VERMONT YANKEE

PRIMARY CONTAINMENT LEAKAGE RATE TESTING

1983

TEST COORDINATORS

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Introduction

During the 1983 refueling and 10 year inservice inspection outage which occurred during the period from March 5, 1983 to June 17, 1983, a type A containment integrated leakage rate test was performed. This test fulfilled the Appendix J requirement to perform a Type A test during the ten year ISI outage. The last leak rate test report was filed with the USNRC in April, 1981.

This report describes all primary containment leakage testing performed subsequent to the 1980 Type A test, and up to and including the type A test conducted in June 1983. In accordance with 10 CFR 50, Appendix J, a summary analysis of all periodic Type B and Type C tests performed since December 1980 are included in this report.

All testing performed during the period covered by this report conformed to the rules and regulations specified in 10 CFR 50, Appendix J.

Summary

The plant was shut down on March 5, 1983 for refueling and the ten-year inservice inspection. The Type B and C testing commenced shortly before the plant shut down. The Type A test was conducted at the end of the outage.

Pressurization for the Type A test commenced on June 8, 1983 with two air compressors of 1800 scfm total capacity and approximately 5 psi/hr charging rate. Containment pressure was raised to the calculated peak accident pressure of 44 psig over an 11-hour and 36-minute period. During this time period the pressurization rate was reduced at the 5, 15, and 30 psig levels to facilitate investigation for containment leakage. No significant leaks were found during the pressurization period.

After stabilizing for four hours, it was determined that stable conditions had been met to start the test at 0203. Based upon this, 0203 was chosen as the time for starting the test. The 24-hour test was completed June 10, 1983 at 0202.

The absolute method of leakage determination was employed. The ideal gas laws are utilized to find the mass of air in the containment at ten minute intervals.

The containment mass was plotted against time and the absolute leakage rate was determined from the slope of the least squares fit line (See Figure II). The measured leakage rate at the upper one sided 95% confidence level was 0.2172 Wt%/day. The final corrected leakage rate at the upper one sided 95% confidence level was 0.318 Wt%/day.

Description of the Test

The containment was made ready for the integrated leakage rate test and pressurization commenced at 1304 hours on June 8, 1983. Pressurization was accomplished by using two mobile, oil-free air compressors, each with a capacity of 900 scfm. They were connected by the hose to the nitrogen purge supply line at a tee, through VNP-1071, as shown on the attached Figure I.

As the containment pressure reached the hold points of 5, 15, and 30 psig, the air flow into the containment was reduced and survey personnel were dispatched. The survey personnel found no significant leaks and the pressurizing rate returned to normal.

During the pump-up, drywell pressure transmitter PT-1-156-3 was isolated and RRU3 and RRU4 were manually tripped. The pressure transmitter was isolated due to high pressure and the RRU's due to high amperage readings.

One of the two oil-free air compressors tripped during the pressurization causing the lengthy pressurization period.

The test pressure was attained at 2350 hours. Pressures and temperatures in the containment were allowed to stabilize for four hours. At the end of the four hours, review of the data indicated that the stabilization criteria had been met since 0203 and the decision was made to make this time the start of the test.

Due to the inability to obtain the equipment necessary to provide the pressure signal to the process computer, the contained mass was calculated by manually inputing the data into a timeshare program PCLRTP.

Table 1983-A (Primary Containment Leakage Rate Data Sheet) contains 1) the results of the timeshare program (PCLRTP) contained mass calculations, 2) the containment pressure as read from the quartz manometer, and 3) weighted average drywell temperature.

The peak pressure Type A test was completed at 0202, June 10, 1983. A supplemental test, (required by Appendix J, 10 CFR 50) to verify the accuracy of the instrumentation was conducted by metering a mass of air approximately equal to 1/2 the allowable leakage back into the containment. This pumpback of 231.9 lbs. was completed at 0300 hours. Containment depressurization commenced at 0445 hours.

Analysis and Interpretation of Test Data

This test employed the ideal gas laws to determine the absolute leakage rate from primary containment. The total containment mass calculation was performed approximately every ten minutes during the 24-hour test on the timeshare computer. Input data for the calculation consisted of containment pressure, drywell and torus weighted average air temperature, drywell and torus dew points, and torus water level.

The data (consisting of a series of independent calculations of the total contained air mass taken at ten minute intervals) lends itself to a statistical analysis based upon a time dependant rate of change of the contained mass of air. A small pressure change over the test interval is the basis for the assumption that the containment leakage is constant with respect to time.

A linear least squares fit method is utilized to determine the best straight line to fit the data. The slope of the least squares fit line is the leakage rate.

The equation of the least squares fit line is of the form:

$$Q = b + mT$$

Where: Q = mass of air
b = Q intercept (Q value at t = 0)
m = slope of line (leakage rate)
T = time
N = number of data points

The values for b and m are determined from the following equations:

$$b = \frac{\Sigma Q - m\Sigma T}{N}$$

$$m = \frac{N(\Sigma QT) - (\Sigma Q)(\Sigma T)}{N(\Sigma T^2) - (\Sigma T)^2}$$

The upper one sided 95% confidence level (UCL) of the leakage rate (slope of line) may be determined from the standard error of the slope and a "Students Table of t". The standard error is:

$$\text{Standard Error, } S(m) = \left[\frac{1}{N-2}\left[\frac{\text{Variance of Q}}{\text{Variance of T}} - M^2\right]\right]^{1/2}$$

$$S(m) = \left[\frac{1}{N-2}\left[\frac{N\Sigma Q^2 - (\Sigma Q)^2}{N\Sigma T^2 - (\Sigma T)^2} - M^2\right]\right]^{1/2}$$

The upper one sided 95% confidence level on the true leakage rate is:

$$\text{UCL (approx.)} = \text{Lam} + 2400 * (t.95) * (S(m)/b) \quad (1)$$

Where: UCL = Upper confidence level

Lam = -(2400)*(m/b)

t.95 = The t factor at the 95% confidence level for 142 data points

Variance = (Standard deviation)^2 = $\frac{\Sigma(xi - \bar{x})^2}{n}$

(1) ANSI/ANS 56.8 - 1980 App. B

Test Results

A linear least squares fit of the 142 data points calculated during this test (presented in Table 1983-A), result in the following equation:

Q = 73038 - 6.3732T

Where: 73038 represents the initial mass of contained air in pounds
6.3732 represents the slope or leakage rate in the lbm/hour

The upper one sided 95% confidence level of the leakage rate using this data is:

UCL = - Lam + 2400 (t.95)(S(m)/b)
= -(2400)(m/b) + 2400 (t.95)(S(m)/b)
= -(2400) (-6.3732/73038) + 2400 (1.65) (.1449/73038)
= .2172 WT%/day

Correction Factors

1. Correction for loss through isolation valves

CRD-181
RCU-68 = + .0137 Wt%/day
RCU-1[illegible]

2. Correction for increase in drywell sump levels

+ .0279 Wt%/day

3. Correction for increase in reactor vessel water level

+ .0596 Wt%/day

The corrected leak rate at the upper one sided 95% confidence level is 0.3181 Wt%/day. This measured value is less than the Technical Specification limit of 0.75 La, (where La = 0.80 weight percent of contained mass per 24 hours), which is equivalent to 0.60 weight percent of contained mass per 24 hours.

Verification of Instrumentation Sensitivity

Section III.A.3 (b) of Appendix J to 10 CFR 50 requires that the accuracy of the Type A Test shall be verified by a supplemental test. The Pumpback Method of verification was selected. In this method, a known quantity (mass) of air is metered into the containment and is compared with the change in the calculated weight of air. The required accuracy between the metered quantity and the calculated quantity is specified in Appendix J to be $\pm$ .25 La.

The quantity metered back was selected to be approximately equivalent to 1/2 the allowable leakage rate of 0.60 Wt%/day. The actual quantity metered was 618 Ft^3, 58 psig feed pressure and 60°F, which is equivalent to 231.9 pounds mass.

The average of five calculated values of mass of air prior to the charge was 72866.1 lbs. The average of five calculated values of mass of air following the charge was 73140.3 lbs. During the 60 minute elapsed time between before and after average measurements at the measured leakage rate of 6.503 lbm/hr, 6.5 lbs was assumed to leak during the pump back test.

The balance is as follows:

Mass following air charge	73140.3
Mass prior to charge	72866.1
Difference	274.2
"Normal Leakage"	6.5
Total Difference	280.7

The comparison to the actual charge of 231.9 lbs is:

280.7 - 231.9 = 49.8 lbs. difference.

The allowable Supplement Test error of .25 La - 146.02 lbs.

The 49.8 lbs in the 1983 Supplement Test was well within the accuracy limits specified in Appendix J.

Instrument Selection Guide Calculation

The following calculations verify the ability of the instrumentation system to measure the integrated leakage rate of the primary containment system. Instrumentation errors are combined using a root-sum-square formula.

$$ISG = \pm \frac{2400}{t} \left[2\left(\frac{ep}{p}\right)^2 + 2\left(\frac{epv}{p}\right)^2 + 2\left(\frac{eT}{T}\right)^2 \right]^{1/2} \qquad (2)$$

ISG = instrument selection guide
t = minimum expected test duration (hours)
p = containment atmosphere total absolute pressure
pv = containment atmosphere part pressure of water vapor
T = containment atmosphere weighted average absolute drybulb temperature
e = error associated with measurement of change in a given parameter

The ISG shall not exceed 0.25 La (where La is the maximum allowable primary containment integrated leak rate).

(2) ANSI/ANS 56.8 - 1980

A. Test Parameters

La = 0.8%/day
P = 58.7 psia
T = 550°R drybulb
Tdp = 60°F dewpoint
t = 24 hours

B. Instrument Parameters

1) Total absolute pressure

No. of sensors: 1
Range 0-150" Hg absolute (0-73.68 psia)
Measurement system error: ±0.002% of F.S. = ± 0.003 in Hg Abs = ±.001 psia

eP = ±0.001 psia

2) Water vapor pressure
No. of sensors: 4
Sensor sensitivity error (E_{pv}) ±0.5°F
Measurement sensitivity error (εpv)
Computer resolution = 0.1°F
Computer repeatability = (40 mv scale) = ± .08%
Therefore at 60°F 60°F x .0008 = 0.048°F

At a dewpoint temperature of 60°F, the equivalent water vapor pressure (as determined from the steam tables) is 0.0092 psia/°F.

$Epv = (\pm 0.5°F)\ (0.0092\ psia/°F) = \pm 0.0046\ psia$
$\varepsilon pv = (\pm 0.048°F)\ (0.0092\ psia/°F) = \pm 0.00044\ psia$

$$epv = \frac{\pm\ [(Epv)^2 + (\varepsilon pv)^2]^{1/2}}{[\text{No. of sensors}]\ 1/2} \quad \frac{[(0.0046)^2 + (0.00044)^2]^{1/2}}{[4]\ 1/2}$$

$epv = 0.0023\ psia$

3) Temperature

No. of sensors: 19
Sensor sensitivity error (Et) = $\pm 0.5°F$
Measurement sensitivity error (ET) excluding sensor

Computer resolution = 0.1°F
Computer repeatability (40 mv scale) = $\pm 0.08\%$
at 100°F 100°F x 0.0008 = $\pm 0.08°F$

$$E_T = \pm 0.5°F = \pm 0.5°R$$

$$\varepsilon_T = \pm 0.08°F = \pm 0.08°R$$

$$e_T = \frac{[(E_T)^2 + (\varepsilon_T)^2]^{1/2}}{[\text{No of Sensors}]\ 1/2} = \frac{[(0.5)^2 + (0.08^2]^{1/2}}{(19)\ 1/2}$$

$$e_T = \pm\ 0.1162°R$$

4) ISG

$$ISG = \pm \frac{2400}{t}\left[2\left(\frac{ep}{p}\right)^2 + 2\left(\frac{epv}{p}\right)^2 + 2\left(\frac{e_T}{T}\right)^2\right]^{1/2}$$

$$= \pm \frac{2400}{24}\left[2\left(\frac{0.001}{58.7}\right)^2 + 2\left(\frac{0.0023}{58.7}\right)^2 + 2\left(\frac{0.1162}{550}\right)^2\right]^{1/2}$$

$$= \pm 100\ [(5.8 \times 10^{-10}) + (3.07 \times 10^{-9}) + (8.9 \times 10^{-8})]^{1/2}$$

$$= \pm 100\ [9.29 \times 10^{-8}]^{1/2} = \pm\ 0.0305$$

$ISG = \pm 0.0305$ Wt %/day

.0305 Wt %/day is less than 0.2 wt %/day (.25 La); therefore, the instruments are acceptable for the test.

1981 and 1983 Type B and C Testing

Introductory Description of Testing

During 1981 and 1983 refueling outages, Type B and C primary containment leak rate testing was conducted in accordance with 10 CFR 50, Appendix J. Type B leakage tests were performed on containment penetrations utilizing gasketed seals prior to opening. This provided accurate as-found leakage data from the previous operating cycle. After each containment penetration closeout, a type B leak test was again performed. This leakage was combined with all measured leakage of the various containment isolation valves as a baseline for the upcoming operating cycle. The summary test results for type B penetrations are presented in Tables 81-B and 83-B.

Type C leakage tests were performed on containment isolation valves. Four types of leakage tests were used, 1) the water leakage method, 2) the pressure drop method, 3) the pressure buildup method, and 4) the inleakage test method. All valves that were found to have leakage rates in excess of that allowed by the Technical Specifications were reported to the Director of the Office of Inspection and Enforcement, Region 1, in thirty-day licensee event reports, LER 81-32 and 83-10. Following disassembly, repair, and retesting, a satisfactory leakage rate was demonstrated. The summary for Type C valves is presented in Tables 81-C and 83-C. MSIV leakages shown in these tables have been corrected to the equivalent 44 psig leakage to allow them to be included in the total.

Due to maintenance requirements, some valves/penetrations were tested outside the refueling outages. The results of these tests are included as Table D.

Valves That Exceeded the Leakage Criteria

1. Tech. Spec. Isolation Valves

During the 1981 refueling outage, two primary containment isolation valves were found to have seat leakages in excess of that permitted by the Technical Specifications. On all valves found to have leakage greater than that allowed, a second valve on the same line provided the proper containment isolation capability. Testing, repair, and retest details for the valves found to have excessive leakage are described below.

a) Reactor Cleanup Suction Isolation Valve

On October 23, 1981, the Reactor Cleanup Suction Isolation Valves, RCU-15 was leak tested and the test volume could not be pressurized. Disassembly and inspection of the valve revealed damage to the valve gate. The valve gate and stem were replaced and the valve was reassembled. Following the repair, the valve was retested and the leakage rate was found to be 0.0 lbm/hr. RCU-15 is a 4", 1500 lb motor operated gate valve manufactured by Wm. Powell Co.

b) Reactor Cleanup Return Isolation Valve

On November 11, 1981 the Reactor Cleanup Return Isolation Valve, RCU-68 was leak tested and the test volume could not be pressurized. Disassembly and inspection of the valve revealed damage to the valve disc. The disc was replaced and the valve was reassembled. Following the repair, the valve was retested and the leakage rate was found to be 0.048 lbm/hr. RCU-68 is a 4", 1500 lb motor operated globe valve manufactured by Wm. Powell Co.

During the 1983 refueling outage there were no valves listed in our Technical Specifications found to have excessive leakage.

2. Non-Tech. Spec. Isolation Valves

During the 1981 refueling outage there were two valves tested which were determined to have excessive leakage. These valves are included in our leak test program but are not required to be tested by our Technical Specifications. The two valves are in series; however, this penetration is isolated by manual valves during operation.

SB-16-19-51 and 52 were tested on November 5, 1981 and were found to be leaking at a rate of 1.525 lbm/hr. Disassembly and inspection revealed the valve internals to be dirty. The valve internals were cleaned and the valves were reassembled. After repair, the leakage rate was found to be 0.466 lbm/hr. SB-16-19-51 and 52 are 2", 600 lb. lift check valves manufactured by Hancock Co.

During the 1983 refueling outage there was one valve tested (FDW-96A) which was determined to have excessive leakage. This valve is included in our leak test program but is not required to be tested by our Technical Specifications. The upstream valve (FDW-28A) is listed in our Tech. Spec. as a containment isolation valve not subject to type C testing. FDW-28A is therefore assumed to be leaking the maximum allowable by our Technical Specifications, 0.522 lbm/hr.

FDW 96A was tested on March 24, 1983 and found to be leaking at a rate of 12.265 lbm/hr. Disassembly and inspection revealed damage to the resilient seat ring in the valve. The seat ring was replaced and the valve was reassembled. After repair, the leakage was found to be 0.039 lbm/hr. FDW 96A is a 16" 900 lb. swing check valve manufactured by Anchor/Darling Valve Co.

Quantitive Calculations of Technical Specifications Limits

1. The combined leak rate of all penetrations and valves subject to Type B and C tests shall be less than 0.60 La. Sixty (60) percent of LA = 354 lbm/day.

2. The leakage from any one isolation valve shall not exceed 5% of Ltm. Five (5) percent of Ltm = 0.522 lbm/hr.

3. The leakage from any one main steam line isolation valve shall not exceed 11.5 SCFH at 24 PSIG (Pt).

General Conclusion

Based on the successful completion of the Type A, B, and C leak rate test programs, along with the corrective action taken as a result of the test data, it is concluded that the condition of the Primary Containment System is acceptable for continued plant operation. The plant was returned to service with a containment leakage of less than 0.318 WT%/day. This compares to the allowed leakage of 0.600 WT%/day.

AIR SUPPLY SCHEMATIC

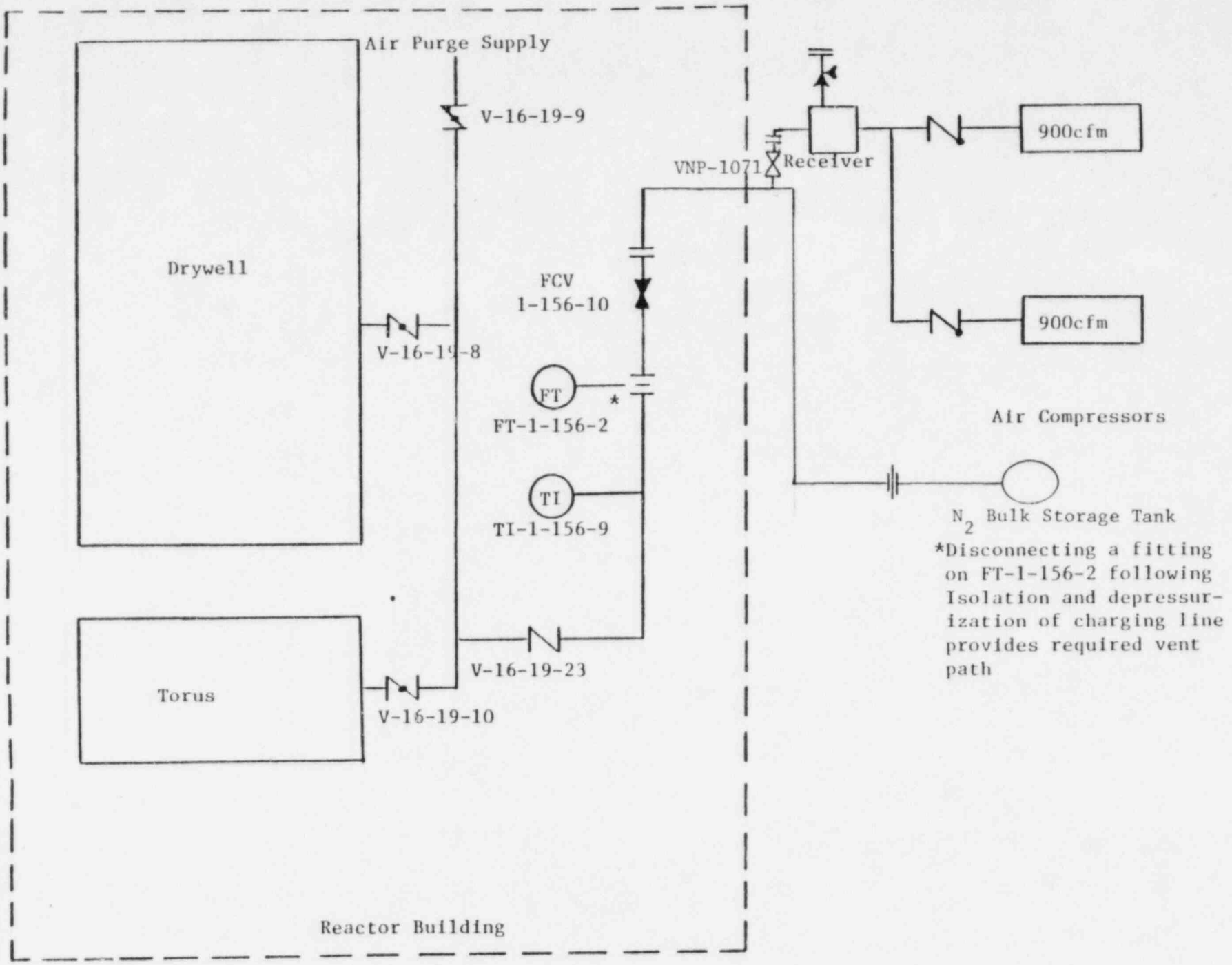
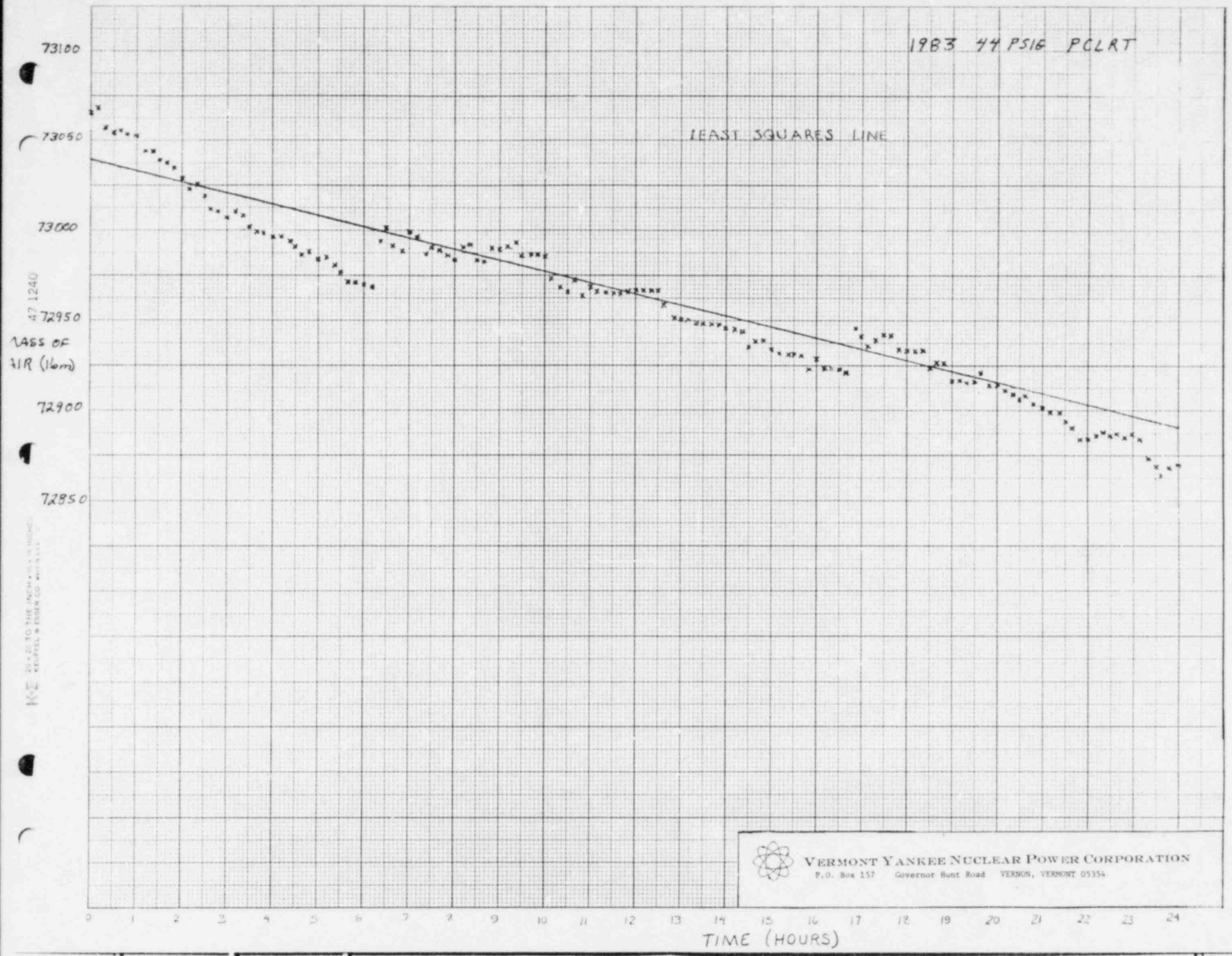
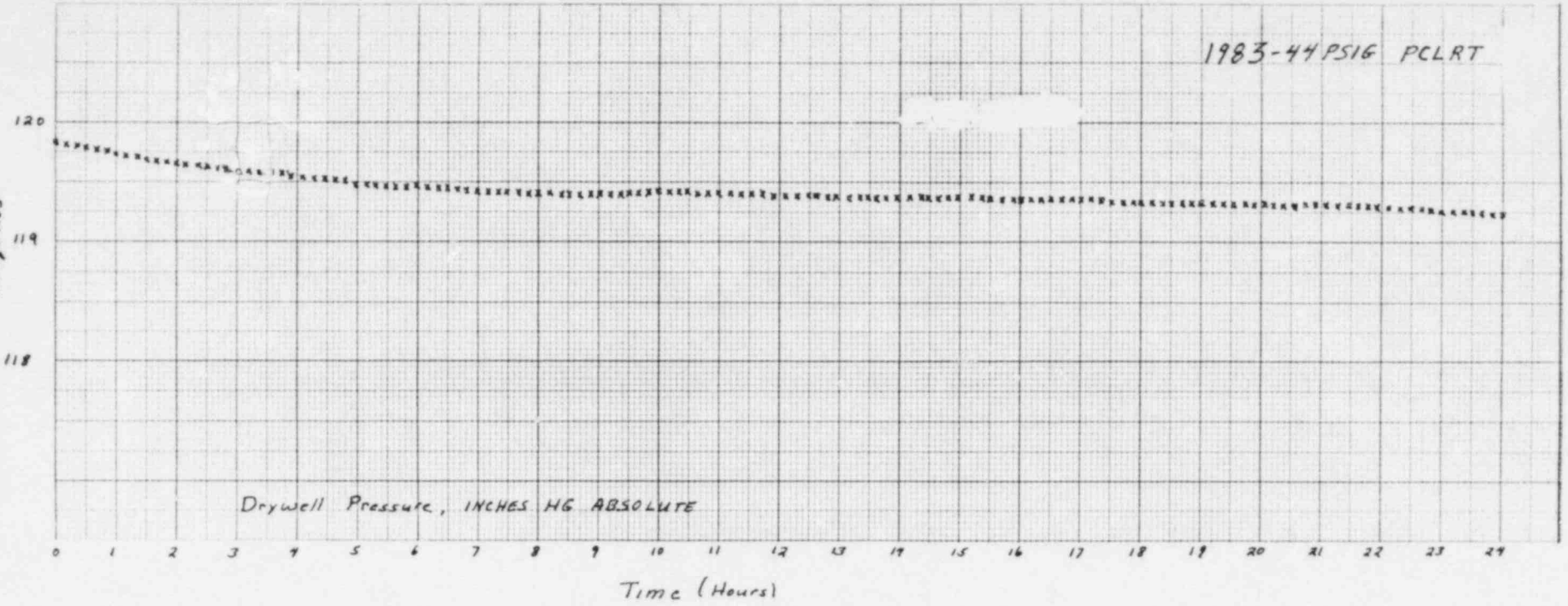
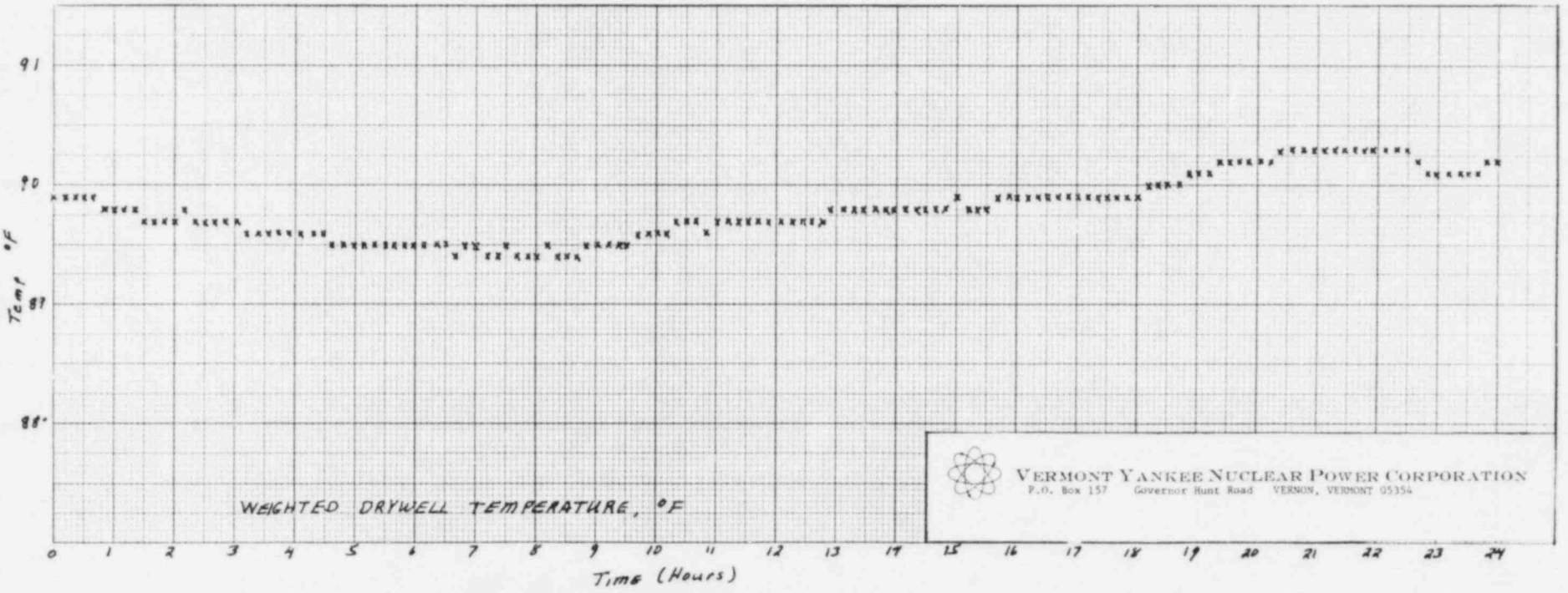


Figure I


1983 44 PSIG PCLRT
LEAST SQUARES LINE
73100
73050
73000
72950
72900
72850
MASS OF AIR (lbm)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME (HOURS)
VERMONT YANKEE NUCLEAR POWER CORPORATION
P.O. Box 157 Governor Hunt Road VERNON, VERMONT 05354

1983-44 PSIG PCLRT





VERMONT YANKEE NUCLEAR POWER CORPORATION
P.O. Box 157 Governor Hunt Road VERNON, VERMONT 05354

PRIMARY CONTAINMENT LEAKAGE RATE DATA SHEET

(TYPE A)

TABLE 1983A

Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F	Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F
0203	73065.859	119.839	89.9	0536	73002.646	119.568	89.6
0213	73067.854	119.823	89.9	0547	72999.349	119.562	89.6
0223	73057.681	119.807	89.9	0557	72998.463	119.551	89.6
0233	73054.683	119.791	89.9	0607	72996.432	119.544	89.6
0244	73056.325	119.773	89.8	0617	72996.683	119.537	89.6
0254	73054.166	119.759	89.8	0627	72992.755	119.526	89.6
0304	73053.091	119.743	89.8	0637	72990.023	119.511	89.5
0314	73043.756	119.729	89.8	0648	72986.073	119.507	89.5
0324	73044.271	119.715	89.8	0658	72988.716	119.499	89.5
0335	73039.662	119.696	89.7	0708	72982.122	119.491	89.5
0345	73037.504	119.682	89.7	0718	72985.433	119.485	89.5
0355	73035.809	119.670	89.7	0728	72980.103	119.480	89.5
0405	73029.112	119.660	89.7	0739	72977.185	119.474	89.5
0415	73023.723	119.650	89.8	0749	72972.846	119.467	89.5
0425	73026.701	119.640	89.7	0759	72971.813	119.464	89.5
0435	73019.254	119.630	89.7	0809	72970.524	119.457	89.5
0446	73011.906	119.618	89.7	0819	72968.869	119.454	89.5
0456	73010.826	119.607	89.7	0830	72994.459	119.450	89.5
0506	73007.587	119.598	89.7	0840	73002.339	119.445	89.4
0516	73012.390	119.587	89.6	0850	72989.833	119.440	89.5
0526	73008.771	119.578	89.6	0900	72987.334	119.435	89.5

Test Asst. Michael A. Volk

Date 6-10-83

Approved _____
Test Coordinator

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Rev. 1

PRIMARY CONTAINMENT LEAKAGE RATE DATA SHEET

(TYPE A)

Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F	Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F
0911	72999.622	119.431	89.4	1245	72964.367	119.409	89.7
0921	72996.001	119.426	89.4	1255	72972.489	119.409	89.6
0931	72987.224	119.421	89.5	1305	72962.768	119.407	89.7
0941	72991.972	119.417	89.4	1316	72969.089	119.405	89.7
0951	72989.067	119.415	89.4	1326	72967.730	119.404	89.7
1002	72986.805	119.411	89.4	1336	72967.250	119.402	89.7
1012	72984.193	119.408	89.5	1346	72965.277	119.400	89.7
1022	72991.336	119.407	89.4	1356	72963.727	119.399	89.7
1032	72992.269	119.407	89.4	1407	72968.371	119.397	89.7
1042	72983.176	119.406	89.4	1417	72966.628	119.396	89.7
1053	72982.728	119.405	89.5	1427	72968.270	119.395	89.7
1103	72990.896	119.403	89.5	1437	72968.270	119.395	89.7
1113	72989.901	119.405	89.5	1447	72968.775	119.394	89.7
1123	72991.499	119.407	89.5	1458	72958.680	119.392	89.8
1133	72992.727	119.409	89.5	1508	72951.812	119.391	89.8
1144	72985.69	119.412	89.6	1518	72951.717	119.389	89.8
1154	72986.921	119.414	89.6	1528	72951.344	119.389	89.8
1204	72986.921	119.414	89.6	1538	72949.369	119.387	89.8
1214	72985.560	119.413	89.6	1549	72948.811	119.387	89.8
1224	72973.007	119.412	89.7	1559	72947.960	119.387	89.8
1225	72967.579	119.410	89.7	1609	72947.960	119.385	89.8

Test Asst. Michael A. Volk

Date 6-10-83

Approved _____
Test Coordinator

VYOPF 4029.04
Rev. 1

PRIMARY CONTAINMENT LEAKAGE RATE DATA SHEET

(TYPE A)

TABLE 1983A

Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F	Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F
1619	72945.416	119.383	89.8	1954	72942.359	119.345	89.9
1630	72945.179	119.382	89.8	2004	72941.373	119.344	89.9
1640	72944.145	119.380	89.8	2014	72933.767	119.343	90.0
1650	72935.966	119.379	89.8	2024	72933.393	119.343	90.0
1700	72938.108	119.377	89.9	2035	72932.405	119.342	90.0
1710	72939.571	119.375	89.8	2045	72933.527	119.342	90.0
1721	72934.404	119.374	89.8	2055	72924.855	119.342	90.1
1731	72932.429	119.372	89.8	2105	72926.163	119.342	90.1
1741	72931.952	119.370	89.9	2115	72926.163	119.342	90.1
1751	72931.475	119.368	89.9	2126	72916.311	119.341	90.2
1801	72930.995	119.366	89.9	2136	72916.963	119.339	90.2
1812	72924.504	119.364	89.9	2146	72915.462	119.339	90.2
1822	72928.276	119.364	89.9	2156	72916.351	119.338	90.2
1832	72924.181	119.361	89.9	2207	72921.655	119.338	90.2
1842	72923.710	119.359	89.9	2217	72913.246	119.336	90.2
1852	72923.473	119.358	89.9	2227	72913.717	119.334	90.3
1903	72921.258	119.355	89.9	2237	72911.879	119.331	90.3
1913	72947.130	119.354	89.9	2247	72909.292	119.328	90.3
1923	72941.667	119.350	89.9	2258	72906.702	119.325	90.3
1933	72936.272	119.348	89.9	2308	72908.837	119.323	90.3
1933	72939.593	119.346	89.9	2318	72903.401	119.319	90.3

Test Asst. Michael A. Volk

Date 6-10-83

Approved [signature]
Test Coordinator

PRIMARY CONTAINMENT LEAKAGE RATE DATA SHEET

(TYPE A)

TABLE 1983A

Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F	Time (Min)	Contained Mass (pounds)	Pressure "Hg	Temp. °F
2318	72902.312	119.316	90.3	0303	73163.9	119.647	90.0
2339	72899.348	119.313	90.3	0313	73157.0	119.613	90.1
2349	72898.021	119.309	90.3	0323	73128.9	119.595	90.0
2359	72894.719	119.303	90.3	0333	73124.6	119.581	90.0
0009	72890.188	119.295	90.3	0344	73127.2	119.569	89.9
0019	72883.130	119.285	90.3				
0030	72883.853	119.276	90.3				
0040	72886.199	119.266	90.2				
0050	72888.385	119.260	90.1				
0100	72886.066	119.255	90.1				
0110	72887.003	119.255	90.1				
0121	72885.454	119.254	90.1				
0131	72887.262	119.253	90.1				
0141	72884.489	119.250	90.1				
0151	72872.771	119.245	90.2				
0202*	72868.154	119.239	90.2				
0212	72862.875	119.231	90.2				
0222	72868.433	119.225	90.2				
0232	72869.151	119.216	90.1				
0242	72862.2	119.209	90.1				
0253**	72926.3	119.270	90.1				

Test Asst. Michael A. Volk

Date 6-10-83

Approved _____
Test Coordinator

* End of 24-hour test.

** Supplemental Test pumpback completed at 0300.

VYOPF 4029.04
Rev. 1

Summary Test Results for Type B Testing

Table 81-B

PENETRATION NUMBER	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
X-2	Personnel Lock	1.720	1.720
	Bellows Seals		
X-7A	Main Steam Line A	0.000	
X-7B	Main Steam Line B	0.000	
X-7C	Main Steam Line C	0.000	
X-7D	Main Steam Line D	0.000	
X-9A	Feedwater A	0.000	
X-9B	Feedwater B	0.000	
X-11	HPCI Steam Line	0.000	
X-12	RHR Suction	0.000	
X-13A	RHR Return A	0.000	
X-13B	RHR Return B	0.000	
X-14	Cleanup Suction	0.000	
X-16A	Core Spray A	0.000	
X-16B	Core Spray B	0.000	
	Electrical Penetrations		
100A	Electrical Penetration	0.000	
100B	Electrical Penetration	0.001	
100C	Electrical Penetration	0.000	
100D	Electrical Penetration	0.000	
101A	Electrical Penetration	0.000	
101C	Electrical Penetration	0.003	
101D	Electrical Penetration	0.001	
102	Electrical Penetration	0.000	

Table 81-B (Cont'd) Summary Test Results for Type B Testing

PENETRATION NUMBER	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
103	Electrical Penetration	0.000	
104A	Electrical Penetration	0.000	
104B	Electrical Penetration	0.000	
104C	Electrical Penetration	0.001	
105A	Electrical Penetration	0.000	
105B	Electrical Penetration	0.000	
105C	Electrical Penetration	0.000	
105D	Electrical Penetration	0.000	
214	Electrical Penetration	0.000	
	Double Gasketed Seals		
X-1	Equipment Hatch	0.002	
X-4	Drywell Head Access Hatch	0.000	
X-6	Control Rod Drive Removal Hatch	0.000	0.000
X-200A	Torus Access Hatch	0.000	
X-200B	Torus Access Hatch	0.000	0.000
VBC-A	Vacuum Breaker Access Cover	0.000	0.001
VBC-B	Vacuum Breaker Access Cover	0.000	0.002
VBC-C	Vacuum Breaker Access Cover	0.000	
VBC-D	Vacuum Breaker Access Cover	0.000	
VBC-E	Vacuum Breaker Access Cover	0.000	
VBC-F	Vacuum Breaker Access Cover	0.000	
VBC-G	Vacuum Breaker Access Cover	0.000	
VBC-H	Vacuum Breaker Access Cover	0.000	
VBC-I	Vacuum Breaker Access Cover	0.000	
VBC-J	Vacuum Breaker Access Cover	0.000	

Table 81-B (Cont'd) Summary Test Results for Type B Testing

PENETRATION NUMBER	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
VBSL-A	Vacuum Breaker Shaft Left	0.000	
VBSR-A	Vacuum Breaker Shaft Right	0.000	
VBSL-B	Vacuum Breaker Shaft Left	0.000	
VBSR-B	Vacuum Breaker Shaft Right	0.000	
VBSL-C	Vacuum Breaker Shaft Left	0.000	
VBSR-C	Vacuum Breaker Shaft Right	0.000	
VBSL-D	Vacuum Breaker Shaft Left	0.000	
VBSR-D	Vacuum Breaker Shaft Right	0.000	
VBSL-E	Vacuum Breaker Shaft Left	0.000	
VBSR-E	Vacuum Breaker Shaft Right	0.000	
VBSL-F	Vacuum Breaker Shaft Left	0.000	
VBSR-F	Vacuum Breaker Shaft Right	0.000	
VBSL-G	Vacuum Breaker Shaft Left	0.000	
VBSR-G	Vacuum Breaker Shaft Right	0.000	
VBSL-H	Vacuum Breaker Shaft Left	0.000	
VBSR-H	Vacuum Breaker Shaft Right	0.000	
VBSL-I	Vacuum Breaker Shaft Left	0.000	
VBSR-I	Vacuum Breaker Shaft Right	0.000	
VBSL-J	Vacuum Breaker Shaft Left	0.001	
VBSR-J	Vacuum Breaker Shaft Right	0.000	
SLH-A	Shear Lug Access Cover	0.004	
SLH-B	Shear Lug Access Cover	0.000	
SLH-C	Shear Lug Access Cover	0.000	
SLH-D	Shear Lug Access Cover	0.000	
SLH-E	Shear Lug Access Cover	0.002	
SLH-F	Shear Lug Access Cover	0.000	
SLH-G	Shear Lug Access Cover	0.002	
SLH-H	Shear Lug Access Cover	0.000	
---	Drywell Head Flange	0.027	0.001
X-213-A	Torus Drain	0.000	
X-213-B	Torus Drain	0.000	
X-35A	TIP Penetration Flange	0.000	
X-35B	TIP Penetration Flange	0.000	
X-35C	TIP Penetration Flange	0.000	
X-35E	TIP Penetration Flange	0.000	
	Total B Penetration Leakage After Repairs		1.741

Summary Test Results for Type C Testing

Table 81-C

VALVE(S) TESTED	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
MS-77	Main Steam Drain	0.113	
RV39 & 40	Recirc. Sample	0.009	
RHR-57	RHR Disch. to Radwaste	0.047	
LRW-83	Drywell Floor Drain	0.379	
LRW-95	Drywell Equip. Drain	0.478	
SB-16-19-8,9,10 & 23	Containment Purge	0.000	0.369
SB-16-19-11A & 12A	Vacuum Relief	0.015	
SB-16-19-11B & 12B	Vacuum Relief	0.124	
SB-16-19-6,7,6A,6B,7A and 7B	Containment Exhaust	0.830	
RCU-18	Reactor Cleanup	0.009	
V-16-20-20	Containment Purge Makeup	0.010	0.015
V-16-20-22A	Containment Purge Makeup	0.028	0.011
V-16-20-22B	Containment Purge Makeup	0.006	0.010
RCU-68 and CRD-181	Reactor Cleanup	could not seat	0.477
HPCI-16	HPCI Steam Supply	0.107	
RCIC-16	RCIC Steam Supply	0.038	
CA-38A	Cont. Air Compressor	$\leq$0.096	
CA-38B	Cont. Air Compressor Suction	$\leq$0.096	
CA-89B	Instrument Air Check Valve	0.002	
CA-89C	Instrument Air Check Valve	0.003	
NG 13A & 13B, 15	CAD Injection	0.010	
NG 12A & 12B	CAD Injection	0.005	
NG 11A & 11B	CAD Injection	0.025	
VG-9A	CAD Vent	0.012	
VG-22A	CAD Vent	0.045	
VG-9B	CAD Vent	0.019	

Table 81-C (Cont'd) Summary Test Results for Type C Testing

VALVE(S) TESTED	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
VG-22B	CAD Vent	0.014	
VG-23	CAD Rad. Mon. Supply	0.021	
VG-26	CAD Rad. Mon. Supply	0.015	
VG-76A	Rad. Mon. Return	0.105	
VG-76B	Rad. Mon. Return	0.003	
MS-74	Main Steam Drain	0.000	0.113
HPCI-15	HPCI Steam Supply	0.000	0.107
RCIC-15	RCIC Steam Supply	0.000	0.038
RCU-15	Reactor Cleanup	could not seat	0.000
LRW-82	Drywell Floor Drain	0.131	
LRW-94	Drywell Equipment Drain	0.075	
RHR-66	RHR Discharge to Radwaste	0.000	
RHR 29/32	Head Spray Line	0.000	0.006 corrected
RHR 33	Head Spray Line	0.006	
FDW-7A,7B,37A,37B, 5	Feedwater	1.524	
SB-16-19-51/52	PCAC	1.525	0.466
SB-16-19-53	PCAC	0.042	
IA-103	Instrument Air Check Valve	0.013	
FDW-27A	Feedwater Check Valve	0.002	
FDW-96A	Feedwater Check Valve	0.008	
MS80A	A Main Steam Line	0.187	
MS86A	A Main Steam Line	0.503	
MS80B	B Main Steam Line	0.049	
MS86B	B Main Steam Line	0.318	
MS80C	C Main Steam Line	0.000	
MS86C	C Main Steam Line	0.265	
MS80D	D Main Steam Line	0.000	
MS86D	D Main Steam Line	0.106	

Total Type C Leakage Following Repairs 7.461

Total Type B & C Leakage Following Repairs 9.202

Summary Test Results for Type B Testing

Table 83-B

PENETRATION NUMBER	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
X-2	Personnel Lock	0.574 lbm/hr	1.461
	Bellows Seals		
X-7A	Main Steam Line A	0.000	
X-7B	Main Steam Line B	0.000	
X-7C	Main Steam Line C	0.000	
X-7D	Main Steam Line D	0.000	
X-9A	Feedwater A	0.000	
X-9B	Feedwater B	0.000	
X-11	HPCI Steam Line	0.000	
X-12	RHR Suction	0.000	
X-13A	RHR Return A	0.000	
X-13B	RHR Return B	0.000	
X-14	Cleanup Suction	0.000	
X-16A	Core Spray A	0.000	
X-16B	Core Spray B	0.000	
	Electrical Penetrations		
100A	Electrical Penetration	0.000	
100B	Electrical Penetration	0.000	
100C	Electrical Penetration	0.001	
100D	Electrical Penetration	0.000	
101A	Electrical Penetration	0.001	
101C	Electrical Penetration	0.045	
101D	Electrical Penetration	0.000	
102	Electrical Penetration	0.008	

Table 83-B (Cont'd) Summary Test Results for Type B Testing

PENETRATION NUMBER	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
103	Electrical Penetration	0.002	
104A	Electrical Penetration	0.000	
104B	Electrical Penetration	0.001	
104C	Electrical Penetration	0.000	
105A	Electrical Penetration	0.000	
105B	Electrical Penetration	0.001	
105C	Electrical Penetration	0.000	
105D	Electrical Penetration	0.004	
214	Electrical Penetration	0.000	
	Double Gasketed Seals		
X-1	Equipment Hatch	0.001	
X-4	Drywell Head Access Hatch	0.000	
X-6	Control Rod Drive Removal Hatch	0.000	
X-200A	Torus Access Hatch	0.000	0.000
X-200B	Torus Access Hatch	0.000	0.000
VBC-A	Vacuum Breaker Access Cover	0.000	0.000
VBC-B	Vacuum Breaker Access Cover	0.203	0.000
VBC-C	Vacuum Breaker Access Cover	0.000	0.000
VBC-D	Vacuum Breaker Access Cover	0.000	0.000
VBC-E	Vacuum Breaker Access Cover	0.000	0.000
VBC-F	Vacuum Breaker Access Cover	0.000	0.000
VBC-G	Vacuum Breaker Access Cover	0.000	0.000
VBC-H	Vacuum Breaker Access Cover	0.000	0.000
VBC-I	Vacuum Breaker Access Cover	0.000	0.000
VBC-J	Vacuum Breaker Access Cover	0.000	0.000

Table 83-B (Cont'd) Summary Test Results for Type B Testing

PENETRATION NUMBER	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
VBSL-A	Vacuum Breaker Shaft Left	0.000	
VBSR-A	Vacuum Breaker Shaft Right	0.000	
VBSL-B	Vacuum Breaker Shaft Left	0.000	
VBSR-B	Vacuum Breaker Shaft Right	0.000	
VBSL-C	Vacuum Breaker Shaft Left	0.000	
VBSR-C	Vacuum Breaker Shaft Right	0.000	
VBSL-D	Vacuum Breaker Shaft Left	0.000	
VBSR-D	Vacuum Breaker Shaft Right	0.000	
VBSL-E	Vacuum Breaker Shaft Left	0.000	
VBSR-E	Vacuum Breaker Shaft Right	0.000	
VBSL-F	Vacuum Breaker Shaft Left	0.000	
VBSR-F	Vacuum Breaker Shaft Right	0.000	
VBSL-G	Vacuum Breaker Shaft Left	0.000	
VBSR-G	Vacuum Breaker Shaft Right	0.000	
VBSL-H	Vacuum Breaker Shaft Left	0.000	
VBSR-H	Vacuum Breaker Shaft Right	0.000	
VBSL-I	Vacuum Breaker Shaft Left	0.000	
VBSR-I	Vacuum Breaker Shaft Right	0.000	
VBSL-J	Vacuum Breaker Shaft Left	0.000	
VBSR-J	Vacuum Breaker Shaft Right	0.000	
SLH-A	Shear Lug Access Cover	0.000	
SLH-B	Shear Lug Access Cover	0.000	
SLH-C	Shear Lug Access Cover	0.000	
SLH-D	Shear Lug Access Cover	0.000	
SLH-E	Shear Lug Access Cover	0.002	
SLH-F	Shear Lug Access Cover	0.000	
SLH-G	Shear Lug Access Cover	0.002	
SLH-H	Shear Lug Access Cover	0.000	
---	Drywell Head Flange	0.014	
X-213-A	Torus Drain	0.000	
X-213-B	Torus Drain	0.000	
X-35A	TIP Penetration Flange	0.000	
X-35B	TIP Penetration Flange	0.000	
X-35C	TIP Penetration Flange	0.000	
X-35E	TIP Penetration Flange	0.000	
	Total B Penetration Leakage After Repairs		1.543

Summary Test Results for Type C Testing

Table 83-C

VALVE(S) TESTED	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
MS-77	Main Steam Drain	0.326	
RV39 & 40	Recirc. Sample	0.018	
RHR-57	RHR Disch. to Radwaste	0.051	
LRW-83	Drywell Floor Drain	0.418	
LRW-95	Drywell Equip. Drain	0.042	
SB-16-19-8,9,10 & 23	Containment Purge	0.113	
SB-16-19-11A & 12A	Vacuum Relief	0.037	
SB-16-19-11B & 12B	Vacuum Relief	0.126	
SB-16-19-6,7,6A,6B,7A and 7B	Containment Exhaust	0.489	
RCU-18	Reactor Cleanup	0.034	
V-16-20-20	Containment Purge Makeup	0.001	
V-16-20-22A	Containment Purge Makeup	0.001	
V-16-20-22B	Containment Purge Makeup	0.015	
RCU-68 and CRD-181	Reactor Cleanup	0.182	0.386
HPCI-16	HPCI Steam Supply	0.043	
RCIC-16	RCIC Steam Supply	0.477	
CA-38A	Cont. Air Compressor	0.181	
CA-38B	Cont. Air Compressor Suction	0.017	
CA-89B	Instrument Air Check Valve	0.018	
CA-89C	Instrument Air Check Valve	0.027	
NG 13A & 13B,	CAD Injection	0.001	
NG 12A & 12B	CAD Injection	0.001	
NG 11A & 11B	CAD Injection	0.001	
VG-9A	CAD Vent	0.001	
VG-22A	CAD Vent	0.001	
VG-9B	CAD Vent	0.001	

Table 83-C (Cont'd) Summary Test Results for Type C Testing

VALVE(S) TESTED	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
VG-22B	CAD Vent	0.034	
VG-23	CAD Rad. Mon. Supply	0.001	
VG-26	CAD Rad. Non. Supply	0.001	
VG-76A	Rad. Mon. Return	0.001	
VG-76B	Rad. Mon. Return	0.001	
MS-74	Main Steam Drain	0.004	
HPCI-15	HPCI Steam Supply	0.000	
RCIC-15	RCIC Steam Supply	0.000	
RCU-15	Reactor Cleanup	0.032	
LRW-82	Drywell Floor Drain	0.025	
LRW-94	Drywell Equipment Drain	0.027	
RHR-66	RHR Discharge to Radwaste	0.000	
SB-16-19-51	PCAC	0.067	
SB-16-19-52	PCAC	0.015	
1A-103	Instrument Air Check Valve	0.025	
FDW-27A	Feedwater Check Valve	0.096	
FDW-96A	Feedwater Check Valve	12.265	0.039
CRD-413B	Recirc Pump Seal Purge ISO Valves (check)	0.021	
CRD-413A	Recirc Pump Seal Purge ISO Valves (Check)	0.045	
CRD-412A	Recirc Pump Seal Purge ISO Valves (check)	0.001	
CRD-412B	Recirc Pump Seal Purge ISO Valves (check)	0.039	
PCV2-32A	North SDV Vent	0.023	
PVC3-32B	South SDV Vent	0.013	
LCV3-33A	North SDV Drain	0.001	
LCV3-33B	South SDV Drain	0.182	
LCV3-33C	North SDV Drain	0.027	
LCV3-33D	South SDV Drain	0.001	
CRD-162A	North SDV Vent	0.030	
CRD-162B	South SDV Vent	0.012	

Table 83-C (Cont'd) Summary Test Results for Type C Testing

VALVE(S) TESTED	DESCRIPTION	LEAKAGE (LBM/HR) INITIAL	RETEST
MS80A	A Main Steam Line	0.386	
MS86A	A Main Steam Line	0.933	
MS80B	B Main Steam Line	0.000	
MS86B	B Main Steam Line	0.373	
MS80C	C Main Steam Line	0.000	
MS86C	C Main Steam Line	1.065	
MS80D	D Main Steam Line	0.000	
MS86D	D Main Steam Line	0.277	
	Total Type C Leakage Following Repairs		6.623
	Total Type B & C Leakage Following Repairs		8.166

TABLE D
Leakage Test Performed Outside of Shutdown

Type B

Penetration	Description	Date	Leakage (lbm/hr)
X-2	Personnel Lock	10/16/81	1.720
X-2	Personnel Lock	9/1/82	0.430
X-2	Personnel Lock	1/11/83	0.000
X-2	Personnel Lock	2/2/83	0.574

Type C

Valve No.	Description	Date	Leakage (lbm/hr)
SB-16-19-8,9,10,23	Containment Purge	6/10/82	0.369
V-16-20-20	Containment Purge Makeup	6/22/82	0.015
V-16-20-22A	Containment Purge Makeup	6/22/82	0.011
V-16-20-22B	Containment Purge Makeup	6/22/82	0.010
V-16-20-20	Containment Purge Makeup	1/9/83	0.018
V-16-20-22B	Containment Purge Makeup	1/9/83	0.025
V-16-20-20	Containment Purge Makeup	2/15/83	0.004
V-16-20-22B	Containment Purge Makeup	2/15/83	0.011

VERMONT YANKEE
NUCLEAR POWER CORPORATION

RD 5, Box 169, Ferry Road, Brattleboro, VT 05301

2.C.2.1
FVY 83-97
REPLY TO:
ENGINEERING OFFICE
1671 WORCESTER ROAD
FRAMINGHAM, MASSACHUSETTS 01701
TELEPHONE 617-872-8100

September 13, 1983

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Office of Nuclear Reactor Regulation
Harold R. Denton, Director

Reference: (a) License No. DPR-28 (Docket No. 50-271)

Dear Sir:

Subject: Primary Containment Leak Rate Test Report

In accordance with the requirements of Appendix J to 10 CFR 50, we hereby submit a copy of the report entitled, "Vermont Yankee Primary Containment Leak Rate Test 1983."

We trust this information is acceptable to you; however, should you have any questions, please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Warren P. Murphy
Vice President and
Manager of Operations

WPM/dm

A017
1/1