water
2	Letdown
3	Chemical and Volume Control
4	Containment Spray
5	Containment Spray
10	Shutdown Cooling
11	Safety Injection
14	Containment Sump Discharge
21	Primary Coolant Sample
22	#1 Steam Generator Blowdown
23	#2 Steam Generator Blowdown
24	Reactor Building Component Cooling Water
25	Reactor Building Component Cooling Water
26	Reactor Building Component Cooling Water
27	Reactor Building Component Cooling Water
28	Reactor Building Component Cooling Water
29	Reactor Building Component Cooling Water
30	Reactor Building Component Cooling Water
31	Reactor Building Component Cooling Water
32	Reactor Building component Cooling Water
33	Reactor Building Component Cooling Water

PENETRATION NUMBER	FUNCTION
35	Liquid Radwaste
37	Instrument Air
38	Station Air
39	Containment Purge
40	Containment Purge
43	Chemical and Volume Control System
49	Containment Fire Protection Water
51	Gaseous Radwaste
53	Reactor Building Component Cooling Water
54	Reactor Building Component Cooling Water
61	Radiation Monitoring
62	Hydrogen Monitoring
63	ILRT Sample Connections
64	ILRT Sample Connections
65	#1 Steam Generator Blowdown
67	Refueling Water Purification
68	Refueling Water
72	#2 Steam Generator Blowdown
82	Hydrogen Purge System
83	Hydrogen Purge System
85	ILRT Pressurization Path
86	Radiation Monitoring
87	Hydrogen Monitoring
88	Hydrogen Monitoring
89	Hydrogen Monitoring
SEXA5	Electrical Penetration
SEXA6	Electrical Penetration
SEXB2	Electrical Penetration
SEXB4	Electrical Penetration
SEXB5	Electrical Penetration
SEXB6	Electrical Penetration
SEXB7	Electrical Penetration
SEXB8	Electrical Penetration

PENETRATION NUMBER	FUNCTION
SEXB9	Electrical Penetration
SEXC1	Electrical Penetration
SEXC3	Electrical Penetration
SEXD1	Electrical Penetration
SEXD3	Electrical Penetration
SEXD6	Electrical Penetration
SEXD8	Electrical Penetration
SEXD9	Electrical Penetration
SEXE6	Electrical Penetration
SEXE9	Electrical Penetration
SWXB1	Electrical Penetration
SWXB2	Electrical Penetration
SWXB3	Electrical Penetration
SWXB4	Electrical Penetration
SWXB5	Electrical Penetration
SWXB6	Electrical Penetration
SWXB7	Electrical Penetration
SWXB8	Electrical Penetration
SWXB9	Electrical Penetration
SWXC3	Electrical Penetration
SWXC5	Electrical Penetration
SWXD1	Electrical Penetration
SWXD3	Electrical Penetration
SWXD5	Electrical Penetration
SWXD8	Electrical Penetration
SWXD9	Electrical Penetration
SWXE5	Electrical Penetration
SWXE9	Electrical Penetration
SEXA4-1	Electrical Penetration
SEXA4-2	Electrical Penetration
SEXA4-3	Electrical Penetration
SEXA8-1	Electrical Penetration
SEXA8-2	Electrical Penetration

PENETRATION NUMBER	FUNCTION
SEXA8-3	Electrical Penetration
SWXA2-1	Electrical Penetration
SWXA2-2	Electrical Penetration
SWXA2-3	Electrical Penetration
SWXA8-1	Electrical Penetration
SWXA8-2	Electrical Penetration
SWXA8-3	Electrical Penetration
	Equipment Hatch
	Transfer Tube
	Personnel Hatch

- D. 1. A complete listing of individual penetrations and leakages from 1979 through 1983 is shown in Appendix E. The total combined leakage rate of all Type B and Type C penetrations shall not exceed 0.60 La, where La is a leakage rate equal to 0.50 percent by weight of the containment air per 24 hours, at a pressure of 54 PSIG. Thus, the total leakage rate must be less than 0.30 weight percent per day. The total accumulated leakages since the previous Type A test are given below:

<u>YEAR</u>	<u>TOTAL LEAKAGE</u> (weight %/Day)
1979	As Left 0.0410
1980	As Found 0.294
1980	As Left 0.019
1981	As Found 2.312*
1982	As Left 0.01524
1983	As Found 1.315*
1983	As Left 0.018

\*The total leakage rate for penetrations subject to type B & C testing exceed the allowable limit primarily due to the excessive leakage on the RBCCW penetrations. These events were the subject of Licensee Event Reports 50-336/84-05/3L-0 and 50-336/82-06/3L-0 forwarded on 2/24/84 and 4/8/82.



2. In accordance with Section 4.6.1.3.b of the Technical Specification an overall personnel air lock leakage test at 54 PSIG (Pa) is required at least once per 6 month period. The leak rate must be less than or equal to .05 La (.025%/day).

The results of the leak tests since the previous type A test are presented below:

<u>Date Tested</u>	<u>Personnel Air Lock Leakage</u>
5/18/79	$2.362 \times 10^{-2}\%/Day$
11/3/79	$3.22 \times 10^{-2}\%/Day^*$
11/3/79	$2.38 \times 10^{-3}\%/Day$
4/15/80	$2.65 \times 10^{-4}\%/Day$
9/28/80	$2.26 \times 10^{-2}\%/Day$
9/28/80	$5.30 \times 10^{-3}\%/Day$
3/10/81	$2.10 \times 10^{-3}\%/Day$
9/14/81	$6.0 \times 10^{-4}\%/Day$
3/4/82	$2.66 \times 10^{-1}\%/Day^*$
3/4/82	$1.1 \times 10^{-4}\%/Day$
9/15/82	0.0%/Day
11/27/83	$2.45 \times 10^{-3}\%/Day$
3/18/83	0.0%/Day

\*The personnel access door leakage rate exceeded the allowable limit twice since the previous integrated leak rate test. In both cases the cause of the leakage was due to the door operating rod packing gland seal. These events were reported on licensee Event Reports 50-336/79-34/3L-0 and 50-336/82-006/3L-0 forwarded on 11/20/79 and 4/8/82 respectively.

3. Section 4.6.1.2.e of the Technical Specifications requires that the combined bypass leakage rate shall be less than or equal to .017 La (.0085 %/day). The total accumulated bypass leakage rates since the previous ILRT are listed below:

<u>YEAR</u>	<u>TOTAL LEAKAGE</u> (%/day)
5/19/80	0.001073%/Day
10/15/80	0.00121%/Day
3/8/82	0.0002%/Day
3/15/83	0.0002%/Day

SS:ejz

## APPENDIX A

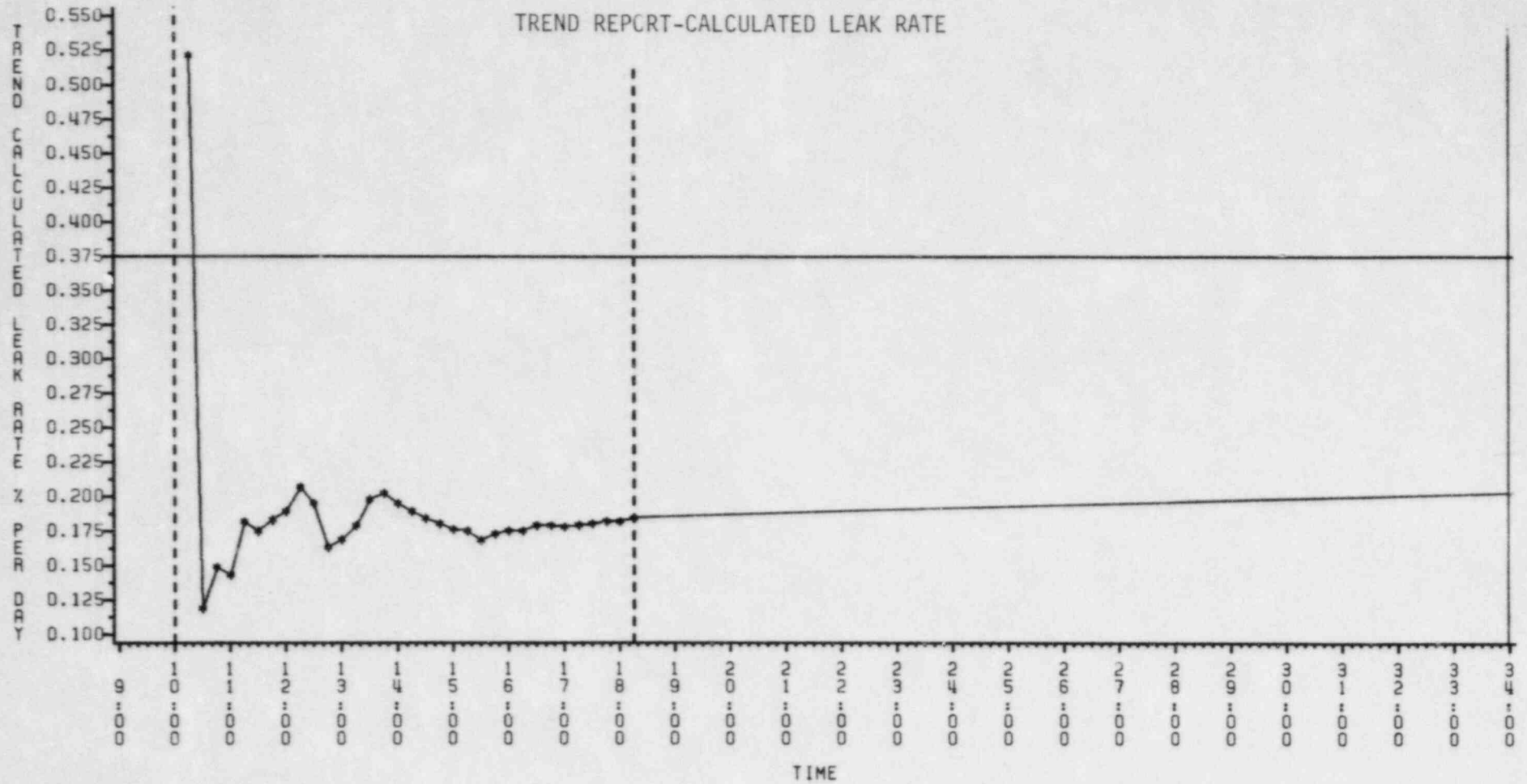
SENSOR VOLUME FRACTIONS  
(and Locations)

TEMPERATURE RTD TE	ELEV (Ft.)	AZ (Deg.)	DIST. FROM CL (Ft.)	VOLUME FRACTION
9769	150	90	12	0.096
8110	105	220	40	.0000*
9767	105	40	45	.1730
8111	90	320	60	0.086
8112	90	105	60	0.087
8084	44	5	45	0.058
8108	44	145	60	0.058
8109	44	263	58	0.058
8097	30	125	20	0.016
8098	30	235	20	0.014
8094	20	350	45	0.040
9770	18	220	55	0.040
9771	18	90	50	0.040
8087	3	5	32	0.032
9765	3	240	65	0.032
9766	3	125	65	0.032
8091	-15	330	35	0.069
9768	-18	135	50	0.069
TOTAL				1.000

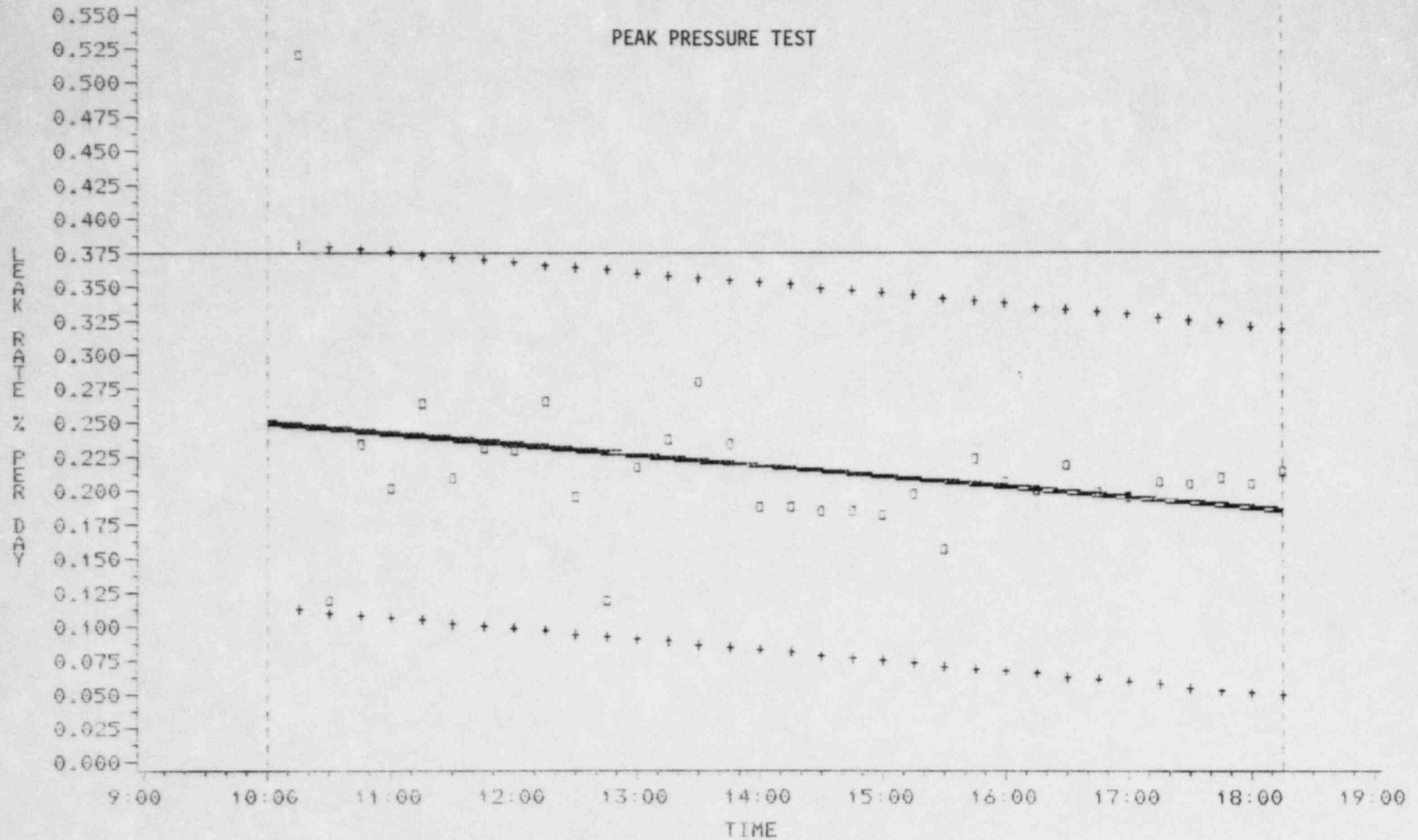
DEWPOINT ME#	ELEV (Ft.)	AZ (Deg.)	DIST. FROM CL (Ft.)	VOLUME FRACTION
9772	55	320	60	0.2950
8064	55	105	60	0.2770
9773	-20	10	35	0.192
9774	-20	330	35	0.192
TOTAL				1.000

\*Instrument Failed

### MILLSTONE UNIT 2 CONTAINMENT INTEGRATED LEAK RATE DATA DECEMBER 24, 1963



MILLSTONE UNIT 2  
CONTAINMENT INTEGRATED LEAK RATE DATA  
DECEMBER 24, 1983



# MILLSTONE UNIT 2

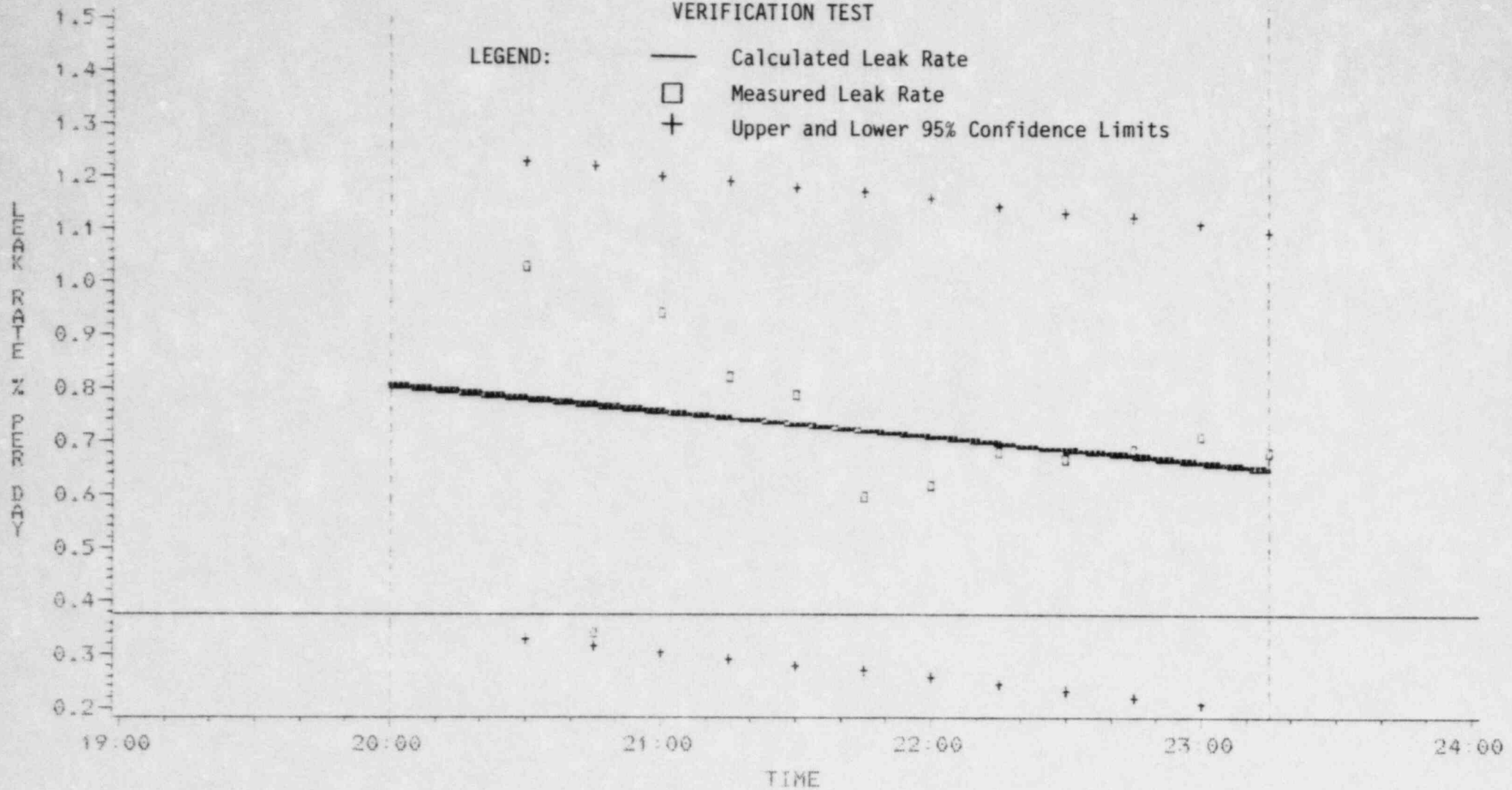
## CONTAINMENT INTEGRATED LEAK RATE DATA

DECEMBER 24, 1983

VERIFICATION TEST

LEGEND:

- Calculated Leak Rate
- Measured Leak Rate
- + Upper and Lower 95% Confidence Limits



APPENDIX C  
PEAK PRESSURE TEST DATA--MP2ILRT DEC 24, 1983  
LEAK RATE BASED ON TOTAL TIME CALCULATIONS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
					LOWER	UPPER
1000	533.648	68.761				
1015	533.651	68.758	0.521D+00	0.247D+00	0.112E+00	0.382D+00
1030	533.645	68.759	0.119D+00	0.245D+00	0.110E+00	0.380D+00
1045	533.657	68.758	0.235D+00	0.243D+00	0.108E+00	0.378D+00
1100	533.649	68.756	0.202D+00	0.241D+00	0.106E+00	0.376D+00
1115	533.660	68.754	0.264D+00	0.239D+00	0.104E+00	0.374D+00
1130	533.629	68.750	0.209D+00	0.237D+00	0.102E+00	0.372D+00
1145	533.652	68.750	0.231D+00	0.235D+00	0.100E+00	0.370D+00
1200	533.647	68.748	0.230D+00	0.233D+00	0.985E+00	0.368D+00
1215	533.652	68.745	0.265D+00	0.231D+00	0.965E+00	0.366D+00
1230	533.652	68.748	0.196D+00	0.229D+00	0.945E+00	0.364D+00
1245	533.584	68.744	0.119D+00	0.227D+00	0.926E+00	0.362D+00
1300	533.653	68.743	0.217D+00	0.226D+00	0.906E+00	0.360D+00
1315	533.660	68.741	0.237D+00	0.224D+00	0.886E+00	0.358D+00
1330	533.667	68.736	0.279D+00	0.222D+00	0.867E+00	0.356D+00
1345	533.653	68.737	0.234D+00	0.220D+00	0.847E+00	0.355D+00
1400	533.638	68.739	0.188D+00	0.218D+00	0.827E+00	0.353D+00
1415	533.639	68.737	0.187D+00	0.216D+00	0.808E+00	0.351D+00
1430	533.658	68.739	0.184D+00	0.214D+00	0.788E+00	0.349D+00
1445	533.663	68.738	0.185D+00	0.212D+00	0.768E-01	0.347D+00
1500	533.655	68.736	0.182D+00	0.210D+00	0.749E-01	0.345D+00
1515	533.670	68.735	0.197D+00	0.208D+00	0.729E-01	0.343D+00
1530	533.622	68.733	0.157D+00	0.206D+00	0.709E-01	0.341D+00
1545	533.679	68.729	0.223D+00	0.204D+00	0.690E-01	0.339D+00
1600	533.682	68.730	0.207D+00	0.202D+00	0.670E-01	0.337D+00
1615	533.683	68.730	0.200D+00	0.200D+00	0.650E-01	0.335D+00
1630	533.695	68.727	0.219D+00	0.198D+00	0.631E-01	0.333D+00
1645	533.686	68.728	0.199D+00	0.196D+00	0.611E-01	0.331D+00
1700	533.686	68.727	0.195D+00	0.194D+00	0.591E-01	0.329D+00
1715	533.691	68.724	0.206D+00	0.192D+00	0.572E-01	0.327D+00
1730	533.698	68.724	0.205D+00	0.190D+00	0.552E-01	0.325D+00
1745	533.717	68.724	0.209D+00	0.188D+00	0.532E-01	0.323D+00
1800	533.691	68.720	0.204D+00	0.186D+00	0.513E-01	0.321D+00
1815	533.732	68.722	0.214D+00	0.184D+00	0.493E-01	0.319D+00

The Calculated Leak Rate using the Total Time Method = 0.184.

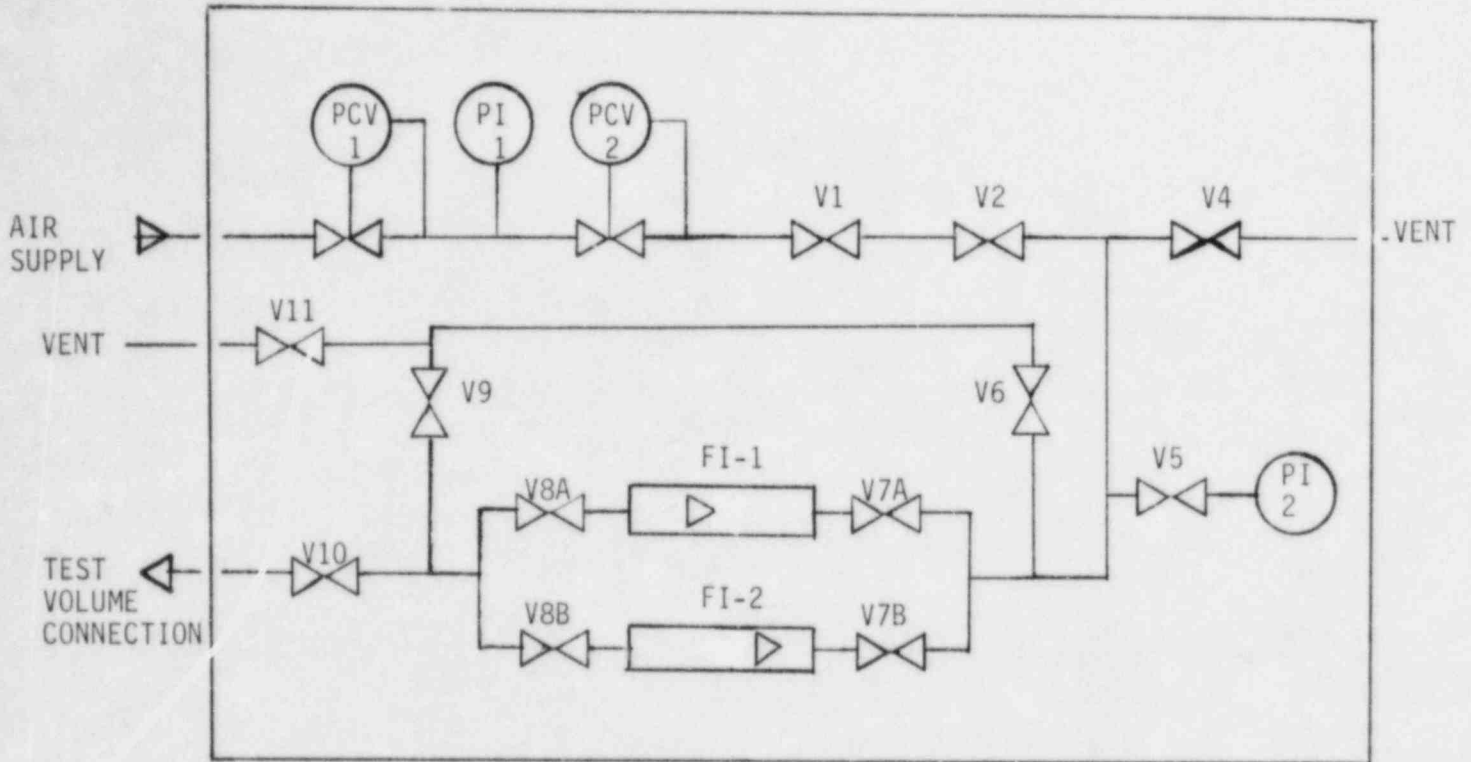
VERIFICATION TEST DATA--MP2ILRT DEC 24, 1983  
LEAK RATE BASED ON TOTAL TIME CALCULATIONS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
					LOWER	UPPER
2015	533.753	68.699				
2030	533.752	68.692	0.103D+01	0.779D+00	0.329E+00	0.123D+01
2045	533.725	68.691	0.342D+00	0.767D+00	0.317E+00	0.122D+01
2100	533.781	68.683	0.941D+00	0.755D+00	0.305E+00	0.120D+01
2115	533.769	68.678	0.821D+00	0.743D+00	0.293E+00	0.119D+01
2130	533.768	68.673	0.787D+00	0.730D+00	0.281E+00	0.118D+01
2145	533.733	68.671	0.594D+00	0.718D+00	0.269E+00	0.117D+01
2200	533.735	68.666	0.618D+00	0.706D+00	0.257E+00	0.116D+01
2215	533.757	68.661	0.681D+00	0.694D+00	0.245E+00	0.114D+01
2230	533.742	68.655	0.665D+00	0.682D+00	0.233E+00	0.113D+01
2245	533.773	68.653	0.682D+00	0.670D+00	0.220E+00	0.112D+01
2300	533.768	68.646	0.707D+00	0.658D+00	0.208E+00	0.111D+01
2315	533.759	68.642	0.678D+00	0.646D+00	0.196E+00	0.109D+00

THE CALCULATED LEAK RATE USING THE TOTAL TIME METHOD = 0.646



## APPENDIX D



## LOCAL LEAK TEST PANEL

<u>INSTR</u>	<u>DESCRIPTION</u>
PCV-1, PCV-2	Pressure Regulator, Range 0-100 psig
PI-1	Pressure Gauge, 0-100 psig, 2 psig increments
PI-2	*Pressure Gauge, Wallace & Tiernan Absolute Pressure Gauge Model 61A-1A-0100, Range 0-100 psia, accuracy 0.1% full scale, sensitivity .01% full scale.
FI-1,	Flow Indicator, Brooks full view rotameter, model 1370-00F2AAS
FI-2	Dual Scale Measuring Air at 42 psig, 70°F, Scale Range: Various, as indicated on Flow Meter Face.

\* Alternate gauge, Heise - range 0-100 psig

APPENDIX E  
LOCAL LEAKAGE RATES

The attached pages show "As Found" and "As Left" local leakage rates for containment penetrations, electrical, piping, equipment hatch, and fuel transfer tube.

The electrical penetrations are designated as SEX or SWX. Since 1980 the leakage from these penetrations has been consistently low. A change from General Electric to Conax Co. electrical penetrations during the 1980 refuel outage has shown improved leakage rates. Penetration SEXA4 tube A4 shows leakage above 9000 SCCM however, when this penetration is tested warm (80-100°F) the leakage is minimal. The leakage rate increases to the value shown as the seal cools. This leakage is not significant when all other penetrations are considered.

NOTE: The local leak rate test equipment contain flowmeters with either 20, 25, or 100 SCCM as the lowest reading. When the leakage rate thru a penetration is not detectable, 20, 25, or 100 is recorded as the leakage value for that penetration.

APPENDIX E  
LOCAL LEAKAGE RATES

A review of the leakage rates for the piping penetrations show several that have been large contributors to the overall Type "B" and "C" leakage rate. These penetrations (25/30, 26/31, 27/32, 28/33) contain 6" and 10" diameter Fisher Type 9222 Butterfly valves with T-ring seats. These valves are currently being investigated/evaluated in an effort to reduce their leakage rate.

In addition penetration 14 (inside and outside) valve indicates a higher "As Left" than "As Found" leakage rate for 1983. This penetration was isolated during the type "A" test. Immediately following the test a type "C" test was performed. The type "C" leakage rate was above administrative limits, therefore the valves were repaired and another type "C" test performed. This final type "C" test result appears in the table.

Due to concerns identified in Section 3.1 of NRC Inspection No. 50-336/83-03\*, Northeast Nuclear Energy Company (NNECo) is presently reviewing the classification and application of the General Design Criteria provided in Appendix A to 10CFR50 to certain penetrations at Millstone Unit No. 2. NNECo intends to docket the results of this review in the near future.

NOTE: The type "C" leakate rate obtained immediately after the type "A" test was added as penalty leakage to the type "A" test leakage rate.

\*T. T. Martin letter to W. G. Council, dated February 25, 1983.

APPENDIX E  
LOCAL LEAKAGE RATE (STANDARD CUBIC CENTIMETERS PER MINUTE-SCCM)

PENETRATION NUMBER	1979	1980	1980	1981	1982	1983	1983
	AS LEFT	1983 AS FOUND	AS LEFT	AS FOUND	AS LEFT	AS FOUND	AS LEFT
SEXA5	2458	2973	100	20	20	20	20
SEXA6	25	25	20	20	20	20	20
SEXB2	1580	1658	88	100	20	20	20
SEXB4	25	25	20	100	20	20	20
SEXB5	25	2423	20	20	20	20	20
SEXB6	2412	4455	20	20	20	20	20
SEXB7	25	25	20	100	20	20	20
SEXB8	25	25	100	100	20	20	20
SEXB9	50	35	100	20	20	20	20
SEXC1	25	25	25	20	20	20	20
SEXC3	25	25	25	20	20	20	20
SEXD1	25	25	20	100	20	20	20
SEXD3	25	25	64	100	20	25	25
SEXD6	25	25	20	20	20	20	20
SEXD8	25	2430	20	20	20	20	20
SEXD9	50	118	100	20	20	20	20
SEXE6	60	25	20	100	20	20	20
SEXE9	25	25	100	100	20	20	20
SWXB1	25	25	20	20	20	20	20
SWXB2	25	25	20	20	20	20	20
SWXB3	119	182	20	20	20	20	20
SWXB4	25	25	100	20	20	20	20
SWXB5	25	1997	20	20	20	20	20
SWXB6	25	25	20	100	20	25	25
SWXB7	207	197	20	20	20	20	20
SWXB8	295	246	20	100	20	20	20
SWXB9	25	89	20	20	20	20	20
SWXC3	25	25	25	100	20	20	20
SWXC5	25	25	25	100	20	20	20
SWXD1	25	25	562	163.4	200	176	168
SWXD3	25	1948	20	100	20	20	20
SWXD5	25	1087	100	100	20	20	20
SWXD8	25	25	100	100	85	85	44
SWXD9	25	25	20	100	20	20	20

APPENDIX E  
LOCAL LEAKAGE RATE (STANDARD CUBIC CENTIMETERS PER MINUTE-SCCM)

PENETRATION NUMBER	1979 AS LEFT	1980 AS FOUND	1980 AS LEFT	1981 AS FOUND	1982 AS LEFT	1983 AS FOUND	1983 AS LEFT
SWXE5	169	148	20	20	20	20	20
SWXE9	25	25	20	100	20	20	20
SEXE4	25	25	25	100	20	20	20
TUBE 1							
SEXA4	25	25	25	100	20	20	20
TUBE 2							
SEXA4	25	1236	1236	7662	9500	9930	9930
TUBE 3							
SEXA8	25	25	25	20	20	20	20
TUBE 1							
SEXA8	25	25	25	100	20	20	20
TUBE 2							
SEXA8	25	25	25	20	20	20	20
TUBE 3							
SWXA2	25	25	25	100	20	20	20
TUBE 1							
SWXA2	25	25	25	20	20	20	20
TUBE 2							
SWXA2	25	25	25	100	20	20	20
TUBE 3							
SWXA8	25	25	25	20	20	20	20
TUBE 1							
SWXA8	25	25	25	20	20	20	20
TUBE 2							
SWXA8	25	25	25	20	20	20	20
TUBE 3							
1	60	20	20	20	20	20	20
2i	65	198	198	45	45	790	20
2o	25	20	20	250	250	20	20
3	25	20	20	20	20	20	20
4i	*	*	*	*	*	20	20
4o	25	20	20	40	40	20	20
5i	*	*	*	*	*	20	20
5o	25	20	20	50	50	128	128

APPENDIX E  
LOCAL LEAKAGE RATE (STANDARD CUBIC CENTIMETERS PER MINUTE-SCCM)

PENETRATION NUMBER	1979 AS LEFT	1980 AS FOUND	1980 AS LEFT	1981 AS FOUND	1982 AS LEFT	1983 AS FOUND	1983 AS LEFT
10	25	7856	7856	3000	3000	3260	118
11	1386	445	445	283105	20	20	20
14i	50	1385	25	15969	116	34	4200
140	1550	25	25	230	230	443	1398.6
21A	30	100	100	115	20	69	69
21B	25	20	20	20	20	20	20
21C	600	393	393	2000	20	32	20
21D	25	100	100	20	20	30	30
210	229	25	25	100	100	20	20
22	45	6860	416	900	900	2980	69
23	991	1194	20	20	20	20	20
24	1690	400	400	121	121	89	89
25	200	100	100	20	20	7539	20
26	1500	9850	197	820	820	103560	108
27	598	231288	990	73015	40	630241	99
28	497	30913	709	1327406	80	1520906	20
29	1690	179	179	20	20	89	89
30	TESTED WITH PENETRATION #25						
31	TESTED WITH PENETRATION #26						
32	TESTED WITH PENETRATION #27						
33	TESTED WITH PENETRATION #28						
34	350	20	20	65	65	276	276
35	30	100	20	89	89	20	20
37	56	128	128	595	595	182	182
38	129	20	20	20	20	20	20
39	1200	5132	1184	3400	3400	988	988
40	1400	145908	1037	172493	100	987	987
43i	25	100	20	20	20	20	20
430	110	100	100	20	20	20	20
49	SPARE-PENETRATION		100	20	20	98	98
51	299	493	493	5106	181	217	217
53	200	100	100	20	20	30	30
54	600	197	197	100	100	2587	99
61	90	25	20	20	20	20	20

APPENDIX E  
LOCAL LEAKAGE RATE (STANDARD CUBIC CENTIMETERS PER MINUTE-SCCM)

PENETRATION NUMBER	1979 AS LEFT	1980 AS FOUND	1980 AS LEFT	1981 AS FOUND	1982 AS LEFT	1983 AS FOUND	1983 AS LEFT
62i	*	*	*	*	*	5215.6	601
62o	110	25	25	110	110	45	45
63	25	20	20	20	20	20	25
64	25	20	20	20	20	20	20
65	TESTED WITH PENETRATION #22						
67	25	197	197	20	20	20	20
68	30	197	197	20	20	20	20
72	TESTED WITH PENETRATION #23						
82	26	100	100	1700200	20	4000	20
83	25	25	25	333	333	20	20
85	100	25	25	20	20	20	20
86	40	100	100	20	20	20	20
87i	*	*	*	*	*	6539	100
87o	1244	93	93	62	62	28	28
88	25	100	100	20	20	20	20
89	25	25	25	20	20	20	20
EQUIPMENT HATCH	25	100	400	400	61	61	20
FUEL TRANSFER TUBE	90	89	89	89	230	230	40

\* INNER VALVE WAS NOT CONSIDERED A CONTAINMENT ISOLATION VALVE