REACTOR CONTAINMENT BUILDING

INTEGRATED LEAK RATE TEST

TYPE A, B, AND C

PREOPERATIONAL TEST

LONG ISLAND LIGHTING COMPANY

Shoreham Nuclear

Power Station

Unit No. 1

December 1982

PREPARED BY STONE & WEBSTER ENGINEERING CORPORATION

BOSTON, MASS

TABLE OF CONTENTS

REFERENCES

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

2. Shoreham Nuclear Power Station Primary Containment Preoperational Integrated Leak Rate Test, PT.654.001-2.

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

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

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

LIST OF ATTACHMENTS

SECTION 1

PURPOSE

The purpose of this report is to present a description and analysis of the December, 1982, Type A Preoperational Integrated Leak Rate Test (ILRT), and a summary of the Type B and C tests performed at the Shoreham Nuclear Power Station Unit 1, which is owned and operated by the Long Island Lighting Company.

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

SECTION 2

SUMMARY

2.1 TYPE A TEST

2.1.1 Test Summary

On December 7, 1982, pressurization of the primary containment commenced at 2340 hours. The initial drywell and suppression chamber weighted average air temperatures were 64°F and 72°F, respectively.

During the initial stages of pressurization, it was discovered that certain containment isolation valves may not have been entirely closed by their motor operators. In the process of hanging tags on the valves, the potential for hand-torquing the handwheel existed. This hand-torque checking process is typically performed to verify the valve position, before the tag is hung. Since this action may have violated the intent of the test, and since a satisfactory review of each tagging request was not able to verify the closure means, 68 valves were cycled to ensure the valve closure was performed by the normal means (i.e., no hand tightening).

Several leakage investigations were performed during the primary containment presurization period. During one of the investigations, a differential pressure transmitter, 1T47-PDT028B, was observed to be leaking through the flange adapter O-ring. One of the bolts on the flange adapter was missing. The instrument was manually isolated by closure of the instrument isolation valves.

Observations of primary containment water inventory were made throughout the pressurization period. The reactor level was dropping at approximately 75 gallons per hour. It was believed to be leaking out through the Control Rod Drive System. A steady drop in the suppression pool level was noted, but it was determined that the level loss was due to the water being displaced into the downcomers since they were capped in the drywell.

Near the end of the pressurization period, an air block of 42 psig was established between each of the Main Steam isolation valves. This was performed since these valves were not considered as Type A leakage paths in the Shoreham accident analysis. The air block pressure, later increased to approximately 46 psig, was always maintained sufficiently below the Type A test pressure so as to prevent air in-leakage.

At 1119 hours on December 8, 1982, the pressurization source was secured with a peak pressure of 64.479 psia. For the purpose of this test, the Type A Pa pressure was increased to the design pressure (48 psig). This was done to ensure that the test was performed above the maximum calculated design-basis-loss-of-coolant-accident pressure.

At 1148 hours on December 8, 1982, the mass stablization period commenced. The drywell and suppression chamber weighted average air temperatures were 65°F and 73°F, respectively.

Since the hand-torque checking process used to verify valve position before hanging a tag may have also been performed on those valves in the open position (i.e., valve was backseated), 7 valves were cycled to ensure they were opened by their normal mode of operation.

From approximately 1300 hours on December 8, 1982, to approximately 0100 hours on December 9, 1982, an intensive leakage investigation of all the penetration areas was performed to identify leakage paths. This search was initiated due to an average mass loss slightly in excess of the procedural mass stabilization rate of 15 lbm per hour.

The following leakage paths and observations were noted:

a. Suppression pool level stopped decreasing when the compressors were secured.

b. A significant stem packing leak was observed on 1T46*AOV038D.

c. A flange leak on the discharge of 1E11*RV152A was observed.

d. Relatively minor packing leaks on other containment isolation valves.

e. Decreasing RPV water level.

The following action was taken to reduce the leakage:

a. At approximately 2100 hours on December 8, 1982, the CRD charging header and the Flow Station manual isolation valves were closed.

b. At approximately 0230 hours on December 9, 1982, the packing gland on 1T46*AOV038D was tightened to stop the leakage.

Note: This repair was done to isolate and quantify the leakage path.

c. At approximately 0230 hours on December 9, 1982, the flange on 1E11*RV152A was taped to minimize leakage.

These actions reduced the average mass loss from approximately 19.3 lbm/hr (between 1548 hours on December 8, 1982, and 0148 hours on December 9, 1982) to an average mass loss of approximately 9.2 lbm/hr (between 0248 to 0651 hours on December 9, 1982). At 0730 hours on December 9, 1982, the tape on 1E11*RV152A was removed in order to quantify flange leakage. The average mass loss increased by approximately 2.11 lbm/hr (from 0751 hours to 1111 hours on December 9, 1982). The following estimates of leakage can be obtained from a review of the Type A mass trend data:

a. 1T46*AOV038D packing leakage 105 scfh

b. 1E11*RV152A flange leakage 28 scfh

c. No significant mass trend change was observed when the CRD manual isolation valves were opened at 1130 hours on December 9, 1982.

The ILRT program was initiated with the first ten minute data average taken at 0811 hours on December 9, 1982, with data collected at approximately hourly intervals until 0810 hours on December 10, 1982. A discussion of the ILRT test results is contained in Section 3.3.

At 1400 hours on December 10, 1982, depressurization of the primary containment commenced. A steady increase in the pool level was observed, verifying the premise that the pool water had been forced up into the downcomers. Pool level subsequently returned to the initial water level for a net change of zero throughout the entire test period. (See Section 3.3.2, Item 3.iii.)

2.1.2 Conclusions

The corrective action plan proposed in Section 2.1.3 will prevent recurrence of the identified leakage paths during plant operation.

The leakage paths were identified to be from 1T46*AOV038D stem packing, 1T47-PDT028B flange adapter, and 1E11*RV152A discharge flange.

The Upper Confidence Level (UCL) obtained after the stem packing adjustment and the instrument isolation was 0.217274 percent per day, which is well below the acceptance criteria.

2.1.3 Corrective Action Plan

1T46*AOV038D - Modify the Local Leak Rate Test (LLRT) procedure to test those containment isolation butterfly valves (1T46*AOV038D and 1T46*AOV039D), which are currently reverse tested, to require pressurization from the containment side of the valves. This test will detect packing leaks as observed during the Type A test.

1T47-PDT028B - Those differential pressure cells, with sensing elements dismantled, will receive a hydrostatic and/or pneumatic test to verify leaktightness of the instrument. The test pressure shall be at least equal to Pa in all cases.

Only those instruments which use a manufacturer equivalent differential pressure cell and are part of the Type A, B, and/or C pressure boundary shall be subject to this corrective action plan. The plant specific instruments are listed in Attachment 2.1A.

Note: Instrument connections were broken numerous times during construction and startup testing for various reasons. None of these connections showed any noticeable leakage during the Type A test and are therefore not subject to this corrective action plan.

1E11*RV152A - Develop a special fitup procedure for the five bolted joints in the Type A boundary that cannot be Type C tested, and are not exposed to system pressure, but communicate with the primary containment (1E11*RV152A,B; 1E11*RV155; 1E11*RV157A,B discharge flanges). The procedure will be validated using a bench test.

2.2 LOCAL LEAK RATE TESTS (TYPES B AND C)

The Local Leak Rate Tests (LLRT) of containment isolation valves and other primary containment penetrations were performed by the methods described in the plant preoperational test procedures PT.654.003-1, "Primary Containment Leak Rate Test - Type C," and PT.654.002-3, "Primary Containment Leak Rate Test - Type B."

In accordance with Appendix J to 10CFR50, Paragraph V.B, data for the Local Leak Rate Test is summarized in Section 4 of this report.

ATTACHMENT 2.1A

CORRECTIVE ACTION PLAN INSTRUMENTS
(Rosemount "DP" Series)

Nuclear Boiler System (1B21)

FT011A,B,C,D,E,F,G,H,J,K,L,M,N,P,R,S,T,U,V,W
FT016A,B,C,D
LT005
*LT154A,B,C,D
*LT155A,B,C,D
*LT157A,B,C,D
*LT159A,B
FDT014

Reactor Recirculation System (1B31)

*FT011A,B
*FT012A,B
*FT013A,B
*FT014A,B
PDT005A,B

Control Rod Drive Hydraulic Control System (1C11)

FT001
FT005
FT006
PDT002
PDT003

Feedwater Control System (1C32)

FT001A,B
FT002A,B,C,D
LT008A,B,C

Reactor Plant Remote Shutdown System (1C61)

*LT026

Residual Heat Removal System (1E11)

*FT001A,B

Core Spray System (1E21)

*FT002A,B

High Pressure Coolant Injection System (1E41)

*FT003
LT013

Reactor Core Isolation Cooling System (1E51)

*FT003

Radwaste System (1G11)

*FT647C

Reactor Water Cleanup System (1G33)

*FT001

Primary Containment Air Cooling System (1T47)

PDT028A,B

Primary Containment ILRT System (1T49)

PDT029

Post-Accident Tracking System (1Z93)

*LT001A,B
*LT012A,B

SECTION 3

TYPE A TEST

3.1 EDITED LOG OF EVENTS

This log was edited from the Test Engineer's ILRT Log.

December 7, 1982

Drywell interior inspection completed at approximately 1400 hours.

Inner door of Personnel Airlock, closed at 1405 hours. Type B LLRT performed on both main doors with a 0.0 scfh observed leak rate.

At 2340 hours, pressurization of Primary Containment started.

December 8, 1982

Between 0100 and 0440, cycled 68 isolation valves due to operations red-tagging procedure of manually ensuring valves closed.

At 0430 hours, performed gross leakage inspection.

At 0610 hours, 1T47-PDT028B was isolated due to major leakage by O-ring.

At 0800 hours, pumped approximately 1000 gallons of water from reactor building sump.

At 0800 hours, reactor pressure vessel water level at 26.5 inches. Suppression pool water level at -18 inches.

Reduced containment pressurization rate at 0934 hours.

At 1045 hours, established 42 psig air block on MSIV lines A,B,C, and D.

At 1119 hours, isolated containment pressurization system at a peak pressure of 64.479 psia.

At 1150 hours, cycled 7 containment isolation valves due to operations red-tagging procedure of manually ensuring valves open.

At 1400 hours, MSIV air block increased to 46 psig.

At 1430, determined 1T46*AOV038D had leakage by stem packing.

At 1435 hours, reactor vessel level at 23 inches.

At 1600 hours, MSIV lines A,C, and D maintaining 46 psig air block. MSIV line B isolated with no air block.

At approximately 2100 hours, isolated 1C11-02V-0006 and 1C11-02V-0007A.

December 9, 1982

At 0230 hours, tightened 1T46*AOV038D packing gland and taped 1E11*RV152A discharge flange.

At 0515 hours, plant computer tripped.

At 0605 hours, plant computer reinitialized.

At 0612 hours, suppression pool level stable at -18 inches and reactor level at 19 inches.

At 0730 hours, tape was removed from 1E11*RV152A discharge flange to quantify leakage using the Type A program.

At 0801 hours, satisfied stabilization requirements, started 24 hour ILRT test period.

At 1130 hours, 1C11-02V-0006 and 1C11-02V-0007A were re-opened.

At 1431 hours, plant computer disc driver failed requiring manual input of data to back-up computer.

At 1613 hours, disc driver restored.

At 1711 hours, disc driver restarted.

At 2010 hours, disc driver again failed.

At 2151 hours, disc driver restarted at 2151 hours.

December 10,1982

At 0220 hours, secured cooling water to drywell coolers.

ILRT successfully completed at 0810 hours.

Between 1153 and 1323 hours, successfully performed mass step change verification test with a constant flowrate of approximately 70 scfm.

At 1400 hours, began containment depressurization.

At 1730 hours, depressurization stopped at 45 psia for hydrogen recombiner system valve operability test.

Depressurization reinitiated at 1900 hours.

December 11, 1982

At 0530 hours, containment depressurization completed. Suppression pool hatches and personnel air lock opened.

At 0730 hours, primary containment post-test inspection completed. No significant deviations from pretest inspection were noted.

3.2 GENERAL TEST DESCRIPTION

3.2.1 Prerequisites

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

a. Controlled access plan in effect.

b. General inspection of accessible interior and exterior containment structures and components completed.

c. All instrumentation aligned for normal operation.

d. All test instrumentation calibrated or functionally verified.

e. All Type B and C leak rate testing completed and/or reviewed for impact on the Type A test.

f. All required system valve line-ups completed.

g. All computer software used for test calculations, tested and operational.

h. Official Log of Events book established, to be maintained by the Test Director or his designee.

i. Site meteorology data recorded beginning at least three days prior to and during ILRT (Attachment 3.2A).

3.2.2 Equipment

Pressurization of the containment was achieved by utilizing two temporary electric-driven air compressors having a total capacity of 3600 cfm. This could have been supplemented, if necessary, with station instrument and service air compressors through temporary field installed hose.

The portable air compressors and test skid included an aftercooler and a refrigerant air dryer with valving and instrumentation to maintain proper monitoring and operation. From this, air was supplied to the containment, through the plant's permanent ILRT system, which includes additional components and instrumentation for monitoring and controlling containment pressurization.

3.2.3 Instrumentation

The variables required to calculate containment leakage during the test were monitored using a leakage monitoring system consisting of pressure, temperature, and moisture sensors (Attachment 3.2B) for both the drywell and suppression chamber air volumes. The general locations of the temperature and moisture sensors, including applicable test zones, are shown in Attachments 3.2C and 3.2D.

Flow instrumentation in the air supply system was used during the pump back verification test.

In order to preclude bias associated with temperature sensor readings monitored by the plant computer data acquisition system, calculated corrections were programmed into both the plant data reduction program and the Hicksville computer program.

INSTRUMENT SELECTION GUIDE (ISG)

The ISG formula is used to determine the ability of an instrumentation system to measure the integrated leakage rate of the primary containment system. The ISG is only used for instrument selection prior to the test or for loss of sensor evaluation after the test.

$$*ISG = \frac{\pm 2400}{t}\left[2\left(\frac{EP}{p}\right)^2 + 2\left(\frac{ET}{T}\right)^2 + 2\left(\frac{EPv}{p}\right)^2\right]^{1/2}$$

where t = Test Duration in hours
p = 61.096 psia (Pa)
T = 65°F or 525°R

ISG ≤ 0.25La which equals 0.125% per day since La = 0.5% per day

*See Reference 3 for derivation

a. EP = error associated with absolute pressure instruments

$$EP = \pm \left((Ep)^2 + (eP)^2 \right)^{1/2} / (\text{No. of sensors})^{1/2}$$

where: Ep = .05 psia

eP = 0 psia

$$EP = \pm \left((.05)^2 + (0)^2 \right)^{1/2} / (2)^{1/2}$$

$$EP = \pm 0.035355 \text{ psia}$$

b. EPv = error associated with Vapor Pressure instruments

$$EPv = \pm \left((Epv)^2 + (ePv)^2 \right)^{1/2} / (\text{No. of sensors})^{1/2}$$

where: Epv = ±0.54°F (±0.3°C)

ePv = ±0.1°F

Using steam tables, a dewpoint temperature of 60°F is equivalent to water vapor pressure change of 0.0092 psia/°F.

Epv = ±0.54°F (0.0092 psia/°F) =.004968 psia

ePv = ±0.1°F (0.0092 psia/°F) =.00092 psia

$$EPv = \pm((.004968)^2 + (.00092)^2)^{1/2} / (5)^{1/2}$$

EPv = ±0.002260

c. ET = error associated with temperature instruments

$$ET = \left((Et)^2 + (eT)^2 \right)^{1/2} / (\text{No. of sensors})^{1/2}$$

where: Et = +1.0°F

eT = ±0.2°F

$$ET = \pm((1.0)^2 + (0.2)^2)^{1/2} / (14)^{1/2}$$

ET = ±0.272554

Using values established in a, b, and c above, calculate ISG.

$$ISG = \frac{\pm 2400}{24} \left[2 \left(\frac{0.035355}{61.096} \right)^2 + 2 \left(\frac{0.272554}{525} \right)^2 + 2 \left(\frac{0.002260}{61.096} \right)^2 \right]^{1/2}$$

ISG = ±0.110069 which is less than 0.25 La.

3.2.4 Data Acquisition System

During the ILRT, Shoreham's plant process computer was used to monitor ILRT instruments.

The ILRT plant computer programs consist of data acquisition and data reduction tasks. Instruments were scanned, by the computer on 60 second intervals, and values stored for calculation of containment parameters.

A manual data log was also maintained, recording instantaneous values every 20 minutes. Readings for this log were taken from a panel located in the Secondary Containment.

The plant computer monitored the following instrumentation:

Type	Scan Rate
16 Temperature sensors	60 sec.
6 Moisture sensors	60 sec.
2 Pressure sensors	60 sec.

As part of the data reduction program, the plant computer stored 10 minute averages of each instrument to calculate air pressure, weighted air temperature, weighted dew point temperature, vapor pressure, and the mass for both the drywell and suppression chamber air volumes. This data was presented as a log on the computer printer. Data calculated at hourly intervals were used in the plant computer data analysis program.

3.2.5 Data Resolution System

In order to monitor leakage rate trends during the ILRT, the data analysis program was used to calculate containment leakage rate, upper confidence level, and upper confidence limit, based on stored hourly data. For periods of the test when the disc driver failure disabled the ten minute average portion of the analysis program, readings were taken at one minute intervals and reduced manually. Input of this data into the Hicksville computer provided leakage rate trend information.

Both Shoreham's process computer and the Hicksville computer calculated leakage rate trend data utilizing the Absolute Method of Mass Point Analysis.

Absolute Method of Mass Point Analysis

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

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

where:

M = air mass, lbm
P = total pressure, psia
Pv = average vapor pressure, psia
R = 53.35 ft. lbf/lbm °R (for air)
T = average containment temperature, °R
V = containment free volume, ft^3

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

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

where A is the slope of the least-squares curve and B is the y-intercept. The sign convention is such that an outward leak is positive and the units are in percent/day.

In general, the containment is divided into two volumes: the suppression chamber and the drywell air volumes. The mass of each volume is computed separately and added together. The result is correlated as a function of time by means of a least-squares curve fit of the form:

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

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

A 95 percent confidence interval is calculated using a Students T distribution. The sum of the leakage rate and the 95 percent confidence interval is the UCL. The measured leak rate may be described as 95 percent accurate to within the value of the UCL.

ATTACHMENT 3.2A

SITE METEOROLOGY

Date	Time	Barometric Pressure (in. Hg)	Primary Reactor Bldg. Dew Point (°C)	Secondary Reactor Bldg. Wet Bulb Temp. (°F)	Secondary Reactor Bldg. Temp. (°F)
12/6/82	0600	30.0	16.9	66.0	74.0
	1030	29.95	17.1	65.0	74.0
	1430	29.94	17.4	66.0	74.5
	1830	30.00	17.1	65.50	74.50
	2230	30.10	16.6	65.00	74.50
12/7/82	0230	30.10	16.3	62.0	75.0
	0630	30.10	16.3	62.1	75.0
	1030	30.30	16.3	65.50	76.0
	1430	30.40	16.4	64.00	75.0
	1830	30.49	16.1	63.5	74.0
	2230	30.52	16.0	63.5	73.5
12/8/82	0230	30.6	16.7	63.5	74.0
	0630	30.6	17.3	62.5	73.5
	1030	30.7	16.8	62.5	75.0
	1400	30.52	16.7	62.5	74.0
	1800	30.58	16.5	62.0	74.0
	2200	30.43	16.3	61.5	74.0
12/9/82	0200	30.32	16.4	61.50	74.00
	0600	30.23	15.9	61.50	73.50
	0800	30.24	15.7	62.5	74.0
	0801 - Begin 24 hr. Test Period				
	0900	30.30	15.7	62.0	73.5
	1000	30.30	15.8	62.0	74.0

ATTACHMENT 3.2A (Cont'd)

Date	Time	Barometric Pressure (in. Hg)	Primary Reactor Bldg. Dew Point (°C)	Secondary Reactor Bldg. Wet Bulb Temp. (°F)	Secondary Reactor Bldg. Temp. (°F)
12/9/82	1100	30.25	15.5	62.5	74.0
	1200	30.25	15.6	62.5	74.0
	1300	30.24	15.6	62.0	73.0
	1400	30.30	15.4	61.5	74.0
	1500	30.32	15.4	61.0	73.5
	1600	30.42	15.2	60.5	73.0
	1700	30.51	15.0	60.5	73.5
	1800	30.56	14.9	60.0	73.5
	1900	30.60	14.6	59.5	73.0
	2000	30.60	14.5	60.0	73.0
	2100	30.58	14.4	59.5	73.0
	2200	30.57	14.3	59.0	73.0
	2300	30.58	14.3	59.5	71.0
	2400	30.57	14.2	59.0	71.5
12/10/82	0100	30.57	14.1	59.0	73.0
	0200	30.57	14.1	59.0	72.5
	0300	30.60	14.8	59.0	73.0
	0400	30.61	16.7	59.0	73.0
	0500	30.59	16.8	59.0	72.5
	0600	30.57	17.1	59.50	74.0
	0700	30.60	17.4	59.0	73.0
	0800	30.60	18.0	59.5	74.0
	0810 - Complete ILRT				
	0900	30.58	18.2	59.0	74.0

ATTACHMENT 3.2A (Cont'd)

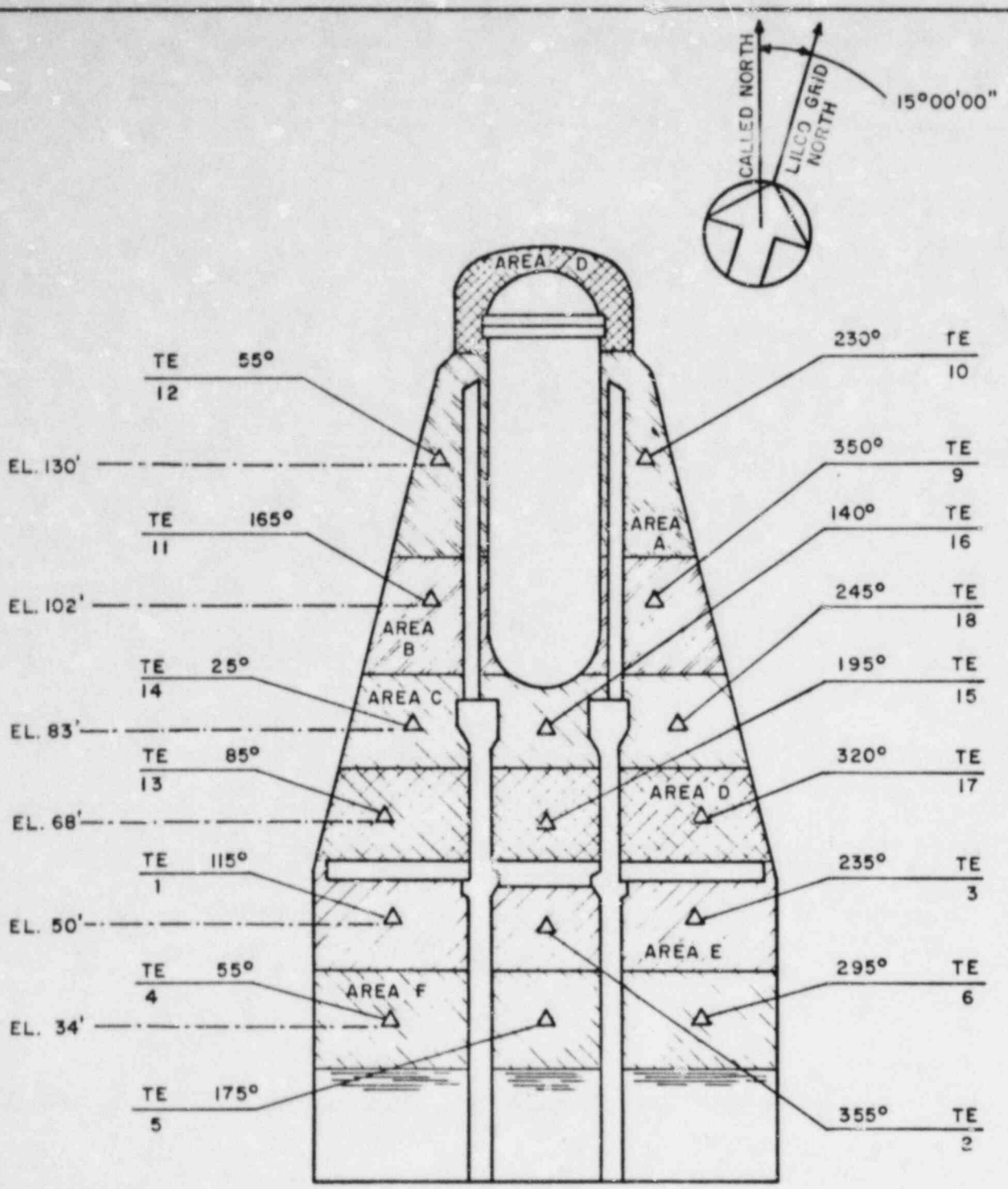
Date	Time	Barometric Pressure (in. Hg)	Primary Reactor Bldg. Dew Point (°C)	Secondary Reactor Bldg. Wet Bulb Temp. (°F)	Secondary Reactor Bldg. Temp. (°F)
12/10/82	1000	30.56	18.3	60.0	74.0
	1100	30.54	18.6	59.5	74.0
	1200	30.48	18.6	59.5	74.0

ATTACHMENT 3.2B

INSTRUMENTATION

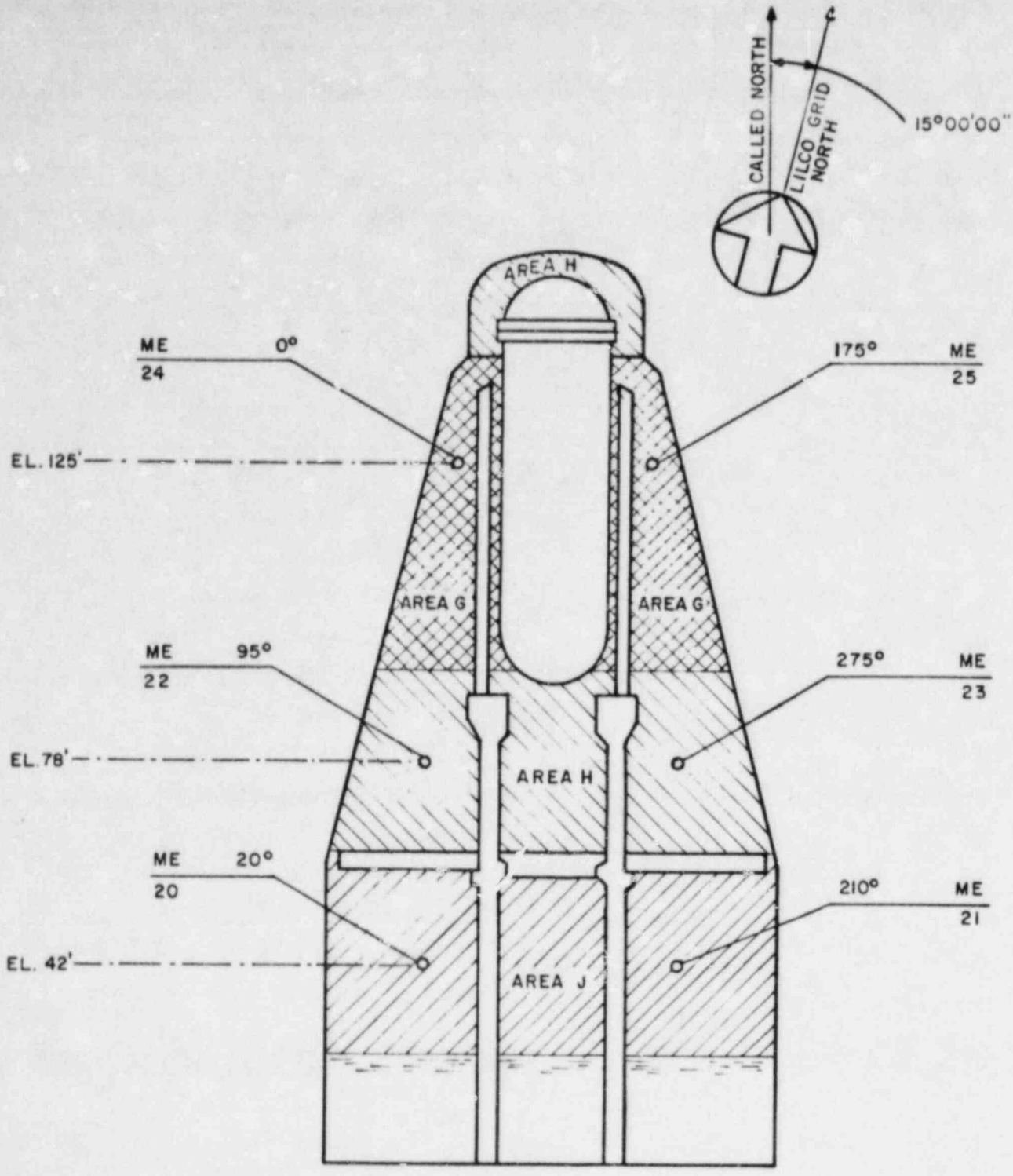
	Instrument	Weight Factor	Computer Point	Calculated Range	Zone	Accuracy
A.	Temperature					
	1T49-TE010	0.0983	L691	60-110°F	A	±1.0°F
	1T49-TE012	0.0983	L693	60-110°F	A	±1.0°F
	1T49-TE011	0.0000	L692	60-110°F	B	±1.0°F
	1T49-TE009	0.1928	L696	60-110°F	B	±1.0°F
	1T49-TE014	0.1035	L680	60-110°F	C	±1.0°F
	1T49-TE016	0.1035	L682	60-110°F	C	±1.0°F
	1T49-TE018	0.1035	L684	60-110°F	C	±1.0°F
	1T49-TE013	0.1001	L679	60-110°F	D	±1.0°F
	1T49-TE015	0.1001	L681	60-110°F	D	±1.0°F
	1T49-TE017	0.1001	L683	60-110°F	D	±1.0°F
	1T49-TE001	0.1667	L673	60-110°F	E	±1.0°F
	1T49-TE002	0.1667	L674	60-110°F	E	±1.0°F
	1T49-TE003	0.1667	L675	60-110°F	E	±1.0°F
	1T49-TE004	0.2500	L676	60-110°F	F	±1.0°F
	1T49-TE005	0.2500	L677	60-110°F	F	±1.0°F
	1T49-TE006	0.0000	L678	60-110°F	F	±1.0°F
B.	Dew Point					
	1T49-ME024	0.0000	L685	-50 to 100°C	G	±.3°C
	1T49-ME025	0.3894	L686	-50 to 100°C	G	±.3°C
	1T49-ME022	0.3053	L670	-50 to 100°C	H	±.3°C
	1T49-ME023	0.3053	L672	-50 to 100°C	H	±.3°C
	1T49-ME020	0.5000	L668	-50 to 100°C	J	±.3°C
	1T49-ME021	0.5000	L669	-50 to 100°C	J	±.3°C

	Instrument	Weight Factor	Computer Point	Calculated Range	Zone	Accuracy
C.	Pressure					
	1T49-PIT030	NA	NA	0-100 psia	Drywell	±.02% range
	1T49-PIT031	NA	NA	0-100 psia	Supp. Pool	±.02% range
	1T49-PIT032	NA	NA	0-100 psia	Spare	±.02% range
D.	Pump Back Verification Test Flow					
	1T49-FIT040	NA	L998	0-100 scfm	NA	±1% range



NOTE
ACTUAL RTD ELEVATIONS
ARE ± 5'

ATTACHMENT 3.2C
ILRT TEMPERATURE DETECTOR LOCATIONS
SHOREHAM NUCLEAR POWER STATION-UNIT 1



NOTE
ACTUAL SENSOR ELEVATIONS ARE ± 5'

ATTACHMENT 3.2D
ILRT DEW POINT TEMPERATURE DETECTOR LOCATIONS
SHOREHAM NUCLEAR POWER STATION-UNIT 1

3.3 TEST RESULTS

3.3.1 Analysis of Test Results

The test data for the period of 0801 hours on December 9, 1982, through 0810 hours on December 10, 1982, were analyzed for the final test results using LILCO's ILRT program. The reduced input data, mass point analysis results, and the representative graphs are contained in Attachments 3.3A through 3.3G.

During the ILRT, the plant computer data reduction program corrected individual readings prior to calculation of the ten minute averages. For those periods of the test requiring manual reduction of data, a calculated correction for instrument bias was used on the averaged value inputted into the Hicksville computer. The use of two slightly different data corrections had a negligible effect on the calculated containment parameters. This is graphically represented on the containment air mass versus time graph shown on Attachment 3.3C.

The irregularities in the containment air mass versus time plot can be explained with a review of the additional trend plots shown on Attachments 3.3D through 3.3F.

Attachment 3.3D shows individual plots for the drywell and suppression chamber air masses versus time. The step increase in total containment air mass between 2300 hours on December 9, 1982, and 0010 hours on December 10, 1982, can be attributed to the step increase in suppression chamber mass during the same time period. The suppression chamber mass change is the result of a suppression chamber pressure increase (see Attachment 3.3F) with a constant suppression chamber temperature (Attachment 3.3E). The suppression chamber pressure instrument trended exactly with the drywell pressure instrument throughout the entire test, except for an approximately 0.05 psia step increase in suppression chamber pressure between 2350 hours on December 9, 1982, and 0010 hours on December 10, 1982.

The increase in the containment air mass between 0140 hours and 0310 hours on December 10, 1982, and the subsequent apparent increase in leak rate immediately following is in response to the containment air temperature conditions presented by the isolation of cooling water to the drywell coolers at 0230 hours on December 10, 1982. The cooling water was secured to maintain individual drywell temperature element readings greater than 60°F, the minimum temperature with

calibration corrections. As drywell temperature increased (see Attachment 3.3E), drywell and suppression chamber pressures increased (see Attachment 3.3F). This resulted in an increase in suppression chamber mass since suppression chamber temperature remained constant (see Attachment 3.3E), and a decrease in drywell mass (see Attachment 3.3D). As conditions started to stabilize again, the leak rate returned to a level consistent with the first part of the test.

The leakage rate results in Attachment 3.3B are well below the test procedure acceptance criteria of .75 La or .375 percent per day. The results, including corrections for Type B and C leakage, are outlined in Section 3.3.2.

The leak rate test calculations were verified during the supplemental test which used the metered pump back test method.

3.3.2 61.096 Psia ILRT Results

The 61.096 psia ILRT was conducted in accordance with Section 8.0 of preoperational test procedure PT-654.001-2 (Reference Section 4 and Attachment 4B).

			%/Day
1.	Measured Leakage Rate, Lam		0.200950
2.	95 Percent Confidence Level		0.016324
3.	Corrections for:		
		SCFD	%/Day
i.	Measured Type B Leakage at 43.7 psig	60.72	0.004443
ii.	Measured Type C Leakage at 43.7 psig	319.274	0.023361
iii.	Water Levels	0.0	0.0
iv.	H_2 Recombiner A-Loop	222.72	0.016296
v.	Total Corrections at Pa = 43.7 psig (Sum of i. thru iv.)	602.714	0.044099
vi.	Leakage Corrected to Pa = 46.4 psig (Multiply v. by 1.03)	620.795	0.045422
vii.	Measured Type B Leakage at 46.4 psig	0.0	0.0
viii.	Measured Type C Leakage at 46.4 psig	1.224	0.000090
ix.	H_2 Recombiner B-Loop	2.496	0.000183
x.	Instrument Leakage	82.752	0.006055
xi.	Total Corrections for Flowmeters See Note 1. (Applied to Sum of vi. thru x.)	63.654	0.004657

		SCFD	%/Day	%/Day
xii.	Total Corrections at Pa = 46.4 psig (Sum of vi. thru xi.)	770.921	0.056407	0.056407

4. Lam leakage with confidence level and corrections (1+2+3xii.) 0.273681

Results of the ILRT are acceptable as the measured leak rate, with confidence level and applicable corrections, is well below the procedural acceptance criteria of 0.375 percent per day. SAT

NOTE 1: Corrections to the measured leakage rates should consider the accuracy of the flow measuring device. Since calibration of the flowmeters was done periodically throughout the test program, the highest value obtained from the calibration data is conservatively applied to all the flowrate readings in lieu of making individual corrections. This results in a 9 percent correction to the measured leakage rate.

3.3.3 Verification Test Results

The supplemental verification test was performed using the Mass Pump Back Method in accordance with Section 8.0 of PT.654.001-2

a.	Calculated change in containment gas mass (from Appendix C, computer printout).	454.03 lbm
b.	Total measured gas flow into containment	496.28 lbm
c.	Difference between measured gas and calculated gas (a-b)	42.25 lbm
d.	0.25 La verification limit	124 lbm

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

ATTACHMENT 3.3A

INTEGRATED LEAK RATE TEST
From 0811 Hours on 12/09/82 to 0810 Hours on 12/10/82

Input Variables

	DRYWELL				SUPPRESSION POOL			
Time (hrs)	Abs. Press. (psia)	Vap. Press. (psia)	Abs Temp. (°R)	Dewpoint (°F)	Abs. Press. (psia)	Vap. Press. (psia)	Abs. Temp. (°R)	Dewpoint (°F)
0811	63.9818	0.2589	523.5370	60.3092	64.0037	0.3767	531.7053	71.0980
0911	63.9686	0.2596	523.4429	60.3841	63.9896	0.3751	531.6694	70.9714
1011	63.9537	0.2591	523.3560	60.3239	63.9743	0.3686	531.6432	70.4567
1111	63.9386	0.2584	523.2583	60.2543	63.9596	0.3748	531.6443	70.9461
1211	63.9232	0.2562	523.1847	60.0103	63.9438	0.3731	531.6305	70.8111
1311	63.9059	0.2558	523.0224	59.9608	63.9264	0.3736	531.5614	70.8533
1411	63.8889	0.2531	522.8980	59.6716	63.9094	0.3747	531.5831	70.9377
1511	63.8703	0.2528	522.7480	59.6349	63.8909	0.3745	531.5483	70.9208
1611	63.8500	0.2509	522.6036	59.4228	63.8700	0.3731	531.5241	70.8107
1711	63.8290	0.2492	522.4124	59.2304	63.8490	0.3724	531.5069	70.7560
1810	63.8077	0.2463	522.2290	58.9107	63.8280	0.3735	531.4816	70.8406
1910	63.7827	0.2442	522.0069	58.6627	63.8036	0.3730	531.4448	70.8027
2010	63.7587	0.2417	521.7540	58.3763	63.7785	0.3739	531.4052	70.8742
2110	63.7369	0.2394	521.5572	58.1136	63.7553	0.3719	531.3877	70.7138
2210	63.7162	0.2378	521.4612	57.9252	63.7351	0.3706	531.5086	70.6122
2310	63.6990	0.2372	521.3422	57.8515	63.7190	0.3721	531.5121	70.7352
0010	63.6843	0.2351	521.2442	57.6095	63.7585	0.3717	531.4726	70.7014
0110	63.6711	0.2354	521.1764	57.6478	63.7445	0.3713	531.4530	70.6677
0140	63.6607	0.2315	521.1114	57.1847	63.7342	0.3715	531.4530	70.6889

ATTACHMENT 3.3A (Cont'd)

	DRYWELL				SUPPRESSION POOL			
Time (hrs)	Abs. Press. (psia)	Vap. Press. (psia)	Abs Temp. (°R)	Dewpoint (°F)	Abs. Press. psia)	Vap. Press. (psia)	Abs. Temp. (°R)	Dewpoint (°F)
0310	63.8483	0.2523	523.2442	59.5742	63.9167	0.3719	531.5163	70.7183
0410	63.9254	0.2733	524.4709	61.8322	63.9974	0.3712	531.4632	70.6634
0510	63.9776	0.2821	525.3664	62.7299	64.0486	0.3713	531.4378	70.6677
0610	64.0154	0.2927	526.0393	63.7822	64.0890	0.3715	531.3818	70.6888
0710	64.0479	0.2986	526.5704	64.3749	64.1209	0.3717	531.3563	70.7014
0810	64.0756	0.3054	527.0419	64.9965	64.1473	0.3718	531.3611	70.7056

ATTACHMENT 3.3B

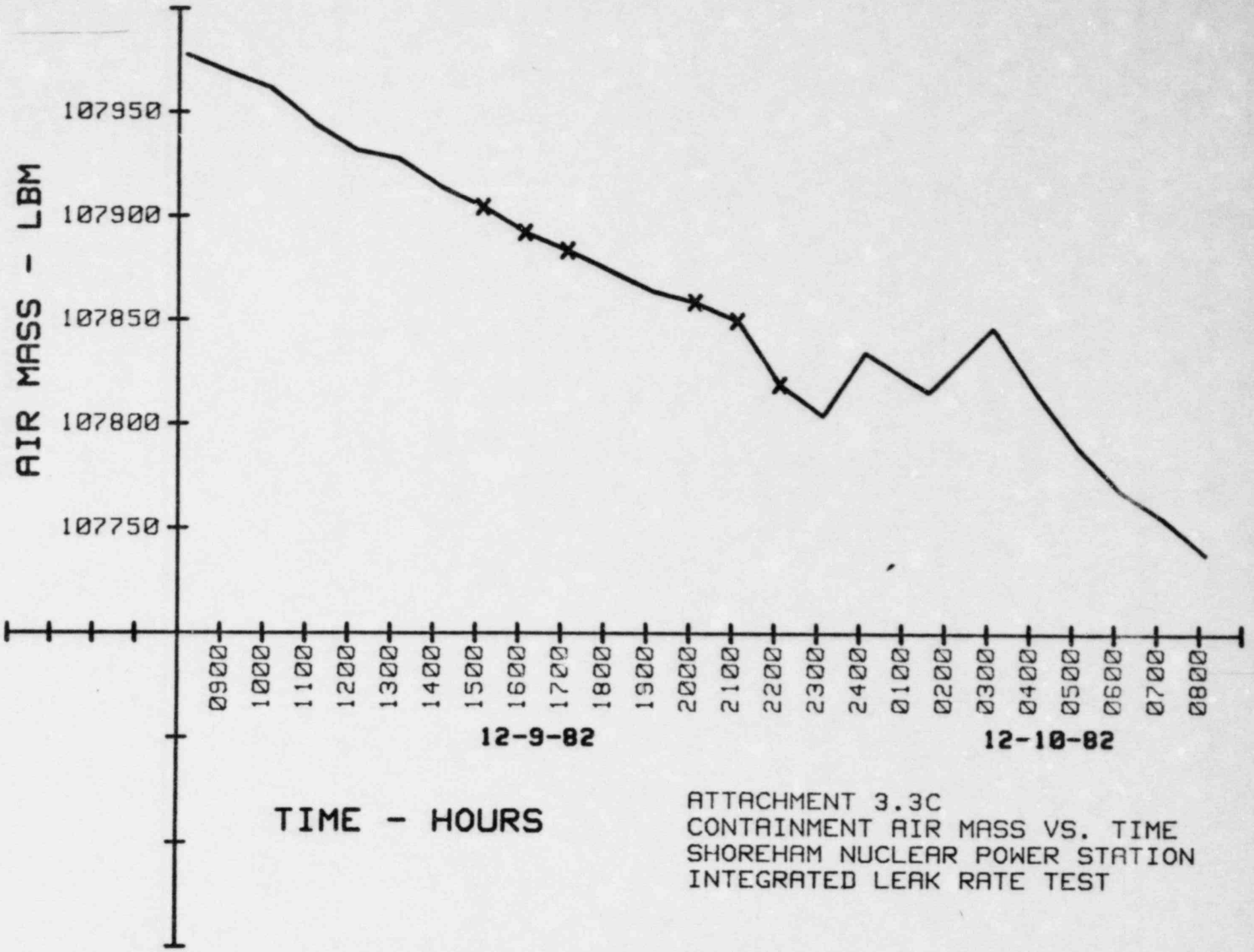
INTEGRATED LEAK RATE TEST
From 0811 Hours on 12/09/82 To 0810 Hours on 12/10/82

ABSOLUTE METHOD TEST RESULTS

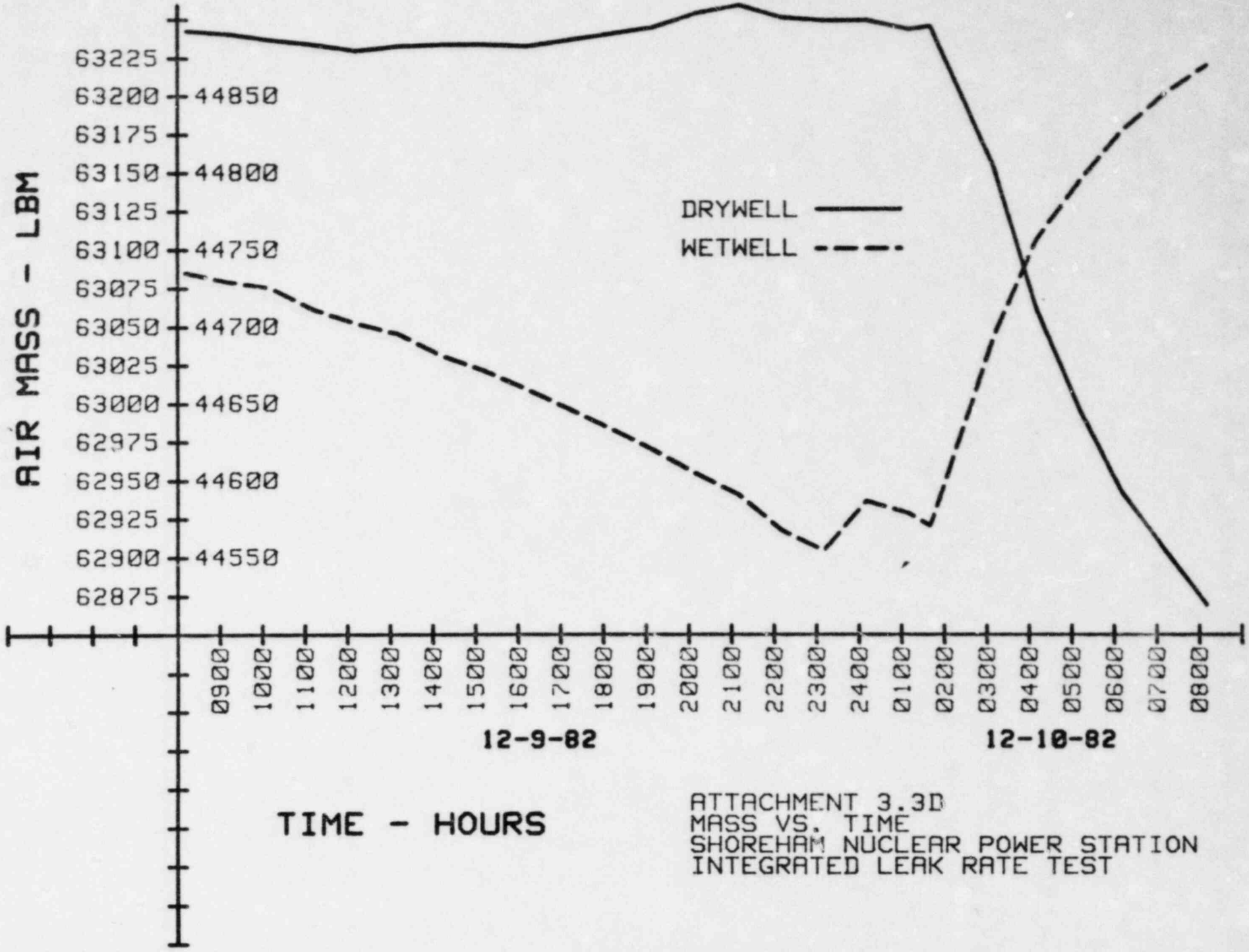
Time (hrs)	Mass of Air (lbm)	Leak Rate Pct/Day	95 Pct Conf. Pct/Day	UCL
0811	107,977.3	0.0	0.0	0.0
0911	107,969.0	0.0	0.0	0.0
1011	107,961.4	0.0	0.0	0.0
1111	107,944.0	0.239111	0.099648	0.338760
1211	107,931.3	0.260220	0.055767	0.315987
1311	107,927.2	0.242131	0.040053	0.282184
1411	107,913.3	0.242810	0.026879	0.269439
1511	107,903.5	0.240891	0.019450	0.260340
1611	107,891.0	0.242563	0.014815	0.257379
1711	107,882.1	0.240950	0.011734	0.252684
1810	107,872.5	0.238934	0.009694	0.248629
1910	107,862.9	0.236819	0.008282	0.245102
2010	107,857.3	0.231856	0.008642	0.240498
2110	107,848.2	0.227867	0.008416	0.236283
2210	107,817.4	0.236717	0.011593	0.248310
2310	107,802.6	0.244671	0.012927	0.257598
0010	107,833.3	0.231943	0.017169	0.249112
0110	107,820.2	0.224055	0.017148	0.241203
0140	107,814.1	0.218954	0.016323	0.235277

ABSOLUTE METHOD TEST RESULTS

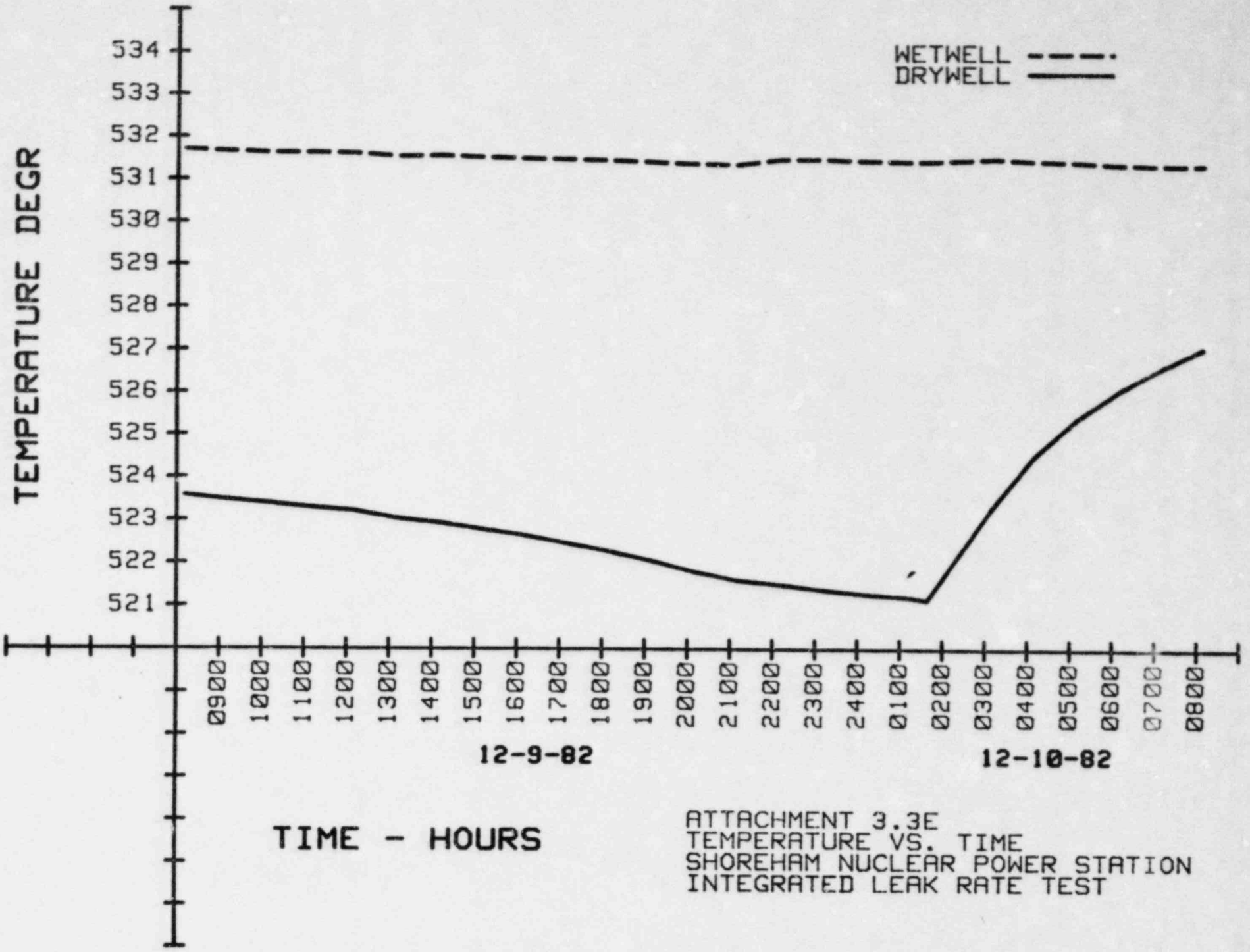
Time (hrs)	Mass of Air (lbm)	Leak Rate Pct/Day	95 Pct Conf. Pct/Day	UCL
0310	107,844.9	0.200286	0.023577	0.223863
0410	107,814.4	0.192834	0.022484	0.215318
0510	107,788.0	0.191986	0.020380	0.212366
0610	107,767.1	0.194320	0.018689	0.213008
0710	107,754.1	0.197074	0.017296	0.214370
0810	107,736.8	0.200950	0.016324	0.217274



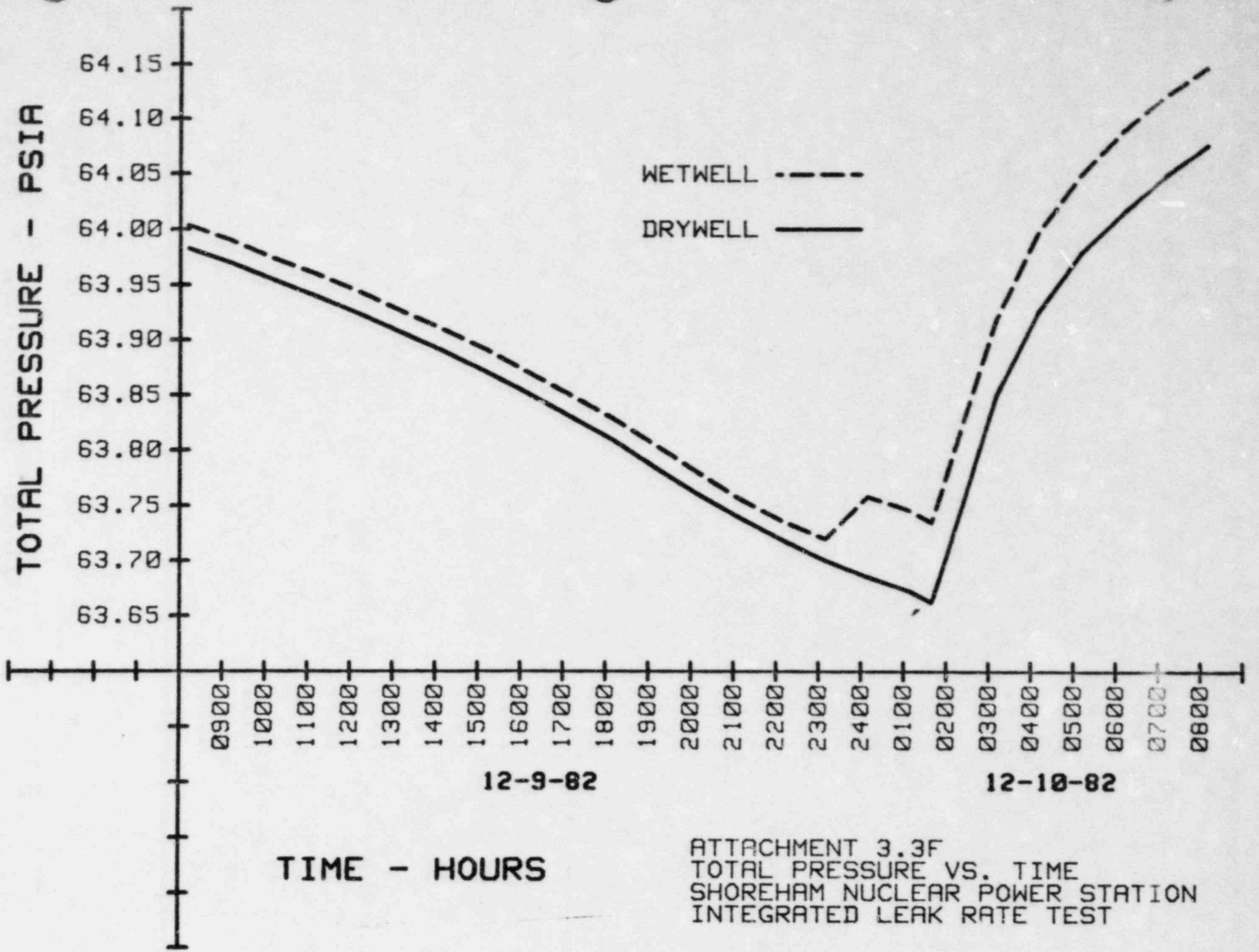
ATTACHMENT 3.3C
CONTAINMENT AIR MASS VS. TIME
SHOREHAM NUCLEAR POWER STATION
INTEGRATED LEAK RATE TEST



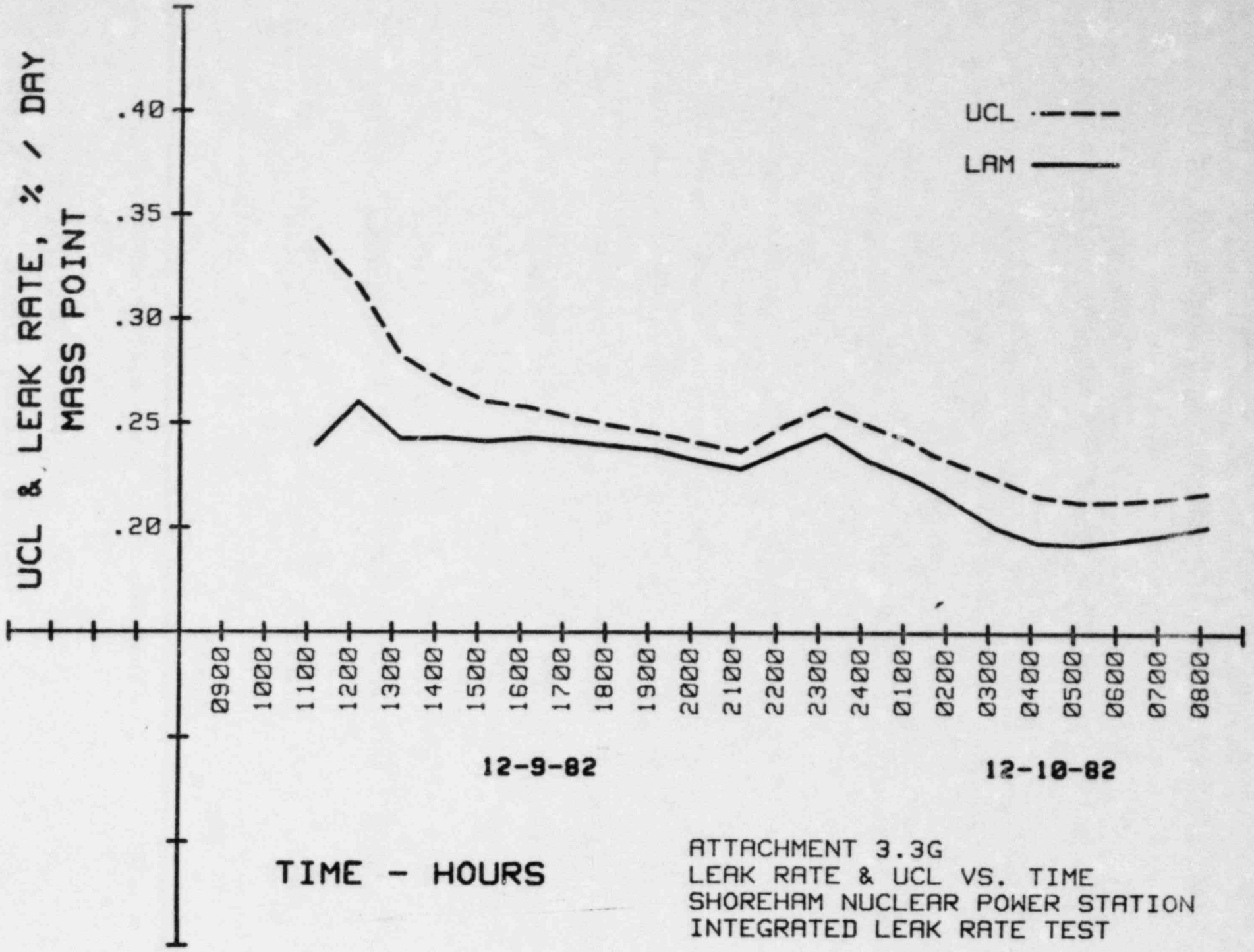
ATTACHMENT 3.3D
MASS VS. TIME
SHOREHAM NUCLEAR POWER STATION
INTEGRATED LEAK RATE TEST



ATTACHMENT 3.3E
TEMPERATURE VS. TIME
SHOREHAM NUCLEAR POWER STATION
INTEGRATED LEAK RATE TEST



ATTACHMENT 3.3F
TOTAL PRESSURE VS. TIME
SHOREHAM NUCLEAR POWER STATION
INTEGRATED LEAK RATE TEST



ATTACHMENT 3.3G
LEAK RATE & UCL VS. TIME
SHOREHAM NUCLEAR POWER STATION
INTEGRATED LEAK RATE TEST

SECTION 4

LOCAL LEAK RATE TEST (TYPE B AND C)

Attachment 4A summarizes the Local Leak Rate Test (LLRT) data that was established to support the overall containment leakage testing program. Attachment 4B summarizes the leakage penalties added to the Type A overall leakage for systems that were either isolated or not vented and drained during the Type A Test. These LLRTs were performed by pressurizing the listed penetrations with air or nitrogen and either measuring leakage across the containment isolation valves (Type C) or across the resilient seals (Type B). A correction factor of 1.03 was applied to those leakage rates resulting from tests conducted at a pressure of 43.7 psig prior to the Type A test. A correction factor of 9 percent was also applied to all leakage rates for flowmeter inaccuracies.

Also included are the results of local leak rate testing performed on the Hydrogen Recombiners. This leakage, not identified as Type B or C, was added to the overall leakage to support Shoreham's Leakage Reduction Program.

The results of local leak rate testing performed on those instrument lines which are an extension of the primary containment boundary, but which were isolated during the Type A Test, are also included. This leakage, not identified as Type B or C, was added to the overall leakage for verification of the instrument lines containment capabilities.

The acceptance criteria for Type B and C testing is in accordance with 10CFR50, Appendix J. The combined leakage rate for all penetrations and valves, subject to Type B and C tests, is well below the acceptable leakage rate of 0.6 La or 4100 scfd.

ATTACHMENT 4A

Local Leak Rate Test Data

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
X-1A	Main Steam	C	1B21*AOV081A (IPC) 1B21*AOV082A (OPC) 1B21*MOV061 (OPC) 1E32*MOV021A (OPC)	24.0	
X-1B	Main Steam	C	1B21*AOV081B (IPC) 1B21*AOV082B (OPC) 1B21*MOV062 (OPC) 1E32*MOV021B (OPC)	95.52	
X-1C	Main Steam	C	1B21*AOV081C (IPC) 1B21*AOV082C (OPC) 1B21*MOV063 (OPC) 1E32*MOV021C (OPC)	163.2	
X-1D	Main Steam	C	1B21*AOV081D (IPC) 1B21*AOV082D (OPC) 1B21*MOV064 (OPC) 1E32*MOV021D (OPC)	81.84	
X-2A	Feedwater	C	1B21*18V-1103A (IPC) 1B21*AOV036A (OPC)	1.224	Note 3 Note 3
X-2B	Feedwater	C	1B21*18V-1103B (IPC) 1B21*AOV036B (OPC)	18.768	
X-3	Main Steam Drains	C	1B21*MOV031 (IPC) 1B21*MOV032 (OPC)	4.56	
X-4	Reactor Water Cleanup	C	1G33*MOV033 (IPC) 1G33*MOV034 (OPC)	6.12	
X-5	RHR from RPV	C	1E11*MOV047 (IPC) 1E11*MOV048 (OPC) 1E11*RV163 (OPC)	84.00	
X-6A	RHR Recirc. Return	C	1E11*AOV081A (IPC) 1E11*MOV081A (IPC) 1E11*MOV037A (OPC)	50.40	
X-6B	RHR Recirc. Return	C	1E11*AOV081B (IPC) 1E11*MOV081B (IPC) 1E11*MOV037B (OPC)	33.34	

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
X-7A	RHR Drywell Spray	C	1E11*MOV038A (OPC) 1E11*MOV039A (OPC)	5.04	
X-7B	RHR Drywell Spray	C	1E11*MOV038B (OPC) 1E11*MOV039B (OPC)	8.40	
X-8A	RHR Pool Spray	C	1E11*MOV040A (OPC) 1E11*MOV041A (OPC) 1E11*MOV042A (OPC)	24.672	
X-8B	RHR Pool Spray	C	1E11*MOV040B (OPC) 1E11*MOV041B (OPC) 1E11*MOV042B (OPC)	19.20	Note 2
X-9A	RHR Suction	C	1E11*MOV031A (OPC)	74.40	
X-9B	RHR Suction	C	1E11*MOV031B (OPC)	45.17	
X-9C	RHR Suction	C	1E11*MOV031C (OPC)	2.352	
X-9D	RHR Suction	C	1E11*MOV031D (OPC)	6.24	
X-10A	RHR Test Line Return, RHR Test, Pass, Radwaste, Fuel Pool Cooling and Cleanup, Core Spray	C	1G11*MOV639C (OPC) 1G41*MOV033A (OPC) 1G11*03V-2110C (OPC) 1E21*MOV035A (OPC) 1G41*MOV033B (OPC) 1E11*MOV044A (OPC) 1E11*MOV045A (OPC) 1E21*MOV034A (OPC) 1E11*SOV168 (OPC) 1E11*01V-0047 (OPC)	57.888	
X-10B	RHR Test Line Return, HPCI, RCIC, Core Spray, PASS, Relief to RCIC Pump Suction	C	1E11*MOV044B (OPC) 1E11*MOV045B (OPC) 1E41*MOV036 (OPC) 1E51*MOV036 (OPC) 1E21*MOV034B (OPC) 1E21*MOV035B (OPC) 1E11*SOV169 (OPC) 1E11*C1V-0048 (OPC) 1E11*RV155 (OPC)	9.836	 Note 3 Note 3
X-11	RHR Head Spray	C	1E11*MOV054 (IPC) 1E11*MOV053 (OPC) 1E11*RV164 (OPC)	3.672	Note 3

ATTACHMENT 4A (Con't)

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
X-12	HPCI Turbine Steam	C	1E41*MOV041 (IPC) 1E41*MOV042 (OPC) 1E41*MOV047 (IPC) 1E41*MOV048 (OPC)	49.032	
X-13	HPCI Turbine Exhaust	C	1E41*MOV044 (OPC) 1E41*18V-0021 (OPC) 1E41*18V-0022 (OPC)	36.72	
X-14	Spare	C		0.0	
X-15	HPCI Pump Suction	C	1E41*MOV032 (OPC)	0.24	Note 3
X-16	RCIC Turbine Steam	C	1E51*MOV041 (IPC) 1E51*MOV042 (OPC) 1E51*MOV047 (IPC) 1E51*MOV048 (OPC)	0.00	
X-17	RCIC Turbine Exhaust	C	1E51*MOV045 (OPC) 1E51*08V-0020 (OPC) 1E51*08V-0021 (OPC)	146.4	
X-18	RCIC Vacuum Pump	C	1E51*MOV046 (OPC) 1E51*02V-0025 (OPC)	0.0	
X-19	RCIC Pump Suction	C	1E51*MOV032 (OPC)	1.68	
X-20A	Core Spray	C	1E21*AOV081A (IPC) 1E21*MOV081A (IPC) 1E21*MOV033A (OPC)	36.00	
X-20B	Core Spray	C	1E21*AOV081B (IPC) 1E21*MOV081B (IPC) 1E21*MOV033B (OPC)	53.76	
X-21A	Core Spray Suction	C	1E21*MOV031A (OPC)	8.856	
X-21B	Core Spray Suction	C	1E21*MOV031B (OPC)	19.44	
X-22A	RBCLCW	C	1P42*MOV035 (OPC)	1.618	
X-22B	RBCLCW	C	1P42*MOV047 (OPC)	0.192	
X-23A	RBCLCW	C	1P42*MOV036 (OPC)	3.552	

ATTACHMENT 4A (Cont'd)

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
X-23B	RBCLCW	C	1P42*MOV048 (OPC)	0.192	
X-24A	RBCLCW to Drywell Coolers	C	1P42*03V-0037AA (IPC) 1P42*MOV232 (OPC)	14.88	
X-24B	RBCLCW to Drywell Coolers	C	1P42*03V-0037AB (IPC) 1P42*MOV233 (OPC)	36.48	
X-24C	RBCLCW to Drywell Coolers	C	1P42*03V-0037AC (IPC) 1P42*MOV234 (OPC)	6.864	
X-24D	RBCLCW to Drywell Coolers	C	1P42*03V-0037AD (IPC) 1P42*MOV235 (OPC)	2.424	
X-24E	RBCLCW to Drywell Coolers	C	1P42*03V-0037BA (IPC) 1P42*MOV237 (OPC)	12.00	
X-24F	RBCLCW to Drywell Coolers	C	1P42*03V-0037BB (IPC) 1P42*MOV238 (OPC)	0.00	
X-24G	RBCLCW to Drywell Coolers	C	1P42*03V-0037BC (IPC) 1P42*MOV239 (OPC)	6.624	
X-24H	RBCLCW to Drywell Coolers	C	1P42*03V-0037BD (IPC) 1P42*MOV240 (OPC)	0.00	
X-25A	RBCLCW from Drywell Coolers	C	1P42*MOV147 (IPC) 1P42*MOV231 (OPC) 1P42*RV291A (OPC)	49.82	
X-25B	RBCLCW from Drywell Coolers	C	1P42*MOV148 (IPC) 1P42*MOV236 (OPC) 1P42*RV291B (OPC)	12.312	
X-26	Purge Air	C	1T46*AOV038A (IPC) 1T46*AOV038B (OPC)	59.784	
X-27	Purge Air	C	1T46*AOV039A (IPC) 1T46*AOV039B (OPC)	15.76	
X-28	Purge Air	C	1T46*AOV038C (OPC) 1T46*AOV038D (OPC) 1T24*AOV004A (OPC) 1T24*AOV004B (OPC)	103.68	

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
X-29	Purge Air	C	1T46*AOV039C (OPC) 1T46*AOV039D (OPC) 1T46*AOV079A (OPC) 1T46*AOV079B (OPC)	90.384	
X-30	Reactor Recirc. Sample	C	1B31*AOV081 (IPC) 1B31*AOV082 (OPC)	0.168	
X-31	Equip. Drains	C	1G11*MOV248 (OPC) 1G11*MOV249 (OPC)	61.704	
X-32	Floor Drains	C	1G11*MOV246 (OPC) 1G11*MOV247 (OPC)	46.32	
X-33	Spare	C		0.0	Note 4
X-34	Spare	C		0.0	Note 4
X-35	Spare	C		0.0	Note 4
X-36	Standby Liquid Control	C	1C41*02V-0008 (IPC) 1C41*02V-0010 (OPC)	41.28	
X-37A	TIP	C B	1C51*SOV801A (OPC) "O" Rings	3.41 0.0	
X-37B	TIP	C B	1C51*SOV801B (OPC) "O" Rings	0.0 0.0	
X-37C	TIP	C B	1C51*SOV801C (OPC) "O" Rings	0.0 0.0	
X-37D	TIP	C B	1C51*SOV801D (OPC) "O" Rings	0.0 0.0	
X-38	TIP	C B	1C51*SOV028 (OPC) 1C51*01V-0867 (OPC) "O" Rings	23.568 0.0	
X-39A	Instrument Air	C	1P50*01V-698A (IPC) 1P50*MOV106 (OPC)	2.58	
X-39B	Instrument Air	C	1P50*01V-698B (IPC) 1P50*MOV104 (OPC)	0.984	
X-40	Spare	C		0.0	Note 4

ATTACHMENT 4A (Con't)

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
X-41	HPCI Vacuum Breaker	C	1E41*MOV049 (OPC)		Tested with X-13
X-42	RCIC Vacuum Breaker	C	1E51*MOV049 (OPC)		Tested with X-17
X-43	RHR				Tested with XS-5
X-44	Cont. Atmos. Cntrl., Drywell Floor Seal Pressurization	C	1T48*MOV033A (OPC) 1T48*MOV038A (OPC) 1T23*MOV031A (OPC)	8.002	
X-45	Cont. Atmos. Cntrl., Drywell Floor Seal Pressurization	C	1T48*MOV033B (OPC) 1T48*MOV038B (OPC) 1T23*MOV031B (OPC)	12.54	
X-46	Cont. Atmos. Control	C	1T48*MOV031A (IPC) 1T48*MOV035A (OPC) 1T24*AOV001A (OPC) 1T24*AOV001B (OPC)	2.33	
X-47	Cont. Atmos. Control	C	1T48*MOV031B (IPC) 1T48*MOV035B (OPC)	1.95	
XS-1	Spare	C		0.0	Note 4
XS-2	Spare	C		0.0	Note 4
XS-3	Spare	C		0.0	Note 4
XS-4	Spare	C		0.0	Note 4
XS-5	RHR	C	1E11*MOV055A (OPC) 1E11*MOV055B (OPC) 1E11*MOV056A (OPC) 1E11*MOV056B (OPC) 1E11*RV157A (OPC) 1E11*RV157B (OPC) 1E11*RV152A (OPC) 1E11*RV152B (OPC) 1E11*01V-3144 (OPC) 1E11*01V-3145 (OPC)	22.944	
XS-6	Supp. Pool Pump Down	C	1G41*MOV034A (OPC) 1G41*MOV034B (OPC)	8.76	

ATTACHMENT 4A (Con't)

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
XS-7	Cont. Atmos. Clean-up	C	1T48*MOV034B (OPC) 1T48*MOV040B (OPC)	0.0	
XS-8	Cont. Atmos. Clean-up	C	1T48*MOV034A (OPC) 1T48*MOV040A (OPC)	49.2	
XS-11	Spare	C		0.0	Note 4
XS-12	Spare	C		0.0	Note 4
XS-13	Spare	C		0.0	Note 4
XS-14	Spare	C		0.0	Note 4
XS-15	Spare	C		0.0	Note 4
XS-16A	Service Air	C	1P50*02V-0603 (IPC) 1P50*02V-0601 (OPC)	9.12	
XS-16B	Rad. Mon.	C	1D11*MOV032A (IPC) 1D11*MOV032B (OPC)	0.984	
XS-16C	Rad. Mon.	C	1D11*MOV033A (IPC) 1D11*MOV033B (OPC)	0.0	
XS-17	Spare	C		0.0	Note 4
XS-18	Spare	C		0.0	Note 4
XS-19	Spare	C		0.0	Note 4
XS-20	Cont. Atmos. Control	C	1T48*MOV032A (IPC) 1T48*MOV037A (OPC)	16.15	
XS-21	Cont. Atmos. Control	C	1T48*MOV032B (IPC) 1T48*MOV037B (OPC)	7.056	
XS-22	DW Vent	C	1T46*AOV078A (IPC) 1T46*AOV078B (OPC)	18.72	
XS-23	Spare	C		0.0	Note 4
XS-24	Spare	C		0.0	Note 4
XS-25	Spare	C		0.0	Note 4
XS-26	Spare	C		0.0	Note 4

ATTACHMENT 4A (Con't)

Penetration No.		Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
XS-27	Spare	C		0.0	Note 4
XS-29	Spare	C		0.0	Note 4
XS-30	PASS	C	1T48*SOV131 (OPC) 1T48*01V-0016B (OPC)	2.208	
F-10	Reactor Recirc. Pump Seal	C	1B31*01V-0002A (IPC) 1B31*01V-1028A (OPC)	91.68	
F-11	Reactor Recirc. Pump Seal	C	1B31*01V-0002B (IPC) 1B31*01V-1028B (OPC)	48.24	
B-3	PASS	C	1T48*SOV128A (OPC) 1T48*SOV128B (OPC)	0.166	
B-7	Inst. Air to Drywell	C	1P50*02V-695B (IPC) 1P50*MOV103A (OPC)	0.0	
C-2	PASS	C	1B21*SOV313A (OPC) 1B21*SOV313P (OPC)	0.0	
D-5	Inst. Air to Drywell	C	1P50*02V-0695A (IPC) 1P50*MOV103B (OPC)	0.36	
J-2	PASS	C	1T48*01V-0016A (OPC) 1T48*SOV130 (OPC)	4.60	
J-10	PASS	C	1T48*SOV126A (OPC) 1T48*SOV126B (OPC)	0.166	
SP-SE	PASS	C	1T48*SOV129A (OPC) 1T48*SOV129B (OPC)	0.0	Note 3 Note 3
SP-NW	PASS	C	1T48*SOV127A (OPC) 1T48*SOV127B (OPC)	0.190	Note 3 Note 3
Hydrogen Recombiner Loop A				222.72	Tested under Leakage Reduction Program
Hydrogen Recombiner Loop B				2.496	Tested under Leakage Reduction Program Note 3
1T23-Z-WA1-Spare		B	Epoxy Seal	0.0	

ATTACHMENT 4A (Con't)

Penetration No.	Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
1T23-Z-WA2	B	Welded Seal	0.0	
1T23-Z-WA3	B	Welded Seal	0.0	
1T23-Z-WB1	B	Epoxy Seal	0.0	
1T23-Z-WB2	B	Epoxy Seal	0.0	
1T23-Z-WB3	B	Epoxy Seal	0.0	
1T23-Z-WB4	B	Epoxy Seal	0.0	
1T23-Z-WB5	B	Epoxy Seal	0.0	
1T23-Z-WB6	B	Epoxy Seal	0.0	
1T23-Z-WC1	B	Epoxy Seal	0.0	
1T23-Z-WC2 Spare	B	Epoxy Seal	0.0	
1T23-Z-WC3 Spare	B	Epoxy Seal	0.0	
1T23-Z-WC4	B	Epoxy Seal	0.0	
1T23-Z-WC5	B	Epoxy Seal	0.0	
1T23-Z-WC6	B	Epoxy Seal	0.0	
1T23-Z-WD1	B	Epoxy Seal	0.0	
1T23-Z-WD2	B	Epoxy Seal	0.0	
1T23-Z-WD3	B	Epoxy Seal	0.0	
1T23-Z-WD4	B	Epoxy Seal	0.0	
1T23-Z-WD5	B	Epoxy Seal	0.0	
1T23-Z-WD6 Spare	B	Epoxy Seal	0.0	
1T23-Z-EA1	B	Epoxy Seal	0.0	
1T23-Z-EA2	B	Epoxy Seal	0.0	
1T23-Z-EA3	B	Epoxy Seal	0.0	
1T23-Z-EB1	B	Epoxy Seal	0.0	

ATTACHMENT 4A (Con't)

Penetration No.	Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
1T23-Z-EB2	B	Welded Seal	0.0	
1T23-Z-EB3	B	Epoxy Seal	0.0	
1T23-Z-EB4 Spare	B	Epoxy Seal	0.0	
1T23-Z-EB5	B	Epoxy Seal	0.0	
1T23-Z-EB6	B	Epoxy Seal	0.0	
1T23-Z-EC1 Spare	B	Epoxy Seal	0.0	
1T23-Z-EC2 Spare	B	Epoxy Seal	0.0	
1T23-Z-EC3	B	Epoxy Seal	0.0	
1T23-Z-EC4 Spare	B	Epoxy Seal	0.0	
1T23-Z-EC5	B	Epoxy Seal	0.0	
1T23-Z-EC6	B	Epoxy Seal	0.0	
1T23-Z-ED1 Spare	B	Epoxy Seal	0.0	
1T23-Z-ED2 Spare	B	Epoxy Seal	0.0	
1T23-Z-ED3 Spare	B	Epoxy Seal	0.0	
1T23-Z-ED4 Spare	B	Epoxy Seal	0.0	
1T23-Z-ED5	B	Epoxy Seal	0.0	
1T23-Z-ED6	B	Epoxy Seal	0.0	
Supp. Pool Level A	B	Resilient Seal and Single Drn. Valve	0.0	
Supp. Pool Level B	B	Resilient Seal and Single Drn. Valve	0.0	
1T48*PNL-068A	B	"O" Rings	0.24	
1T48*PNL-068B	B	"O" Rings	48.0	
1T48*PNL-069A	B	"O" Rings	8.16	
1T48*PNL-069B	B	"O" Rings	4.32	

ATTACHMENT 4A (Con't)

Penetration No.	Type Test	Equipment/Valves Tested (Note 1)	Leakage (Scf/day)	Remarks
Personnel Airlock	B	"O" Rings and Gaskets	64.08	
Emergency Airlock	B	"O" Rings	17.04	
Equipment Hatch	B	"O" Rings	0.0	
Control Rod Removal Hatch	B	"O" Rings	0.0	
Supp. Pool Access Hatch - SE	B	"O" Rings	0.0	
Supp. Pool Access Hatch - NW	B	"O" Rings	0.0	
Drywell Head	B	"O" Rings	0.0	

Notes

1. The preliminary local leak rate program commenced approximately 18 months prior to the performance of the Type A test. Repairs performed to these isolation valves were generally minor in nature and consisted of packing adjustments, torque switch adjustments, lapping, cleaning/flushing, and alignment adjustment. Specific repairs are identified in site records.

2. This valve was returned to the manufacturer for repair.

3. Tested at a minimum of 46.4 psig.

4. Spare penetrations with welded caps were LLRT for support of the preoperational ILRT only.

MSIV's		Leakage (Scf/day)
X-1A	Total Leakage-Including 9% Flowmeter Inaccuracy	26.16
X-1B	Total Leakage-Including 9% Flowmeter Inaccuracy	104.117
X-1C	Total Leakage-Including Correction to 46.4 psig plus 9% Flowmeter Inaccuracy	177.888
X-1D	Total Leakage-Including 9% Flowmeter Inaccuracy	89.206

Type B

Total Type B Leakage-Including Correction to 46.4 psig and 9% Flowmeter Inaccuracy	159.244

Type C		Leakage (Scf/day)
	Total Type C Leakage-Including Correction to 46.4 psig for valves tested @ 43.7 psig and 9% Flowmeter Inaccuracy	1920.087
Hydrogen Recombiner Loop A		
	Total Leakage-Including Correction to 46.4 psig and 9% Flowmeter Inaccuracy	250.048
Hydrogen Recombiner Loop B		
	Total Leakage-Including 9% Flowmeter Inaccuracy	2.721

ATTACHMENT 4B

Leakage Penalties Added to Type A Leakage

Penetration No.		Type Test	Equipment/Valves Tested	Leakage (Scf/day)	Remarks
X-2A	Feedwater	C	1B21*18V-1103A (IPC) 1B21*AOV036A (OPC)	1.224'	Water filled during Type A Test
X-2B	Feedwater	C	1B21*18V-1103B (IPC) 1B21*AOV036B (OPC)	18.768	Water filled during Type A Test
X-4	Reactor Water Cleanup	C	1G33*MOV033 (IPC) 1G33*MOV034 (OPC)	6.12	Water filled during Type A Test
X-22A	RBCLCW	C	1P42*MOV035 (OPC)	1.618	Operating during Type A Test
X-22B	RBCLCW	C	1P42*MOV047 (OPC)	0.192	Operating during Type A Test
X-23A	RBCLCW	C	1P42*MOV036 (OPC)	3.552	Operating during Type A Test
X-23B	RBCLCW	C	1P42*MOV048 (OPC)	0.192	Operating during Type A Test
X-24A	RBCLCW to Dry-well Coolers	C	1P42*03V-0037AA (IPC) 1P42*MOV232 (OPC)	14.88	Operating during Type A Test
X-24B	RBCLCW to Dry-well Coolers	C	1P42*03V-0037AB (IPC) 1P42*MOV233 (OPC)	36.48	Operating during Type A Test
X-24C	RBCLCW to Dry-well Coolers	C	1P42*03V-0037AC (IPC) 1P42*MOV234 (OPC)	6.864	Operating during Type A Test
X-24D	RBCLCW to Dry-well Coolers	C	1P42*03V-0037AD (IPC) 1P42*MOV235 (OPC)	2.424	Operating during Type A Test
X-24E	RBCLCW to Dry-well Coolers	C	1P42*03V-0037BA (IPC) 1P42*MOV237 (OPC)	12.0	Operating during Type A Test
X-24F	RBCLCW to Dry-well Coolers	C	1P42*03V-0037BB (IPC) 1P42*MOV0238 (OPC)	0.0	Operating during Type A Test
X-24G	RBCLCW to Dry-well Coolers	C	1P42*03V-0037BC (IPC) 1P42*MOV239 (OPC)	6.624	Operating during Type A Test

Penetration No.		Type Test	Equipment/Valves Tested	Leakage (Scf/day)	Remarks
X-24H	RBCLCW to Drywell Coolers	C	1P42*03V-0037BD (IPC) 1P42*MOV240 (OPC)	0.0	Operating during Type A Test
X-25A	RBCLCW from Drywell Coolers	C	1P42*MOV147 (IPC) 1P42*MOV231 (OPC) 1P42*RV291A (OPC)	49.82	Operating during Type A Test
X-25B	RBCLCW from Drywell Coolers	C	1P42*MOV148 (IPC) 1P42*MOV236 (OPC) 1P42*RV291B (OPC)	12.312	Operating during Type A Test
X-30	Reactor Recirc. Sample	C	1B31*A0V081 (IPC) 1B31*A0V082 (OPC)	0.168	Water filled during Type A Test
XS-30	PASS	C	1T48*S0V131 (OPC) 1T48*01V-0016B (OPC)	2.208	Isolated during Type A Test
F-10	Reactor Recirc. Pump Seal	C	1B31*01V-0002A (IPC) 1B31*01V-1028A (OPC)	91.68	Water filled during Type A Test
F-11	Reactor Recirc. Pump Seal	C	1B31*01V-0002B (IPC) 1B31*01V-1028B (OPC)	48.24	Water filled during Type A Test
B-3	PASS	C	1T48*S0V128A (OPC) 1T48*S0V128B (OPC)	0.166	Isolated during Type A Test
J-2	PASS	C	1T48*01V-0016A (OPC) 1T48*S0V130 (OPC)	4.80	Isolated during Type A Test
J-10	PASS	C	1T48*S0V126A (OPC) 1T48*S0V126B (OPC)	0.166	Isolated during Type A Test
Hydrogen Recombiner Loop A		LLRT		222.72	Added under Leakage Reduction Program
Hydrogen Recombiner Loop B		LLRT		2.496'	Added under Leakage Reduction Program

Penetration No.	Type Test	Equipment/Valves Tested	Leakage (Scf/day)	Remarks
1T48*PNL-068A	B	"O" Rings	0.24	Isolated during Type A test
1T48*PNL-068B	B	"O" Rings	48.0	Isolated during Type A test
1T48*PNL-069A	B	"O" Rings	8.16	Isolated during Type A test
1T48*PNL-069B	B	"O" Rings	4.32	Isolated during Type A test
Instrumentation				
1T47-PDT028B	LLRT		1.008'	Isolated during Type A test
1Z93*LT012A	LLRT		49.968'	Vented during Type A test
1Z93*LT012B	LLRT		29.808'	Vented during Type A test
Manometer Manifold	LLRT		1.968'	Isolated during Type A Test
1T48*FT-006A,B	LLRT		0.0'	Installation not complete for H2 Recombiner test
1T48*FT-007A,B	LLRT		0.0'	Installation not complete for H2 Recombiner test
1T48*PT-007A,B	LLRT		0.0'	Installation not complete for H2 Recombiner test

Leakage Correction	Type Test	Equipment/Valves Tested	Leakage (Scf/day)	Remarks
Correction for Flowmeter Inaccuracies - 9% of Total Type A Penalties			63.654[2]	

NOTES

[1]Tested at a minimum of 46.4 psig
[2]Correction applied to all leakages not measured at a mimimum of 46.4 psig prior to correction for flowmeter inaccuracies.