DUKE POWER COMPANY

OCONEE NUCLEAR STATION

UNIT 3

INTEGRATED LEAK RATE TEST
OF THE
REACTOR CONTAINMENT BUILDING

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1.0 INTRODUCTION

The periodic Integrated Leak Rate Test (ILRT) of the Oconee Nuclear Station Unit 3 Reactor Building was satisfactorily completed on July 3, 1978. The testing was conducted in accordance with the requirements of FSAR Section 5.6.2.1, Technical Specification 4.4, BN-TOP-1 (Bechtel Testing Criteria for ILR Testing), ANSI N45.4-1972 and 10 CFR Part 50, Appendix J. The absolute method of testing was employed with containment temperatures measured at 24 locations and containment dewpoint temperatures at two locations. Leakage was measured at half the design basis accident pressure of ~ 29.5 psig. A measured induced leak was used to verify the results. Interpretation and final analysis of the test data show results well within the specified limits for this containment, which has a maximum allowable leak rate of .176% per day. The leakage rate for Oconee Unit 3 Containment Building was found to be .1029% per day. The mean of the leakage rate over the 24 hour test period was .06381% per day.

2.0 SUMMARY AND CONCLUSIONS

2.1 Synopsis

The successful ILRT was performed in accordance with periodic test procedure PT/O/A/150/03 as approved for use on July 8, 1977. This procedure is similar to that used for the pre-operational ILRT.

Pressurization for the ILRT began at 1435 hours on 6/30/78 with both air compressors. Pressurization was stopped at 10 psig and the building was entered and inspected for indications of leakage. No indications were found and the compressors were restarted. The compressors were secured at 0840 on 7/1/78 with the containment at approximately 30 psig. It was noted at 1715 hours that the emergency personnel hatch was at the containment pressure (The hatch had equalized with the containment). It is believed the inner door leaked past its seal and equalized the inner lock of this penetration. This was acceptable since credit is taken for the outer door only.

The 24 hour test period started at 1240 hours on 7/1/78. At 1425 hours on 7/2/78, inspection of data and calculations indicated that the test was satisfactory and data aquisition was teminated. The approximate 2 hour delay was due to bad data at the start of test due to the leaking inner door on the emergency personnel hatch.

At 2055 hours on 7/2/78 a known leak rate of approximately .176% was induced for purposes of verifying the capability to measure a leakage rate. This induced leak rate test gave favorable results. Depressurization of the containment building was begun at 1220 on 7/3/78 and completed at 0400 on 7/4/78.

Instrumentation consisted of one (1) precision pressure sensor, twenty four (24) temperature sensors and two (2) dewpoint sensors which were used to measure containment atmospheric conditions during the ILRT.

The emergency personnel hatch was locally tested on 7/6/78 with satisfactory results.

2.2 Test Organization

The Performance section at oconee Nuclear Station had overall responsibility for this periodic ILRT. The testing activities

were supervised by the test coordinator. See Figure 2.2-1 for organization chart. The test personnel were as follows:

A.	Test coordinator Responsible for all ILRT Activities	- -	R. P. Rogers
B.	Data Engineers (one per shift) Responsible for Testing Activities on their assigned shifts	- - -	B. G. Davenport G. B. Beam M. Beck
C.	Data Takers (one per shift) Responsible for reading and recording all test data	- - -	L. Heddon D. W. DeNard G. F. Long
D.	Computer Operators (one per shift)	- - -	T. E. Evans B. Owens H. Thompson
E.	Operators (normal shift)		

2.3 Test Criteria

Pressure: 29.5 psig

Leak Rate: .176% limiting Condition for Operation
.132% Test Acceptance

Temperature: 60°-100°

Volume: 1,910,000 cu. ft.

2.4 Test Results

As shown in the computer printouts and graphs in Section 4.2 of this report, the calculated leak rate, the mean of the calculated leak rates and the mean of the measured leak rates are all well below the allowable leakage rate limit. The leakage rate test results are tabulated below:

Test	Maximum Allowable Leak Rate (%/day)	Calculated Leak Rate	Upper Limit Of 95% Confidence Limit
29.5 psig	.176	.1029%	.132

For reporting purposes, a leak rate of .1029% shall be used for this test. This leak rate was obtained by using a least squares linear fit of the 15 min. leak rate data taken during the ILRT. These calculations are based on the total time method as described in ANSI N45.4-1972.

The verification test consisted of imposing a known leak rate on the containment at the end of the ILRT. Results from this supplemental test are acceptable provided the difference between the supplemental test data and the type A test data is within .25 L_t. A summary of the verification test data is given below.

29.5 psig ILRT	%/day
Leak Rate calc. during ILRT, L_{tm}	.1029
Imposed verification leak rate, Lt	.1760
Total	.2789
Upper verification limit = .2789 + .25 L_t	.323
Leak rate calc. during verification test	.267
Lower verification limit = .2789 - .25 L_t	.235

2.5 Error Analysis

The leakage rate in weight percent per day is computed using the absolute method by the formula:

$$Lr = \frac{2400}{H}\left[1 - \frac{To\ P}{T\ Po}\right] \quad (1)$$

Where:

Po = Initial Reactor Building absolute pressure corrected for water vapor pressure.

P = Final reactor Building absolute pressure corrected for water vapor pressure.

To = Initial Reactor Building mean absolute temperature.

T = Final Reactor Building mean absolute temperature.

H = Number of hours held at test pressure.

The change or uncertainty interval in LR due to uncertainties in the measured variables is given by:

$$\sigma LR = \left[\left(\frac{dLR}{dP} \cdot \sigma_P\right)^2 + \left(\frac{dLR}{dPO} \cdot \sigma_{Po}\right)^2 + \left(\frac{dLR}{dTo} \cdot \sigma_{To}\right)^2 + \left(\frac{dLR}{dT} \cdot \sigma_T\right)^2\right]^{\frac{1}{2}}$$

Where σ is the standard error for each variable.

The error in LR after differentiating is:

$$eLR = \frac{2400}{H}\left[\left(\frac{-To}{TPo} \cdot e_P\right)^2 + \left(\frac{To\ P}{T\ Po^2} \cdot e_{Po}\right)^2 + \left(\frac{-P}{TPo} \cdot e_{To}\right)^2 + \left(\frac{To\ P}{T^2 Po} \cdot E_T\right)^2\right]^{\frac{1}{2}} \quad (3)$$

Where: $e_P = \sigma_P$ $\quad e_{Po} = \sigma_{po}$

$e_{To} = \sigma_{To}$ $\quad e_T = \sigma_T$

The analysis technique, based on equation (3) above, was verified by K. Horoschek and E. Weipport in "Tightness Investigations on Reactor Safety Pressure Vessels," Vol, 13, No. 3, March 1961.

For small values of LR:

$T \simeq To$, $P \simeq Po$ and

$e_P = e_{Po}$, $e_T = e_{To}$

Therefore, the equation then simplifies to:

$$eLR = \frac{2400}{H}\left[\left(\frac{-eP}{P}\right)^2 + \left(\frac{eP}{P}\right)^2 + \left(\frac{-eT}{T}\right)^2 + \left(\frac{eT}{T}\right)^2\right]^{\frac{1}{2}}$$

or

$$eLR = \frac{2400}{H}\left[2\left(\frac{eP}{P}\right)^2 + 2\left(\frac{eT}{T}\right)^2\right]^{\frac{1}{2}} \quad (5)$$

Where e_P = error in pressure which accounts for the error in the absolute pressure measurement instrument (e_{PT}) and the water vapor measurement system (e_{Pv}) and where e_T = error in temperature.

$$e_P = \left[(e_{PT})^2 + (e_{Pv})^2\right]^{\frac{1}{2}} \quad (5)$$

e_{PT} = Absolute Pressure Instrument Accuracy Error

$$e_{Pv} = \frac{\text{Dew Point Sensor Accuracy Error}}{(\text{Number of Sensors})^{\frac{1}{2}}}\left(\frac{dP_v}{dT_D}\right)$$

$$e_T = \frac{\text{RTD Accuracy Error}}{(\text{Number of RTD's})^{\frac{1}{2}}}$$

To develop a numerical value for e_{LR} it will be assumed that:

H = 10 hours
RB mean absolute pressure = 29.5 psig
RB mean absolute temperature = 529.7°R (70°F)

RB mean dewpoint temperature = 68°F

Substituting the instrument accuracy values given in Section 3.2.1 into the above equations yields:

$E_{PT} = \pm$ 0.0005 percent full scale*

*Value of full scale repeatability used. This number is more significant for the error analysis than the absolute accuracy.

$$e_{Pv} = \pm \frac{0.5^\circ F}{\sqrt{2}} = \pm 0.353^\circ F$$

From the ASME Steam Tables at 68°F:

e_{Pv} = 0.00414 psi

$$e_P = \sqrt{(0.0005 \text{ psi})^2 + (0.00414 \text{ psi})^2}$$

$e_P = \pm$ 0.00417 psi

$$e_T = \pm \frac{0.07^\circ F}{(24)^{1/2}} \ *$$

* Value of full scale repeatability used. This number is more significant for the error analysis than the absolute accuracy.

$e_T = \pm$ 0.0143

Substitution into equation (4) yields:

$$eLR = \pm \left[2 \left(\frac{0.00417}{44.645}\right)^2 + 2 \left(\frac{0.0143}{530.00}\right)^2 \right]^{1/2} \frac{2400}{10}$$

= ± 0.0330% per day

REACTOR BUILDING INTEGRATED
LEAK RATE TEST ORGANIZATION

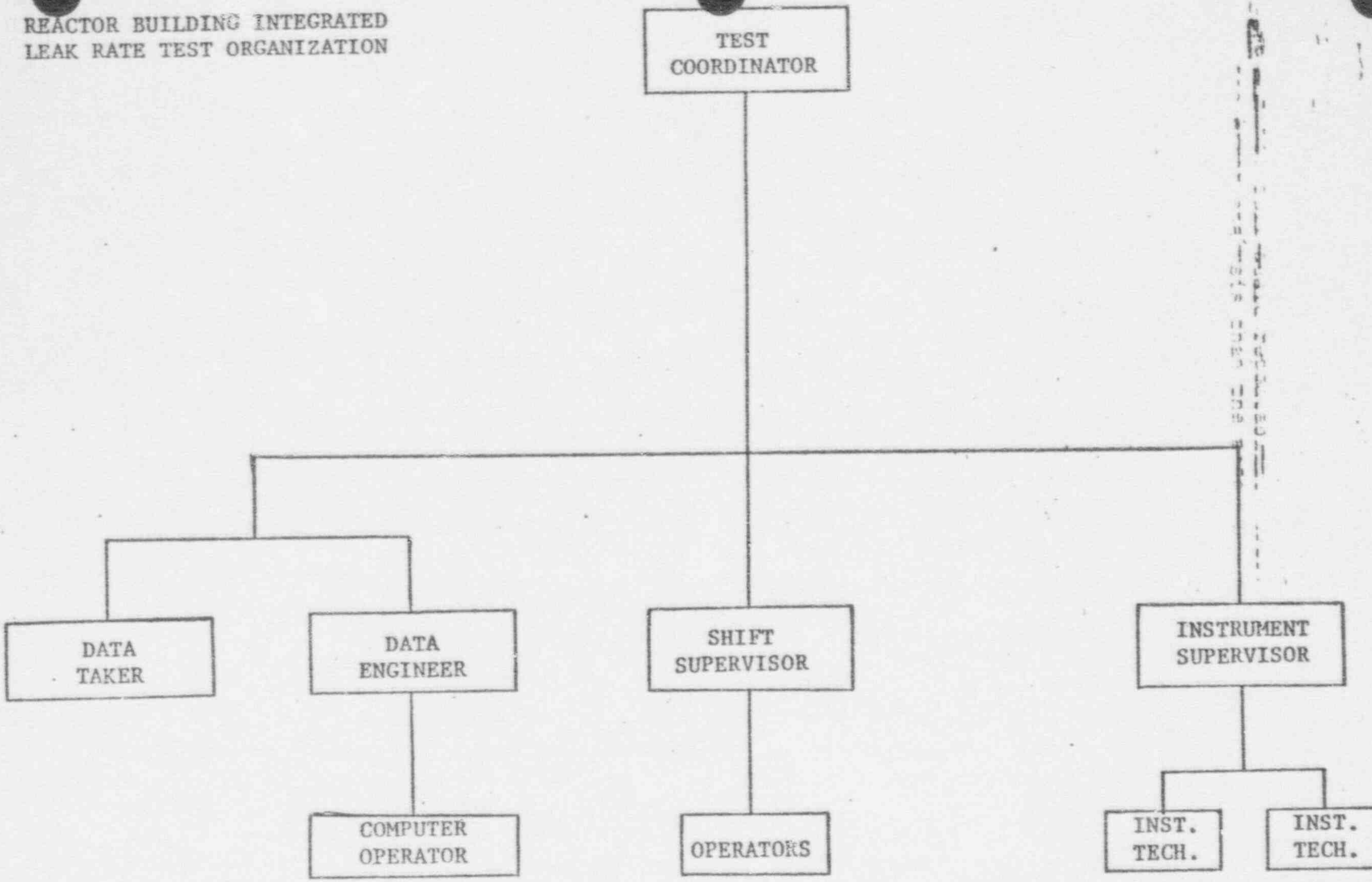


Figure 2.2-1

3.0 DESIGN INFORMATION

3.1 Reactor Building

The reactor building is a reinforced and post-tensioned concrete structure designed to contain any accidental release of radioactivity from the reactor coolant system as defined in the Final Safety Analysis Report (Reference 1).

The structure consists of a post-tensioned reinforced concrete cylinder and dome connected to and supported by a massive reinforced concrete foundation slab as shown in Figure 3.1-1. The entire interior surface of the structure is lined with a 1/4 inch thick welded ASTM A36 steel plate to assure a high degree of leak tightness. Numerous mechanical and electrical systems penetrate the reactor building wall through welded steel penetrations.

Principal dimensions are as follows:

Inside Diameter	116 ft.
Inside Height (Including Dome)	208-1/2 ft.
Vertical Wall Thickness	3-3/4 ft.
Dome Thickness	3-1/4 ft. Typical
Foundation Slab Thickness	8-1/2 ft.
Linear Plate Thickness	1/4 inch
Internal Free Volume	1,910,000 Cu. Ft.

3.2 Measurement Systems

Instrumentation used for the Oconee Unit 2 ILRT is similar to that used on previous tests conducted by Bechtel. The leak rate test measurement system is shown schematically in Figure 3.2-1.

Reactor Building pressure was measured by a Texas Instrument precision pressure gage. The unit was calibrated at the Duke Power Standards Lab before the test.

Reactor Building temperature was measured by twenty-four (24) calibrated RTD's and read on a Leeds and Northrup Numatron digital readout device. Each RTD was assumed to be representative of a fraction of the total containment volume. In addition to the twenty-four (24) RTD's used for the calculation of reactor Building temperature, four (4) additional RTD's were used to measure the linear plate temperature.

Reactor Building dewpoint temperature was measured by two (2) Cambridge Dewpoint Hygrometers. The relative location of the himidity sensors is shown in Figure 3.4-1. A 0-10.45 scfm Brooks rotometer was used in establishing a known leak rate.

3.2.1 Instrument List

Specifications for the instrumentation used for the Oconee Unit 2 ILRT are listed in Table 3.2-1.

3.2.2 Temperature Sensor Locations

The locations of temperature sensors within the Reactor Building are shown in Figures 3.2-2 through 3.2-6.

3.2.3 RTD and Dewpoint Volume Fractions

Volume fractions were used for calculating the average temperature and the average dewpoint temperature in the containment. These fractions were determined using an equivalent volume for each sensor. The free volume of the containment was divided into "cells" with a sensor center in each. Volume fractions are given in Table 3.2-2.

3.3 Pressurization System

Reactor Building pressurization was accomplished by two (2) electric motor driven air compressors operating in parallel. These compressors, purchased for pressurization of the Oconee Reactor Building, also include aftercoolers as integral equipment. The discharge from the compressors passes through a single air dryer which reduces the moisture content in the air prior to its entry into the Reactor Building. The specifications for these components are as follows:

A. Two (2) electric driven Joy Turbo-Air (20V2) centrifigual type air compressors with a capacity of 2300 scfm @ 80 psig.

B. Two (2) Basco size 22048 aftercoolers (Integral to Compressors), type "ES" Fixed Tubesheet, with a capacity of 2100 scfm @ 14.4 psia and with a design pressure of 150 psig.

C. One (1) Hankison (Model H-15) refrigerator type air dryer with inertial impigement separator, and a capacity of 3750 scfm (100°F Sat. inlet) @ psig.

Three valves, 3LRT-15, 3LRT-16, and 3LRT-17 are used to control pressurization and depressurization of the Reactor Building. The controls for these valves are located in the test panel. The pressurization system is shown schematically in Figure 3.3-1.

3.4 Recirculation System

The Reactor Building Air Recirculation System consists of four (4) auxiliary fans and three (3) Reactor Building cooling fans. The auxiliary fans take suction through ducts in the upper region of the Reactor Building and circulate it downward. The Reactor Building cooling fans take air from midheight in the Reactor Building and exhaust it through duct work down to the lower levels of the Reactor Building. This is shown schematically in Figure 3.4-1.

3.5 Computer Programs

All calculations, summaries, and reports were performed using the Duke Power Company ILRT computer program.

3.5.1 Duke Computer Program

The Integrated Leak Rate Program calculates the leak rate for a nuclear reactor containment vessel. The program computes the leak rate at a given time from input values of pressure, temperature and vapor pressure. The leak rate, as a function of time, is determined by elementary linear least-square methods.

The Integrated Leak Rate Program is designed to allow the user to evaluate containment leak rate test results at the jobsite during containment leak rate testing. Interim leak rate test reports may be obtained at any time during the testing period. Each interim report consists of two printouts. The first printout, called the total-time computation, uses the initial and latest input data to compute leak rate. Each computed leak rate is statistically averaged using a linear least-squares fit. Early in the test this method of computation gives indication as to whether or not the leak rate is acceptable.

A second printout, called the point-to-point computation, is also provided. The point-to-point method uses the data at a given hour and the data from the previous reading to compute leak rate. Each individually computed leak rate is then statistically averaged using a linear least-squares fit.

The results of the two methods used indicate that either method is a satisfactory method for computing containment integrated leak rates. Both methods of computing the containment leak rate are presented in ANSI N45.4-1972. However, the total-time method is recommended by Appendix J to 10 CFR 50.

3.5.1.1 Explanation of Program

3.5.1.1.1 Purpose

a. Process raw data for use in leak rate calculation.

b. Calculate leak rate on a point-to-point or total time basis.

c. Calculate a statistical point-to-point or total time leak rate by a linear least squares fit of the data.

d. Output data.

3.5.1.1.2 Process Raw Data

a. Temperature

(a.1) Unit - °F.

(a.2) Number - 28 (Includes 4 on linear plate).

(a.3) Input to computer will be in °F. The computer will apply necessary calibration corrections to the temperature.

(a.4) Each temperature (28) will be weighted by a volume fraction. The calculation for the average building temperature is:

$$T = \Sigma T_n \cdot V_n$$

Where: T = Average building temperature, °F

T_n = Temp. at each point, n + 1-28 °F

V_n = Volume fraction for each point. The volume represented divided by the total volume. Volume fractions must add to 1.

The Average Temperature must be converted to ^{o}R by adding 459.7.

(a.5) The temperature on the linear plate will be available for output.

b. Pressure

(b.1) Unit - psia.

(b.2) Number - 1.

(b.3) Input is in psia. The computer will apply necessary calibration correction to the pressure.

(b.4) The pressure will be weighted by a volume fraction. The calculation for the average building pressure is:

$$P = W_1 P_t$$

Where: P = Average Building Pressure, psia.

P_t = Pressure by texas instrument, psia.

W_1 = Volume fraction (must equal 1).

c. Barometer

(c.1) Unit - Inches of Hg @ 32^{o}F.

(c.2) Number - 1.

(c.3) Input is not used by calculations, but will be available for output.

d. Dewpoint Temperature

(d.1) Unit - ^{o}F.

(d.2) Number - 2.

(d.3) Input to computer will be in ^{o}F. A calibration curve will be associated with each sensor and the input will be corrected.

(d.4) Each Dewpoint Temperature is weighted by a volume fraction. The calculation for the average is:

$$T_v = W_3 T_{v1} + W_4 T_{v2}$$

Where: T_v = Dewpoint Temperature, ^{o}F.

T_{v1} = First Sensor Dewpoint temperature, ^{o}F.

T_{v2} = Second Sensor Dewpoint temperature, ^{o}F.

W = Volume Fraction ($W_3 + W_4 = 1$)

(d.5) From the Dewpoint Temperature (Saturation Temperature) the Vapor Pressure (Saturation Pressure) is determined from the steam tables. The range required is 40 to 120^{o}F from the steam tables.

$$P_v = f\ (T_v)$$

3.5.1.1.3 Leak Rate Calculations

a. Leak Rate on Hourly Basis

Leak rate will be calculated on a point-to-point basis from data obtained at the previous point readings (data subscript 1) and data obtained at the present point readings (data subscript 2).

(a.1) Absolute Method

$$La = \frac{2400}{Wt}\left[1 - \frac{T_1}{T_2}\frac{(P_2 - P_{v2})}{(P_1 - P_{v1})}\right]$$

Where in (a.1) above

L = Percent leak rate per hour (La or Lx)

T1 = Average absolute temperature of Reactor Building air at start of each test period, °F.

T2 = Average absolute temperature of Reactor Building air at end of each test period, °F.

P1 = Absolute pressure of Reactor Building at start of each test period, psia.

P2 = Absolute pressure of Reactor Building at end of each test period, psia.

Pv1= Vapor pressure of Reactor Building at start of each test period, psia.

Pv2= Vapor Pressure of Reactor Building at end of each test period, psia.

Δt = Time interval between start and end of test period, hours.

b. Statistical Point-to-Point Leak Rate

Linear least square fitting is used to calculate a statistical point-to-point leak rate for the Absolute Method.

$$Li = a + bti$$

Where: $$a = \frac{\Sigma \ell i \ \Sigma(ti^2) - \Sigma ti \ \Sigma \ell i ti}{N \ \Sigma(ti^2) - (\Sigma ti)^2}$$

$$b = \frac{N \Sigma \ell i ti - \Sigma \ell i \ \Sigma ti}{N \Sigma (ti^2) - (\Sigma ti)^2}$$

Li = Statistical leak rate

ℓi = Calculated leak rate

ti = Time between data sets

N = Number of points to be fit (number of data sets)

c. Leak Rate From Initial Data Set

Leak rate from the initial data set to each successive data set is calculated by the following equation:

(c.1) Absolute Method

$$Laa = \frac{2400}{TI}\left[1 - \frac{Ti\ (Pt - Pvt)}{Tt\ (Pi - Pvi)}\right]$$

Where: i = Indicates data from initial set

t = Indicates data from each successive set

TI = Time from initial data set.

d. Statistical Leak Rate From Initial Data Set

The leak rate is calculated by a linear least squares fit over a period from the initial data set to each successive data set.

(d.1) The equations are the same as in 3.5.2.1.3(b).

(d.2) The data used is obtained from 3.5.2.1.3(c).

e. 95 Percent Confidence Limits

$CLi = Li \pm T\ \sigma i$

Where: CLi = Confidence limits at time ti

Li = Statistical leak rate at time ti

σi = Standard deviation

T = Tabulated constant

$$T = 1.95996 + \frac{2.37226}{(N-2)} + \frac{2.8225}{(N-2)^2}$$

Where: N = Number of data points

$$\sigma i = \left[\text{Variance} \left[1 + \frac{1}{N} + \frac{(to - \bar{t})^2}{\Sigma(ti - \bar{t})^2} \right] \right]^{\frac{1}{2}}$$

Where: to = 0

$$\bar{t} = \frac{1}{N} \Sigma \; ti$$

$$\text{Variance} = \left[\Sigma(\ell i - a - bti)^2 \right] \div \left[N-2 \right]$$

INSTRUMENT SPECIFICATIONS

Pressure Digital Readout

Serial No.	10132 2646
Mfg.	Texas Instrument
Model	145
Type	Precision pressure gauge
Range	0-100 psia or 100,000 counts full scale
Stability	± .001 psi
Repeatability	± .0005 psi
Resolution	± .001 psi
Accuracy	± .015% of reading

Pressure Gauge

Mfg.	Heise
Range	0-100 psig
Accuracy	0.1 psi
Repeatability	0.1 psi

Temperature Elements

Mfg.	Leeds & Northrup
Model	8197
Type	RTD, Copper 100 ohms
Range	0-150°F
Repeatability and hysterisis	± .02°F
Accuracy	± 0.12°F

Temperature Indications for Temperature Elements

Mfg.	Leeds & Northrup
Model	245 Numatron
Range	0-150°F
Reproductivity	± .07°F from 60°F to 120°F
Accuracy	± .12 from 60°F to 120°F and ± .48 Below 60°F

Dewpoint Temperature

Mfg.	Cambridge
Model	992-C1
Range	-100°F to +200°F
Accuracy	± 0.5°F
Serial No.	332 and 333

Table 3.2-1

Flow Indicator

Mfg.	Brooks
Type	Rotometer
Model	1110-24
Range	0 to 10.45 scfm
Accuracy	$\pm$ 1% of instantaneous reading
Repeatability	Better than 1/4% of instrument reading
Serial No.	7004-39848

Table 3.2-1 (con't)

VOLUME FRACTIONS

Volume Fractions for RTD's

RTD #	Volume Fraction
1	.03
2	.02
3	.02
4	.05
5	.02
6	.03
7	.01
8	.08
9	.05
10	.05
11	.02
12	.02
13	.01
14	.02
15	.02
16	.01
17	.05
18	.09
19	.11
20	.01
21	.01
22	.09
23	.11
24	.07
TOTAL	1.00

Dew Point Sensors Volume Fraction

Dew Point Sensor #	Volume Fraction
1 (Azimuth 100° Elevation 850')	0.4
2 (Azimuth 260° Elevation 850')	0.6
TOTAL	1.0

Table 3.2-2

REACTOR BUILDING

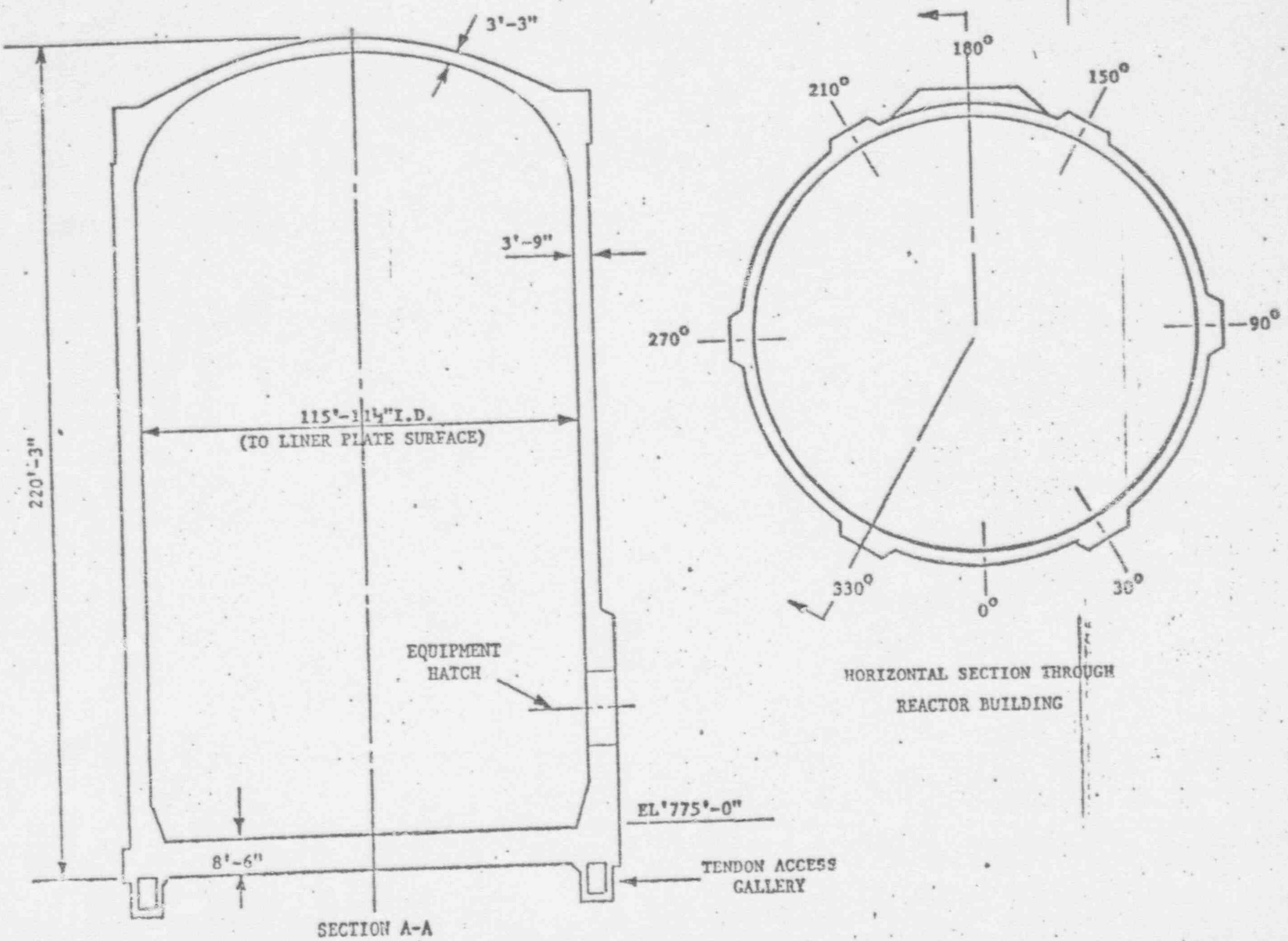


Figure 3.1-1

LEAK RATE MEASUREMENT SYSTEM

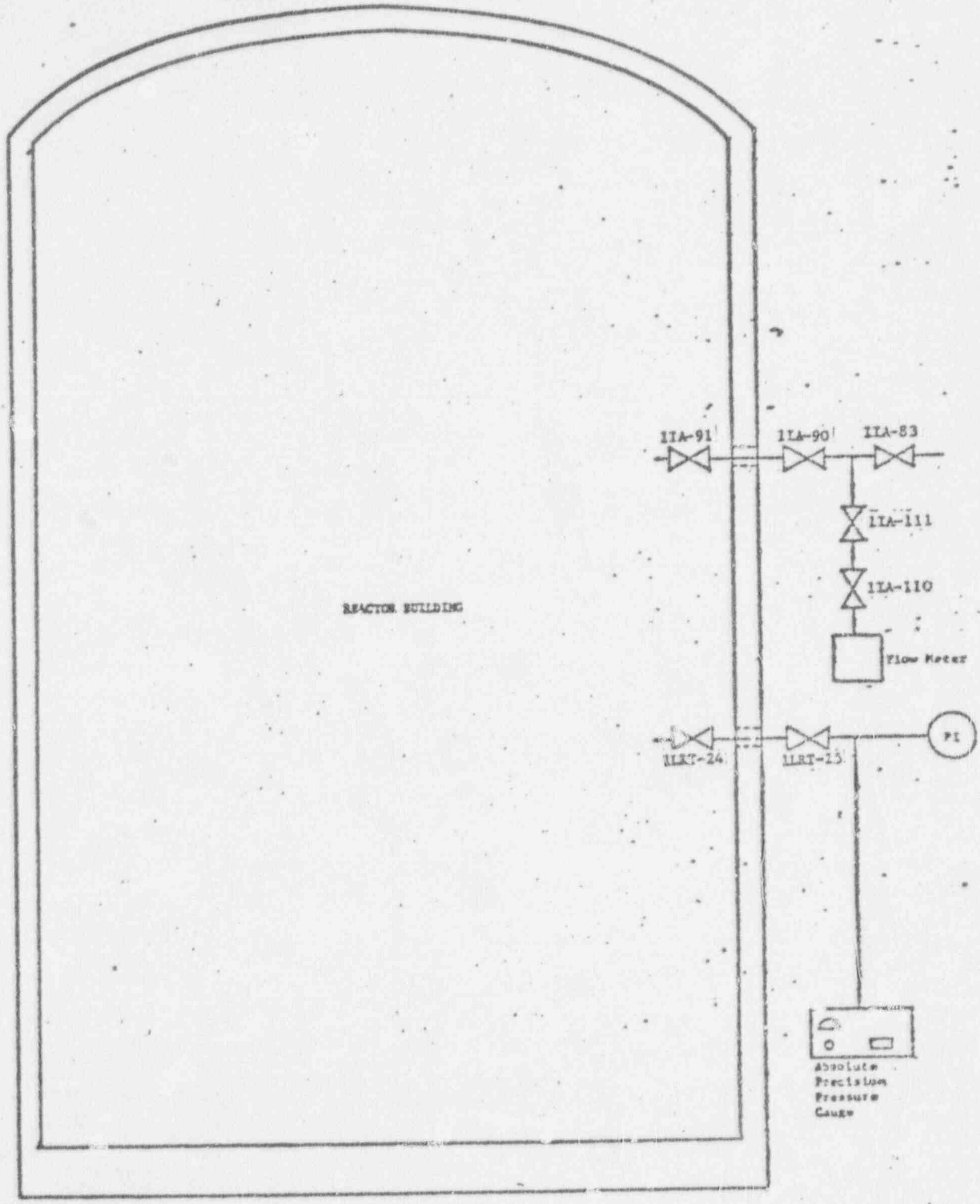


Figure 3.2-1

REACTOR BUILDING
BASEMENT FLOOR
ELEVATION 787'

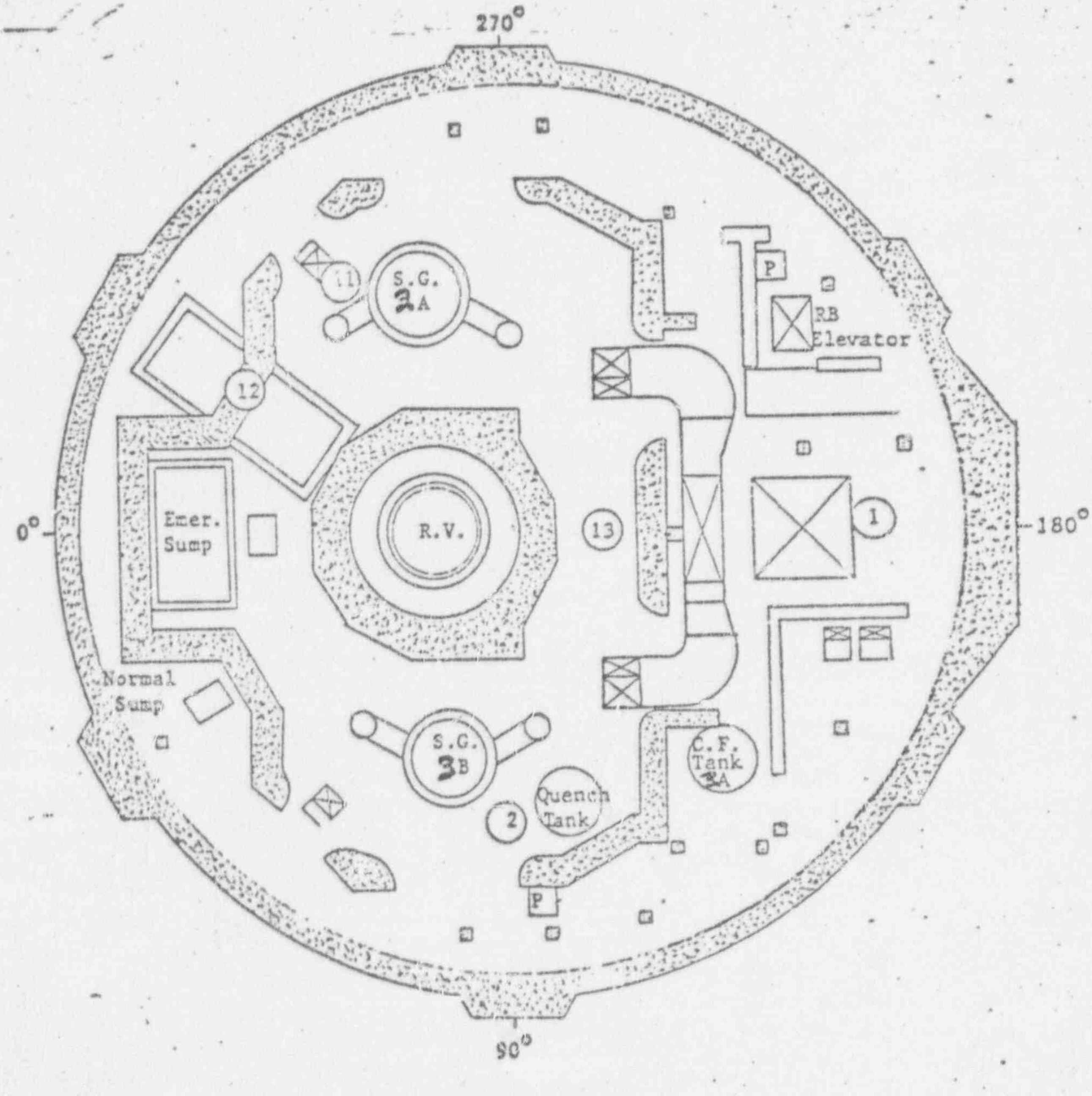


Figure 3.2-2

REACTOR BUILDING

INTERMEDIATE FLOOR

ELEVATION 830'

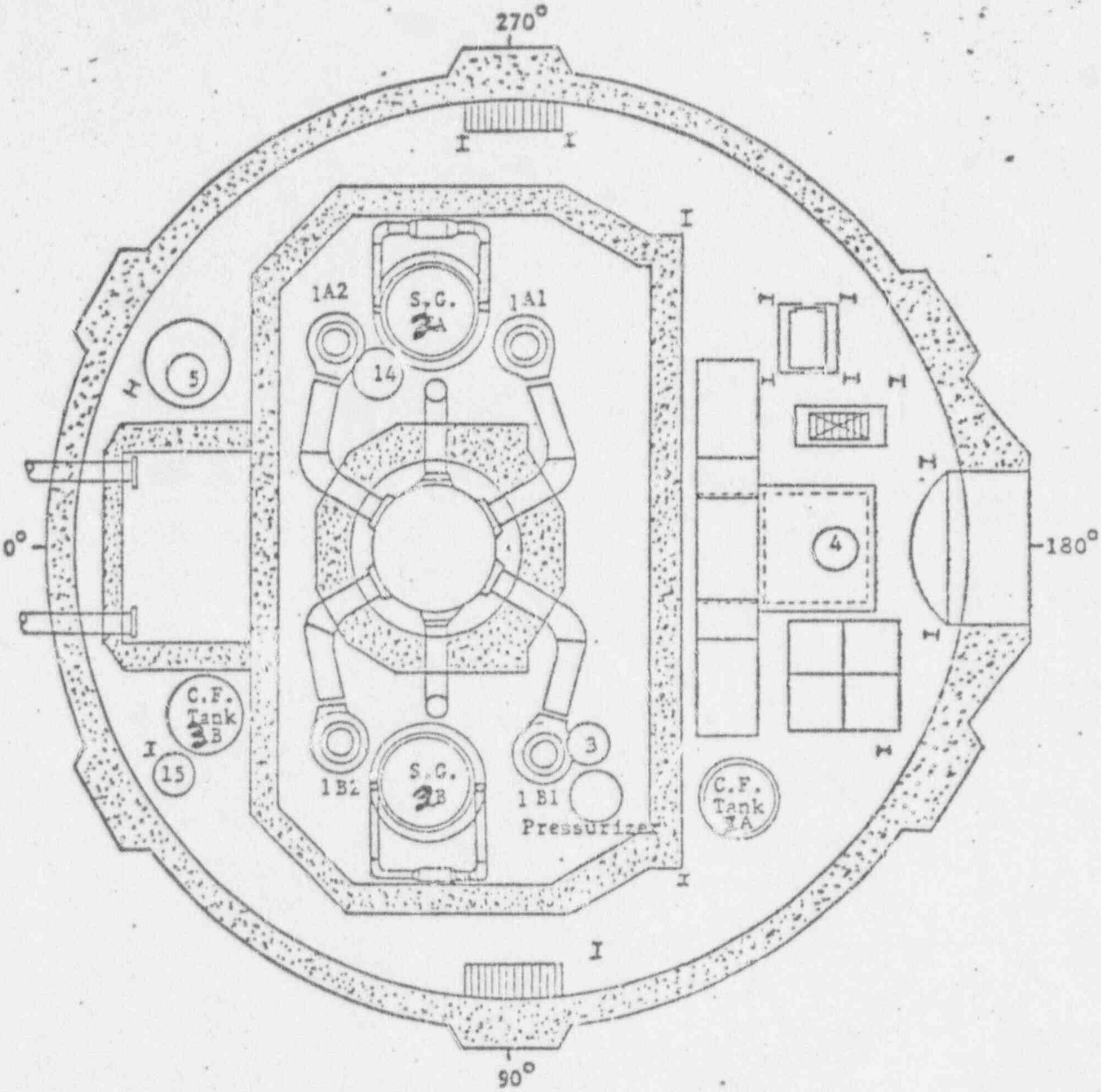


Figure 3.2-3

REACTOR BUILDING
OPERATING FLOOR
ELEVATION 850'

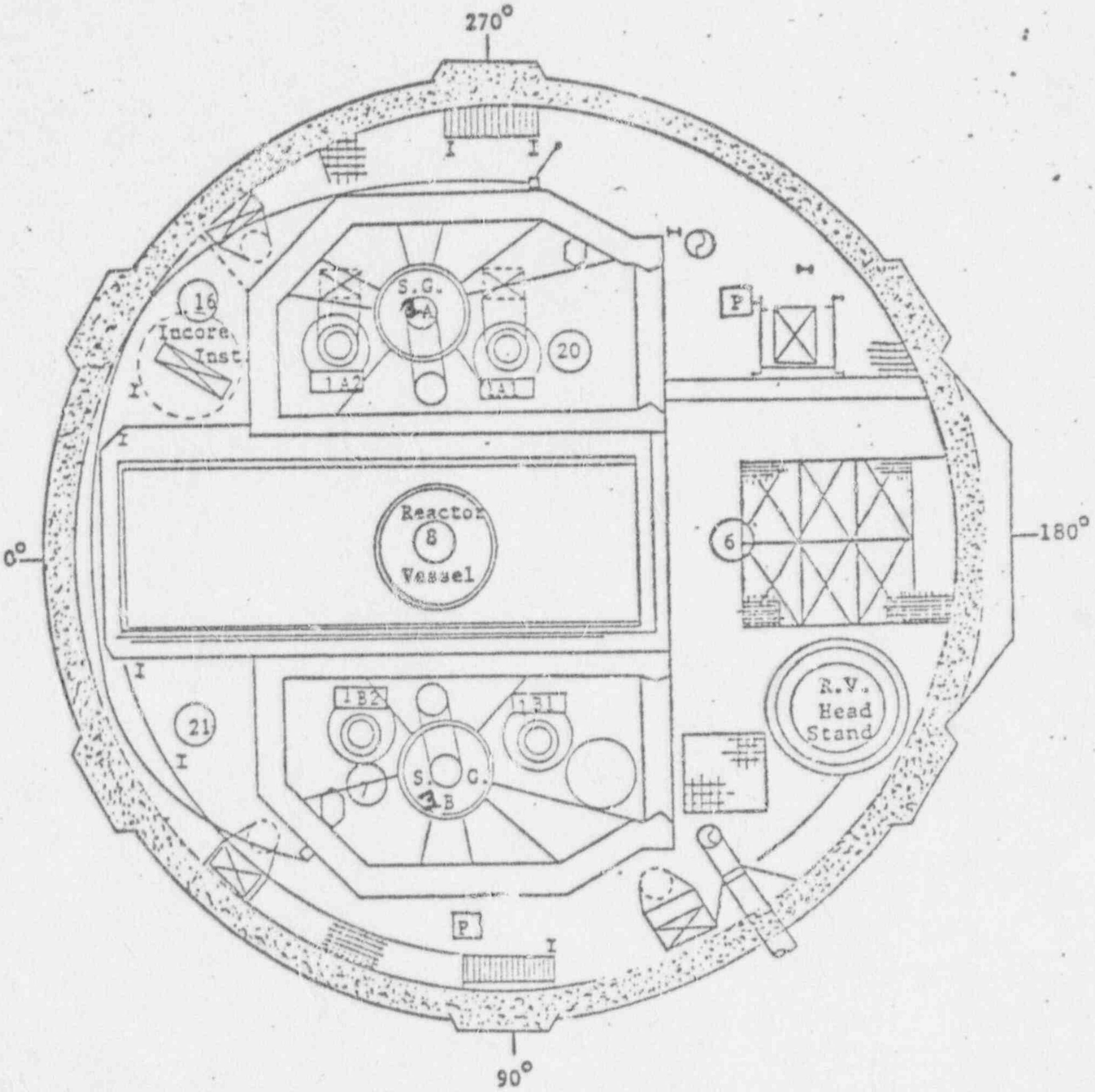


Figure 3.2-4

REACTOR BUILDING
SHIELDING FLOOR
ELEVATION 866'

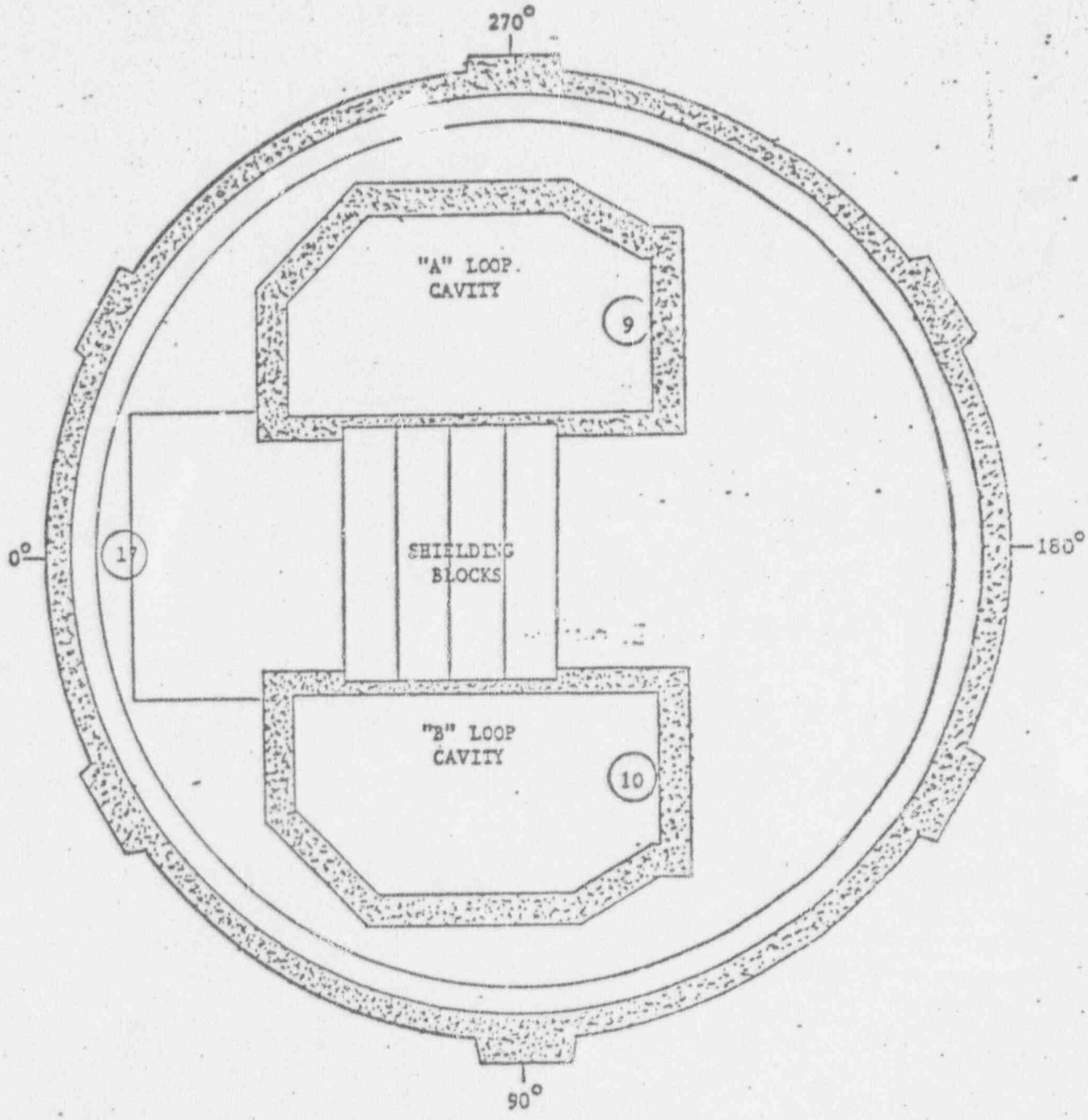


Figure 3.2-5

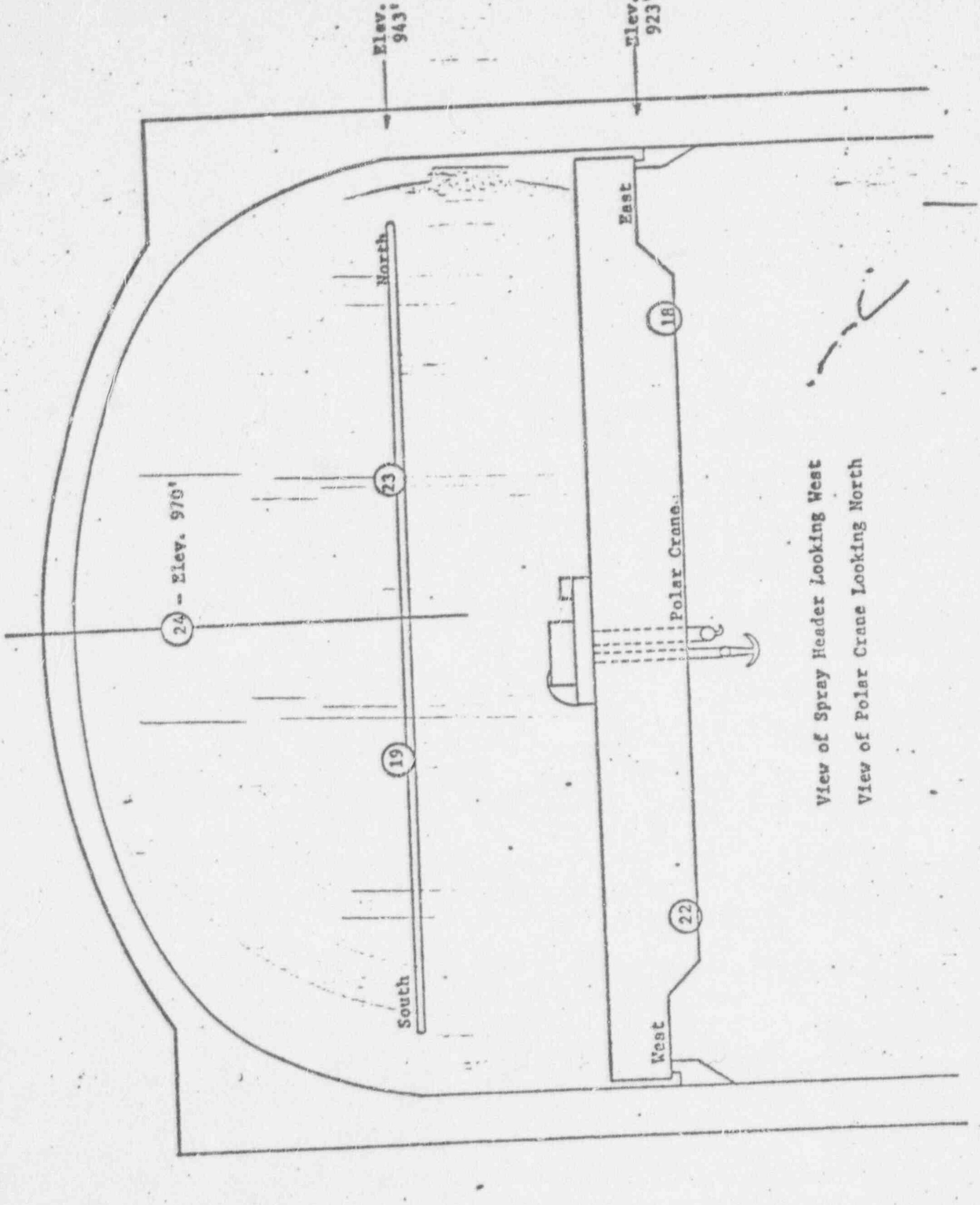

Elev. 943'
Elev. 923'
Elev. 970'
North
South
East
West
Polar Crane
24
23
19
18
22
View of Spray Header Looking West
View of Polar Crane Looking North

Figure 3.2-6

REACTOR BUILDING PRESSURIZATION SYSTEM

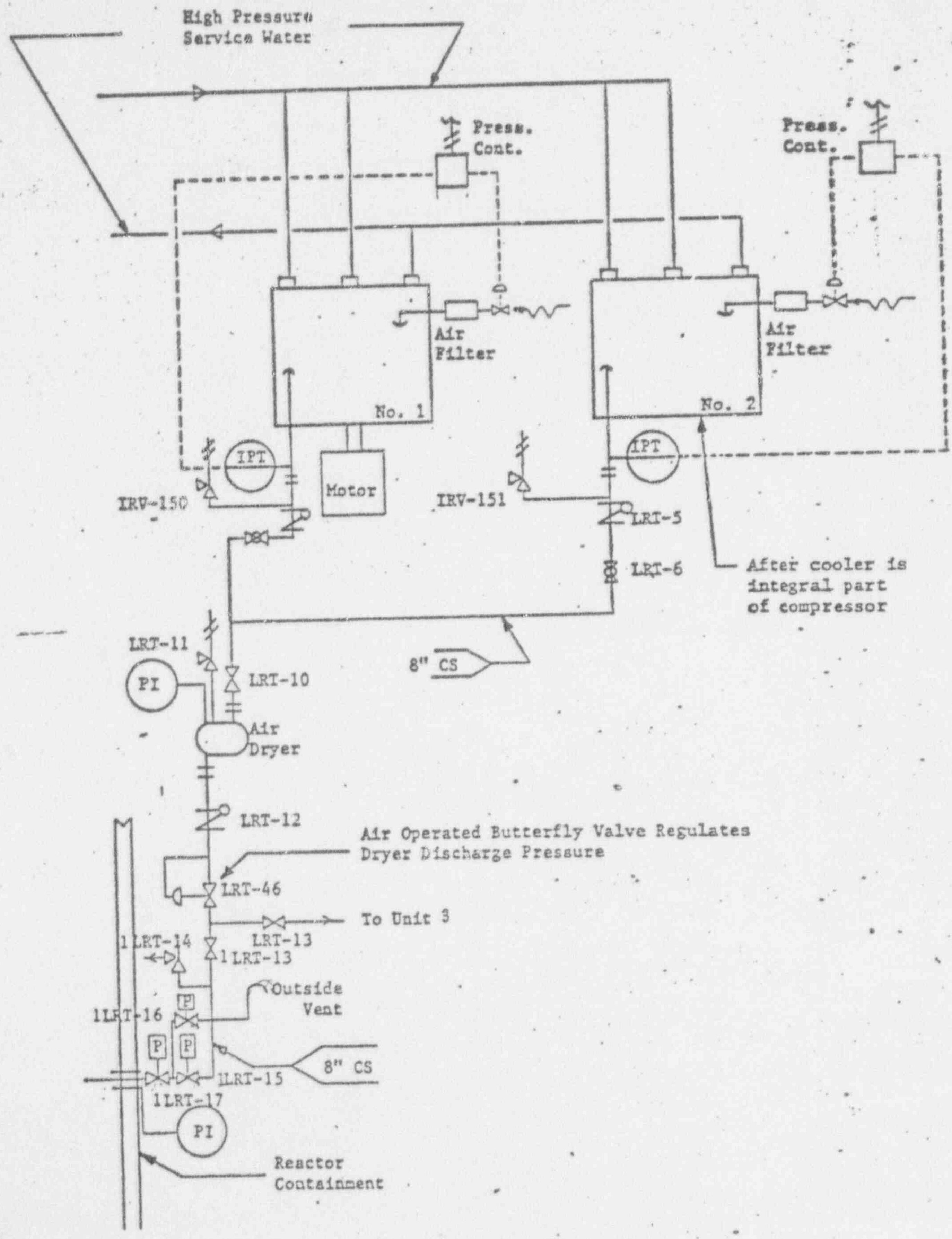


Figure 3.3-1

REACTOR BUILDING AIR RECIRCULATION SYSTEM

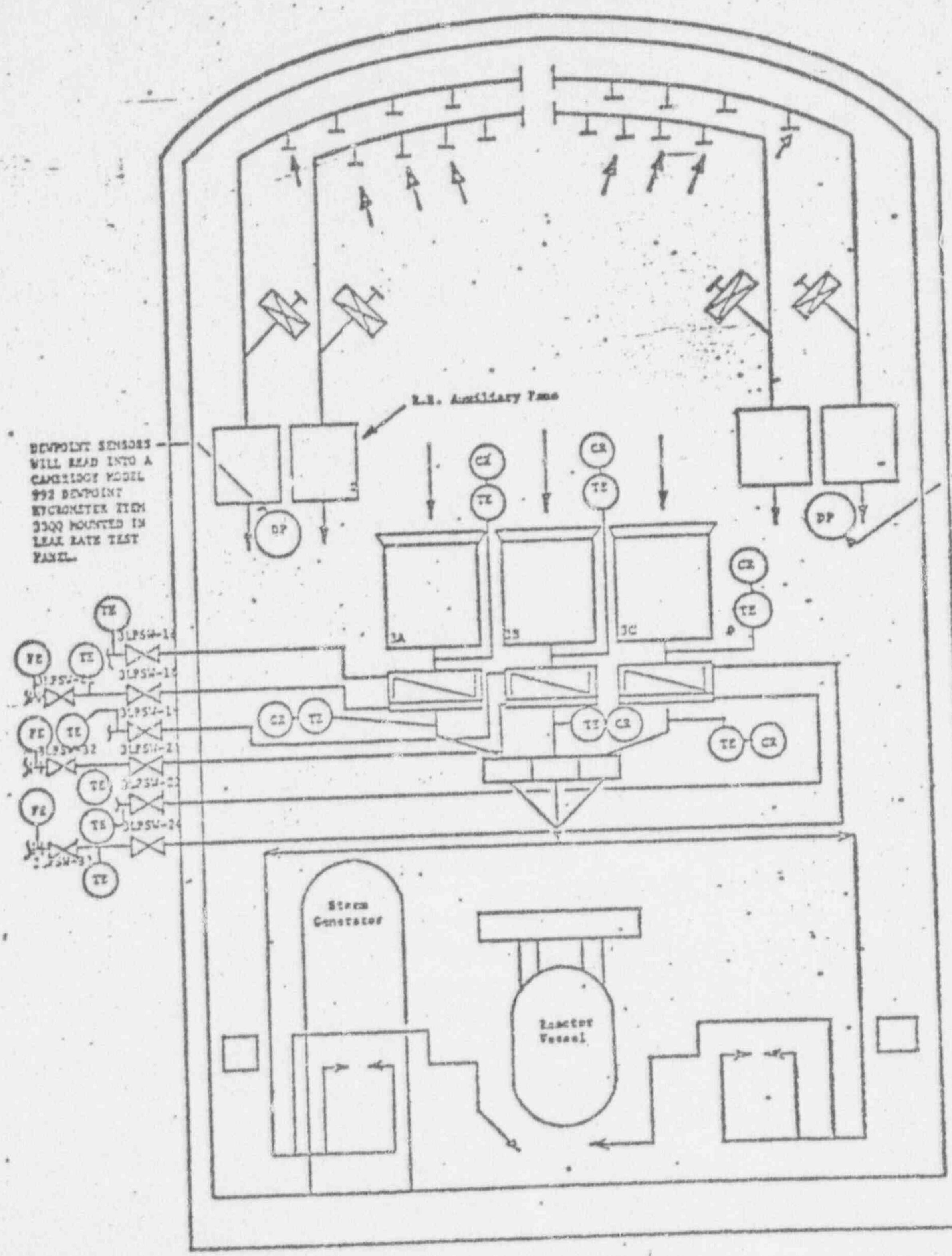


Figure 3.4-1

4.0 CONDUCT OF TEST PROGRAM

4.1 Local Leak Rate Test

The purpose of the Local Leak testing program was to systematically check the integrity of valves (seats and packing), flanges, pipe and electrical penetration welds, seals and compression fittings that are part of the boundaries of the containment system. These tests, specified by Section 4.4.1.2 of the Technical Specifications, have a combined Acceptance Criteria of less than or equal to 0.125% of the reactor building atmosphere per 24 hours. Final analysis of all penetration leakage rates shows that the total penetration leakage rate was approximately 46 percent of the allowable.

4.1.1 Test Method

All electrical and mechanical penetration, including locks and hatches, were tested by pressurizing to ~ 59 psig. The pressure, temperature and barometric pressure were recorded before and after the leak test (duration of test determined by penetration volume) and the leak rate determined by the mass difference method.

4.1.2 Penetration Test Results

Per Technical Specification 4.4.1.2.3, the total leakage from all penetrations and isolation valves shall not exceed .125% of the Reactor Building atmosphere in 24 hours. The total measured leak rate from all penetrations prior to this test was .0576% per 24 hours. Results of all local penetration tests done since the last type A test are given in Tables 4.1-1 through 4.1-2.

4.2 Computer Calculations and Results

4.2.1 29.5 psig ILRT

The curves for the 29.5 psig ILRT are shown in Figure 4.2-1 through 4.2-4. Supporting summary data is given in Table 4.2-1.

4.2.2 29.5 psig Verification Test

The curves for the 29.5 psig verification test are shown in Figure 4.2-5 through 4.2-8. Supporting summary data is given in Table 4.2-2.

TYPE B LOCAL LEAK RATE TEST RESULTS

Penetration	Date	LR SCF/Hr.	LR %/Day
Elec. Penetrations	4/18/75	.033798	4.25×10^{-5}
Type A	3/26/76	0	
	9/21/76	.03275	4.12×10^{-5}
	10/26/77	.02751	3.46×10^{-5}
	6/29/78	.022139	2.78×10^{-5}
Fuel Trans. Tubes	8/8/74	0	0
	10/8/75	5.3972×10^{-4}	0
	9/21/76	1.8830×10^{-3}	0
	11/1/77	2.6868×10^{-3}	0
	6/27/78	1.6201×10^{-3}	0
Equipment Hatch	8/16/74	0	0
	8/31/74	7.336×10^{-3}	0
	4/17/75	0	0
	4/14/76	4.492×10^{-1}	5.65×10^{-4}
	7/5/76	0	0
	10/26/76	1.1895×10^{-2}	4.49×10^{-5}
	11/23/77	1.965×10^{-4}	0
	6/29/78	8.9001×10^{-3}	1.13×10^{-5}
Personnel Hatch	11/15/74	0	0
	2/21/75	0	0
	7/2/75	0	0
	1/11/75	11.2267	1.41×10^{-2}
	3/16/76	5.8046	7.29×10^{-3}
	8/23/76	.050435	6.34×10^{-5}
	11/23/76	21.881	2.75×10^{-2}
	3/1/77	7.1395	8.97×10^{-3}
	8/5/77	21.3176	2.68×10^{-2}
	10/19/77	33.064	4.15×10^{-2}
	11/23/77	0	0
	3/28/77	0	0
	6/29/78	5.2321	6.58×10^{-3}
Emerg. Personnel Hatch	11/15/74	0	0
	11/22/74	1.58[illegible]48	1.99×10^{-3}
	8/7/75	2.358	2.96×10^{-3}
	12/8/75	0	0
	4/20/76	0	0
	8/17/76	2.882	3.62×10^{-3}
	12/6/76	1.5523	1.95×10^{-3}
	4/6/77	4.0213	
	8/30/77	5.8157	5.05×10^{-3}
	12/5/77	2.4588	3.09×10^{-3}
	4/4/78	1.6309	2.05×10^{-3}
	6/22/78	6.0987	7.66×10^{-3}
	7/6/78	6.1933	7.78×10^{-3}

NOTE: All Leakage Less Than 10^{-5} Is Considered To Be Zero.

Table 4.1-1

TYPE C LOCAL LEAK RATE TEST RESULTS

Penetration	Date	LR SCF/Hr.	LR %/Day
Mechanical Penetration	4/23/75	1.8159	2.28×10^{-3}
	1/21/76	1.494×10^{-1}	1.88×10^{-4}
	11/1/77	27.73357	3.48×10^{-2}
	6/27/78	35.197735	4.42×10^{-2}

Table 4.1-2

Rick Rogers 1/2/78

End of ILRT data taking Step

Beginning Rx Building LR Verification Test

DUKE POWER COMPANY
OCONEE NUCLEAR STATION
INTEGRATED [illegible] RATE TEST

07/01/79

0.0 PSIG VERIFICATION TEST

TREND REPORT (FROM INIT CALCU / ABS)

DATA SET	TIME	PRESSURE (PSIA)	TEMPERATURE (F)	ABS LR MEASURED %/DAY	ABS LR CALCULATED %/DAY	95 % CONFIDENCE LIMITS LOWER	UPPER
9	02:40P	44.3313	85.5927	0.06823	*	0.00000	0.00000
10	02:55P	44.3311	85.5971	0.00471	0.00471	*	*
11	03:10P	44.3313	85.6066	-0.04216	-0.02219	-0.33791	0.25359
1 12	03:25P	44.3313	85.5757 ✓	0.15670	0.13335	-0.09060	0.41451
13	03:40P	44.3310	85.6032	-0.13869	-0.31452	-0.53955	0.23217
14	03:55P	44.3310	85.6171	-0.06567	-0.04040	-0.53219	0.20044
15	04:10P	44.3310	85.6347	-0.01235	-0.03392	-0.22667	0.20197
2 16	04:25P	44.3310	85.6516 ✓	0.02652	-0.00345	-0.15584	0.20887
17	04:40P	44.3313	85.6576	-0.03144	-0.01558	-0.19195	0.12905
18	04:55P	44.3313	85.6565	-0.03024	-0.02023	-0.17403	0.11355
19	05:10P	44.3313	85.6594	-0.00105	-0.01409	-0.13507	0.13097
3 20	05:25P	44.3311	85.5452 ✓	-0.02185	-0.01580	-0.14230	0.09659
21	05:40P	44.3313	85.6841	-0.05530	-0.01621	-0.15094	0.05895
22	05:55P	44.3310	85.6932	-0.03962	-0.03027	-0.14720	0.06795
23	06:10P	44.3313	85.7080	-0.01961	-0.02659	-0.12982	0.06160
4 24	06:25P	44.3313	85.7178 ✓	-0.00760	-0.02449	-0.10234	0.08713
25	06:40P	44.3310	85.7119	-0.01325	-0.02258	-0.10135	0.07482
26	06:55P	44.3310	85.6579	-0.06534	-0.03131	-0.15294	0.02226
27	07:10P	44.3310	85.7565	0.02945	-0.02022	-0.05774	0.11065
5 28	07:25P	44.3333	85.7686 ✓	0.04955	-0.00722	-0.04327	0.14237

TABLE 4.2-1

	29	07:40P	44.3300	85.7694	0.01111	-0.00310	-0.07539	0.09762
	30	07:55P	44.3300	85.7988	0.01[illegible]	0.00150	-0.05408	0.10434
	31	08:10P	44.3300	85.8141	0.02706	0.00731	-0.05689	0.11531
6	32	08:25P	44.3300	85.8230 ✓	0.03437	0.01305	-0.04499	0.11372
	33	08:40P	44.3310	85.8280	0.05322	0.02237	-0.01594	0.14238
	34	08:55P	44.3310	85.8330	0.06216	0.03026	-0.01082	0.14113
	35	09:10P	44.3310	85.8544	0.07575	0.03906	-0.00365	0.15456
7	36	09:25P	44.3320	85.8754 ✓	0.07716	0.04694	-0.00147	0.15584
	37	09:40P	44.3320	85.8724	0.04335	0.04943	-0.03517	0.12186
	38	09:55P	44.3320	85.8870	0.05047	0.05247	-0.02107	0.12202
	39	10:10P	44.3330	85.9047	0.05164	0.05534	-0.01961	0.12329
8	40	10:25P	44.3330	85.9230 ✓	0.04930	0.05754	-0.02204	0.12065
	41	10:40P	44.3330	85.9432	0.04091	0.05850	-0.03354	0.11215
	42	10:55P	44.3330	85.9480	0.05475	0.05144	-0.01141	0.13092
	43	11:10P	44.3330	85.9610	0.06418	0.06454	-0.00590	0.13525
9	44	11:25P	44.3330	85.9701 ✓	0.06664	0.05950	0.00333	0.13034
	45	11:40P	44.3340	85.9721	0.06008	0.06953	-0.00330	0.12352
	46	11:55P	44.3340	85.9874	0.06558	0.07201	0.00221	0.12696
	47	12:10A	44.3340	85.9966	0.06605	0.07438	0.00473	0.13136
10	48	12:25A	44.3350	86.0199 ✓	0.07113	0.07681	0.00787	0.13439
	49	12:40A	44.3350	86.0250	0.05737	0.07772	-0.00584	0.12057
	50	12:55A	44.3350	86.0349	0.06707	0.07941	0.00392	0.13023
	51	01:10A	44.3350	86.0329	0.06594	0.08083	0.09283	0.12455
11	52	01:25A	44.3350	86.0641 ✓	0.07569	0.09247	0.02108	0.13031
	53	01:40A	44.3350	86.0727	0.07737	0.09537	0.02283	0.13195
	54	01:55A	44.3350	86.0812	0.07694	0.09711	0.02443	0.13348
	55	02:10A	44.3360	86.0835	0.07348	0.09555	0.01598	0.12798

TABLE 4.2-1

12	56	02:28A	44.3383	86.0959 ✓	0.07649	0.09336	0.02202	0.13096
	57	02:43A	44.3373	86.1036	0.07[illegible]	0.09120	0.01679	0.12757
	58	02:58A	44.3373	86.1142	0.07725	0.09255	0.02284	0.13150
	59	03:10A	44.3370	86.1263	0.07612	0.09386	0.02374	0.13250
13	60	03:28A	44.3373	86.1193 ✓	0.07432	0.09477	0.01990	0.12657
	61	03:43A	44.3393	86.1365	0.06145	0.09465	0.03712	0.11577
	62	03:58A	44.3393	86.1340	0.05500	0.09436	0.03373	0.10930
	63	04:10A	44.3393	86.1712	0.05573	0.09424	0.01142	0.11998
14	64	04:28A	44.3393	86.1785 ✓	0.06682	0.09446	0.01257	0.12137
	65	04:43A	44.3433	86.1903	0.06637	0.09436	0.03314	0.11056
	66	04:58A	44.3403	86.1945	0.06560	0.09445	0.01139	0.11981
	67	05:13A	44.3433	86.2139	0.07027	0.09434	0.01606	0.12440
15	68	05:28A	44.3403	86.2351 ✓	0.07531	0.09391	0.02114	0.12940
	69	05:43A	44.3433	86.2458	0.07716	0.09524	0.02301	0.13131
	70	05:58A	44.3433	86.2580	0.07937	0.09706	0.02524	0.13350
	71	06:13A	44.3400	86.2676	0.08079	0.09791	0.02666	0.13490
16	72	06:28A	44.3433	86.2764 ✓	0.08194	0.09377	0.02785	0.13604
	73	06:40A	44.3433	86.3022	0.08199	0.09451	0.02691	0.13537
	74	06:58A	44.3433	86.3128	0.08258	0.10333	0.02852	0.13654
	75	07:13A	44.3433	86.3237	0.08421	0.10112	0.03016	0.13625
17	76	07:28A	44.3433	86.3241 ✓	0.08436	0.10123	0.03338	0.13639
	77	07:43A	44.3433	86.3443	0.08731	0.10274	0.03303	0.14193
	78	07:58A	44.3433	86.3529	0.07657	0.10313	0.02457	0.13257
	79	08:13A	44.3433	86.3592	0.08026	0.10355	0.02626	0.13425
18	80	08:28A	44.3433	86.3746 ✓	0.08169	0.10401	0.02771	0.13550
	81	08:43A	44.3433	86.3792	0.08167	0.10443	0.02772	0.13555
	82	08:58A	44.3433	86.3841	0.08173	0.10483	0.02779	0.13550

TABLE 4.2-1

	83	09:10A	44.3430	86.3983	0.0[illegible]	0.13332	0.23304	0.13790
	84	09:25A	44.3[illegible]	86.4390 ✓	0.05[illegible]	0.13335	0.03150	0.13940
	85	09:40A	44.3[illegible]	86.3850	0.07592	0.13337	0.02292	0.12983
	86	09:55A	44.3443	86.4183	0.06244	0.13320	0.02854	0.13039
	87	10:10A	44.3410	86.4372	0.05823	0.13333	0.01434	0.12212
20	88	10:25A	44.3410	86.4592 ✓	0.07221	0.10550	0.01634	0.12009
	89	10:40A	44.3410	86.4573	0.07391	0.10534	0.01704	0.12477
	90	10:55A	44.3410	86.4725	0.07330	0.10520	0.01945	0.12713
	91	11:10A	44.3410	86.4894	0.07549	0.10513	0.02215	0.12984
21	92	11:25A	44.3443	86.4994 ✓	0.07198	0.10495	0.01315	0.12592
	93	11:40A	44.3502	86.5186	0.07254	0.10478	0.01871	0.12690
	94	11:55A	44.3500	86.5251	0.07332	0.10451	0.01921	0.12634
	95	12:10P	44.3500	86.5323	0.07364	0.10440	0.01985	0.12744
22	96	12:25P	44.3510	86.5464 ✓	0.07313	0.10431	0.01934	0.12693
	97	12:40P	44.3520	86.5490	0.06642	0.10345	0.01264	0.12021
	98	12:55P	44.3520	86.5334	0.06596	0.10337	0.01215	0.11974
	99	01:10P	44.3520	86.5844	0.07566	0.10335	0.02189	0.12943
23	100	01:25P	44.3530	86.5881 ✓	0.07326	0.10320	0.01952	0.12735
	101	01:40P	44.3530	86.5985	0.07435	0.10310	0.02357	0.12810
	102	01:55P	44.3540	86.5207	0.07538	0.10304	0.02164	0.12913
	103	02:10P	44.3540	86.6263	0.07562	0.10299	0.02184	0.12930
MET ACCEPTANCE → 24	104	02:25P	44.3550	86.6425 ✓	0.07553	0.10243	0.02183	0.12920
	105	02:40P	44.3550	86.6543	0.07665	0.13272 219357	0.02313	0.13357
	106	02:55P	44.3550	86.6787	0.07159	0.13267	0.01783	0.12520
	107	03:10P	44.355[illegible]	86.6756	0.07711	0.13277	0.02340	0.13292
25	108	03:25P	44.3570	86.6593 ✓	0.07646	0.13273	0.02278	0.13017
	109	03:40P	44.3560	86.7076	0.07066	0.13270	0.02295	0.13335

TABLE 4.2-1

DUKE POWER COMPANY
OCONEE NUC[illegible] STATION
INTEGRATED [illegible] RATE TEST

07/02/78

29.5 PSIG VERIFICATION TEST

TREND REPORT (FROM INIT CALCU / ASS)

VERIF[illegible] TEST WITH IMPOSED LEAK OF .176 %/DAY 7/2/78 [illegible]

DATA SET	TIME	PRESSURE (PSIA)	TEMPERATURE (F)	ASS LR MEASURED %/DAY	ASS LR CALCULATED %/DAY	95 % CONFIDENCE LIMITS LOWER	UPPER
10	[illegible]P	44.3620	87.0165	0.01616	*	0.00000	0.00000
11	12:25A	44.3620	87.0256	0.01035	0.01035	*	*
12	12:40A	44.3620	87.0424	0.04670	0.03543	-0.67483	0.78820
13	12:55A	44.3610	87.0492	0.11945	0.15575	-0.19898	0.45798
14	01:10A	44.3610	87.0513	0.10295	0.13252	-0.13331	0.38021
15	01:25A	44.3610	87.0606	0.11300	0.19141	-0.14289	0.36598
16	01:40A	44.3610	87.0677	0.09420	0.15535	-0.23783	0.31819
17	01:55A	44.3590	87.0847	0.13926	0.18552	-0.08568	0.36744
18	02:10A	44.3580	87.0916	0.23990	0.28160	0.04170	0.43023
19	02:25A	44.3560	87.0988	0.22861	0.25923	0.04387	0.40834
20	02:40A	44.3570	87.1053	0.23963	0.23112	0.07414	0.45513
21	02:55A	44.3570	87.1219	0.24249	0.29686	0.06514	0.49183
22	03:10A	44.3570	87.1307	0.23570	0.33582	0.07325	0.39515
23	03:25A	44.3560	87.1439	0.25101	0.31574	0.09511	0.49090
24	03:40A	44.3550	87.1530	0.23118	0.31793	0.07296	0.38940
25	03:55A	44.3560	87.1670	0.21844	0.31530	0.05435	0.38254
26	04:10A	44.3560	87.1727	0.21140	0.31247	0.04502	0.37795
27	04:25A	44.3550	87.1819	0.22082	0.31075	0.05190	0.38955
28	04:40A	44.3540	87.1939	0.20547	0.30525	0.03423	0.37671
29	04:55A	44.3540	87.2057	0.21646	0.30377	0.04594	0.38690

TABLE 4.2-2

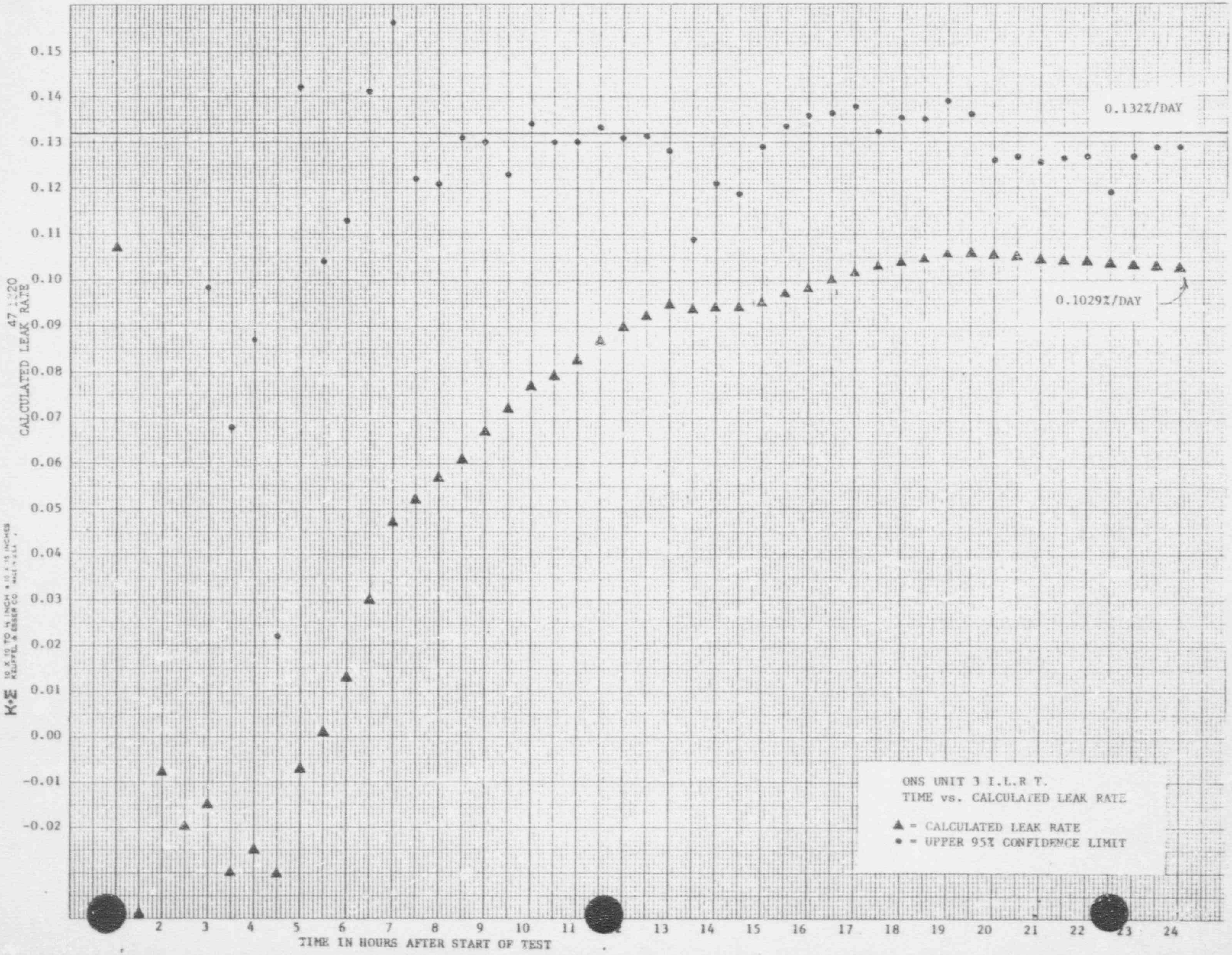
30	05:10A	44.3540	87.2079	0.23799	0.33324	0.03499	0.38130
31	05:25A	44.3530	87.2187	0.21[illegible]	0.29831	0.34469	0.38944
32	05:40A	44.3520	87.2255	0.22231	0.29726	0.35343	0.39421
33	05:55A	44.3510	87.2417	0.23398	0.29794	0.06563	0.40232
34	06:10A	44.3520	87.2486	0.22073	0.29633	0.35281	0.38858
35	06:25A	44.3510	87.2558	0.22549	0.29544	0.35106	0.38990
36	06:40A	44.3510	87.2706	0.22675	0.29455	0.05269	0.39081
37	06:55A	44.3510	87.2831	0.22648	0.29377	0.06[illegible]74	0.39022
38	07:10A	44.3510	87.2874	0.22127	0.29217	0.05782	0.38472
39	07:25A	44.3500	87.2965	0.22649	0.29128	0.06647	0.38651
40	07:40A	44.3500	87.3055	0.22427	0.29313	0.35453	0.38405
41	07:55A	44.3500	87.3231	0.21375	0.28758	0.35421	0.37330
42	08:10A	44.3500	87.3254	0.20850	0.28483	0.34917	0.36783
43	08:25A	44.3500	87.3328	0.20618	0.28185	0.04705	0.36591
44	08:40A	44.3480	87.3453	0.21902	0.28351	0.35333	0.37475
45	08:55A	44.3480	87.3553	0.21605	0.27412	0.35250	0.37351
46	09:10A	44.3480	87.3602	0.[illegible]	0.27739	0.35885	0.36964
47	09:25A	44.3470	87.3702	0.21890	0.27623	0.06700	0.37092
48	09:40A	44.3470	87.3754	0.21568	0.27479	0.06587	0.36750
49	09:55A	44.3460	87.3784	0.21706	0.27355	0.35538	0.36374
50	10:10A	44.3460	87.3868	0.21536	0.27219	0.06381	0.36691
51	10:25A	44.3460	87.3970	0.21449	0.27382	0.05533	0.36259
52	10:40A	44.3450	87.4031	0.21706	0.25974	0.06907	0.36535
53	10:55A	44.3440	87.4178	0.22095	0.25905	0.07306	0.36883
54	11:10A	44.3440	87.4234	0.22017	0.26433	0.37577	0.36456
55	11:25A	44.3440	87.4335	0.21923	0.25753	0.37493	0.36353
56	11:40A	44.3430	87.4445	0.22331	0.26735	0.37903	0.36752

TABLE 4.2-2

57	1135A	44.3430	87.4548	0.22242	0.25553	0.08178	0.36335
58	[illegible]	44.9433	87.4802	0.2[illegible]	0.25593	0.37925	0.38337

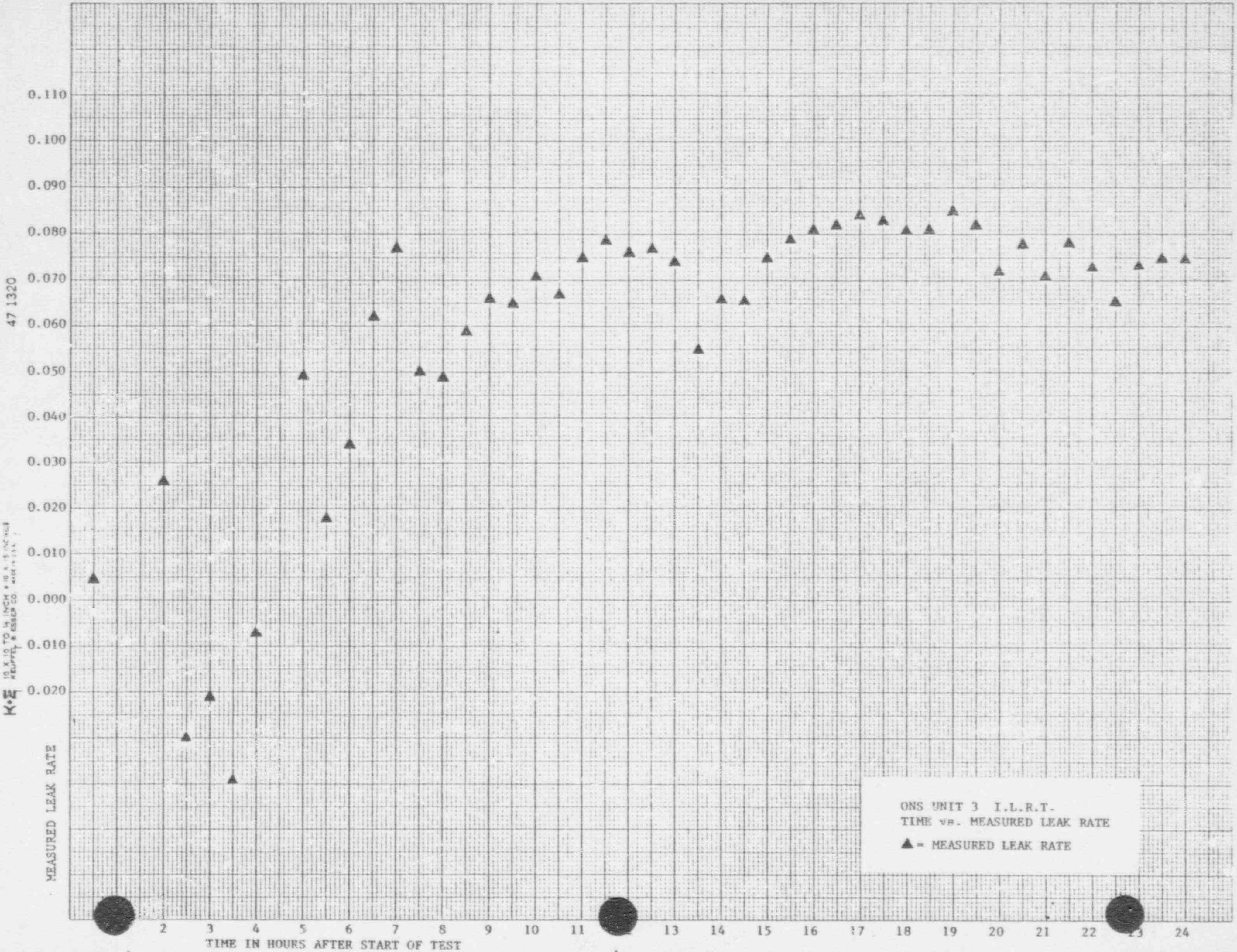
TABLE 4.2-2

Figure 4-2-1



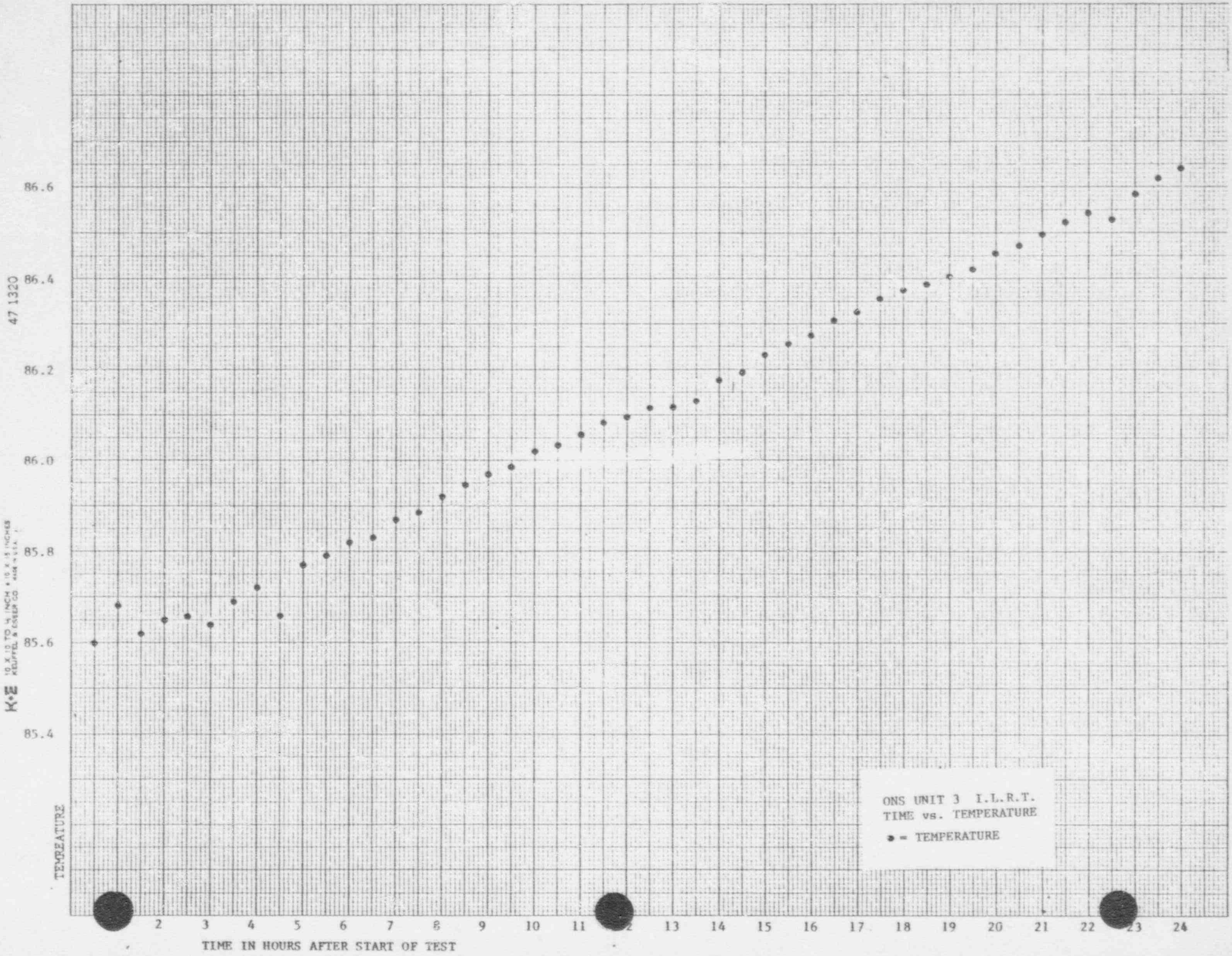
K•E 10 X 10 TO ½ INCH KEUFFEL & ESSER CO. MADE IN U.S.A.
47 1520
CALCULATED LEAK RATE
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
0.132%/DAY
0.1029%/DAY
2
3
4
5
6
7
8
9
10
11
13
14
15
16
17
18
19
20
21
22
23
24
TIME IN HOURS AFTER START OF TEST
ONS UNIT 3 I.L.R T.
TIME vs. CALCULATED LEAK RATE
▲ = CALCULATED LEAK RATE
• = UPPER 95% CONFIDENCE LIMIT

Figure 4-2-2



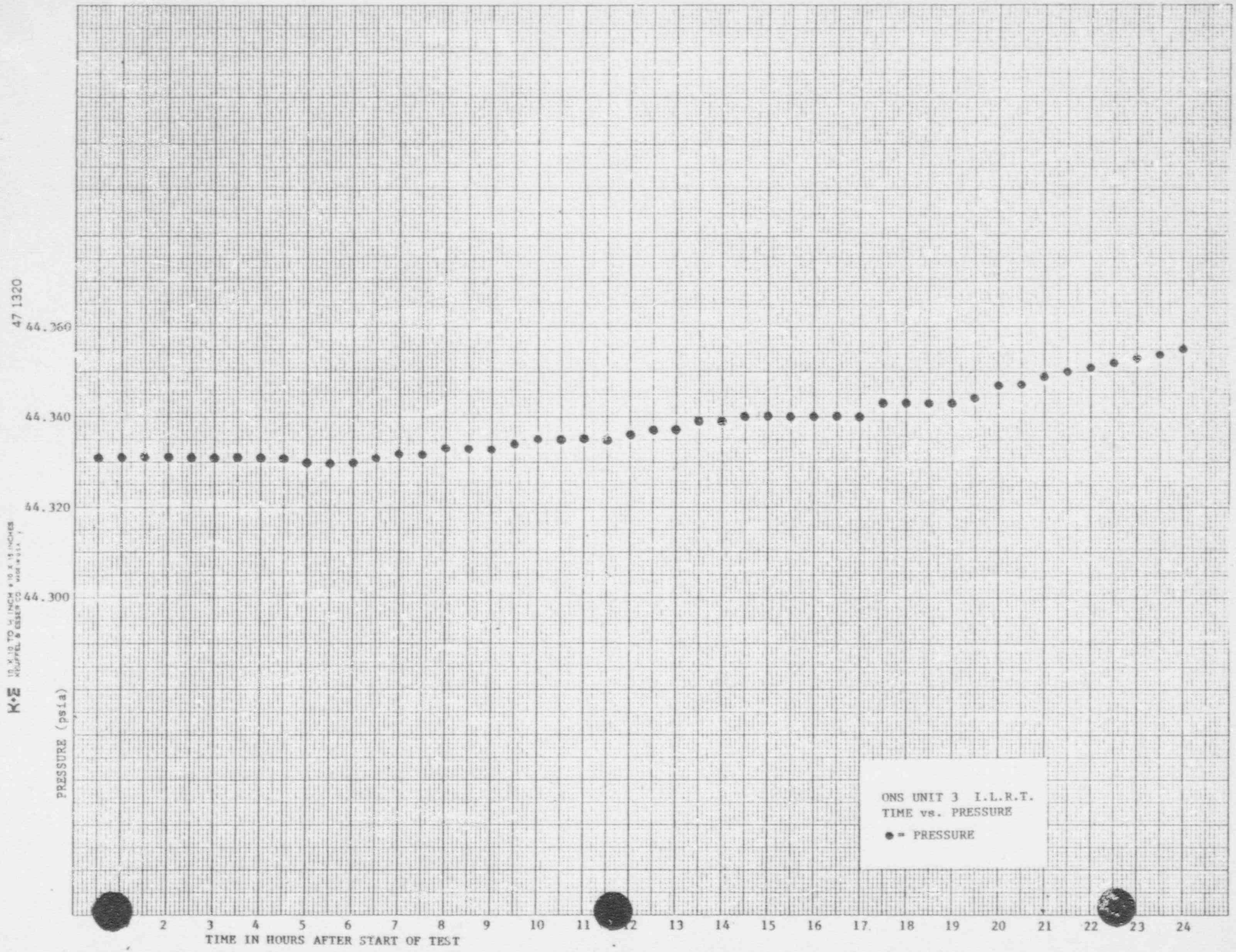
0.110
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
0.010
0.020
MEASURED LEAK RATE
2
3
4
5
6
7
8
9
10
11
13
14
15
16
17
18
19
20
21
22
23
24
TIME IN HOURS AFTER START OF TEST
ONS UNIT 3 I.L.R.T.
TIME vs. MEASURED LEAK RATE
▲ = MEASURED LEAK RATE
47 1320
K+E

Figure 4-2-3



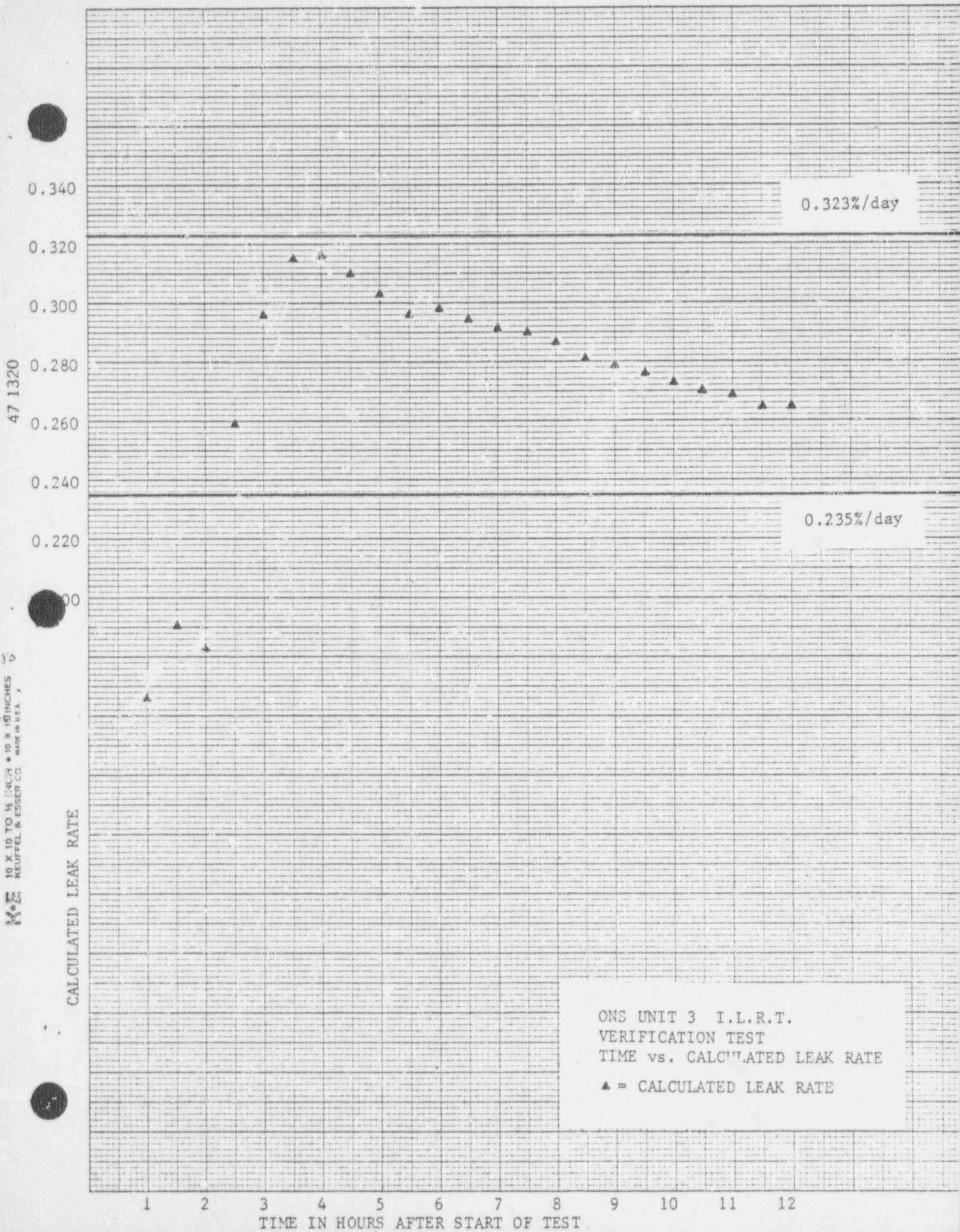
86.6
86.4
86.2
86.0
85.8
85.6
85.4
TEMPERATURE
47 1320
K+E 10 X 10 TO ½ INCH 10 X 15 INCHES
KEUFFEL & ESSER CO.
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME IN HOURS AFTER START OF TEST
ONS UNIT 3 I.L.R.T.
TIME vs. TEMPERATURE
= TEMPERATURE

Figure 4-2-4



47 1320
44.360
44.340
44.320
44.300
PRESSURE (psia)
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
TIME IN HOURS AFTER START OF TEST
ONS UNIT 3 I.L.R.T.
TIME vs. PRESSURE
● = PRESSURE
K+E

Figure 4-2-5



0.340
0.320
0.300
0.280
0.260
0.240
0.220
0.323%/day
0.235%/day
CALCULATED LEAK RATE
1
2
3
4
5
6
7
8
9
10
11
12
TIME IN HOURS AFTER START OF TEST
ONS UNIT 3 I.L.R.T.
VERIFICATION TEST
TIME vs. CALCULATED LEAK RATE
▲ = CALCULATED LEAK RATE
47 1320
10 X 10 TO ½ INCH • 10 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Figure 4-2-6

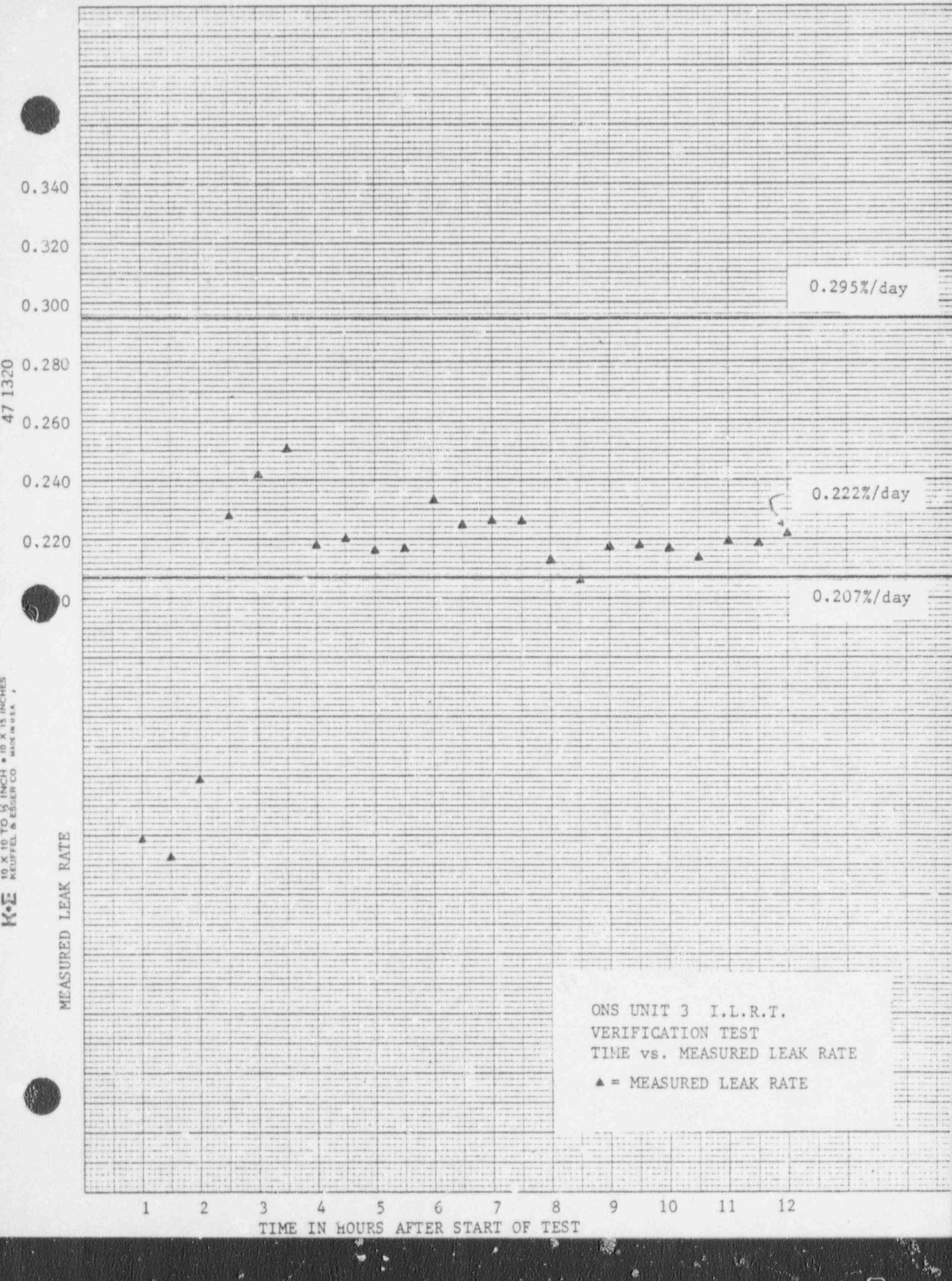
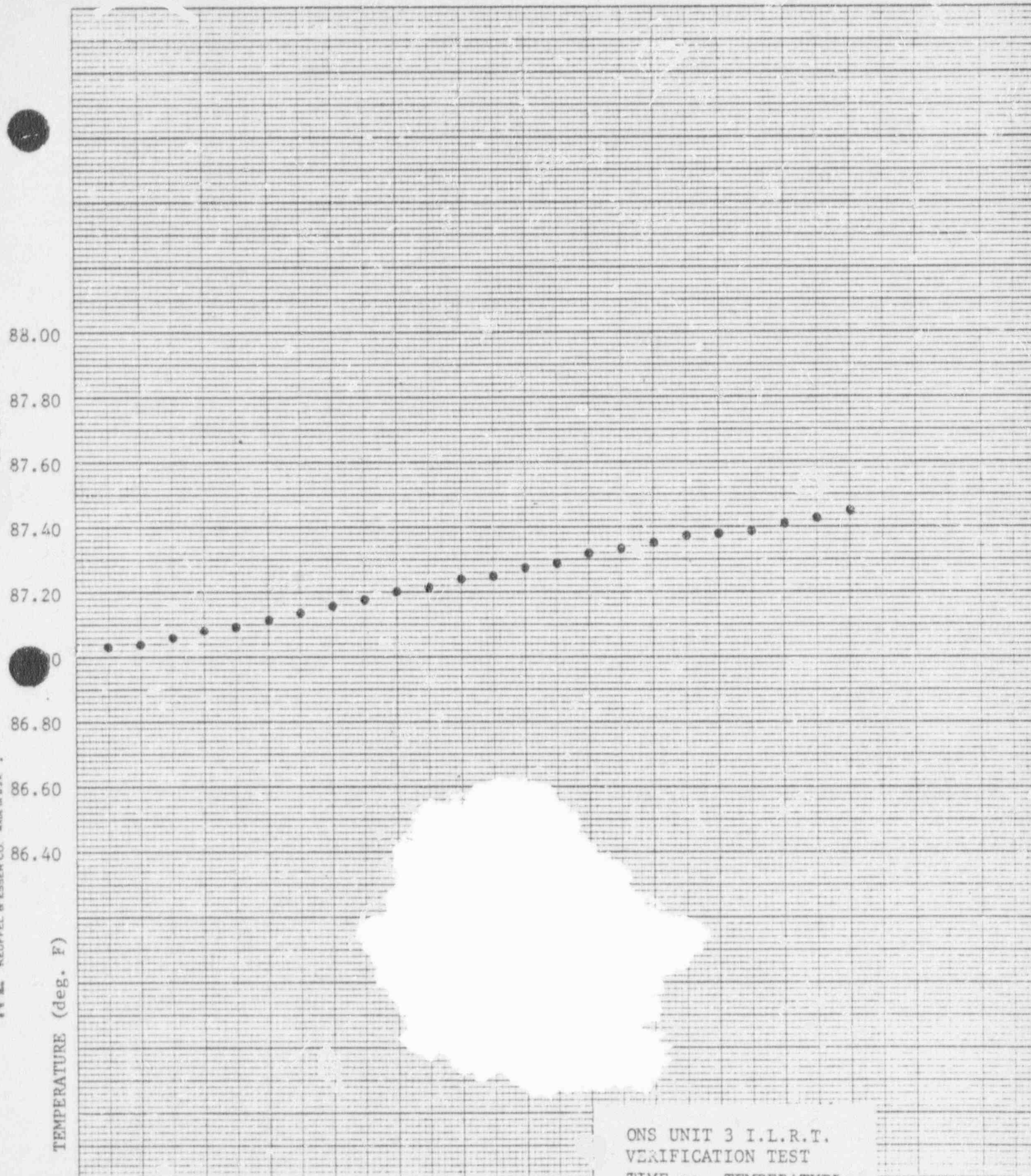
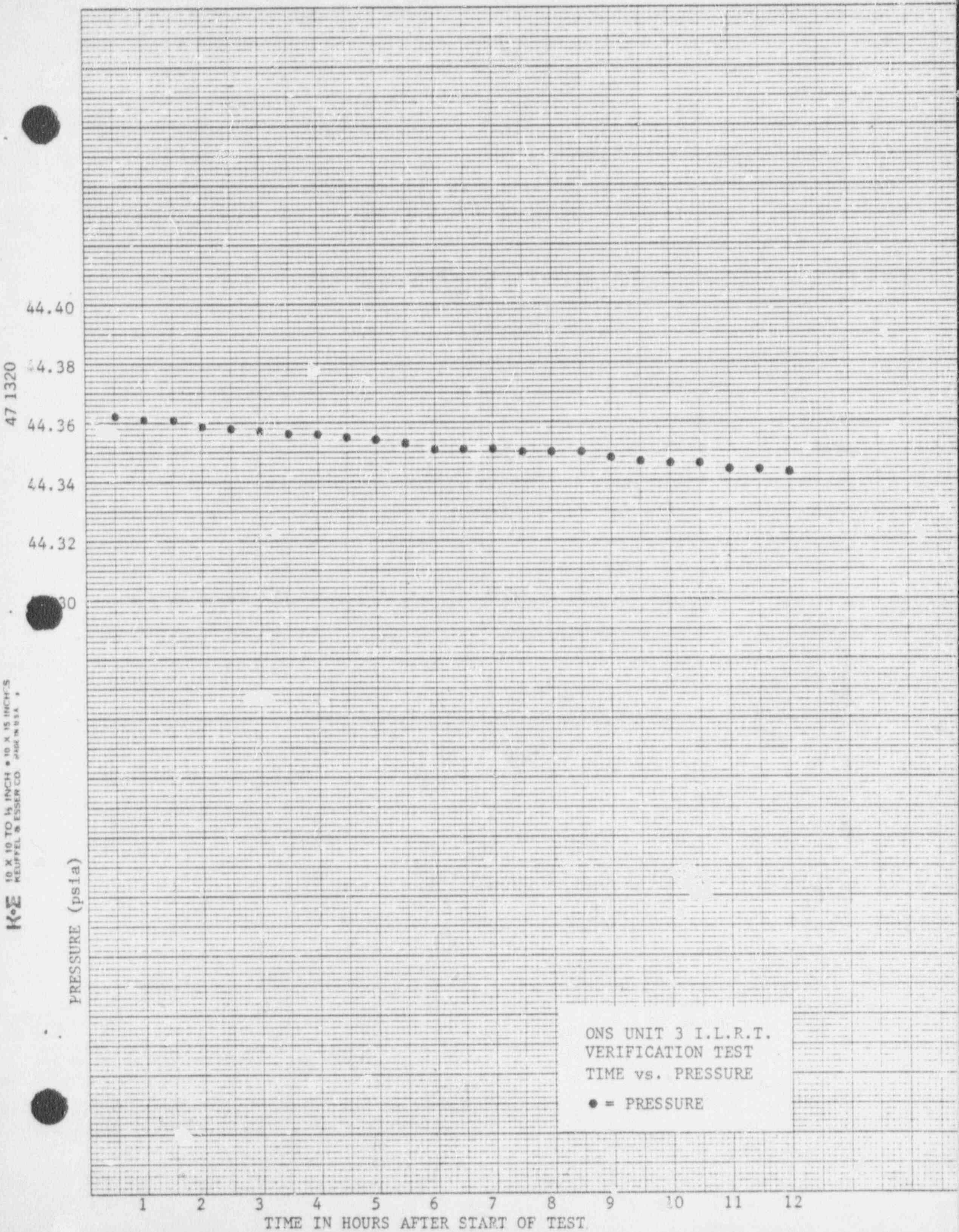

0.340
0.320
0.300
0.280
0.260
0.240
0.220
0.295%/day
0.222%/day
0.207%/day
MEASURED LEAK RATE
1
2
3
4
5
6
7
8
9
10
11
12
TIME IN HOURS AFTER START OF TEST
ONS UNIT 3 I.L.R.T.
VERIFICATION TEST
TIME vs. MEASURED LEAK RATE
▲ = MEASURED LEAK RATE
47 1320
K•E 10 X 10 TO ½ INCH • 10 X 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Figure 4-2-7



88.00
87.80
87.60
87.40
87.20
87.00
86.80
86.60
86.40
TEMPERATURE (deg. F)
1
2
3
4
5
6
7
8
9
10
11
12
TIME IN HOURS AFTER START OF TEST
ONS UNIT 3 I.L.R.T.
VERIFICATION TEST
TIME vs. TEMPERATURE
• = TEMPERATURE
K·E 10 X 10 TO ½ INCH • 10 X 15 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.
47 1320

Figure 4-2-8


44.40
44.38
44.36
44.34
44.32
44.30
47 1320
PRESSURE (psia)
K+E 10 X 10 TO ½ INCH • 10 X 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
ONS UNIT 3 I.L.R.T.
VERIFICATION TEST
TIME vs. PRESSURE
● = PRESSURE
1 2 3 4 5 6 7 8 9 10 11 12
TIME IN HOURS AFTER START OF TEST

5.0 LOCAL LEAK RATE TEST FAILURE DATA

5.1 Introduction

It is required by 10CFR50, Appendix J "Primary Reactor Containment Leakage Testing for Water Cooled Power Reactor" to report failure data on type A, B and C leakage tests. This report contains all failure data on Oconee Unit II since July, 1973.

5.2 Failure Data

ITEM	DATE	REASON FOR FAILURE	CORRECTIVE ACTION
HP-26	4/19/75	Leakage past seat	Lapped seat
HP-68	4/19/75	Packing leak	Replaced packing
CS-5	4/20/75	Leakage past seat	Adjusted stroke
CS-11	4/22/75	Leakage past seat	Cleaned and lubricated
CS-12	4/22/75	Leakage past seat	Cleaned and lubricated
LWD-1	9/21/76	Bad diaphram	Replaced valve
CS-12	9/23/76	Leakage past seat	Lapped seat, installed new disc and disc spring
PR-1	10/5/76	Leakage past seat	Lubricated and adjusted seat
PR-2	10/5/76	Leakage past seat	Lubricated and adjusted seat
HP-26	11/18/77	Leakage past seat	Lapped seat
CC-76	6/25/78	Leakage past seat	Cleaned and lubricated valve
CC-77	6/25/78	Leakage past seat	Cleaned and lubricated valve
CC-78	6/25/78	Leakage past seat	Cleaned and lubricated valve
CC-20	6/25/78	Leakage past seat	Cleaned and lubricated valve
Pers. Hatch	10/19/77	Leak at inner door gasket	Retorqued strongbacks
Pers. Hatch	11/15/74	Inner door leak	Shimmed inner door
Emerg. Pers. Hatch	12/5/77	Outer door leak	Cleaned and lubricated gasket on outer door
Elec. Penet. EC-4	9/21/76	Crack in fill line	Repaired fill line

NOTE:
- HP - High Pressure Injection System
- PR - RB Purge System
- CS - Condensate Storage
- LWD - Liquid Waste Disposal
- CC - Component Cooling