FLORIDA POWER & LIGHT COMPANY
TURKEY POINT NUCLEAR POWER PLANT
UNIT NO. 3

REACTOR CONTAINMENT BUILDING INTEGRATED LEAK RATE TEST

SUMMARY TECHNICAL REPORT

Prepared for:
FLORIDA POWER & LIGHT COMPANY

Prepared by:
William D. Roman
EBASCO SERVICES INCORPORATED
Plant Operations & Betterment Department
February 14, 1976

TABLE OF CONTENTS

I. INTRODUCTION

A periodic Type A integrated leakage rate test was performed on the containment structure of the Florida Power & Light Company, Turkey Point Nuclear Power Plant - Unit No. 3 pressurized water reactor in November and December of 1975 utilizing the "Absolute Method" of testing. This test was performed at the reduced pressure test (P_t) which is defined as not less than 50% of the calculated peak accident pressure.

This report describes and presents the results of this periodic Type A leakage rate test including the supplemental test method utilized for verification.

II. SUMMARY

All Type "B" and "C" tests were satisfactorily performed and repairs and corrections were made where necessary. At the start of the test, all valves were to be in their normal position for accident conditions. Exceptions to this valve lineup were noted during this test and are listed in Appendix B. The measured total-time simple leakage rate was 0.040%/day at 41.89 psia (total containment pressure at start of test). The measured total-time least squares statistical fit leakage rate was 0.058%/day at 41.89 psia.

III. TEST DISCUSSION

A. Description of Containment

The containment structure completely encloses the reactor coolant system and provides adequate biological shielding for both normal and hypothetical accident conditions. The structure is a post-tensioned reinforced concrete cylinder with a shallow dome and is connected to and supported by a reinforced concrete foundation slab. The inside surface of the structure is lined with ¼" thick welded steel plate to insure a high degree of leak tightness.

Principal dimensions of the containment structure are as follows:

Inside diameter	116 feet
Inside height (including dome but excluding reactor cavity)	169 feet
Inside depth of reactor cavity	29 feet 8 inches
Vertical wall thickness	3 feet 9 inches
Dome thickness	3 feet 3 inches
Foundation slab thickness	10 feet 6 inches
Internal free volume	1,550,000 cubic feet

Access to the interior of the containment structure is through a personnel lock located on the west side, at an elevation of 25'-10". An emergency escape lock is located on the east side at elevation 52'-9". A 14'-0" diameter equipment hatch is located on the north side at elevation 30'-6".

The interior of the containment consists of three levels; base floor at elevation 14'-0", mezzanine floor at elevation 30'-6", and operating floor at elevation 58'-0". Two stairways and an elevator have been provided in the containment with landings at elevations 17'-6", 25'10", 58'-10" and 73'-8".

The polar crane can be reached via a stairway to the top of the elevator shaft, and then a ladder to the platform at elevation 113'-10".

A stairway is provided from the personnel access platform to the base floor and from the emergency escape lock to the operating floor. A ladder access is also available from the base floor to the emergency escape platform at 52'-9".

The reactor vessel is located in the reactor cavity at the center of the containment. The three primary coolant loops including the steam generators and the pumps are located in separate compartments around the reactor vessel. The primary shield wall (7'-0" thick and circular in shape) and the secondary shield walls (2'-6" thick) form boundaries of the compartments and also provide radiation shielding. The mezzanine floor is a 2'-6" thick slab and the operating floor is 2'-6" thick slab. On the periphery of the operating floor there is a galvanized steel grating platform which supports the containment normal and emergency coolers and filters and permits air circulation and flow path for water from the containment sprays.

The reactor refueling canal to the east of the reactor cavity is lined with a stainless steel plate. A stainless steel ring seals the reactor cavity during refueling. The canal walls are of reinforced concrete construction and extend from elevation 18'-0" to the operating floor at 58'-0". The canal is illuminated by underwater lights and contains the reactor internals storage stands, refueling tool racks, control rod unlatching tools and fuel transfer tube and mechanism. During refueling, the canal is filled with borated water which provides shielding and cooling for the spent fuel elements. The reactor refueling crane (manipulator crane) spans across the canal and travels longitudinally over rail tracks.

The reactor vessel is supported on its six nozzels, each of which sits on three structural steel beams cantilevering from the primary shield wall into the reactor cavity. The steam generators and pumps are supported on columns and embedded plates and anchor bolts. The supports allow thermal growth but restrain the equipment during earthquakes or pipe rupture.

The polar crane supported on structural steel brackets at elevation 125'-9" with a capacity of 135T/35T services the reactor building during refueling and maintenance operations.

There are eighteen (18) dome trusses which were designed to support the dome liner during construction. These trusses were then lowered and tied to the supporting brackets. They carry the hangers for the containment spray piping.

B. Description of Instrumentation

The containment system was equipped with instrumentation to permit leakage rate determination by the "Absolute Method". Utilizing this method, the actual mass of dry air within the containment is calculated. The leakage rate becomes the time rate of change of this value. The mass of air (Q) is calculated according to the Perfect Gas Law as follows (reference Section 3.1.2 of Appendix B for additional information):

$$Q = \frac{P_a V}{RT}$$

where: P_a = air partial pressure
V = free volume
R = gas constant
T = temperature

The parameters required are temperature, humidity and pressure. The location of the instrumentation is shown in Figures 1 and 2.

1. Temperature Instrumentation

The containment was equipped with 20 precision RTD's plus 2 spares. The accuracy of these detectors is within ± 0.2F. The maximum probable temperature error is equivalent to ± 0.054F.

2. Humidity Instrumentation

The containment was equipped with 6 RHD's plus 2 spares. The accuracy of these detectors is ± 2.5% relative humidity for a 0-100% relative humidity excursion. The maximum probable humidity error is equivalent to ± 0.296%.

3. Pressure Instrumentation

The containment was equipped with 01 precision readout unit plus 01 spare with a calibration accuracy of 0.015% of reading, resolution of 0.001% of full scale and readout of 100,000 counts = full scale. The absolute pressure capsule had a range of 0-49 psi. The maximum probable pressure loop error is equivalent to ± 0.001 psia.

4. Numatron (Digital Voltmeter)

A L&N digital voltmeter (Numatron) was utilized to obtain direct readout humidity data. This instrument has an accuracy of ± 0.01 millivolt which is insignificant.

Consequently, the maximum probable total instrument loop error is equivalent to ± 0.015% per day at a confidence level of 99.87%.

Additional information concerning all the above instrumentation may be found in section 5.1 of Appendix B.

C. Description of Computer Program

Throughout the test, temperatures, humidities and pressure were monitored. These data were used to compute the leak rate from the perfect gas law using either the point-to-point or total-time method. Leak rate predictions and estimates of error were provided by first order linear regression over the test duration of 24 hours. Furthermore,the sensitivity to sensor accuracy was computed to demonstrate that the test had met the minimum allowable leakage rates within statistical error bounds.

All data were manually entered using a Texas Instrument 700 terminal at 15 minute intervals. A weighted average temperature was computed according to the fraction of the total free containment volume each RTD sensed. A weighted average partial pressure was also computed according to the fraction of the total free containment volume each RHD sensed by utilizing "built-in" computer saturation tables. Data were verified by requesting a tabular listing with actual sensor values and other computed values listed in tables or plotted as requested. At 2030 12-2-75, RTD #4 was deleted as a result of this sensor malfunctioning. When this sensor was deleted, the volumetric fraction was updated by the computer and future calculations deleted this sensor. As a result, it was no longer necessary to input a value for this deleted instrument.

Information on the progress of the test was retrieved and listed in tables or graphical form upon request. Raw sensor data and computed variables, such as simple leak rates, average temperatures, vapor pressures, point-to-point, and total-time statistical leak rates were evaluated in these forms. Appendix A contains graphs of major variables, statistical and simple leak rate results, instrument error analysis, tabular listings of both major variables and raw input data, and certain appropriate notes which fully describe the ILRT and CLRT.

It should also be noted that this program has been verified extensively with and against previously performed ILRT's as well as concurrently, during actual test performance, by utilizing a desk calculator. All data have been in exact agreement.

D. Error Analysis

Although maximum instrument loop errors are determined prior to the ILRT to ensure the reliability of the measured data, the effect of instrument inaccuracies is computed following the ILRT and CLRT to reflect actual test conditions. Total instrument error reported is established by the likelihood that additive errors will not exceed 95% confidence limits. Contribution to the reported instrument error is an additive function of the loop errors for temperature, humidity and pressure sensors, and the initial test average variables for the first set of data recorded by either the ILRT or CLRT. In addition, a statistical measure of the goodness of fit of the first order regression is reported as a function of test duration; in particular, this provides regression errors which diminish significantly as the amount of collected data increases.

E. Description of Tests

Interpretation and final analysis of test data show results well within the specified limits for this containment as delineated in section V of this report.

The containment was made ready for the integrated leak rate test with pressurization commencing at 2150 11-28-75 following final inspection and "correction" of relative humidity detector (RHD) problems encountered.

Pressurization was accomplished by utilizing seven (7) mobile oil-free air compressors with a total capacity of 6750 scfm. These units were connected to the containment as shown in Figure 3. Additional information concerning this equipment may be found in section 5.7 of Appendix B. At 0455 11-29-75 at approximately 41.47 psia pressurization was secured with data acquisition commencing at 0515. However, due to malfunctioning RHD's and excessive leakage, the ILRT was aborted at 1845. During the test period, four (4) RHDs had to be deleted with numerous leaks detected and repaired. At 0028 11-30-75, containment blowdown to atmosphere commenced following containment air sampling. This sampling (utilizing a Tracerlab Model MD-12C beta-gamma GM tube and Eberline Model AMS-2 detectors) was continuous during this period. No detectable gaseous or particulate activity was observed. At 1030 the containment was at atmospheric pressure. An inspection team then entered following satisfactory containment atmosphere air sampling.

During the following period, minor leaks were repaired where previously observed or suspected as well as re-verification of the valve line-up. The containment inspection revealed FT-474 on the steam line from "A" steam generator was removed with all associated valves in their open position, steam line high point vent on "C" steam generator was open with an empty packing gland and the level indicator and all associated vents open to containment. These discrepancies were corrected.

Evaluation of the RHD problem indicated that the system was malfunctioning with no repeatability. As a result, a "new" RHD system was obtained from the St. Lucie Nuclear Plant who recently completed a preoperational ILRT. These sensors were then installed in the same location as the previously discussed instruments and the system was functionally tested. Upon achieving satisfactory results, pressurization again commenced at 0923 12-1-75 following containment inspection at 0810. At 1620 at approximately 42.55 psia, pressurization was secured with data acquisition commencing at 1630. Leak survey teams were then instituted with leaks detected and repaired in the ILRT panel sensing lines and associated instrument valves. Time zero was established as 0900 12-2-75 following a 16.5 hour stabilization period. The ILRT was successfully completed at 0900 12-3-75 followed by a 4.5 hour CLRT at an average flow rate of 3.4 scfm. This discharge was also monitored with no detectable gaseous or particulate activity observed. At 1330 the CLRT was satisfactorily completed with blowdown commencing at 1449. Continuous monitoring during blowdown again revealed no detectable gaseous or particulate activities (see Appendix B - Test Log) with atmospheric pressure achieved at 0116 12-4-75. Following satisfactory containment air sampling, an internal inspection was performed from 0149 to 0228 with no discrepancies observed.

Prior to performing the ILRT, a Local Leakage Rate Test (LLRT) was performed by Florida Power & Light personnel to verify containment integrity. Type B and C local leakage rate tests were performed on containment electrical penetrations, mechanical penetrations, piping system isolation valves which become part of the containment boundary under accident conditions, the fuel transfer tube, the personnel access lock, the emergency escape lock, and the equipment hatch. The acceptance criteria for this LLRT is that the total leakage from all local leakage rate tests shall not exceed 60% of the maximum allowable leakage (L_a) at test conditions. The total leakage from these Type B and C tests was within these limits and is presented in Appendix C.

IV. RESULTS AND VERIFICATION

The reduced pressure test (P_t) was conducted for a period of 24 hours starting at 41.89 psia with a total of 97 samples or data sets taken. This test followed a stabilization period of approximately 16.5 hours. The results of a computed total-time least squares statistical fit of all data revealed a leakage rate of 0.058%/day by weight or a total-time simple leakage rate of 0.040%/day by weight. For the purposes of this test, the total-time simple leakage rate shall be utilized due to comparison to the CLRT data which are of much shorter duration. Since the least squares statistical fit of the first order regression is a function of test duration, the regression errors during the CLRT are high. Consequently, for comparison during the verification phase, the total-time simple leakage rate shall be utilized. This leakage rate corresponds to an initial containment air weight of 318,834.2 pounds and a final containment air weight of 318,704.3 pounds or a loss of 129.9 pounds. Maximum probable instrument error for this test contributes ± 0.015%/day.

Following satisfactory completion of the ILRT at P_t, a 4.5 hour verification test or CLRT was performed. This test was conducted by superimposing a known leak of 3.37 scfm at 39.696 psia which corresponds to a leakage rate of 0.123%/day by weight. Consequently, L_{tm} plus the superimposed leak equal 0.163%/day by weight. The measured total-time simple leak was 0.144%/day by weight ($0.027 \times \frac{24 \text{ hrs.}}{4.50 \text{ hrs}} = 0.144$, reference Appendix A, section 2). This corresponds to an initial containment air weight of 318,709.3 pounds and a final containment air weight of 318,624.2 pounds or a loss of 85.1 pounds. Maximum probable instrument error for this test contributes ± 0.015%/day.

V. CONCLUSIONS

The 25.0 psig integrated leakage rate test provided acceptable results as evidenced by the computer printout and graphs in Appendix A of this report. These leakage rates are well within the specified limits. These limits are as follows:

1. The maximum design leakage rate (L_a) shall not exceed 0.25%/day.
2. The maximum allowable reduced pressure leakage rate (L_t) shall be the lesser of:
   1. $L_t = L_a \left(\frac{L_{tm}}{L_{am}}\right)$ or $L_t = L_a \left(\frac{P_t}{P_a}\right)^{1/2}$

      where, L_m = measured leakage rate

      P_t = retest pressure, 25.0 psig

      P_a = peak accident pressure, 50.0 psig
3. The maximum allowable operational leak rate (L_{to}) shall not exceed 0.75 L_t.

Preoperational test have provided the following results:

1. L_{tm}= 0.0667
2. L_{am}= 0.1020

As a result, L_t shall be equal to the lesser of:

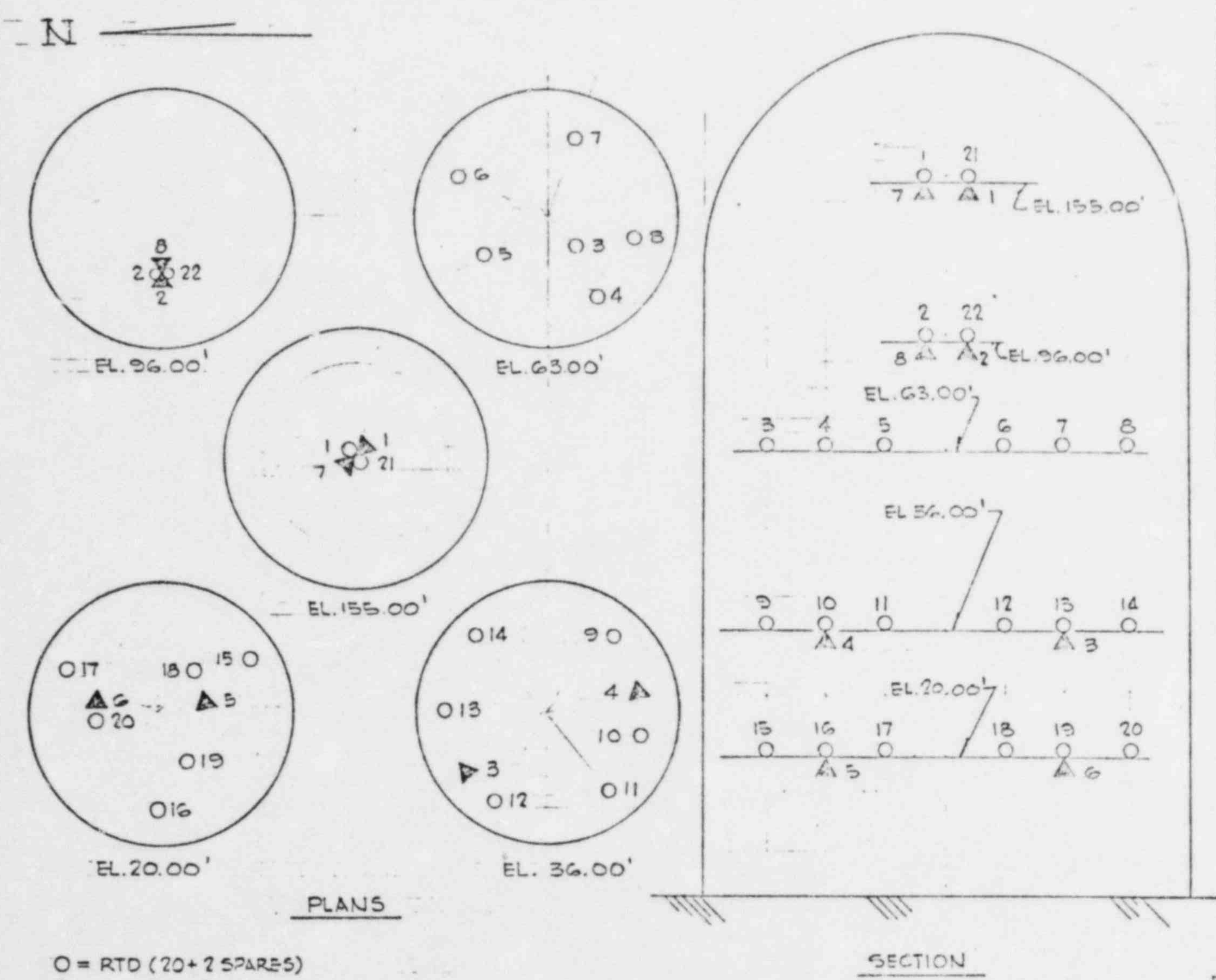
1. $L_t = L_a \left(\frac{L_{tm}}{L_{am}}\right) = 0.25 \left(\frac{0.0667}{0.1020}\right) = 0.1635$
2. $L_t = L_a \left(\frac{P_t}{P_a}\right)1/2 = 0.25 \left(\frac{25.0}{50.0}\right) 1/2 = 0.1768$

In this case, since $\frac{L_{tm}}{L_{am}} = 0.6539$ or <0.70, $L_t = L_a \left(\frac{L_{tm}}{L_{am}}\right) = 0.1635$

As a result, for future periodic testing at the reduced test pressure:

$L_{tm} \leq 0.75\ L_t = 0.75\ (0.1635) = 0.123\%/\text{day}$ by weight.

The verification tests discussed in section IV contain the test results and verify the accuracy of the ILRT measurement system. The close correlation between the ILRT and supplemental test provides sufficient data to validate the ILRT results. The minor differences between these tests and the ILRT results are attributed to rotameter accuracy which is ± 1.0% of full scale or less than the accuracy of the ILRT measurement system.



O = RTD (20 + 2 SPARES)

▲ = RHD (6 + 2 SPARES)

TEMP. INDICATOR	DEW. CELL	LOCATION
RTD-21	RHD-7	TOP OF CRANE
RTD-1	RHD-1	" " " "
RTD-2	RHD-2	TOP OF STM GEN
RTD-22	RHD-8	" " " "
RTD-3		
RTD-4		
RTD-5		
RTD-6		
RTD-7		
RTD-8		
RTD-9		
RTD-10	RHD-4	BY 'C' ACCUM
RTD-11		
RTD-12	RHD-3	BETWEEN 'A' & B ACCUM
RTD-13		
RTD-14		
RTD-15	RHD-5	UNDER 'C' STM GEN.
RTD-16		
RTD-17		
RTD-18		
RTD-19		
RTD-20	RHD-6	UNDER 'A' RCP

NOTE:

RHD-8 SPARE FOR RHD-2
RHD-7 SPARE FOR RHD-1
RTD-21 SPARE FOR RTD-1
RTD-22 SPARE FOR RTD-2

Figure 1

TURKEY POINT PLANT - UNIT #3

REACTOR CONTAINMENT
LOCATIONS OF RTD'S & RHD'S

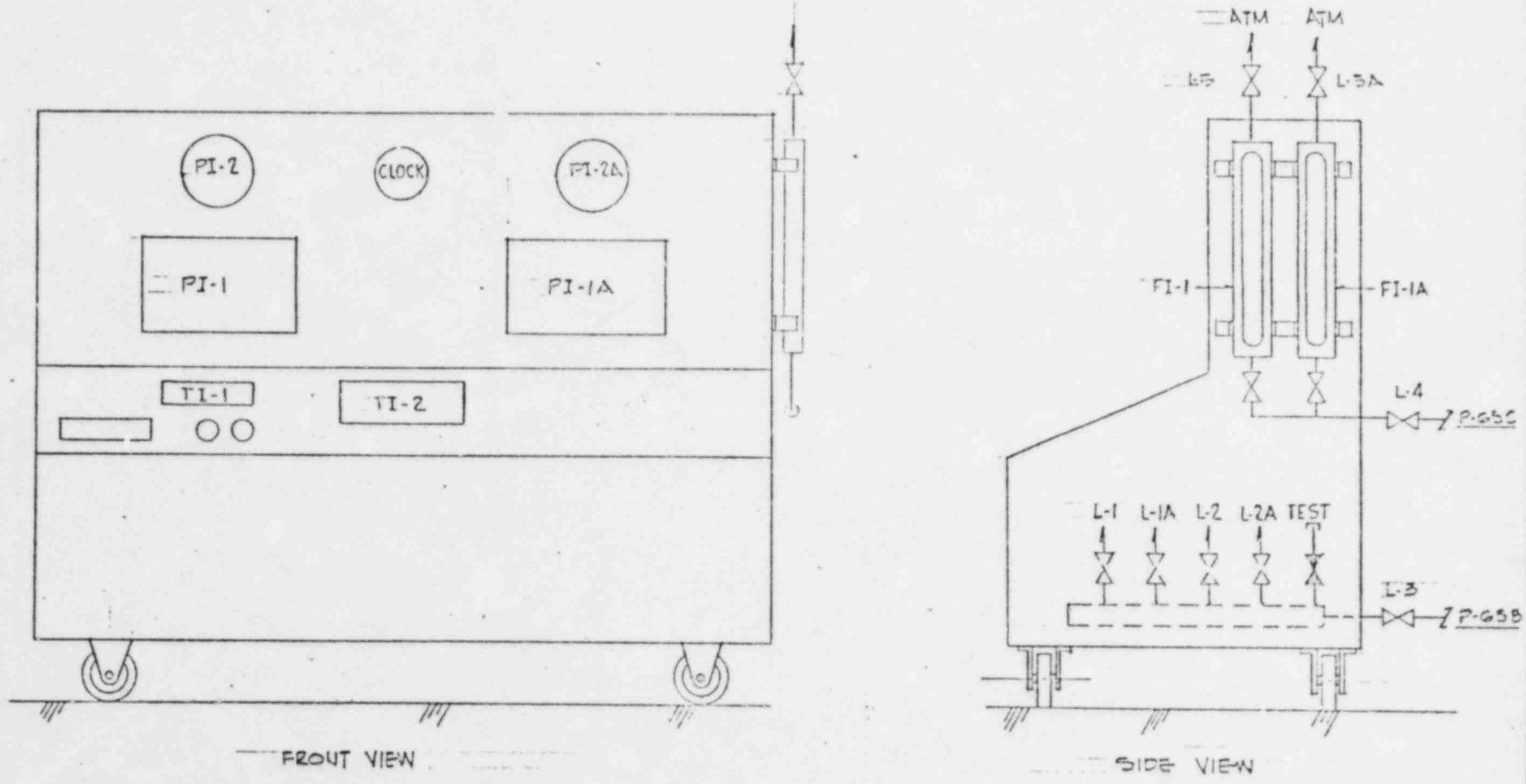


Figure 2

TURKEY POINT PLANT - UNIT #3

ILRT PRESSURE SENSING AND CONTROLLED LEAKAGE TEST PANEL

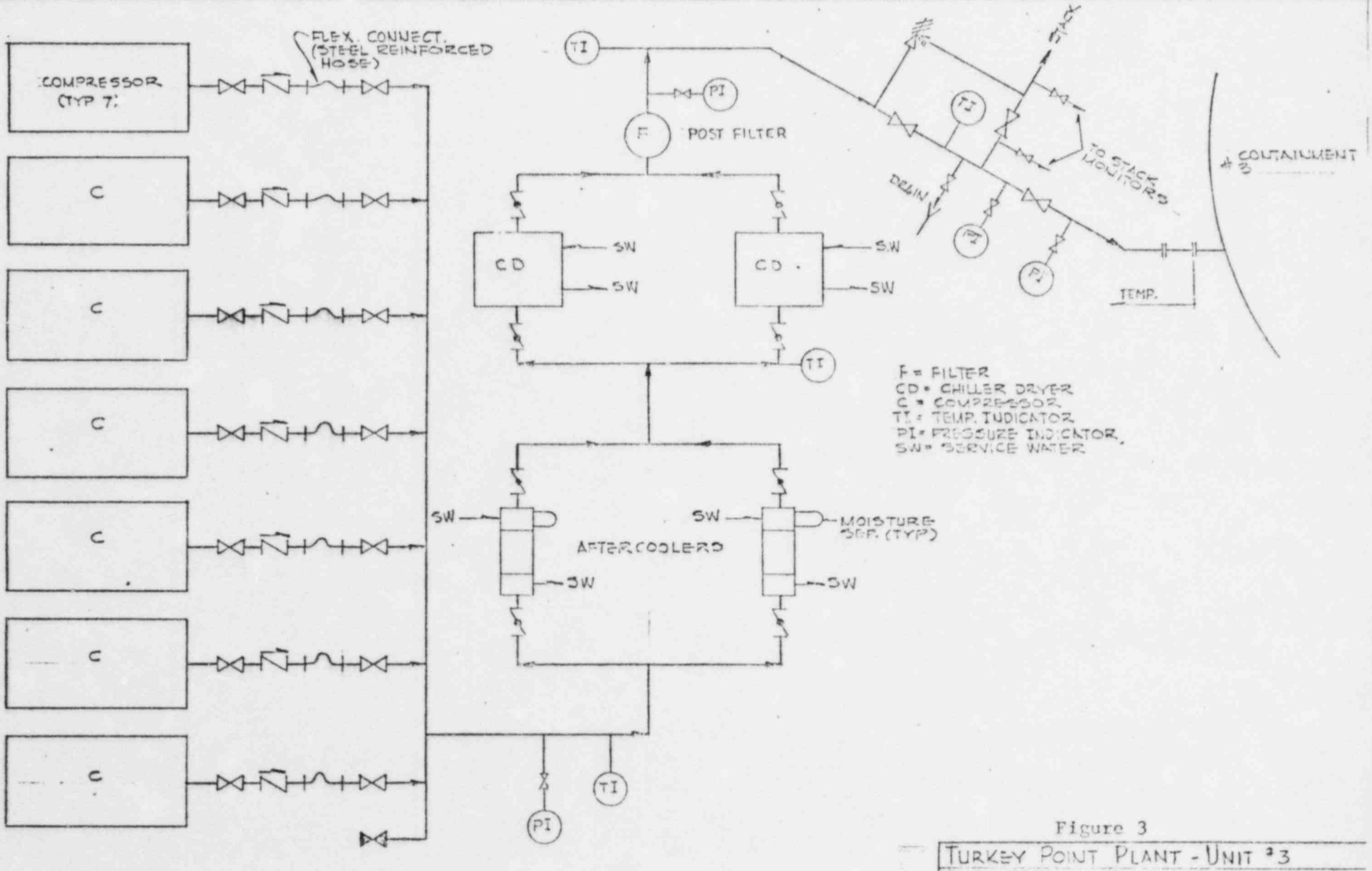


Figure 3

TURKEY POINT PLANT - UNIT #3

ILRT PRESSURIZING AND DEPRESSURIZING STATION

VII. APPENDIX

C-30 Test Procedure

VERMONT YANKEE NUCLEAR POWER CORPORATION
VERMONT YANKEE NUCLEAR POWER STATION

VERNON, VERMONT

PREOPERATIONAL TEST C-30

PRIMARY CONTAINMENT LEAK RATE TEST

PREPARED BY R.E. Sojka/H.H. Fitzroy/D.W. Edwards Vermont Yankee

REVISION NO. 5

DATE 9/15/71

Prior to finalization, this procedure has been reviewed by those representatives of Ebasco, G.E., and Vermont Yankee who have responsibility in design, installation and operation of the equipment.

TEST PROCEDURE RELEASED FOR EXECUTION

E Ulery 9/20/71 9/20/71 Ebasco JTG Member RE GILMAN Chief Plant Operations & Betterment Engineer, Ebasco

R E Spencer RDW 9/20/71 G.E. JTG Member Project Manager Ebasco

B W Riley 9/17/71 9/17/71 VYNPC JTG Member 10/1/71 Plant Superintendent VYNPC

TEST COMPLETED

System satisfactorily operable with reasonable expectation of continued satisfactory operation, subject to completion of exception list items. Reviewed [illegible] 12/3/71

R E Spencer 12/8/71 RDW Site or Operations Manager, G.E.

Carl J Ulery 12-4-71 Senior Plant Operations & Betterment Engineer, Ebasco

Plant Superintendent, Vermont Yankee Nuclear Power Corporation

Page 1 of ____

DCN # 10

DOCUMENT CHANGE NOTICE

Document/Test No. C-30 Rev. 5 Change No. 1

Title Primary Containment Leak Rate Test Date 11/11/71

Change Initiated by D. W. Edwards

Document Change Authorized:

11/10/71 11-10-71 Ebasco JTG Member

General Electric JTG Member

L L Sawyer 11/13/71 11/13/71 Vermont Yankee Nuclear Power Corporation JTG Member

Change:

6.3.6 Remove the requirement to vent the personnel lock during the remainder of the test.

6.3.8 - 6.4.1 Reverse the order of the 24 psig test and the 44 psig test so that the 44 psig test is conducted first. Notes, cautions, pressurization and de-pressurization rates are to remain as specified in the procedure.

DCN # 112

DOCUMENT CHANGE NOTICE

Document/Test No. C-30 Rev. 5 Change No. 2

Title Primary Containment Leak Rate Test Date 11/16/71

Change Initiated by D. W. Edwards

Document Change Authorized:

11-24-71
Ebasco JTG Member

R. E. Spencer 12/1/71
RAW 11/29/71
General Electric JTG Member

B. W. Riley 11/23/71
11/22/71
Vermont Yankee Nuclear Power Corporation
JTG Member

Change:

Attach Addendum #1 and perform testing specified thereon.

Reason: Correct defficiencies encountered during the conduct of C-30.

VY TPIF 007.01
Rev. 2

TEST PROCEDURE SUMMARY EXCEPTION LIST

Title: Primary Containment Leak Rate Test

Test No. C-30 R-5 Date: 11/16/71

Exception	Disposition	Corrected by/Date

3.3.1 Verify zero leakage from inner bellows of type 1 penetrations

Penetration No.	Line	Verified by	Date
X-11	HPCI Steam		
X-12	RHR Supply	Testing not applicable	
X-13A	RHR Return	the inner bellows is	
X-13B	RHR Return	not a containment	
X-16A	Core Spray	pressure boundary	
X-16B	Core Spray	DST	12/3/71

3.3.2 Perform 24 hr. drop test on the spare electrical penetration & attach QC forms.

Penetration	QC Sheet Attached	Verified by	Date
X-101B	[illegible]	[illegible]	[illegible]
X-106	[illegible]	[illegible]	[illegible]
X-107	[illegible]	[illegible]	[illegible]

3.5.8 Calibrate the following instruments and check set points.

* As built designations [illegible] 1/4/71

Instrument	Actual Set Point	Verified by	Date
POS-16-19-31A	Transferred to M.P. # 71-267		
POS-16-19-31B		DWEdwards	[illegible]
FT-1-156-1	[illegible]	[illegible]	[illegible]
*TI-1-156-18	[illegible]	[illegible]	[illegible]
LSH-16-19-26	[illegible]	[illegible]	[illegible]
*TI-1-156-29	[illegible]	[illegible]	[illegible]

Section 6.1 Cycle the valves listed using any convenient remote actuator. Verify proper operation, proper indication, and/or closing time.

Valve No.	Indicating Lights	Closing Time	Verified by	Date
SB-16-19-6B	[illegible]	X	[illegible]	
SB-16-19-9	[illegible]	X	[illegible]	[illegible]
AO-20-82	X	[illegible]	[illegible]	[illegible]
AO-20-83	X	[illegible]	[illegible]	[illegible]
SB-16-19-11A	OK	~1.5 sec	[illegible]	11/16/71
SB-16-19-11B	OK	~1.5 sec	[illegible]	11/?/71
AO-16-19-23	Transferred to M P #71-267		DCE	12/3/71
MS-86A	OK	4.5 sec	DWEdwards	12/3/71

Section 6.2 Measure isolation valve seat leakage in accordance with steps 6.2.1 to 6.2.6 of C-30.

Repeated with more accurate flow meter 12/7/71 by [illegible]

Valve No.	Leakage Rate SCFH	Leakage Rate Lbm/hr	Verified by	Date
MS-86A	5.6	2.52	DCC [illegible]	11/16/71
MS-80B	~~[illegible]~~ 3.5	~~[illegible]~~ 1.04		
MS-86B	~~[illegible]~~ 4.0	~~[illegible]~~ 1.17	DWEdwards	11/22/71
MS-80C	~~[illegible]~~ 3.4	~~[illegible]~~ 1.03		
MS-86D	9.5	2.83	DWEdwards	11/16/71
Personnel Lock	Transferred to MP # 71-2[illegible]		[illegible]	[illegible]
RCIC 15	1.51	0.45	DWEdwards	[illegible]

APPROVAL

All outstanding exceptions have been satisfactorily resolved and the test is considered complete in its entirety.

L L [illegible] 1/4/72 VYNPC JTG Member

RF Spencer 1/11/72 GE JTG Member

TEST PROCEDURE SUMMARY EXCEPTION LIST

Title: Primary Containment Leak Rate Test

Test No. C-30 R-5 Date: 11/16/71

Exception	Disposition	Corrected by/Date
Section 6.2 (Continued)		

Valve No.	SCFH	Lbm/hr	Verified by	Date
RCIC 16	1.5	0.45	DW Edwards	12/2/71
SB 16-19-12A SB 16-19-12B	~~Transferred to MR "71-255~~		~~DW Edwards~~	12/2/71

General. Complete Change-2 Addendum #1 to C-30.

Change #2 Completed DW Edwards 12/12/71
Verified by Date

General. Measure leakage for each main steam isolation valve @ 24 psig

NOTE: This will provide base line data for future measurements of MSIV leakage.

Leakage

Valve No.	SCFH	Lbm/hr	Verified by	Date
MS-80A	2.5	0.49	[illegible]	11/17/71
MS-86A	10.1	2.16	[illegible]	12/6/71
MS-80B	5.6	1.09	DW Edwards	12/6/71
MS-86B	2.5	0.49	DW Edwards	12/7/71
MS-80C	3.5	0.69	DW Edwards	12/6/71
MS-86C	3.7	0.72	DW Edwards	12/6/71
MS-80D	4.5	0.55	DW Edwards	12/6/71
MS-86D	8.0	1.56	DW Edwards	12/6/71

Note: 44 psig retests

MS-80A	3	0.87	MF LaPlante	11/30/71
MS-80D	5.1	1.80	DW Edwards	[illegible]
MS-80A	2.4	0.72	[illegible]	12/17/71

retested 12/17/71

Note: @ 24 psig

RCIC 15	1.0	0.19	DW Edwards	12/2/71
RCIC 16	1.0	0.19	DW Edwards	12/2/71

APPROVAL

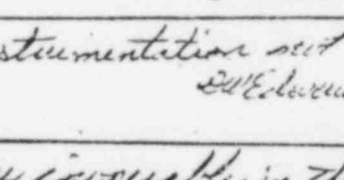
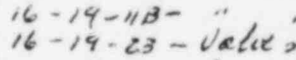
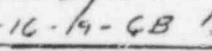
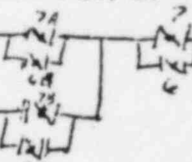
All outstanding exceptions have been satisfactorily resolved and the test is considered complete in its entirety.

1/4/72 VYNPC JTG Member

GE JTG Member

VERMONT YANKEE NUCLEAR POWER CORPORATION
VERMONT YANKEE NUCLEAR POWER STATION

EXCEPTIONS LIST

Test Paragraph	Exception by/date	Exception Corrected by/date
3.3.2	Penetrations X-101B, X-106 & X107 were not tested when the electrical penetrations tests were performed D.W.Edwards 11/10/71	These are spares and have been included in the Class A [illegible] See SEL [illegible]
Table II. line 4.	SB-1-156-23 is not installed. Will require testing when installed D.W.Edwards 11/10/71	See Change #2 (DWE) DWE 11/12/71
3.3.1	Testable penetrations were not individually checked. These will be soap tested when the containment is at 44 psig D.W.Edwards 11/10/71	See Summary Exception List DWE 11/29/71
3.5.1	CRD system is shutdown and valved out D.W.Edwards 11/10/71	Necessary to prevent flow into the vessel DWE 11/10/71 Change [illegible] required
3.5.2 3.6.1(1)(b)	Equipment & Floor Drain Sumps in Drywell were not pumped dry prior to test. Floats were not removed. Pumps were tagged out & breakers opened D.W.Edwards 11/10/71	This deviation did not detract from the intent of the test DWE 11/29/71
3.5.8	Following instruments not calibrated: PCS 16-19 31A & 31B TI-1-156-1 LSH-16-19-26 FT 1-156-1 FI-1-156-2 D.W.Edwards 11/10/71	These instruments were not required for the test DWE 11/12/71
3.6.1(2)	Recirc Pump seal instrumentation not isolated D.W.Edwards 11/10/71	Not necessary per flow sections & press. rating of pressure instr. is 1500 psi DWE 11/12/71
Remarks: 6.1	The following valves are inoperable in the sense of the test: SB 16-19-11A – no control power in Control Room SB 16-19-11B – " " " AO 16-19-23 – Valve not installed Indication inadequate for the following valves: SB-16-19-6B ; SB 16-(19)-9	See Summary Exception List DWE 11/16/71
6.2	The following valves were not tested. SB 6 & 7. Blanks installed as shown:  ED ~~94 & 95~~ 82 & 83 DWE  SS-37 & 40  SB-11 & 12 A&B (Not Headed) SB-1-156-20, 21 & 22  D.W.Edwards 11/10/71	See Change #2 (DWE) 11/12/71 DWE 11/16/71
6.3	MS [illegible] breakers [illegible]	See SEL [illegible]

ADDENDUM NO. 1
TO PREOPERATIONAL
TEST C-30 Rev. 5
PRIMARY CONTAINMENT LEAK RATE TEST

1.0 Purpose:

The purpose of this test is to determine the leakage rate associated with the valves that contribute to the primary containment and were blanked or otherwise isolated during the conduct of C-30.

2.0 Reference:

Refer to C-30 section 2.0.

3.0 Prerequisites:

3.1 Control circuits available for service on valves to be tested (refer to table I for valves).

all except SB-23

Verified by D.W. Edwards Date 12/7/71

4.0 Precautions:

Refer to C-30 Section 4.0

5.0 Special Test Equipment:

Refer to C-30 Section 5.0

6.0 Test Procedure:

6.1 Isolation Valve Seat Leakage Measurements

NOTE 1: Individual boundary valve leakage must be determined in lbm/hr at 44 psig and 24 psig and added to the primary leakage rate determined in C-30 to determine the actual total containment leakage. Table I is organized into groups of valves that must be tested together and specifies the location of blanks, if necessary, to facilitate individual valve testing.

NOTE 2: Perform Steps 6.1.1 to 6.1.7 for each valve to be tested, verify performance on Table I and record leakage.

6.1.1 If necessary, install gasketed blanks on the lines specified in Table I such that the valve to be tested is bounded by absolute seals.

6.1.2 Close the valves to be tested, as specified by Table I using any convenient remote actuater. Tag the valves shut to prevent inadvertant operation.

6.1.3 Drain the isolated volume, depressurize the volume downstream of the valves to be tested, and attach a regulated air supply with a pressure gage and flow meter to the tap provided.

6.1.4 Pressurize the isolated volume to 44 psig (±1 psig) and soap test all mechanical joints to assure leak-tightness.

6.1.5 Maintain the regulated pressure source on the isolated volume for sufficient time to determine the steady state leakage rate by measuring the makeup flow required to maintain 44 psig.

6.1.6 Using Table I record the valve seat leakage rate in SCFH from the flow meter. (Assign seat leakage equally) Convert this value to lbm/hr using the following expression:

$$\frac{\text{lbm}}{\text{ft}^3} = 1.325 \times \frac{Pb}{T}$$

Where: Pb = in Hg Absolute
T = Temp °R

6.1.7 Repeat steps 6.1.5 & 6.1.6 at 24 psig (± 1 Psig).

6.1.8 Depressurize the volume and either re-install blanks as specified by Table I or, if complete, remove all test gear, secure the test connection, and return valves to the pretest conditions.

7.0 Acceptance Criteria:

Refer to C-30 Section 7.0

NOTE: Total measured leakage (L_{pm}) must be [illegible] by the total leakage recorded on Table I (expressed as a percentage of the contained mass (Ca)). Measured leakage (L_{tm}) at 24 psig must be similarly corrected. Finally, a new correlation factor must be calculated based upon the adjusted values of L_{pm} and L_{tm} and all values compared against the criteria stated in Section 2.0.

8.0 Return to Normal:

8.1 Return to normal is conducted as step 6.1.7 of the test procedure.

TABLE I

ISOLATION VALVE SEAT LEAKAGE

ine	Valve(s)	Boundary	Blanks	Steps 6.1.1 - 6.1.8 Completed	44Psig Leakage SCFH	44Psig Leakage lbm/hr	24Psig Leakage SCFH	24Psig Leakage lbm/hr	Verified	Date
urge	SB-6 & 7	SB 6,7, 6A, 6B, 7A, 7B	Inside 6A,7A, 6B & 7B	12/17/71	3.2	0.95	1.7	0.34	D.C. [illegible]	12/17/71
Purge	SB-6A & 7A	same as above	Inside 6B & 7B	12/17/71	0	0	0	0	D.W.Edwards	12/17/71
Purge	SB-6B & 7B	same as above	None	12/17/71	0	0	0	0	D.W.Edwards	12/17/71
Purge	SB-8, 10	SB-8,9, 10	At location of SB-23	SB 8&10 and SB-9 Blanked 12/15/71	0	0	0	0	R.W. Hentschel	12/15/71
Purge	SB-23	SB-8,9, 10,23	~~None~~ None	SB 8,9&10 12/16/71 Transferred to MR#71-269	0	0	0	0	D.W.Edwards D.W. Edwards	12/16/71 12/15/71
F. Drain	FD 82 & 83	FD 82 & 83	None	12/10/71	0	0	0	0	D.C. [illegible]	12/10/71
N2 Supply	SB-20,21 22	SB 20,21 22	None	12/7/71	0	0	0	0	D.C. [illegible]	12/7/71
Rx Sample	SS-39 & 40	SS 39 & 40	None	12/10/71	0	0	0	0	D.C. [illegible]	12/10/71
RCIC Ex-haust	RCIC 50	RCIC-SSC 9 & 50	None	Total leakage from Torus outward 12/17/71	~~1.80~~ .05	0.53 0.028	~~0.62~~	~~0.10~~ 0.02	D.C. [illegible]	12/17/71
RCIC Vacuum Discharge	RCIC 38	RCIC-SSC 10 & 38	None	Total leakage from Torus outward 12/16/71	0.11 ±.0[illegible]	0.03	0.08	0.02	D.W.Edwards	12/16/71
HPCI Ex-haust	HPCI-65	HPCI-65 & SSC-12	None	Total leakage from Torus outward 12/16/71	~~2.8~~	~~0.43~~	~~3.0~~	0.59	D.W.Edwards	12/16/71
HPCI Exhaust Drain	HPCI 56	HPCI-SSC 13 & 56	None	Total leakage from Torus outward 12/16/71	0.05	0.01 ~~0.001~~	0.18	0.03	D.W.Edwards	12/16/71
FW-A	FW-28A	FW 28A & 29A	None	Total leakage outward from vessel side of FW-28A with feed system in normal operating lineup 12/15/71	0.42 ±.0	0.12	0.45	0.09	D.W.Edwards	12/15/71
FW-A	FW-96A	FW 29 & 96A	None							
			Total Leakage:			2.49		1.16		

PRIMARY CONTAINMENT LEAK TEST

C-30

1.0 Purpose - The purpose of this test is two fold: 1) To verify that the degree of leak-tight integrity of the primary containment in its final state prior to reactor operation conforms to plant Technical specification requirements, and 2) Establish leakage standard for future tests.

2.0 References

2.1 Purchase orders

2.1.1 NY-706102 Nuclear steam supply system

2.1.2 NY-706162 Concrete and Steel Shielding Door

2.1.3 NY-706177 Electrical Penetrations

2.1.4 NY-706216 Reactor Seal Well Bellows

2.1.5 NY-706221 Primary Containment Penetrations

2.1.6 NY-706252 Primary Containment Atmosphere Compressor

2.1.7 NY-706271 Primary Containment Leak Monitoring System

2.1.8 NY-706272 Mercury Manometer

2.1.9 NY-706274 Access Door Locks

2.2 Specifications

2.2.1 VYNP-VI-P-1 Containment Electrical Penetrations

2.2.2 5920-S12 Reactor Seal Bellows

2.2.3 VYNP-III-P-12 Containment Penetration Assembly

2.2.4 VYNP-VI-III-C-I-A Containment Atmosphere Compressor

2.2.5 22A1167 Penetrations - Primary Containment

2.2.6 22A1184 Drywell Atmosphere Cooling System

2.2.7 22A1209 Atmosphere Control - Primary Containment

2.2.8 22A1233 Piping Insulation - Primary Containment

2.2.9 22A12[illegible] Reactor Containment

2.2.10 22A1[illegible] [illegible] Containment Penetrations

2.2.11 21A[illegible] [illegible] Suppression Chamber Containment Vessels.

2.2.12 NID-[illegible] Performance Calculations

2.2.13 22A1449 [illegible]

2.3 Diagrams and Drawings

- 2.3.1 Flow and Piping Drawings
  - 2.3.1.1 G-191179, Rev. 2 Nozzle Closure Assemblies
  - 2.3.1.2 5920-41, -45, Rev. 7 Containment Penetrations & Vessels (GE)
  - 2.3.1.3 5920-227, Rev. 4 Drywell Stretchout (CB & I)
  - 2.3.1.4 5920-432, Rev. 4 General Plan (CB &I)
  - 2.3.1.5 5920-419, Rev. 0 Primary Containment Data Sheet (GE)
  - 2.3.1.6 5920-569-71, Rev. 5 Nuclear Boiler Steam Piping (GE)
  - 2.3.1.7 G-191205, Rev. 1 Composite - Primary Containment
  - 2.3.1.8 G-191180-82, Rev. 5 Main Steam & Feed Piping
  - 2.3.1.9 5920-298, Rev. 3 Equipment Door
  - 2.3.1.10 5920-221, Rev. 1 Personnel Lock
  - 2.3.1.11 5920-214, Rev. 2 24" Manhole
  - 2.3.1.12 5920-250, Rev. 4 Suppression Chamber Access Hatch.
  - 2.3.1.13 G-191175, Rev. 4 Flow Diagram Cont. Atm. Control System
- 2.3.2 Electrical and Control Wiring Diagrams
  - 2.3.2.1 B-191301, Sh 1229, Rev. 0 Atm Cont System
  - 2.3.2.2 B-191301, Sh 1236, Rev. 2 Cont. Leak Detectors
  - 2.3.2.3 B-191301, Sh 52, 62, 64, 65, 69, Rev. 0 Control Room Panel Annunciators
  - 2.3.2.4 B-191301, Sh 1226, Rev. 0 Atm. Cont. System
  - 2.3.2.5 B-191301, Sh 600, Rev. 0 Drywell Atm. Oxy Analy
  - 2.3.2.6 B-191301, Sh 834, Rev. 0 Reactor Protection System
  - 2.3.2.7 B-191301, Sh 1028, Rev. 1 Radwaste Instr. - Drywell Drain
  - 2.3.2.8 B-191301, Sh 1000-3, Rev. 2 Drywell Drain Sumps

2.4 Manufacturers' Technical Manuals

- 2.4.1 GEK-27753 Electrical Penetration Seals
- 2.4.2 Atwood & Morrill Instruction Manual - Vacuum Breakers
- 2.4.3 Rockwell Instruction Manual - Steam Isol. Valves
- 2.4.4 C.B. & I Operating and Maint. Instr. - Drywell

2.4.5 C.B. & I Air Locks & Closure

2.4.6 Mercury Manometer Instruction Manual – (Marian Inst.)

2.4.7 Operating Instructions 500 Series Servomanometers

2.5 Other

2.5.1 ORNL-NCIS-26 Testing of Containment Systems used with Light-Water-Cooled Power Reactors

2.5.2 VY FSAR, Vol. I-V Tech. Spec. 4.7

2.5.3 G.E. Mark II TSS Users Guide, Number 807232B

3.0 Prerequisites

3.1 All equipment and piping have been properly installed and the Ebasco instaliation check list signed off.

Verified by D'Aurio Date 10/26/71

3.2 Vermont Yankee visual inspection that the Drywell, suppression chamber, and all associated piping and equipment have been properly installed as required for the implementation of this test.

Verified by LUa Date 11/2/71

3.3 Prerequisite Testing Complete

3.3.1 Class B tests complete in accordance with the attached Quality Compliance Reports for the class B tests and leakage summarized on Table III.

see exception page

Verified by DWEdwards Date 11/8/71

3.3.2 Construction leak rate tests for all containment electrical penetrations have been successfully completed in accordance with references 2.1.1 and 2.4.1 and the Quality Compliance Reports for the Electrical Penetrations are attached. except X-101B, X-106, X-107 } spares corr 11/3/71

Verified by D'Aurio Date 10/26/71 see exception page

3.3.3 Primary Containment Heating & Ventilating fans available and operable.

Verified by D'Aurio Date 10/26/71

3.4 Deficiencies corrected that affect the implementation of this test.

Verified by Date 11/2/71

3.5 Readiness Verification

3.5.1 Systems Operational (All portions located within the primary containment to and including the first leak tested isolation valve outside the primary containment except as noted).

Components/System	Verified by	Date
Personnel Access Lock	[illegible]	11/5/71
Equipment Access Hatch Hardware	[illegible]	11/5/71
Drywell Head Handling Gear	[illegible]	11/5/71
Main Steam System	LCA	10/26/71
Feedwater System see exception page	LCA	10/26/71
RCIC System	LCA	10/26/71
HPCI System	LCA	10/26/71
RHR System see exception page	LCA	10/26/71
Reactor Cleanup System	LCA	10/26/71
Core Spray System see exception page	LCA	10/26/71
Reactor Head Spray	LCA	10/26/71
Drywell Floor Drain sump	LCA	10/26/71
Drywell Equip Drain Sump	LCA	10/26/71
Service Air System	LCA	10/26/71
Instrument Air System	LCA	10/26/71
RBCCW System	LCA	10/26/71
Containment Atm. Control Sys. second	[illegible]	11/2/71 see exception list
C.R.D. Sys. (complete, filled, & normal lineup)	LCA	10/26/71
Reactor Vessel Instrumentation	LCA	10/26/71
Reactor Recric. Instrumentation	LCA	10/26/71
Standby Liquid Control System	LCA	10/26/71
Condensate & Demin Water Sys.	LCA	10/26/71
Neutron Monitoring	LCA	10/26/71
Travelling In-Core Probe Sys.	[illegible]	11/3/71
All Containment Penetrations	[illegible]	11/5/71
All Containment Vacuum Breakers	[illegible]	11/5/71

3.5.2 All drains, sumps and tanks which are to receive or discharge fluids are ready for operation. All drains and sumps mopped dry and all leakoffs shut.

Not Done see exception list

Verified by D.K. Edwards Date 11/2/71

Leakoffs shut [illegible] 11/7/71

3.5.3 Electrical Services Operational

3.5.3.1 4160 V Swgr #3 or #4 for Service Water Pump

3.5.3.2 480 V MCC8D for Travelling screens

3.5.3.3 480 V Swgr #8 or #9 for RBCCW Pumps

3.5.3.4 480 V MCC 8B or 9B for RRU-1 or 3

3.5.3.5 480 V MCC 89 for RRU-2 and RRU-4

3.5.3.6 Temporary Power Supply for Fans of paragraph 3.6.5.

Not an exception
WR was not fully
energizing electrical
lineup to temp.
fans

Verified by [illegible] Date 11/7/71

3.5.4 Control circuits checked and available for service

Verified by [illegible] Date 11/5/71

3.5.10 Ample fire extinguishers available at containment entrances.

Verified by Slia Date 11/5/71

3.5.11 No gas bottles or CO2 extinguishers in the containment during test.

Verified by D. Edwards Date 11/8/71

3.6 Equipment Check

3.6.1 A complete survey shall be made to locate and remove any instrumentation, which could be damaged by external pressure for the conduct of the Class A test:

Item	Verified by	Date
(1) Containment narrow range pressure instrumentation isolated and vented 1-156 3	J J Halvey	11/8/71
(a) All level switches on Recirc Pumps (3/pump) removed (unless FDI 133 is complete)	FDI 133 verified completed by W. Roman 11/8/71	11/8/71
(b) Equipment & Floor Drain Sump Floats removed	Floats not removed	11/8/71
(2) Recric. pump seal instrumentation isolated	Not Necessary	instruments vented at 0-150#
(3) Drywell pressure switches isolated	J J Halvey	11/8/71

3.6.2 Primary Containment Integrity established in accordance with the attached valve lineup sheet. All ECCS Systems in the normal valve lineup condition. see exception list

Verified by D. Edwards Date 11/8/71

3.6.3 The reactor vessel head off or the vessel vented to the drywell and Main Steam lines drained. Drywell inspected for cleanliness and all missile hazards removed (e.g., light bulbs).

Verified by D. Edwards Date 11/8/71

3.6.4 Install new sheaves on two of the blowers in the containment ventilation system. They should be sized for about 1/3 of design speed. The other blowers will be turned off and tagged out. This will allow some forced circulation in the containment without overloading the motors. Make provision for amperage monitoring of the blowers utilized.

Verified by D. Edwards Date 11/8/71

3.6.5 Install two ordinary industrial room circulation fans in the torus. Industry types can be rigged temporarily. These fans should be of the 1 to 1 1/2 HP type, with temporary blading installed that normally would be for a 1/4 to 1/2 HP fan, for the same reason as explained in 3.6.4

NOTE: If temporary blades are not available, a resistance circuit utilizing light bulbs, for example, may be incorporated.

Helan 1/2 [illegible] here temporary fans are on/c used to equivalent of motor protection is satisfied/ [illegible] 11/10/71 See [illegible]

Verified by Llea Date 11/2/71

3.6.6 Map the drywell and suppression chamber dew-points to define the differences between zones.

Verified by B. R. Webber Date 11/4/71

3.6.7 Map the drywell and suppression chamber atmosphere temperatures to define differences between zones. These will be used later to calculate weighted averages. The first operation and calculation will be valuable to establish the techniques to be used during the test.

Verified by B. R. Webber Date 11/4/71

4.0 Precautions

4.1 During the Class A test, no equipment shall be operating within the containment, no heat sources shall be energized, and no hot or cold fluids circulating except as noted in this procedure.

4.2 No major modification or maintenance to the vessels, penetrations, isolation valves, or any other work involving containment integrity except at testable penetrations and seals should be conducted following this test unless the Class A leak-rate test is repeated before nuclear operation is initiated. In the interest of time, the Class A test should not be started until all work likely to affect vessel integrity has been completed.

4.3 The high drywell pressure switch (para 3.6.1(4)) which initiates ECCS must remain defeated throughout the conduct of the Class A test.

4.4 No personnel will be permitted inside the containment after integrity has been established unless the containment atmosphere has been certified safe.

4.5 No leakage repairs by welding, grinding, or chipping will be permitted unless the area in question has been vented and certified for welding by VY Chemistry Department.

4.6 Unless commencement of the Class A test is to begin immediately, at least one large connection between the containment and the reactor building must remain open to prevent the formation of a vacuum in the vessels.

4.7 Whenever containment vessels are pressurized above 22 psig, vessel temperature must be 30°F or greater.

5.0 Special Test Equipment

5.1 ✓ Dial pressure gage, 0-100 psig maximum range, ± .1% accuracy.

5.2✓ Air compressors, minimum total capacity 2100 CFM, and associated equipment. (Specify new filters on air discharge lines and oil free compressors).

5.3✓ Sonic detecter

5.4✓ Coppus blowers (2) or equivalent

6.0 Test Procedure

General - This procedure is intended to verify the integrity of the primary containment through the performance and evaluation of the following:

(1) Isolation valve operability tests - Class C
(2) Isolation Valve seat leakage measurements - Class C
(3) Containment penetration leakage measurements - Class B
(4) Containment Leak Rate Measurements (24-psig) - Class A
(5) Containment Leak rate measurements (44-psig) - Class A

Isolation valve operability tests are performed on lines which penetrate the primary containment and perform a containment function, i.e.,

a. Valves which communicate directly with the outside atmosphere (includes vacuum relief valves).
b. Valves which, in the event of valve leakage or valve malfunction upon isolation signal, may extend the containment boundary beyond that included during the conduct of Class A tests.
c. Valves which, under post-accident containment isolated conditions, are not expected to be maintained continually at system fluid pressures equal to or greater than the containment maximum operating pressure.

Each valve listed in Table I is cycled by remote actuation to demonstrate proper closure of normally open valves (or opening and closing of normally closed valves) Pertinent data such as stroking time, indicating lights, and motor current is recorded for future reference. Where possible, data is transferred from other preoperational test procedures.

Isolation valve seat leakage measurements are performed by local pressurization between isolation valves at the peak accident pressure on lines which penetrate the primary and perform a containment function. Temperature and pressure are recorded and a leakage rate normalized to standard pressure and temperature from the pressure decay data. All field welds between the isolation valves under test are soap tested and the results recorded.

Two containment leakage rate tests (Class A) are performed, one at a retest pressure of 24 psig and the peak accident pressure of 44 psig to obtain measured leak rates. All systems which, under post accident conditions, become an extension of the containment boundary are vented to the containment atmosphere prior to the conduct of each Class A test. Closure of the containment isolation valves is accomplished by the normal mode of actuation and without any preliminary exercising.

The absolute method of leakage rate testing is employed for each of these Class A tests. This method calculates the actual mass of air, in pounds, that is within the containment. Values of this mass of air are determined for each hour the test is in progress and a regression analysis (least square fit) of the data is used to measure the actual leak rate as a function of time.

The station process computer is intended to be used for all data logging and calculations. Sensors are scanned at 60 second intervals and the mass of air calculated at hourly intervals. The calculated values are stored and hourly averages are printed out. Details of this calculation are presented in Appendix A and reference 2.2:12.

Each leak rate test will be verified by metering back into the containment a quantity of air approximately equal to that previously determined to have leaked and calculating the new mass of air within the containment. The test is verified when the difference in the mass of air after the charge and before the charge is equal to the metered charge value. With the computer functioning, this verification can be completed in less than one hour.

6.1 Cycle each valve listed in Table I through one complete opening and closing stroke using any convenient remote actuator. Verify proper operation on Table I. The sequence of operability tests for the valves listed in Table I is not significant; however, the valve seat leakage measurements of Section 6.2 cannot be performed until section 6.1 has been completed for the valves in question.

Note - Where possible transfer data from other preoperational test procedures. see exception list

Verified by D.W. Edwards Date 11/8/71

6.2 Isolation Valve Seat Leakage Measurements

6.2.1 Stroke close each pair of isolation valves listed in Table II using any convenient remote actuator. Tag, deenergize, or otherwise deactivate valve operators to prevent inadvertent operation.

6.2.2 Drain the volume between the isolation valves, depressurize the volumes outside the valves to be tested, and attach a regulated nitrogen or instrument air supply with pressure gage, flow meter, and suitable relief valve to the test tap provided.

6.2.3 Pressurize the volume between the valves to 44 psig and soap test all field welds and mechanical joints.

6.2.4 Maintain the regulated pressure source on the volume between the isolation valves for sufficient time to determine the steady state leakage rate by measuring the makeup flow required to maintain 44 psig.

6.2.5 Using Table II, record the valve seat leakage rate in SCFM from the flow meter. Convert this valve to LB /Hr using the following expression:

~~LB /Hr = SCFM x 13.36~~ $\frac{\text{lbm}}{\text{Sft}^3} = 1.325 \times \frac{P_h}{T}$

where: Ph = in Hg Absolute
T = temp °R

6.2.6 Depressurize the volume between the isolation valves, remove all test gear, secure the test connection, and return valves to pretest conditions.

see exception list

Verified by D.W. Edwards Date 11/8/71

6.3 Containment Leak Rate Measurement (24 psig)

6.3.1 Establish primary containment integrity in accordance with 3.6.2. After conducting a final inspection of the interior of the containment area to insure all prerequisites and precautions of this procedure have been observed. All isolation valves are to be operated by the normal means provided.

NOTE: Leave open one large connection to prevent the formation of a vacuum in the vessels.

Verified by DWEdwards Date 11/8/71

6.3.2 Record the following water contents:

Reactor Vessel Level 325 in.

Suppression Chamber Level 1.~~6~~ 59 ft

6.3.3 Secure the remaining connection to the containment and immediately commence pumping air into the vessels. Pressurize the containment vessels to 5 psig.

Verified by ________ Date 11/8/71

NOTE: If any leakage is noted the first check should be made by applying a soap film to all double gasketed manholes and access hatches listed in Table [illegible] including inner and outer doors and associated penetrations of the personnel access hatch, and instrumentation provided for this test.

NOTE: Enter the personnel access hatch in accordance with reference 2.4.4 after inspection of outer door and penetrations is complete.

6.3.4 Apply a soap film to all field welds listed in the attached Quality Compliance Report forms for the Class A test. These welds have been completed since the construction leak test was conducted. see 3/16/71

Verified by ________ Date 11/10/71

6.3.5 Should a leak be noted during the soap test at 5 psig or at any time before the final pressure of 24 psig is reached the following procedure shall be observed:

(1) Complete the soap test of all double gasketed seals at the existing containment pressure.

(2) Vent the containment vessel pressure to atmosphere.

NOTE: Immediately after pressure has been released, open a large enough connection to prevent the formation of a vacuum in the vessels.

(3) Before performing any work that might cause a spark or admitting personnel into the containment vessels verify the contained atmosphere to be free of toxic and [illegible]

(4) Repair and inspect the defect in accordance with approved procedures.

(5) Continue the leakage test, beginning with paragraph 6.3.1.

6.3.6 Insure that the personnel access lock remains vented to the outside atmosphere for the remainder of these tests. The leakage test of this lock has been previously performed in paragraph 3.3.1

See exception page CWE 11/12/71

Verified by ______________ Date ________

6.3.7 Start each of the four fans provided in paragraph 3.6.4 and 3.6.5, if not already in service.

Verified by C.W. Edwards Date 11/11/71

Depress rate 5.1 psi/hr CWE 11/13/71 (Based on data from depress)

6.3.8 Increase the containment vessel pressure in 10 psi increments until the final test pressure of 24 psig is reached. At each increment perform a rapid visual inspection for leaks. These inspections should be coordinated with the rate of pressure rise such that the air compressors may run continuously until the final test pressure is reached or a leak is noted.

Note: This step was achieved by depressurization (see DCN)

<u>Warning</u> - Before pressurizing the containment vessels above 22 psig, the vessel temperature must be 30°F or greater.

Verified by V. Fitz[illegible] Date 11/12/71

6.3.9 Upon achieving the test pressure of 24(+0.5, -0) psig, begin a final soap test of all field welds.

Note this was not the final soap test. A soap test was also conducted at 41 psig and these are the test documented on the QC sheet attached CWE 11/12/71

Verified by * CWE 11/12/71 Date 11/10/71

6.3.10 Isolate and depressurize the air supply line to the containment vessels when the test supervisor is satisfied that internal temperatures have stabilized. Begin recording pressure, temperature, and humidity data on an hourly basis.

See exception Page CWE 11/12/71

Verified by ______________ Date ________

6.3.11 Maintain a continuous hourly plot of the following data until at least 24 consecutive hourly values are obtained:

Not on computer printout
- (1) Reactor building temperature - °F.
- (2) Atmospheric pressure - inches of mercury, absolute
- (3) ✓ Containment absolute pressure - inches of mercury absolute
- (4) ✓ Containment average internal air temperature -°F.
- (5) ✓ Drywell & Torus air partial pressure - inches of mercury absolute
- (6) ✓ Mass of the contained air

See exception page CWE

Verified by ______________ Date ________

6.3.12 A minimum of 24 consecutive hourly values will be least square fitted determine the containment leakage rate.

Verified by H. Fitz[illegible] Date [illegible]

6.3.13 Establish the validity of the leakage measurements at the end of the test period by introducing a metered quantity of makeup air to the containment.

Verified by W. [illegible] Date [illegible]

6.4 Containment Leak Rate Measurement (44 psig)

6.4.1 Increase the pressure in the containment vessels to 44 psig in the manner specified in step 6.3.8. Repeat paragraphs 6.3.9 through 6.3.13 at the 44 psig pressure.

Verified by DW Edwards Date 11/12/71

6.3.9 [illegible] 11/11/71
6.3.10 See attention page 11/12/71
6.3.11 DW Edwards 11/12/71
6.3.12 E.C. [illegible] 11/12/71
6.3.13 E.C. [illegible] 11/12/71

6.4.2 Vent the containment and reduce pressure to atmospheric at a rate not to exceed 4 to 6 lbs/hr. Immediately after pressure has been released, open a large enough connection to prevent the formation of a vacuum within the vessels. Sample the containment air prior to personnel entry.

Verified by [illegible] Date 11-14-71

7.0 Acceptance Criteria

7.1 Class A Tests

7.1.1 The measured leakage rate at the peak accident pressure of 44 psig and ambient temperature (L_{pm}) shall not exceed 0.80 weight percent of the contained air per 24 hours. OK 11/17/71

7.1.2 The measured leakage rate at ~50 percent of the peak accident pressure (24 psig) and ambient temperature (L_{tm}) shall be determined. The leakage characteristics yielded by measurements L_{pm} and L_{tm} shall establish the maximum allowable test leakage rate L_t for periodic tests as the lesser of $L_a\frac{(L_{tm})}{(L_{pm})}$ or $L_a\frac{(P_t)^{1/2}}{(P_p)^{1/2}}=0.59$

7.2 Class B and C Tests

OK 11/17/71

7.2.1 The sum of the leakage from all penetrations (type B & C) shall not exceed L_p.

8.0 Return to Normal

Not Necessary 12/6/71 · Not Necessary 12/6/71

8.1 Replace Recirc Pump oil level switch instrumentation, pump seal instrumentation, sump instrumentation, and de-isolate drywell instrumentation.

Not necessary [illegible]

Verified by [illegible] Date [illegible]/71

8.2 Position valves listed in Appendix A as required by operational needs. Unblock all Drywell/Torus Vacuum Reliefs. R.E. [illegible] 11/17/71

Verified by [illegible] Date 11-18-71

8.3 Drywell RRU blowers restored to normal; temporary fans removed. N/A 12/6/71

Verified by DW Edwards Date 12/6/71

APPENDIX A

Automatic data acquisition and reduction is performed by the plant computer. The computer program is based upon the absolute method in which the actual mass of air in the containment is calculated by applying the perfect gas laws to temperature and pressure measurements.

The computer reads 19 containment temperatures and calculates a volume weighted average air temperature. From the Exactel servomanometer, it reads the containment absolute pressure and corrects this to partial pressure of dry air by subtracting the partial pressure due to water vapor as determined from 4 dew point temperature readings. From this data, a constant value for containment free volume, and the universal gas constant it calculates the mass of dry air in the containment.

A printer provides an average of input data at 10 minute intervals. This output represents an average of all one minute values in that interval. Calculations are made hourly of the contained mass of air and these results are provided on an hourly basis. The computer calculation is summarized below. Refer to Appendix A, Figures I and II for sample point locations.

Calculation	Units	Description
Weight of Contained Atmosphere	MLBS	CA = DA + TA DA = Weight of Drywell Atmosphere [MLBS] TA - Weight of Torus Atmosphere [MLBS]
Weight of Drywell Atmosphere	MLBS	DA $= \dfrac{K_{51}\ (0.491 \times \text{HAM006} - \text{DEWPSI})}{\text{DWAT} + 459.6°}$ $K_{51} = \dfrac{(1.34 \times 10^5)[ft^3](1.44 \times 10^2)[in^2/ft^3]}{(5.334 \times 10^1)\left[\dfrac{Ft\ lbs}{Lbm\ °R}\right](10^6)} = .362$ [MLBS/PSIA/°R] HAM006 = Hourly average drywell absolute pressure [In Hg] DWAT = Hourly average drywell temperature [°F] DEWPSI = Vapor pressure of drywell atmosphers [PSIA] 0.491 converts In Hg to lbs. 459.6° converts °F to °R
Drywell Absolute Pressure	In Hg	HAM006 Pressure detector is scanned each 15 seconds and a 10 minute average of these 15 sec. scans is calculated. The six 10 minute averages are averaged each hour.

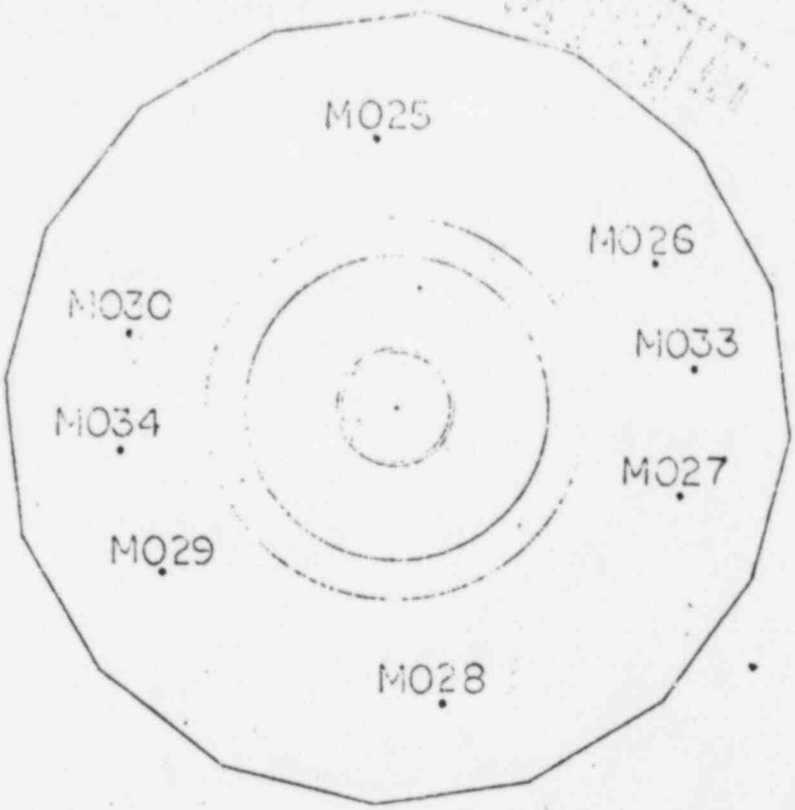
Calculation	Units	Description
Vapor Pressure of Drywell Atmosphere	PSIA	DEWPSI is calculated as a function of drywell dew point temperature in a subroutine called VPDEW, which is a conversion of water vapor dew point (DDPT) to equivalent vapor pressure. DDPT = (M031)(K_{46}) + (M032)(K_{47}) (See Figure I) M031 = Drywell dew point #1 [°F] M032 = Drywell dew point #2 [°F] K_{46} = Dew point weighting factor (0.5) K_{47} = Dew point weighting factor (0.5)
Average Drywell Atmospheric Temperature	°F	$DWAT = \frac{A(K_A) + B(K_B) + C(K_C) + D(K_D)}{2.0} + \frac{F(K_F)}{5.0}$ K_A = .2784 K_B = .1467 K_C = .1467 K_D = .2433 K_F = .1849 Weighting factors to weight temperature readings from the elements by the volume of air at the elevation of the detector. A = M012 + M013 B = M014 + M015 C = M016 + M017 D = M018 + M019 F = M020 + M021 + M022 + M023 + M024 Drywell temperature sensors (See Figures I & II)
Weight of Torus Atmosphere	MLBS	$TA = K_{52} \frac{(0.491 \times HATAP - DEWPSI)}{ATAT + 459.6°}$ Vol $K_{52} = \frac{(1.75 \times 10^5)[ft^3] - 1.44 \times 10^2)[in^2/ft^3]}{5.335 \times 10^1 [\frac{ft\ lbs}{lbm\ °R}](10^6)} = .473$ [MLBS/PSIA/°R] HATAP = Hourly average Torus absolute pressure [In Hg] ATAT = Hourly average Torus Temperature [°F] DEWPSI = Vapor pressure of torus atmosphers [PSIA] 0.491 converts In Hg to lbs 459.6 converts °F to °R
Torus Absolute Pressure	In Hg	HATAP = M006 + M007 M006 - Drywell Absolute pressure [In Hg] M007 - Drywell/Torus Differential Pressure [In Hg] Average obtained in same manner as HM006

Calculation	Units	Description
Average Torus Atmospheric Temperature	°F	$ATAT = \frac{(M025+M026+M027+M028+M029+M030)}{6.0}$ M025 M026 M027 Torus Temperature monitors M028 M029 M030
Vapor Pressure Of Torus Atmosphere	PSIA	DEWPSI is similar to DEWPSI for the drywell (See pg. 15) except that torus dew point TDPT is used. $TDPT = (M033)(K_{48}) + (M034)(K_{49})$ M033 - Torus dew point #1, °F M034 - Torus dew point #2, °F K_{48} = dewpoint vol. weighting factor (0.5) K_{49} = dewpoint vol. weighting factor (0.5)
Torus Volume	Ft^3	$Vol = (K_{60} - \frac{TLV}{K_{28}})/K_{60}$ K_{60} = Total Torus Volume (174) K_{28} converts gals. to cubic feet (7.4802) TLV = Torus Liquid Volume (KGAL)
Torus Liquid Volume	GAL	TLV = 1) Liquid Level below centerline of torus = $\left(RAD)(180-2\ SIN^{-1}\frac{L}{R}) - SIN(180 - 2SIN^{-1}\frac{L}{R}\right) \times K_{60} \times K_{28}$ 2) Liquid level above centerline of torus = $\frac{(1-RAD(180-2\sin^{-1}L/R)-SIN(180-2\sin^{-1}L/R)}{2\pi} \times K_{60} \times K_{28}$ 3) Liquid level equals centerline TLV=1/2K xK L = distance from liquid level to torus ℄ [Ft] R = radius of torus [Ft] [illegible] defined above.

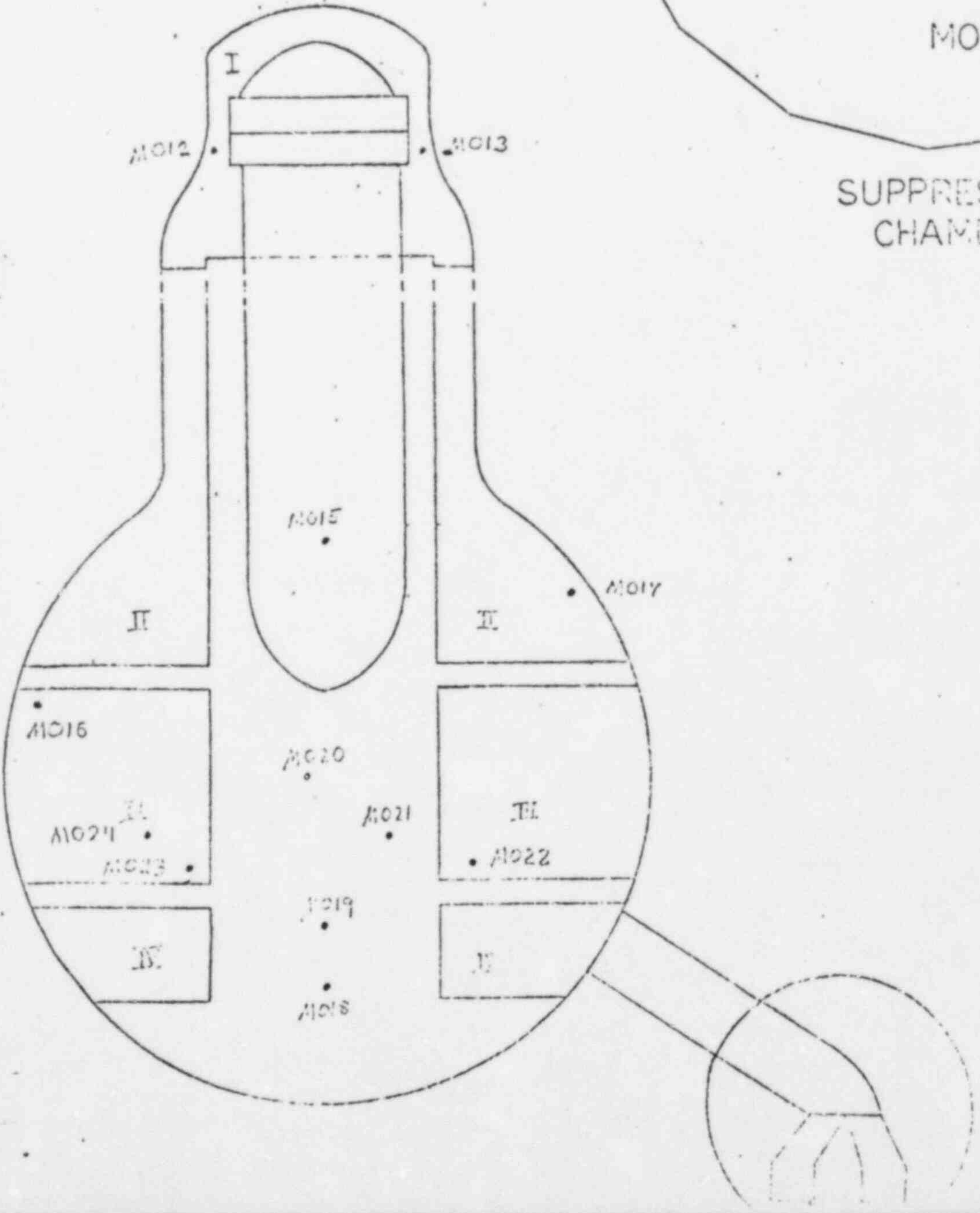
At the completion of the drywell leak rate test at each test pressure, the calculated weight of contained atmosphere for each hour will be utilized to compute the leakage rate using a least-squares linear fit.

APPENDIX A

SENSOR POINTS



SUPPRESSION CHAMBER



SENSOR POINTS

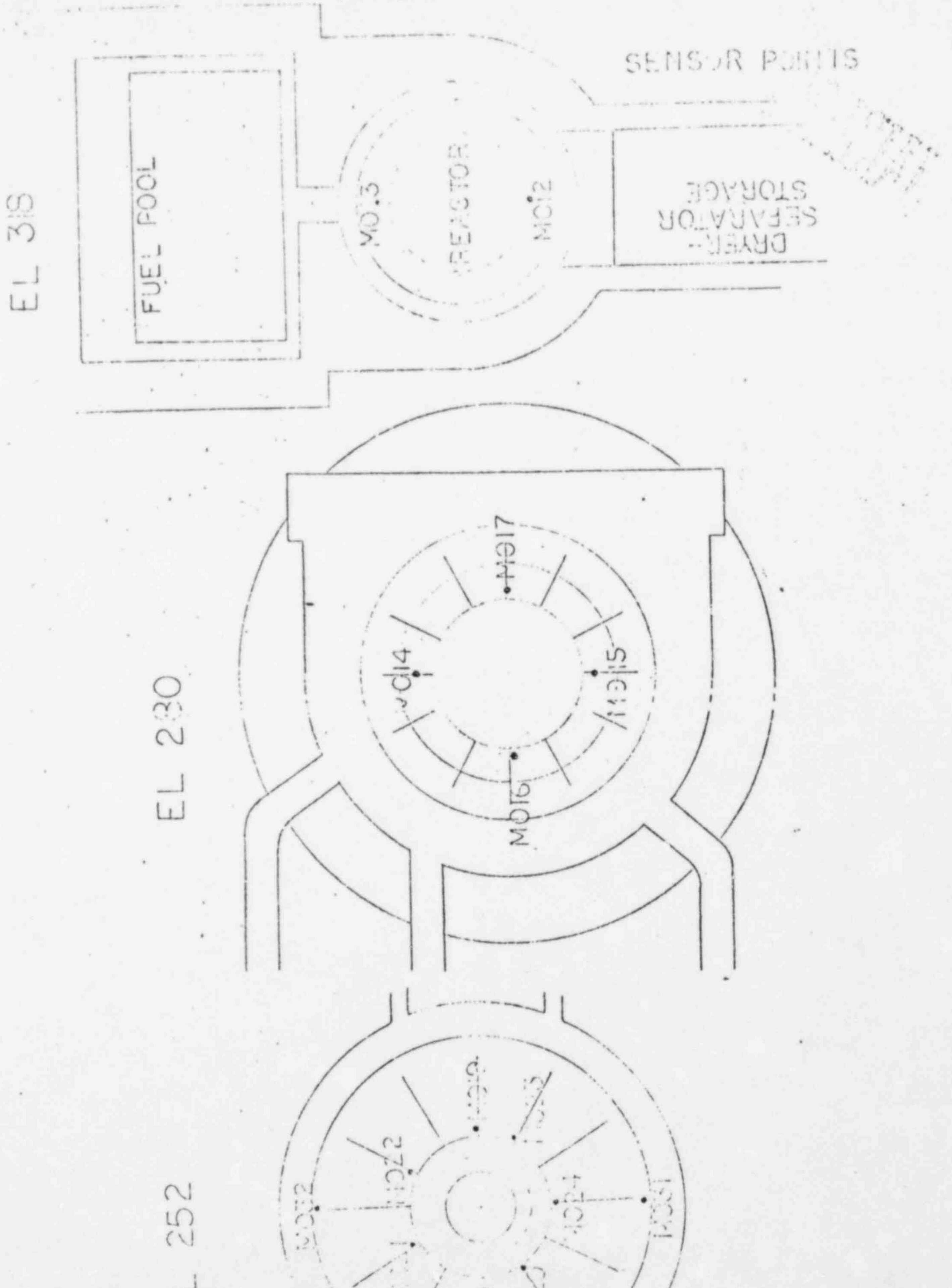


FIGURE 2

TABLE I

ISOLATION VALVE OPERABILITY TESTS

Valve No.	Valve Description	Verified by	Date	Indicating Lights	Closing Time
SB-16-19-7A	Drywell Purge & Vent Exhaust (18")	PREOP C-34	[illegible]	SAT.	[illegible]
SB-16-19-6A	Drywell Purge & Vent Exhaust Bypass (3")	PREOP C-34	[illegible]	SAT.	[illegible]
SB-16-19-7B	Suppression Chamber Purge & Vent Exhaust (18")	PREOP C-34	[illegible]	SAT.	[illegible]
SB-16-19-6B	Suppression Chamber Purge & Vent Exhaust Bypass (3")	PREOP C-34	[illegible]	✓	0.6 SEC
SB-16-19-8	Drywell Air Purge Inlet (18")	PREOP C-34	11/5/71	SAT	[illegible]
SB-16-19-9	Drywell Air Purge Inlet (18")	PREOP C-34	[illegible]	✓	[illegible]
SB-16-19-10	Suppression Chamber Purge Supply (18")	PREOP C-34	[illegible]	SAT.	[illegible]
[illegible]2-40	Recirc. Loop Sample Line (Outboard) (3/4")		11/5/71	SAT	1.2 SEC.
SE-2-39	Recirc. Loop Sample Line (Inboard) (3/4")	REWORKED & RETIMED	11/5/71	Ind Lig. SAT	1.8 sec
AO-20-82	Drywell Floor Drain (Inboard) (3")		11/5/71	SAT	✓
AO-20-83	Drywell Floor Drain (Outboard) (3")		11/5/71	SAT	✓
AO-20-94	Drywell Equipment Drain (Inboard) (3")		11/3/71	OK.	1.0 SEC
AO-20-95	Drywell Equipment Drain (Outboard) (3")		11/3/71	OK.	1.0 SEC
SB-16-19-11A	Vacuum Relief from Sec. Containment (18")		11/26/71	OK.	~1.5 sec
SB-16-19-11B	Vacuum Relief from Sec. Containment (18")		11/26/71	OK	~1.5 sec
[illegible]-6	Exhaust to Standby Gas Treatment System (10")				
SB-7	Drywell & Suppression Chamber Main Exhaust (18")				

Valve No.	Valve Description	Verified by	Date	Indicating Lights	Closing Time
2- -22A [illegible]-AO-16-~~19~~-20	Make-up Nitrogen to Suppression Chamber (1")	[illegible]	[illegible]	[illegible]	[illegible]
20-22B SB-AO-16-~~19~~-~~21~~	Make-up Nitrogen to Drywell (1")	[illegible]	[illegible]	[illegible]	[illegible]
20-20 SB-AO-16-~~19~~-~~22~~	Make-up Nitrogen Supply (1")	[illegible]	[illegible]	[illegible]	[illegible]
SB-AO-16-19-23	Purge Nitrogen Supply (14") Not Installed - Blanked see Exception Sect 5/11/71				
AO-2-80A	Steam Line A Inboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.6 sec
AO-2-80B	Steam Line B Inboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.2 sec
AO-2-80C	Steam Line C Inboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.2
AO-2-80D	Steam Line D Inboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.6
AO-2-86A	Steam Line A Outboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.6
AO-2-86B	Steam Line B Outboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.5
AO-2-86C	Steam Line C Outboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.7
AO-2-86D	Steam Line D Outboard Isol. (18")	DCH Rc Tobin	11-4-71	OK	4.5
MO-2-74	Steam Drain Inboard Isol. (3")	JR LaCour	11/3/71	OK	16.5 SEC
MO-2-77	Steam Drain Outboard Isol. (3")	JR LaCour	11/3/71	O.K.	10.0 SEC
MO-23-15	HPCI Stm Inboard Isol. (20")	JR LaCour	11/3/71	OK	45.3 SEC.
MO-2~~6~~3-16	HPCI Stm Outboard Isol. (20")	[illegible]	[illegible]	[illegible]	[illegible]
MO-13-15	RCIC Stm Inboard Isol. (3")	Preop A-9 C.E. Edwards	4/7/71	OK	12.0 sec.
MO-13-16	RCIC Stm Outboard Isol. (3")	[illegible]	[illegible]	[illegible]	[illegible]
MO-12-15	RWCU Inboard Isol (supply) (4")	[illegible]	[illegible]	[illegible]	[illegible]
-18	RWCU Outboard Isol. (supply) (4")	[illegible]	[illegible]	[illegible]	[illegible]
MO-12-68	RWCU Outboard Return Iso (4")	[illegible]	[illegible]	[illegible]	[illegible]

TABLE II

ISOLATION VALVE SEAT LEAKAGE TEST

Line	Valve Tested	Boundary Valves	[in] Diameter	[Ft^3] Volume	Leak-Rate SCFHe	Leak-Rate [LBM/HR]	Verified by	Date
tainment Purge	SB-6 & SB-7	SB-6A & 7A SB-6B & 7B SB-6 & 7	18	309.71	See Change #2 (DCN #			)
uum Relief	SB-12A	V-16-12A SB-11A	20	11.25	See Change #2 (DCN #			)
uum Relief	SB-12B	V-16-12B SB-11B	20	11.25	See Change #2 (DCN #			)
tainment Purge	SB-9, SB-10 SB-1-156-23	SB-8,9,10 SB-1-156-23 Test Flange used	18 see exception	355.74 list 11/3/71	0	0	DCH	11/4/71
n Steam Drain	MS-77	MS-77 MS-74	3	.61	0	0		
n Steam A	MS-86A	MS-80A MS-86A	18	38.14	1			
n Steam B	MS-86B	MS-80B MS-86B	18	37.2	12			
n Steam C	MS-86C	MS-80C MS-86C	18	37.2		NG		
n Steam D	MS-86D	MS-80D MS-86D	18	38.14	7.5 21	2.83 NG		
C Steam Supply	RCIC-16	RCIC-15 RCIC-16	3	1.03	* 2 (see exception page)	0	for [illegible]	11/6/71
Steam Supply	HPCI-16	HPCI-15 HPCI-16	10	11.56	0	0	DCH	11/4/71

TABLE II

ISOLATION VALVE SEAT LEAKAGE TEST

Line	Valve Tested	Boundary Valves	Diameter [in]	Volume [Ft^3]	Leak-Rate SCFM	Leak-Rate [LBM/HR]	Verified by	Date
p. Drain Discharge	ED-95	ED-94 ED-95	3	.147	0	0	DCH	10/29/7
or Drain Discharge	FD-83	FD-83 FD-82	3	.147	See	Change #2	(DCN #	)
Supply	SB-1-156-22	SB-1-156-20 SB-1-156-22 SB-1-156-21	1	-	See	Change #2	(DCN #	)
nup Suction	CUW-18	CUW-18 CUW-15	4	39.45	0	0	DCH	10/29/7
Discharge	CUW-68	CUW-68 CUW-63	4	10.69	0	0	good	11/3/7
ctor Sample	SS-40	SS-39 SS-40	3/4	.136	See	Change #2	(DCN #	)
TAL LEAKAGE								

FIGURE I

PENETRATION TEST

44 psig
70°F INITIAL CONDITIONS

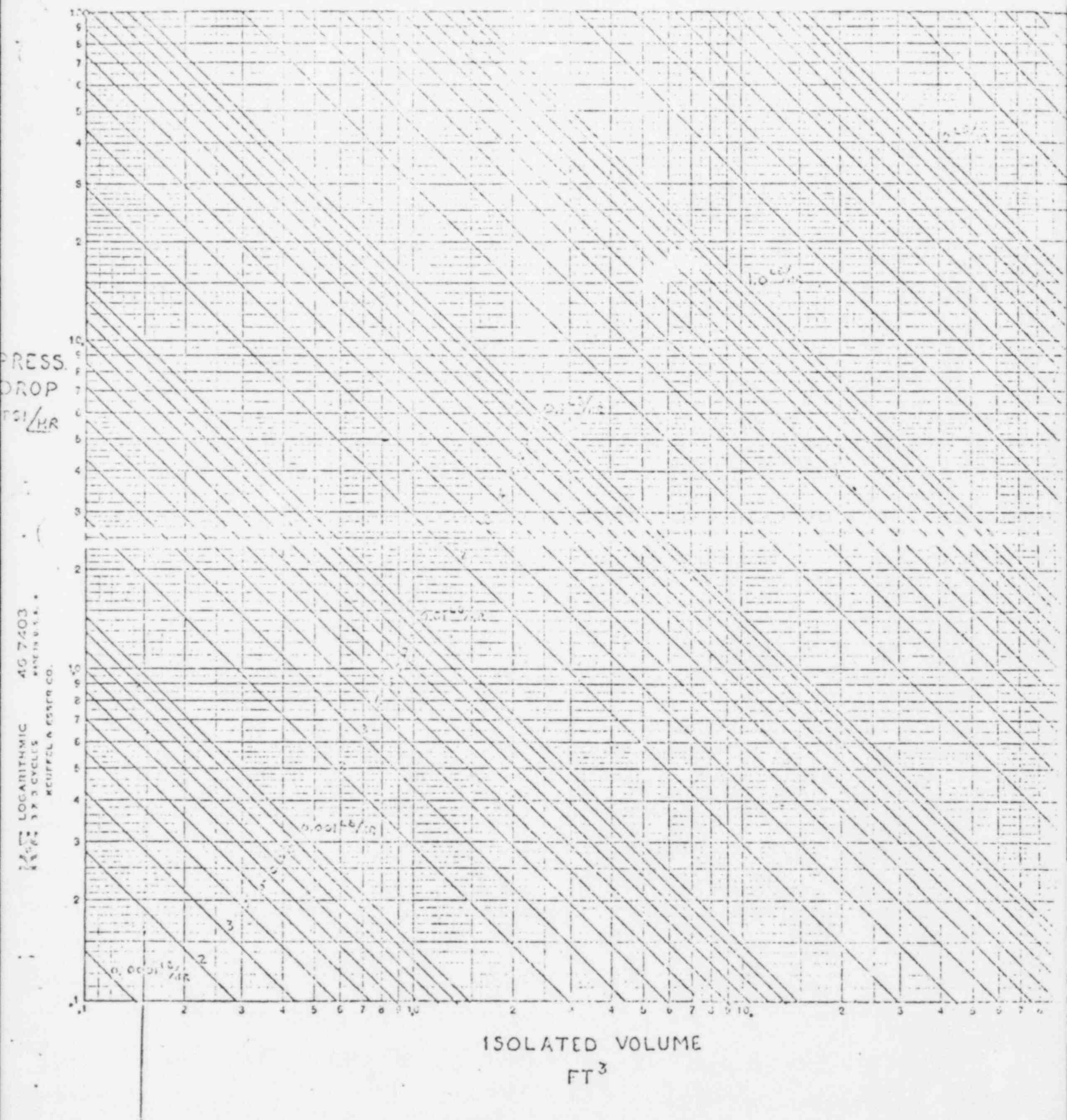


TABLE III

NON-ELECTRICAL TESTABLE PENETRATIONS AND SEALS

Penetration No.	Description	Leak Rate	Verified by	Date
X-7A	Main Steam Line "A"			
X-7B	Main Steam Line "B"			
X-7C	Main Steam Line "C"			
X-7D	Main Steam Line "D"			
X-9A	Feedwater Line "A"			
X-9B	Feedwater Line "B"			
X-11	HPCI Steam Line			
X-12	Supply to RHR Pumps			
X-13A	RHR Return to Rx			
X-13B	RHR Return to Rx			
X-14	Supply to Rx Water Cleanup			
X-(	Core Spray to Rx			
X-16B	Core Spray to Rx			

Performed During Class "A" Test at 44 psig

DWE

DOUBLE GASKETED SEALS

Penetration No.	Description	Leak Rate LB/HR	Verified by	Date
X-1	Equipment Access Hatch	0	DCG	11/4/71
---	Drywell Flange	0	HB by DWE	11/6/71
X-4	Drywell Head Access Hatch	0	HB	11/6/71
X-6	CRD Removal Hatch	0	DWE	11/7/71
X-200A & B	Torus Access Hatchs(2)	0	DWE	11/7/71
---	Shear Lug Access (8)	0	C.R.W.	11/7/71
---	Vacuum Relief Access Hatches (10)	Total leakage (ie. 5 in) 0	DCG	11/2/71
X-2	Air Lock (See page 27)	0	DCG	11/1/71 (at 8½ psig)

These seals were made during testing Discrepancies have been corrected & changed DWE 5-7 Dwk...

~~No. 5 42~~ No. 5 failed will have to be welded No. 7 tapped failed dropped 10 ... 1 minute ~~...~~ No. 8 42

TOTAL LEAKAGE RATE 0

ERSONNEL HATCH LEAK TEST

NOTE: Test of the Personnel Air Lock shall be conducted as a separate test after the inner door has been secured with strongbacks and the outer door has been closed.

1. Pressurize the air lock to 10 psig

2. Observe and record the pressure at the end of 1 hour

Time Start ________ Pressure ________

Time Finish ________ Pressure ________

Pressure Loss ______________

Leak Rate ________________

Verified by ______________ Date ________

Test run from 13:08 to 14:08
at 8½ psig. Retest needed although there
was no leakage.

DCG 11/1/71.

VALVE LINEUP SHEET

DATE 11/8/71

Valve Number		Description	Control Location	Position	Initial
MS-80A	AO-2-80A	Main Steam Line A Isol (Inboard)	CRP 9-3	SHUT	JWD
MS-80B	AO-2-80B	Main Steam Line B Isol (Inboard)	CRP 9-3	SHUT	JWD
MS-80C	AO-2-80C	Main Steam Line C Isol (Inboard)	CRP 9-3	SHUT	JWD
MS-80D	AO-2-80D	Main Steam Line D Isol (Inboard)	CRP 9-3	SHUT	JWD
MS-86A	AO-2-86A	Main Steam Line A Isol (Outboard)	CRP 9-3	SHUT	JWD
MS-86B	AO-2-86B	Main Steam Line B Isol (Outboard)	CRP 9-3	SHUT	JWD
MS-86C	AO-2-86C	Main Steam Line C Isol (Outboard)	CRP 9-3	SHUT	JWD
MS-86D	AO-2-86D	Main Steam Line D Isol (Outboard)	CRP 9-3	SHUT	JWD
MS-74	MO-2-74	Main Steam Line Drain (Inboard)	CRP 9-3	SHUT	JWD
MS-77	MO-2-77 ✓	Main Steam Line Drain (Outboard)	CRP 9-3	SHUT	JWD
SS-40	SE-2-40	Recirc Loop Sample Line (Outboard)	CRP 9-4	SHUT	JWD
SS-39	SE-2-39	Recirc Loop Sample Line (Inboard)	CRP 9-4	SHUT	JWD
RHR-57	MO-10-57 ✓	RHR Discharge to Radwaste	CRP 9-3	OPEN	JWD
RHR-66	MO-10-66 ✓	RHR Discharge to Radwaste	CRP 9-3	SHUT	JWD
RHR-39A	MO-10-39A ✓	RHR Return to Suppression Pool	CRP 9-3	SHUT	JWD
RHR-39B	MO-10-39B ✓	RHR Return to Suppression Pool	CRP 9-3	SHUT	JWD
RHR-34A	MO-10-34A ✓	RHR Return to Suppression Pool	CRP 9-3	SHUT	JWD
RHR-34B	MO-10-34B ✓	RHR Return to Suppression Pool	CRP 9-3	SHUT	JWD
RHR-26B	MO-10-26B ✓	RHR Drywell Spray	CRP 9-3	SHUT	JWD
RHR-31B	MO-10-31B ✓	RHR Drywell Spray	CRP 9-3	SHUT	JWD
RHR-26A	MO-10-26A ✓	RHR Drywell Spray	CRP 9-3	SHUT	JWD
RHR-31A	MO-10-31A ✓	RHR Drywell Spray	CRP 9-3	SHUT	JWD
RHR-38A	MO-10-38A ✓	RHR Suppression Chamber Spray	CRP 9-3	SHUT	JWD
RHR-38B	MO-10-38B ✓	RHR Suppression Chamber Spray	CRP 9-3	SHUT	JW

DATE 11/8/71

Valve Number		Description	Control Location	Position	Initial
IA-96A	V-72-96A	Containment Air Compressor Suction	Local	SHUT	JWD
IA-96B	V-72-96B	Containment Air Compressor Suction	Local	SHUT	JWD
5 Double	Sets	Drywell Air Sampling System		SHUT	JWD
FD-82	AO-20-82	Drywell Floor Drain (Inboard)	CRP 9-4	SHUT	JWD
FD-83	AO-20-83	Drywell Floor Drain (Outboard)	CRP 9-4	SHUT	JWD
ED-94	AO-20-94	Drywell Equipment Drain (Inboard)	CRP 9-4	SHUT	JWD
ED-95	AO-20-95	Drywell Equipment Drain (Outboard)	CRP 9-4	SHUT	JWD
AC-8	SB-16-19-8	Drywell Air Purge Inlet	CRP 9-3	SHUT	JWD
AC-9	SB-16-19-9	Drywell Air Purge Inlet	CRP 9-3	SHUT	JWD
AC-7A	SB-16-19-7A	Drywell Purge & Vent Outlet	CRP 9-3	SHUT	JWD
AC-6A	SB-16-19-6A	Drywell Purge & Vent Outlet Bypass	CRP 9-3	SHUT	JWD
AC-7	~~SB-7~~ V-16·19·4	Drywell & Suppression Chamber Main Exh.	CRP 9-26	SHUT	JWD
AC-10	SB-16-19-10	Suppression Chamber Purge Supply	CRP 9-3	SHUT	JWD
AC-7B	SB-16-19-7B	Suppression Chamber Purge & Vent Outlet	CRP 9-3	SHUT	JWD
AC-6B	SB-16-19-6B	Suppression Chamber Purge & Vent Outlet Bypass	CRP 9-3	SHUT	JWD
AC-6	SB-6	Exhaust to Standby Gas Treatment System	CRP 9-26	SHUT	JWD
RHR-17	MO-10-17	RHR Shutdown Cooling Supply (Outboard)	CRP 9-3	SHUT	JWD
RHR-18	MO-10-18	RHR Shutdown Cooling Supply (Inboard)	CRP 9-3	SHUT	JWD
RHR-33	MO-10-33	RHR Reactor Head Cooling	CRP 9-4	SHUT	JWD
RHR-32	MO-10-32	RHR Reactor Head Cooling	CRP 9-4	SHUT	JWD
CUW-15	MO-12-15	Reactor Cleanup System (Inboard)	CRP 9-4	SHUT	JWD
CUW-18	MO-12-18	Reactor Cleanup System (Outboard)	CRP 9-4	SHUT	JWD
CUW-68	MO-12-68	Reactor Cleanup System	CRP 9-4	SHUT	JWD
HPCI-15	MO-23-15	HPCI (Inboard)	CRP 9-3	SHUT	JWD

VALVE LINEUP SHEET

DATE 11/8/71

Valve Number		Description	Control Location	Position	Initial
HPCI-16	MO-23-16 ✓	HPCI (Outboard)	CRP 9-3	SHUT	JWD
RCIC-15	MO-13-15 ✓	RCIC (Inboard) [illegible]	CRP 9-4	SHUT	JWD
RCIC-16	MO-13-16 ✓	RCIC (Outboard)	CRP 9-4	SHUT	JWD
AC-11A	SB-16-19-11A	Vacuum Relief from Sec. Cont.	CRP 9-3	SHUT	JWD
AC-11B	SB-16-19-11B	Vacuum Relief from Sec. Cont.	CRP 9-3	SHUT	JWD
AC-20	SB-1-156-20	MU Nitrogen to Torus	CRP 9-3	SHUT	JWD
AC-21	SB-1-156-21	MU Nitrogen to Torus	CRP 9-3	SHUT	JWD
AC-22	SB-1-156-22	MU Nitrogen Supply	CRP 9-3	SHUT	JWD
AC-23	SB-1-156-23	Purge Nitrogen Supply	CRP 9-3	SHUT	EK.
---	V-158-50	Drywell Pressure Sensing	Local	OPEN	11/8/71 [illegible]
	V-158-25	Torus Pressure Sensing	Local	OPEN	11/8/71 [illegible]
---	V-158-40	Drywell/Torus P Inst.	Local	OPEN	11/8/71 [illegible]
---	V-158-41	Drywell/Torus P Inst.	Local	OPEN	11/8/71 [illegible]
---	V-158-49	Drywell Pressure Inst. [illegible] Not Calibrated	Local	Closed [illegible] ~~OPEN~~	11/8/71 [illegible]
10 Valves		Drywell Torus Vacuum Breakers	Local	OPEN-BLOC	[illegible]
X-2 Inner Door		Air Lock Door	Local	SHUT	JWD
X-2 Outer Door		Air Lock Door	Local	SHUT	JWD
2 Flanges		Torus Manways	Local	SHUT	DE
X-6	---	CRD Removal Hatch	Local	SHUT	DE
8 Covers		Access to Shear Lugs	Local	SHUT	DE
X-1	---	Equipment Access Hatch	Local	SHUT	DE
CST-11	---	Service Connection	Local	SHUT	EK
72-90D	1A-90D	Drywell Header Isolation Valve	Local	SHUT	JWD
V-72-33	SA-33	Header Isolation Valve	Local	SHUT	JWD

VALVE LINEUP SHEET

DATE 11/8/71

er		Description	Control Location	Position	Initial
-24C	1A-24C	Supply Isolation to the Drywell	Local	SHUT	DWD
72-24D	1A-24D	Supply Isolation to the Drywell	Local	SHUT	DWD
Hatches		Drywell Head Ventilation Hatches	Local	OPEN	DE

APPENDIX A

Computer-Generated Report

1.
INTEGRATED LEAK RATE TEST
(ILRT)

LEAK RATE COMPUTED USING TOTAL TIME METHOD
AS RECOMMENDED BY APPENDIX J FOR 10 CFR 50
(REACTOR CONTAINMENT LEAKAGE TESTING FOR WATER COOLED POWER REACTORS)

TEST PERIOD STARTED AT 0900 HOURS ON DECEMBER 2, 1975

A LEAST SQUARES FIRST ORDER FIT OF LEAK RATE TO TIME
SHOULD YIELD A SLOPE OF ZERO AND AN INTERCEPT EQUAL
TO THE LEAK RATE AS COMPUTED AT THE INITIAL START TIME
THE EQUATION HAS THE FORM - L=ST + R WHERE
L - CORRELATED LEAK RATE
S - SLOPE OF CORRELATION
T - TIME IN HOURS
R - INTERCEPT LEAK RATE

LEAK RATE = 0.001 HOURS + 0.013 PER CENT
MEAN = 0.036 PER CENT
ERROR COEFFICIENT = 0.226
WHERE COEFFICIENT OF 1.0 MEANS A PERFECT FIT &
COEFFICIENT OF 0.0 MEANS NO CORRELATION.

INITIAL CONTAINMENT AIR WEIGHT = 318834.2 LBS.
FINAL CONTAINMENT AIR WEIGHT = 318704.3 LBS.
LEAK RATE FOR 24.00 HOUR PERIOD IS 0.040 PER CENT BY WEIGHT.

MAXIMUM NRC LEAK RATE OF 0.128 PER CENT PER DAY
GIVEN FOR LOW PRESSURE TEST AT 41.890 PSIA

MAXIMUM PROBABLE TEMPERATURE LOOP ERROR = 0.054 DEGREES F.
MAXIMUM PROBABLE PRESSURE LOOP ERROR = 0.001 PSIA.
MAXIMUM PROBABLE HUMIDITY LOOP ERROR = 0.296 PERCENT.

INSTRUMENT ERROR CONTRIBUTES 0.015 PERCENT PER DAY
TO ESTABLISH 99.87 PERCENT CONFIDENCE BOUND

*** NOTE FOR GRAPHS ***

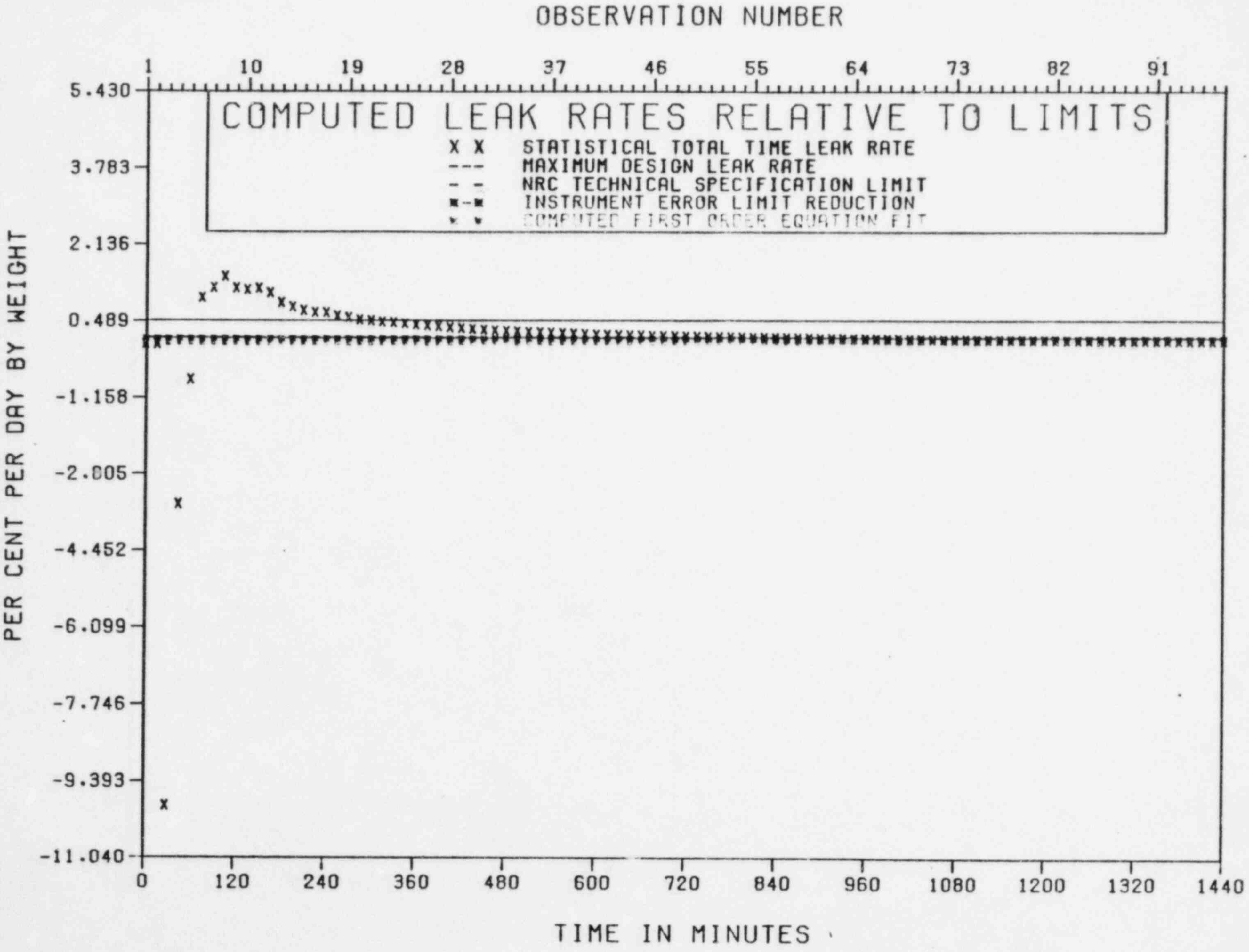
BOTH SAMPLE NUMBERS AND TIME ARE SHOWN.

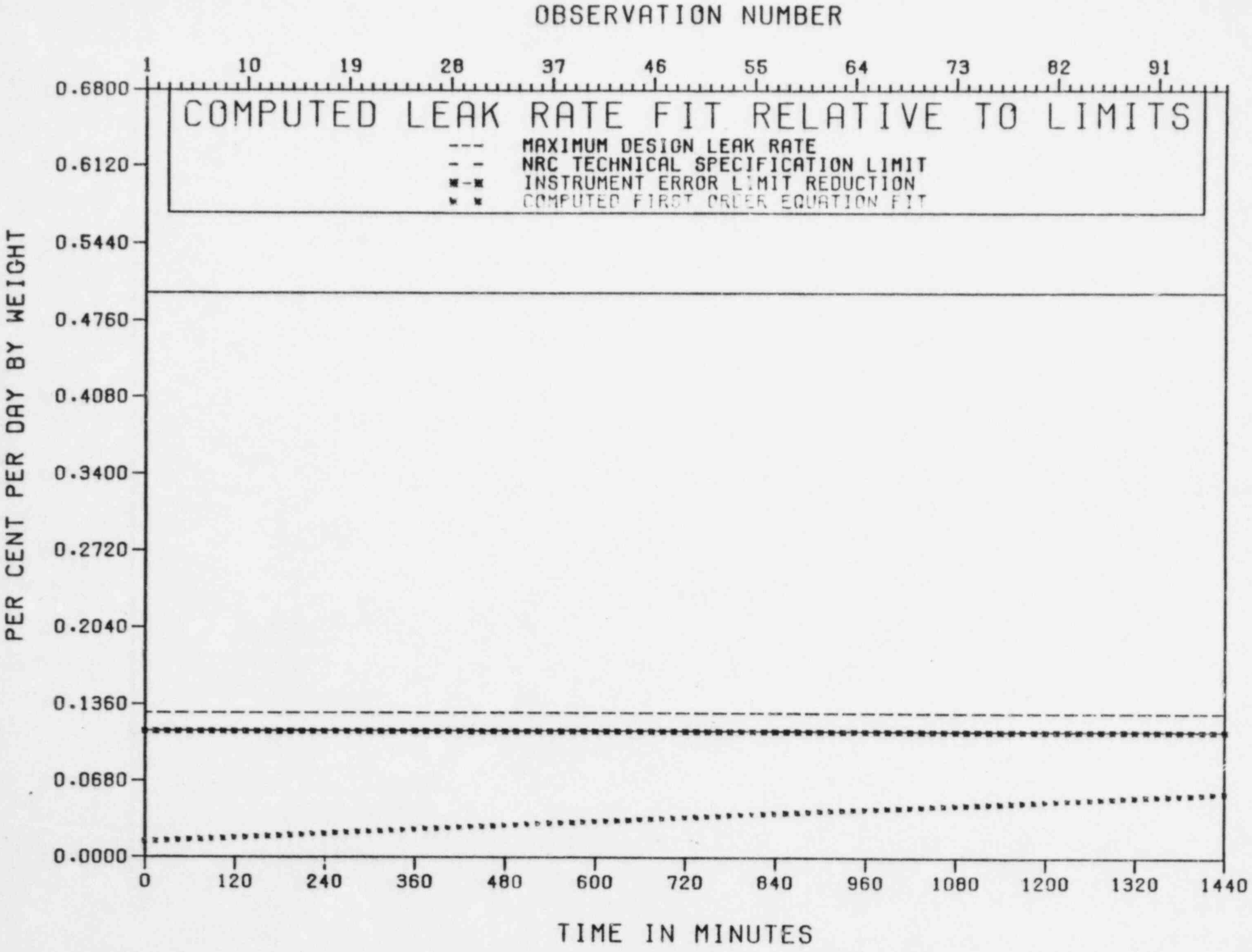
*** NOTE FOR TABULAR DATA ***

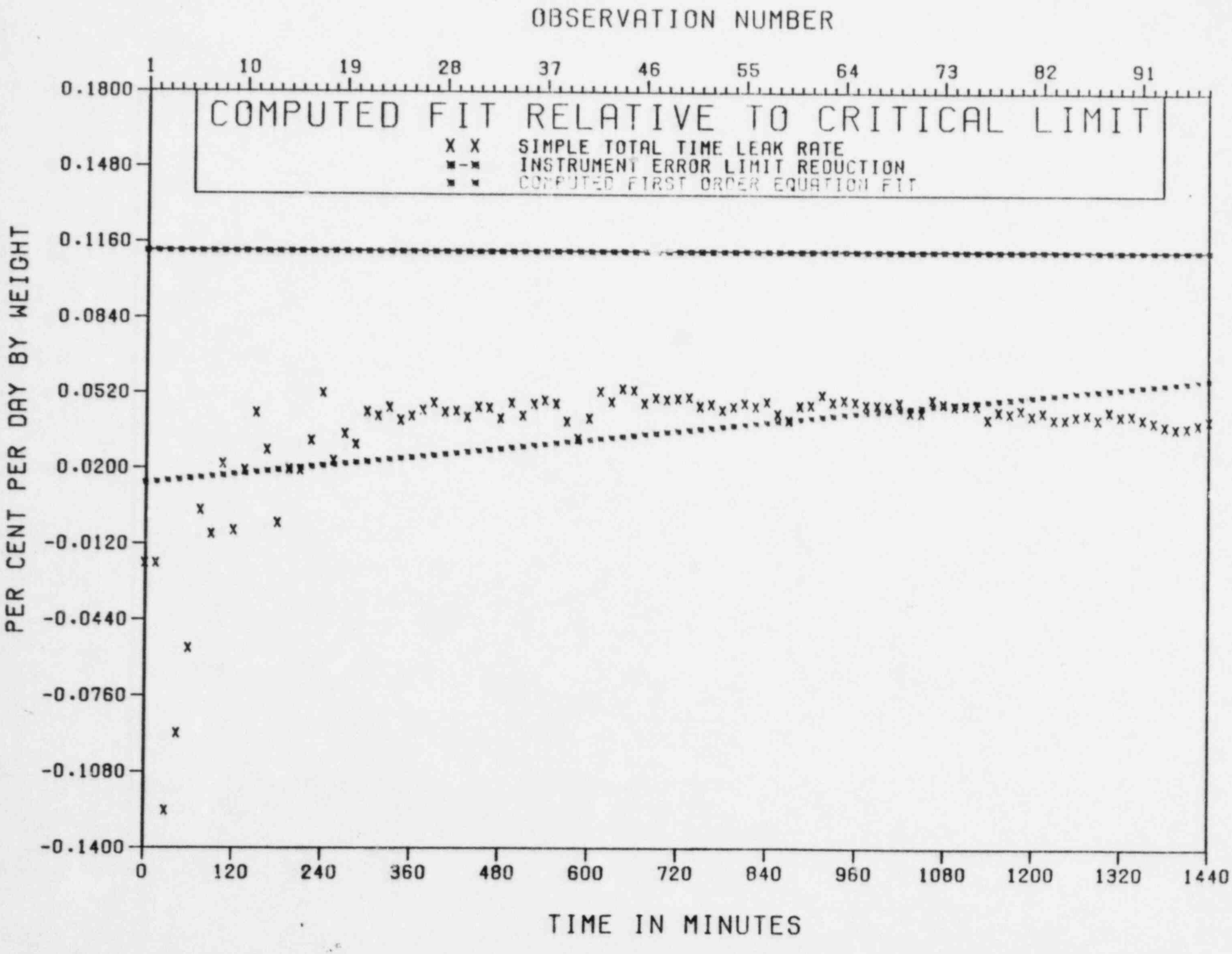
TABLE VALUES OF ZERO SIGNIFY EITHER
1. DATA IS NOT APPLICABLE TO THE CALCULATION OR
2. SENSOR HAS BEEN DELETED FROM MONITORING

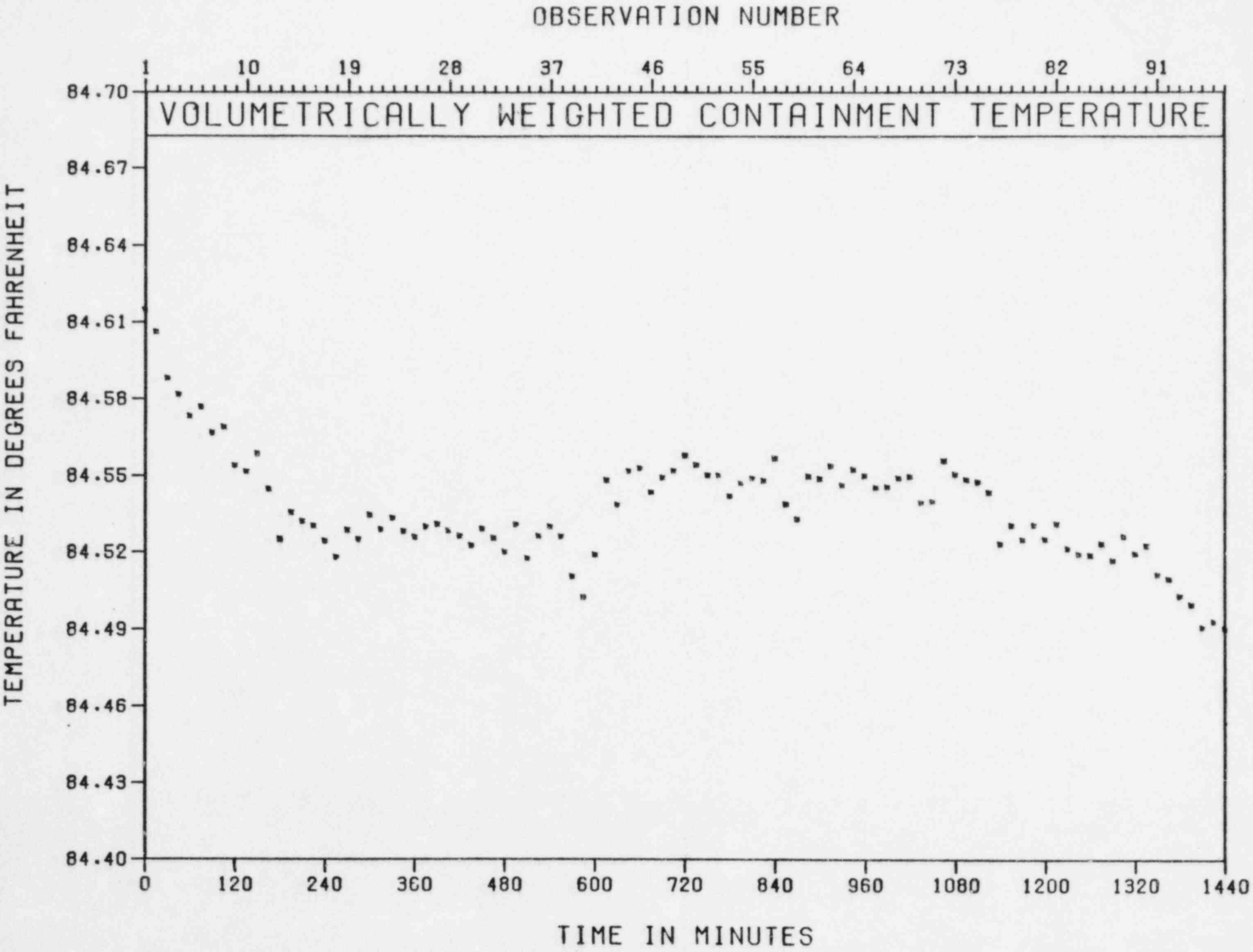
*** DESCRIPTION OF VARIABLES ***

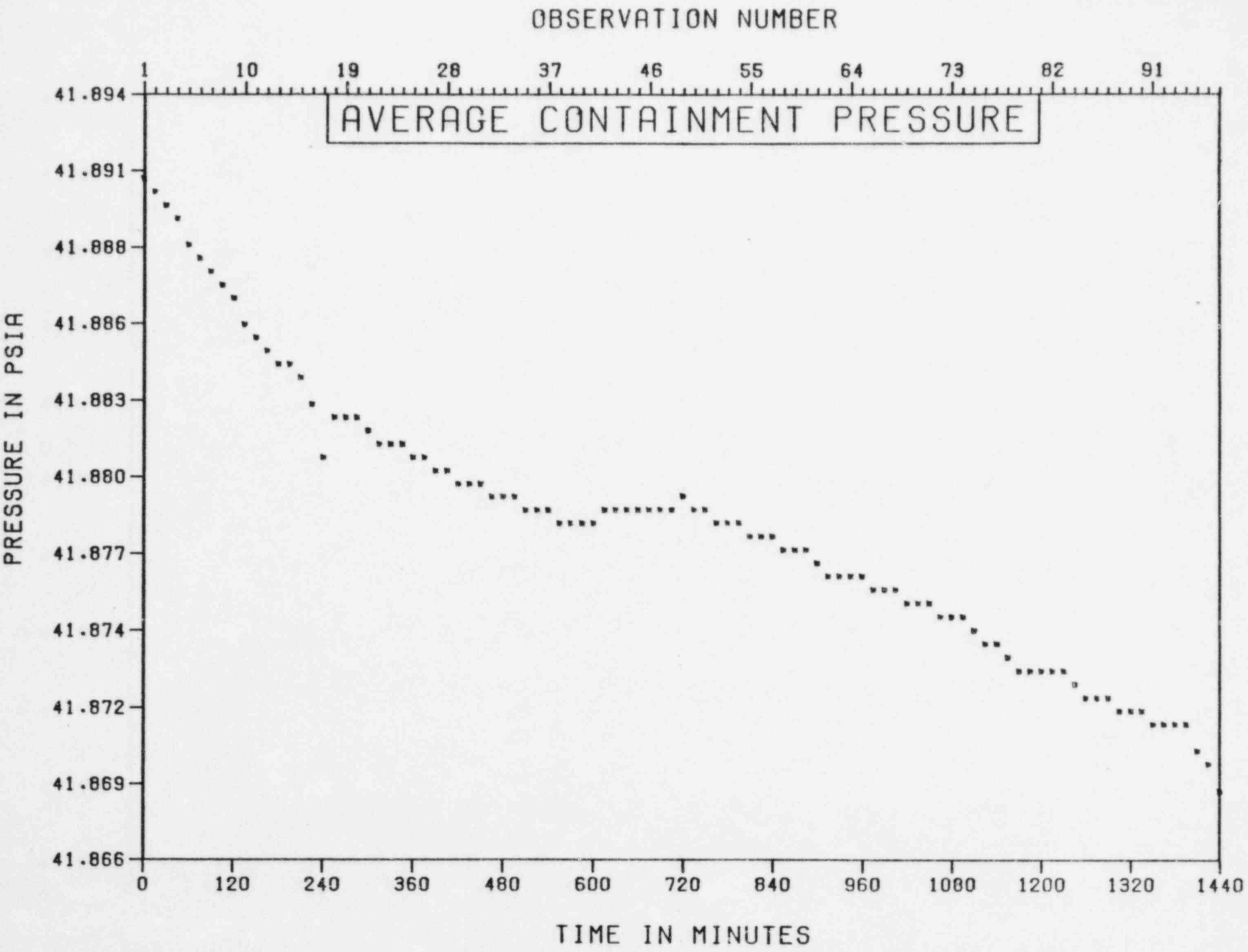
AVG TEM	VOLUMETRICALLY WEIGHTED TEMPERATURE
AVG PRE	AVERAGE PRESSURE
VAP PRE	VOLUMETRICALLY WEIGHTED VAPOR PRESSURE
LEA COM	FIRST ORDER COMPUTED LEAK RATE
LEA TRA	STATISTICAL TOTAL TIME LEAK RATE
LEA SIM	SIMPLE TOTAL TIME LEAK RATE
ERROR	STATISTICAL TOTAL TIME LEAK RATE ERROR

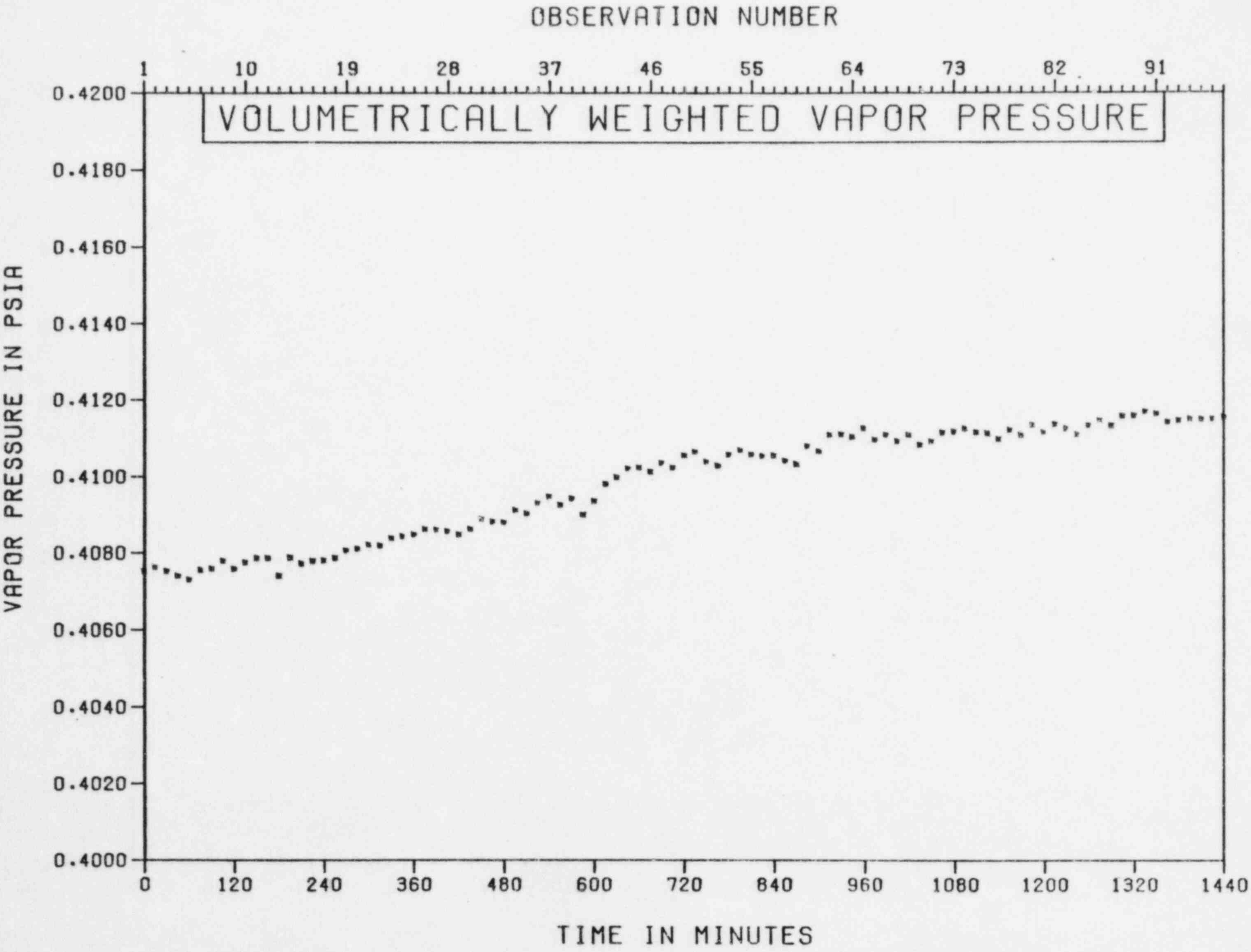

OBSERVATION NUMBER
1
10
19
28
37
46
55
64
73
82
91
COMPUTED LEAK RATES RELATIVE TO LIMITS
X X STATISTICAL TOTAL TIME LEAK RATE
--- MAXIMUM DESIGN LEAK RATE
- - NRC TECHNICAL SPECIFICATION LIMIT
■-■ INSTRUMENT ERROR LIMIT REDUCTION
▾ ▾ COMPUTED FIRST ORDER EQUATION FIT
PER CENT PER DAY BY WEIGHT
5.430
3.783
2.136
0.489
-1.158
-2.805
-4.452
-6.099
-7.746
-9.393
-11.040
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
TIME IN MINUTES


OBSERVATION NUMBER
1
10
19
28
37
46
55
64
73
82
91
COMPUTED LEAK RATE FIT RELATIVE TO LIMITS
--- MAXIMUM DESIGN LEAK RATE
- - NRC TECHNICAL SPECIFICATION LIMIT
- INSTRUMENT ERROR LIMIT REDUCTION
* * COMPUTED FIRST ORDER EQUATION FIT
PER CENT PER DAY BY WEIGHT
0.6800
0.6120
0.5440
0.4760
0.4080
0.3400
0.2720
0.2040
0.1360
0.0680
0.0000
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
TIME IN MINUTES


OBSERVATION NUMBER
1
10
19
28
37
46
55
64
73
82
91
COMPUTED FIT RELATIVE TO CRITICAL LIMIT
X X SIMPLE TOTAL TIME LEAK RATE
- INSTRUMENT ERROR LIMIT REDUCTION
* * COMPUTED FIRST ORDER EQUATION FIT
PER CENT PER DAY BY WEIGHT
0.1800
0.1480
0.1160
0.0840
0.0520
0.0200
-0.0120
-0.0440
-0.0760
-0.1080
-0.1400
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
TIME IN MINUTES


OBSERVATION NUMBER
1
10
19
28
37
46
55
64
73
82
91
VOLUMETRICALLY WEIGHTED CONTAINMENT TEMPERATURE
84.70
84.67
84.64
84.61
84.58
84.55
84.52
84.49
84.46
84.43
84.40
TEMPERATURE IN DEGREES FAHRENHEIT
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
TIME IN MINUTES


OBSERVATION NUMBER
1
10
19
28
37
46
55
64
73
82
91
AVERAGE CONTAINMENT PRESSURE
PRESSURE IN PSIA
41.894
41.891
41.888
41.886
41.883
41.880
41.877
41.874
41.872
41.869
41.866
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
TIME IN MINUTES


OBSERVATION NUMBER
1
10
19
28
37
46
55
64
73
82
91
VOLUMETRICALLY WEIGHTED VAPOR PRESSURE
VAPOR PRESSURE IN PSIA
0.4200
0.4180
0.4160
0.4140
0.4120
0.4100
0.4080
0.4060
0.4040
0.4020
0.4000
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
TIME IN MINUTES

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	AVG. TEM DEG. F	AVG. PRE PSIA	VAP. PRE PSIA	LEAK COM PER CENT	LEAK TRA PER CENT	ERROR(T) PER CENT
1	0	84.615	41.891	0.408	0.014	0.000	0.000
2	15	84.606	41.890	0.408	0.014	-0.020	0.000
3	30	84.588	41.890	0.408	0.015	-9.914	-0.072
4	45	84.582	41.889	0.407	0.015	-3.449	-0.036
5	60	84.573	41.889	0.407	0.016	-0.773	-0.003
6	75	84.577	41.888	0.408	0.016	0.993	-0.007
7	90	84.567	41.888	0.408	0.017	1.211	-0.013
8	105	84.569	41.887	0.408	0.017	1.449	-0.017
9	120	84.554	41.887	0.408	0.018	1.204	-0.015
10	135	84.552	41.886	0.408	0.018	1.164	-0.015
11	150	84.559	41.885	0.408	0.018	1.200	-0.013
12	165	84.545	41.885	0.408	0.019	1.097	-0.011
13	180	84.525	41.884	0.407	0.019	0.886	-0.008
14	195	84.535	41.884	0.408	0.020	0.796	-0.007
15	210	84.532	41.884	0.408	0.020	0.716	-0.006
16	225	84.530	41.883	0.408	0.021	0.674	-0.004
17	240	84.524	41.881	0.408	0.021	0.670	-0.003
18	255	84.518	41.882	0.408	0.022	0.603	-0.002
19	270	84.529	41.882	0.408	0.022	0.564	-0.000
20	285	84.525	41.882	0.408	0.023	0.520	0.000
21	300	84.534	41.882	0.408	0.023	0.498	0.002
22	315	84.529	41.881	0.408	0.024	0.473	0.003
23	330	84.533	41.881	0.408	0.024	0.453	0.004
24	345	84.528	41.881	0.408	0.024	0.427	0.005
25	360	84.526	41.881	0.408	0.025	0.404	0.005
26	375	84.530	41.881	0.409	0.025	0.385	0.006
27	390	84.531	41.880	0.409	0.026	0.369	0.007
28	405	84.528	41.880	0.409	0.026	0.350	0.008
29	420	84.526	41.880	0.408	0.027	0.333	0.008
30	435	84.523	41.880	0.409	0.027	0.316	0.009
31	450	84.529	41.880	0.409	0.028	0.302	0.009
32	465	84.525	41.879	0.409	0.028	0.289	0.010
33	480	84.520	41.879	0.409	0.029	0.274	0.010
34	495	84.530	41.879	0.409	0.029	0.263	0.010
35	510	84.517	41.879	0.409	0.030	0.251	0.010
36	525	84.526	41.879	0.409	0.030	0.241	0.010
37	540	84.530	41.879	0.409	0.030	0.233	0.011
38	555	84.526	41.878	0.409	0.031	0.224	0.011
39	570	84.510	41.878	0.409	0.031	0.213	0.011
40	585	84.502	41.878	0.409	0.032	0.201	0.011
41	600	84.519	41.878	0.409	0.032	0.192	0.011
42	615	84.548	41.879	0.410	0.033	0.188	0.011
43	630	84.538	41.879	0.410	0.033	0.182	0.012
44	645	84.552	41.879	0.410	0.034	0.178	0.012
45	660	84.553	41.879	0.410	0.034	0.173	0.012
46	675	84.543	41.879	0.410	0.035	0.168	0.012
47	690	84.549	41.879	0.410	0.035	0.163	0.013
48	705	84.552	41.879	0.410	0.036	0.159	0.013
49	720	84.558	41.879	0.411	0.036	0.154	0.013
50	735	84.554	41.879	0.411	0.036	0.150	0.013

VARIABLE TABLE SUMMARY (CONTINUED)

SAMPLE NUMBER	DELTA MINS	AVG. TEM DEG. F	AVG. PRE PSIA	VAP. PRE PSIA	LEAK COM PER CENT	LEAK TRA PER CENT	ERROR(T) PER CENT
51	750	84.550	41.879	0.410	0.037	0.145	0.013
52	765	84.550	41.878	0.410	0.037	0.141	0.013
53	780	84.542	41.878	0.411	0.038	0.137	0.013
54	795	84.547	41.878	0.411	0.038	0.133	0.013
55	810	84.549	41.878	0.411	0.039	0.129	0.013
56	825	84.548	41.878	0.411	0.039	0.126	0.013
57	840	84.556	41.878	0.411	0.040	0.123	0.013
58	855	84.538	41.877	0.410	0.040	0.119	0.013
59	870	84.533	41.877	0.410	0.041	0.115	0.013
60	885	84.550	41.877	0.411	0.041	0.112	0.012
61	900	84.549	41.877	0.411	0.042	0.110	0.012
62	915	84.554	41.876	0.411	0.042	0.108	0.013
63	930	84.546	41.876	0.411	0.042	0.105	0.013
64	945	84.552	41.876	0.411	0.043	0.103	0.013
65	960	84.550	41.876	0.411	0.043	0.101	0.013
66	975	84.545	41.876	0.411	0.044	0.099	0.013
67	990	84.545	41.876	0.411	0.044	0.097	0.012
68	1005	84.549	41.876	0.411	0.045	0.095	0.012
69	1020	84.549	41.875	0.411	0.045	0.093	0.012
70	1035	84.539	41.875	0.411	0.046	0.091	0.012
71	1050	84.540	41.875	0.411	0.046	0.089	0.012
72	1065	84.556	41.875	0.411	0.047	0.088	0.012
73	1080	84.550	41.875	0.411	0.047	0.086	0.012
74	1095	84.548	41.875	0.411	0.047	0.085	0.012
75	1110	84.547	41.874	0.411	0.048	0.083	0.012
76	1125	84.543	41.874	0.411	0.048	0.082	0.012
77	1140	84.523	41.874	0.411	0.049	0.080	0.012
78	1155	84.530	41.873	0.411	0.049	0.079	0.011
79	1170	84.525	41.873	0.411	0.050	0.077	0.011
80	1185	84.530	41.873	0.411	0.050	0.076	0.011
81	1200	84.525	41.873	0.411	0.051	0.074	0.011
82	1215	84.531	41.873	0.411	0.051	0.073	0.011
83	1230	84.521	41.873	0.411	0.052	0.072	0.011
84	1245	84.519	41.872	0.411	0.052	0.071	0.010
85	1260	84.519	41.872	0.411	0.053	0.069	0.010
86	1275	84.523	41.872	0.411	0.053	0.068	0.010
87	1290	84.517	41.872	0.411	0.053	0.067	0.010
88	1305	84.526	41.871	0.412	0.054	0.066	0.010
89	1320	84.519	41.871	0.412	0.054	0.065	0.010
90	1335	84.523	41.871	0.412	0.055	0.064	0.010
91	1350	84.511	41.871	0.412	0.055	0.064	0.009
92	1365	84.509	41.871	0.411	0.056	0.063	0.009
93	1380	84.503	41.871	0.411	0.056	0.062	0.009
94	1395	84.499	41.871	0.411	0.057	0.061	0.009
95	1410	84.491	41.870	0.412	0.057	0.060	0.009
96	1425	84.493	41.870	0.412	0.058	0.059	0.008
97	1440	84.490	41.869	0.412	0.058	0.058	0.008

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 1 DEG. F	TEMP 2 DEG. F	TEMP 3 DEG. F	TEMP 4 DEG. F	TEMP 5 DEG. F	TEMP 6 DEG. F
1	0	84.360	84.740	84.880	84.850	84.540	84.840
2	15	84.350	84.730	84.870	84.830	84.540	84.860
3	30	84.300	84.730	84.870	84.850	84.520	84.840
4	45	84.280	84.730	84.870	84.850	84.530	84.850
5	60	84.290	84.700	84.870	84.840	84.530	84.840
6	75	84.300	84.710	84.870	84.820	84.520	84.810
7	90	84.290	84.690	84.860	84.840	84.510	84.810
8	105	84.290	84.700	84.860	84.820	84.490	84.780
9	120	84.260	84.690	84.850	84.820	84.500	84.800
10	135	84.250	84.690	84.840	84.810	84.500	84.860
11	150	84.290	84.680	84.830	84.830	84.490	84.780
12	165	84.240	84.690	84.830	84.790	84.480	84.800
13	180	84.200	84.670	84.820	84.820	84.490	84.810
14	195	84.220	84.680	84.820	84.810	84.490	84.800
15	210	84.240	84.660	84.820	84.800	84.480	84.740
16	225	84.250	84.650	84.810	84.810	84.460	84.780
17	240	84.270	84.630	84.800	84.790	84.450	84.720
18	255	84.210	84.650	84.800	84.810	84.460	84.810
19	270	84.220	84.670	84.810	84.790	84.470	84.790
20	285	84.230	84.650	84.800	84.790	84.470	84.780
21	300	84.250	84.660	84.800	84.780	84.460	84.780
22	315	84.230	84.660	84.790	84.810	84.470	84.800
23	330	84.230	84.670	84.790	84.810	84.480	84.810
24	345	84.240	84.650	84.800	84.820	84.470	84.780
25	360	84.220	84.660	84.800	84.810	84.470	84.770
26	375	84.230	84.660	84.780	84.850	84.480	84.780
27	390	84.250	84.650	84.780	84.800	84.470	84.760
28	405	84.230	84.660	84.790	84.790	84.460	84.760
29	420	84.230	84.650	84.790	84.810	84.470	84.790
30	435	84.220	84.650	84.790	84.810	84.460	84.770
31	450	84.240	84.650	84.780	84.800	84.460	84.780
32	465	84.230	84.650	84.780	84.800	84.460	84.780
33	480	84.220	84.640	84.800	84.840	84.480	84.760
34	495	84.260	84.640	84.780	84.810	84.450	84.760
35	510	84.210	84.640	84.780	84.870	84.470	84.790
36	525	84.230	84.650	84.780	84.810	84.470	84.840
37	540	84.240	84.650	84.770	84.830	84.480	84.750
38	555	84.230	84.650	84.760	84.820	84.440	84.740
39	570	84.220	84.630	84.770	0.000	84.450	84.750
40	585	84.210	84.610	84.780	0.000	84.470	84.780
41	600	84.230	84.630	84.770	0.000	84.460	84.740
42	615	84.280	84.660	84.780	0.000	84.480	84.790
43	630	84.240	84.660	84.780	0.000	84.480	84.840
44	645	84.270	84.670	84.790	0.000	84.480	84.780
45	660	84.260	84.680	84.790	0.000	84.480	84.780
46	675	84.250	84.660	84.790	0.000	84.470	84.780
47	690	84.230	84.690	84.790	0.000	84.490	84.810
48	705	84.250	84.680	84.780	0.000	84.460	84.820
49	720	84.260	84.680	84.790	0.000	84.510	84.840
50	735	84.270	84.670	84.780	0.000	84.480	84.780

VARIABLE TABLE SUMMARY (CONTINUED)

SAMPLE NUMBER	DELTA MINS	TEMP 1 DEG. F	TEMP 2 DEG. F	TEMP 3 DEG. F	TEMP 4 DEG. F	TEMP 5 DEG. F	TEMP 6 DEG. F
51	750	84.250	84.670	84.790	0.000	84.490	84.800
52	765	84.250	84.670	84.780	0.000	84.490	84.780
53	780	84.250	84.650	84.790	0.000	84.490	84.810
54	795	84.240	84.670	84.780	0.000	84.490	84.820
55	810	84.250	84.670	84.770	0.000	84.490	84.800
56	825	84.250	84.670	84.780	0.000	84.490	84.820
57	840	84.260	84.680	84.780	0.000	84.470	84.850
58	855	84.240	84.650	84.790	0.000	84.470	84.810
59	870	84.250	84.630	84.780	0.000	84.480	84.790
60	885	84.270	84.650	84.780	0.000	84.500	84.810
61	900	84.270	84.650	84.790	0.000	84.480	84.800
62	915	84.270	84.660	84.790	0.000	84.470	84.810
63	930	84.250	84.660	84.780	0.000	84.490	84.780
64	945	84.260	84.670	84.770	0.000	84.500	84.810
65	960	84.260	84.660	84.780	0.000	84.480	84.800
66	975	84.250	84.660	84.790	0.000	84.490	84.800
67	990	84.250	84.660	84.780	0.000	84.460	84.780
68	1005	84.260	84.660	84.780	0.000	84.490	84.800
69	1020	84.250	84.670	84.780	0.000	84.470	84.830
70	1035	84.250	84.640	84.770	0.000	84.500	84.810
71	1050	84.220	84.670	84.790	0.000	84.490	84.810
72	1065	84.270	84.670	84.780	0.000	84.490	84.790
73	1080	84.240	84.680	84.780	0.000	84.480	84.800
74	1095	84.260	84.660	84.780	0.000	84.490	84.800
75	1110	84.250	84.670	84.780	0.000	84.460	84.800
76	1125	84.230	84.670	84.770	0.000	84.470	84.820
77	1140	84.220	84.630	84.780	0.000	84.480	84.780
78	1155	84.240	84.630	84.780	0.000	84.460	84.810
79	1170	84.210	84.650	84.760	0.000	84.450	84.750
80	1185	84.230	84.650	84.760	0.000	84.440	84.770
81	1200	84.210	84.650	84.760	0.000	84.460	84.770
82	1215	84.230	84.650	84.770	0.000	84.460	84.770
83	1230	84.220	84.640	84.760	0.000	84.460	84.770
84	1245	84.210	84.640	84.750	0.000	84.470	84.790
85	1260	84.210	84.640	84.750	0.000	84.460	84.780
86	1275	84.230	84.640	84.760	0.000	84.450	84.750
87	1290	84.200	84.650	84.760	0.000	84.460	84.780
88	1305	84.240	84.640	84.760	0.000	84.460	84.770
89	1320	84.220	84.640	84.750	0.000	84.450	84.780
90	1335	84.220	84.650	84.750	0.000	84.440	84.750
91	1350	84.200	84.630	84.750	0.000	84.440	84.780
92	1365	84.200	84.630	84.750	0.000	84.450	84.780
93	1380	84.200	84.620	84.760	0.000	84.460	84.770
94	1395	84.180	84.630	84.740	0.000	84.440	84.720
95	1410	84.170	84.620	84.730	0.000	84.430	84.740
96	1425	84.190	84.610	84.730	0.000	84.430	84.780
97	1440	84.190	84.610	84.720	0.000	84.420	84.750

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 7 DEG. F	TEMP 8 DEG. F	TEMP 9 DEG. F	TEMP 10 DEG. F	TEMP 11 DEG. F	TEMP 12 DEG. F
1	0	85.010	84.840	85.330	85.050	84.710	84.330
2	15	84.950	84.830	85.330	85.030	84.690	84.330
3	30	84.950	84.800	85.320	85.020	84.710	84.330
4	45	84.920	84.820	85.320	85.010	84.690	84.340
5	60	84.920	84.800	85.340	85.020	84.690	84.320
6	75	84.930	84.800	85.330	85.030	84.690	84.310
7	90	84.910	84.780	85.320	85.030	84.690	84.310
8	105	84.910	84.790	85.310	85.010	84.700	84.320
9	120	84.870	84.780	85.300	84.990	84.690	84.310
10	135	84.890	84.780	85 300	85.010	84.680	84.310
11	150	84.890	84.750	85.310	85.010	84.670	84.300
12	165	84.900	84.760	85.300	85.000	84.690	84.290
13	180	84.890	84.760	85.300	84.990	84.670	84.280
14	195	84.890	84.750	85.310	84.990	84.690	84.290
15	210	84.910	84.760	85.300	84.990	84.670	84.300
16	225	84.880	84.740	85.300	85.010	84.660	84.280
17	240	84.880	84.740	85.260	84.980	84.670	84.270
18	255	84.920	84.740	85.300	84.960	84.660	84.270
19	270	84.870	84.740	85.300	84.980	84.680	84.310
20	285	84.910	84.740	85.320	84.960	84.660	84.290
21	300	84.880	84.740	85.320	84.970	84.660	84.300
22	315	84.910	84.740	85.300	84.970	84.660	84.280
23	330	84.880	84.750	85.290	84.980	84.670	84.290
24	345	84.860	84.740	85.300	84.990	84.650	84.270
25	360	84.900	84.730	85.310	84.970	84.670	84.290
26	375	84.870	84.740	85.310	84.980	84.660	84.290
27	390	84.880	84.740	85.300	84.960	84.670	84.280
28	405	84.860	84.750	85.300	84.970	84.690	84.300
29	420	84.880	84.750	85.300	84.990	84.670	84.290
30	435	84.920	84.740	85.310	84.980	84.660	84.310
31	450	84.860	84.740	85.310	84.990	84.670	84.310
32	465	84.890	84.750	85.320	84.970	84.670	84.300
33	480	84.880	84.740	85.310	84.980	84.660	84.290
34	495	84.870	84.750	85.320	84.970	84.660	84.280
35	510	84.870	84.740	85.310	84.980	84.670	84.300
36	525	84.860	84.740	85.300	84.970	84.660	84.290
37	540	84.890	84.750	85.320	84.970	84.670	84.280
38	555	84.890	84.760	85.320	84.980	84.670	84.300
39	570	84.860	84.740	85.300	84.970	84.670	84.300
40	585	84.860	84.740	85.310	84.970	84.670	84.310
41	600	84.890	84.750	85.330	85.010	84.700	84.360
42	615	84.890	84.750	85.320	85.040	84.720	84.340
43	630	84.910	84.760	85.320	85.040	84.740	84.370
44	645	84.910	84.760	85.340	85.060	84.730	84.380
45	660	84.880	84.770	85.330	85.070	84.730	84.370
46	675	84.920	84.760	85.330	85.070	84.740	84.390
47	690	84.870	84.760	85.340	85.080	84.770	84.400
48	705	84.870	84.770	85.350	85.070	84.750	84.400
49	720	84.930	84.780	85.340	85.070	84.760	84.370
50	735	84.890	84.770	85.330	85.080	84.730	84.390

VARIABLE TABLE SUMMARY (CONTINUED)

SAMPLE NUMBER	DELTA MINS	TEMP 7 DEG. F	TEMP 8 DEG. F	TEMP 9 DEG. F	TEMP 10 DEG. F	TEMP 11 DEG. F	TEMP 12 DEG. F
51	750	84.900	84.760	85.350	85.080	84.750	84.380
52	765	84.920	84.770	85.340	85.090	84.770	84.390
53	780	84.910	84.770	85.330	85.080	84.750	84.380
54	795	84.940	84.770	85.340	85.060	84.770	84.400
55	810	84.890	84.780	85.350	85.070	84.750	84.380
56	825	84.890	84.770	85.340	85.060	84.760	84.360
57	840	84.880	84.770	85.330	85.080	84.760	84.390
58	855	84.890	84.770	85.340	85.070	84.770	84.390
59	870	84.870	84.750	85.350	85.080	84.780	84.370
60	885	84.920	84.770	85.360	85.080	84.740	84.370
61	900	84.910	84.770	85.360	85.090	84.750	84.390
62	915	84.940	84.760	85.340	85.090	84.750	84.390
63	930	84.900	84.770	85.340	85.090	84.770	84.380
64	945	84.880	84.770	85.350	85.080	84.770	84.370
65	960	84.900	84.770	85.340	85.100	84.760	84.400
66	975	84.900	84.760	85.350	85.090	84.770	84.390
67	990	84.930	84.770	85.330	85.090	84.780	84.410
68	1005	84.940	84.760	85.350	85.090	84.770	84.380
69	1020	84.930	84.750	85.330	85.080	84.770	84.400
70	1035	84.950	84.760	85.340	85.090	84.780	84.370
71	1050	84.860	84.770	85.340	85.080	84.780	84.390
72	1065	84.880	84.750	85.340	85.100	84.770	84.390
73	1080	84.910	84.760	85.350	85.090	84.770	84.410
74	1095	84.890	84.750	85.350	85.080	84.770	84.380
75	1110	84.890	84.760	85.340	85.070	84.770	84.390
76	1125	84.930	84.770	85.320	85.090	84.780	84.400
77	1140	84.890	84.750	85.320	85.100	84.770	84.380
78	1155	84.890	84.750	85.340	85.090	84.780	84.410
79	1170	84.870	84.770	85.310	85.070	84.770	84.400
80	1185	84.860	84.750	85.330	85.070	84.760	84.390
81	1200	84.910	84.750	85.330	85.080	84.750	84.390
82	1215	84.890	84.740	85.320	85.070	84.770	84.380
83	1230	84.860	84.730	85.310	85.060	84.770	84.360
84	1245	84.900	84.720	85.330	85.070	84.760	84.350
85	1260	84.920	84.730	85.310	85.070	84.750	84.360
86	1275	84.870	84.740	85.290	85.060	84.760	84.380
87	1290	84.830	84.740	85.300	85.050	84.770	84.360
88	1305	84.870	84.720	85.320	85.050	84.760	84.370
89	1320	84.860	84.730	85.310	85.050	84.770	84.380
90	1335	84.860	84.710	85.320	85.060	84.770	84.350
91	1350	84.880	84.720	85.310	85.060	84.760	84.390
92	1365	84.870	84.720	85.300	85.060	84.770	84.350
93	1380	84.840	84.720	85.310	85.050	84.750	84.320
94	1395	84.850	84.710	85.310	85.050	84.770	84.350
95	1410	84.840	84.710	85.270	85.040	84.760	84.340
96	1425	84.820	84.710	85.260	85.040	84.740	84.330
97	1440	84.810	84.700	85.270	85.030	84.740	84.310

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 13 DEG. F	TEMP 14 DEG. F	TEMP 15 DEG. F	TEMP 16 DEG. F	TEMP 17 DEG. F	TEMP 18 DEG. F
1	0	84.590	84.500	84.910	84.160	84.190	85.110
2	15	84.590	84.500	84.900	84.170	84.210	85.110
3	30	84.550	84.490	84.890	84.160	84.220	85.120
4	45	84.560	84.500	84.890	84.150	84.220	85.120
5	60	84.580	84.500	84.890	84.150	84.200	85.110
6	75	84.580	84.480	84.800	84.140	84.190	85.110
7	90	84.580	84.480	84.890	84.140	84.210	85.110
8	105	84.570	84.490	84.880	84.140	84.190	85.100
9	120	84.570	84.490	84.880	84.140	84.180	85.100
10	135	84.550	84.480	84.880	84.140	84.180	85.100
11	150	84.550	84.480	84.870	84.140	84.200	85.100
12	165	84.540	84.480	84.870	84.140	84.170	85.090
13	180	84.560	84.470	84.870	84.150	84.180	85.090
14	195	84.550	84.460	84.870	84.140	84.200	85.090
15	210	84.540	84.480	84.860	84.140	84.170	85.080
16	225	84.530	84.460	84.870	84.130	84.180	85.070
17	240	84.510	84.430	84.860	84.100	84.160	85.080
18	255	84.540	84.470	84.860	84.130	84.170	85.080
19	270	84.550	84.480	84.860	84.120	84.170	85.080
20	285	84.540	84.480	84.870	84.120	84.200	85.080
21	300	84.540	84.480	84.870	84.120	84.180	85.090
22	315	84.550	84.480	84.870	84.120	84.160	85.090
23	330	84.540	84.490	84.870	84.120	84.180	85.090
24	345	84.550	84.490	84.870	84.140	84.170	85.090
25	360	84.550	84.490	84.860	84.120	84.190	85.090
26	375	84.550	84.500	84.870	84.140	84.200	85.090
27	390	84.550	84.500	84.870	84.130	84.180	85.090
28	405	84.550	84.490	84.870	84.130	84.180	85.090
29	420	84.540	84.490	84.870	84.130	84.190	85.100
30	435	84.540	84.490	84.870	84.130	84.170	85.090
31	450	84.540	84.500	84.870	84.120	84.200	85.100
32	465	84.550	84.480	84.870	84.130	84.180	85.100
33	480	84.560	84.510	84.870	84.140	84.180	85.090
34	495	84.540	84.490	84.870	84.140	84.190	85.100
35	510	84.540	84.500	84.870	84.130	84.210	85.100
36	525	84.560	84.490	84.870	84.130	84.180	85.100
37	540	84.580	84.490	84.870	84.140	84.180	85.090
38	555	84.550	84.500	84.870	84.150	84.190	85.110
39	570	84.530	84.520	84.870	84.150	84.190	85.100
40	585	84.570	84.500	84.880	84.140	84.190	85.110
41	600	84.540	84.510	84.890	84.150	84.220	85.110
42	615	84.580	84.510	84.890	84.140	84.220	85.120
43	630	84.590	84.520	84.880	84.150	84.230	85.120
44	645	84.570	84.500	84.900	84.150	84.240	85.130
45	660	84.580	84.530	84.900	84.170	84.250	85.130
46	675	84.580	84.540	84.910	84.150	84.240	85.130
47	690	84.580	84.520	84.910	84.160	84.240	85.140
48	705	84.580	84.550	84.910	84.170	84.250	85.140
49	720	84.590	84.540	84.910	84.180	84.250	85.140
50	735	84.580	84.530	84.910	84.180	84.260	85.140

VARIABLE TABLE SUMMARY (CONTINUED)

SAMPLE NUMBER	DELTA MINS	TEMP 13 DEG. F	TEMP 14 DEG. F	TEMP 15 DEG. F	TEMP 16 DEG. F	TEMP 17 DEG. F	TEMP 18 DEG. F
51	750	84.600	84.520	84.920	84.190	84.250	85.140
52	765	84.590	84.540	84.910	84.180	84.250	85.140
53	780	84.580	84.520	84.920	84.170	84.240	85.150
54	795	84.570	84.530	84.910	84.170	84.230	85.140
55	810	84.590	84.530	84.920	84.170	84.260	85.140
56	825	84.580	84.520	84.910	84.170	84.250	85.130
57	840	84.580	84.530	84.920	84.180	84.260	85.150
58	855	84.580	84.530	84.920	84.180	84.250	85.140
59	870	84.570	84.510	84.910	84.170	84.250	85.140
60	885	84.600	84.520	84.920	84.190	84.260	85.140
61	900	84.590	84.510	84.920	84.190	84.230	85.140
62	915	84.580	84.520	84.920	84.210	84.250	85.150
63	930	84.590	84.530	84.920	84.190	84.240	85.140
64	945	84.610	84.520	84.930	84.170	84.220	85.150
65	960	84.600	84.530	84.920	84.180	84.240	85.140
66	975	84.580	84.520	84.920	84.170	84.250	85.140
67	990	84.580	84.520	84.930	84.170	84.230	85.150
68	1005	84.580	84.510	84.930	84.170	84.220	85.140
69	1020	84.570	84.520	84.930	84.190	84.230	85.150
70	1035	84.610	84.510	84.920	84.180	84.230	85.140
71	1050	84.610	84.510	84.930	84.190	84.220	85.140
72	1065	84.600	84.520	84.930	84.190	84.240	85.140
73	1080	84.590	84.500	84.930	84.180	84.220	85.140
74	1095	84.600	84.500	84.930	84.180	84.220	85.150
75	1110	84.570	84.500	84.930	84.180	84.230	85.150
76	1125	84.580	84.500	84.930	84.180	84.240	85.140
77	1140	84.600	84.510	84.920	84.190	84.220	85.140
78	1155	84.560	84.500	84.920	84.180	84.240	85.140
79	1170	84.570	84.500	84.920	84.180	84.230	85.140
80	1185	84.570	84.490	84.920	84.170	84.210	85.140
81	1200	84.570	84.470	84.920	84.180	84.220	85.140
82	1215	84.560	84.500	84.920	84.170	84.220	85.140
83	1230	84.550	84.470	84.910	84.170	84.230	85.130
84	1245	84.570	84.480	84.920	84.160	84.210	85.130
85	1260	84.570	84.470	84.920	84.180	84.200	85.130
86	1275	84.560	84.470	84.910	84.170	84.210	85.130
87	1290	84.560	84.460	84.910	84.170	84.190	85.120
88	1305	84.560	84.480	84.900	84.170	84.180	85.120
89	1320	84.550	84.470	84.900	84.160	84.200	85.120
90	1335	84.550	84.460	84.900	84.170	84.220	85.120
91	1350	84.540	84.480	84.910	84.170	84.210	85.130
92	1365	84.540	84.480	84.900	84.170	84.210	85.130
93	1380	84.550	84.460	84.890	84.150	84.200	85.120
94	1395	84.530	84.470	84.900	84.150	84.190	85.110
95	1410	84.520	84.450	84.890	84.150	84.210	85.110
96	1425	84.540	84.460	84.890	84.140	84.190	85.100
97	1440	84.510	84.440	84.890	84.140	84.180	85.110

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 19 DEG. F	TEMP 20 DEG. F	PRES 1 PSIA	HUM 1 FRACTION	HUM 2 FRACTION	HUM 3 FRACTION
1	0	84.700	84.460	41.891	0.721	0.672	0.669
2	15	84.690	84.470	41.890	0.722	0.672	0.669
3	30	84.710	84.440	41.890	0.722	0.672	0.669
4	45	84.700	84.450	41.889	0.721	0.672	0.669
5	60	84.700	84.450	41.889	0.722	0.672	0.669
6	75	84.700	84.450	41.888	0.722	0.673	0.670
7	90	84.660	84.460	41.888	0.722	0.673	0.670
8	105	84.690	84.470	41.887	0.723	0.673	0.670
9	120	84.690	84.450	41.887	0.723	0.673	0.670
10	135	84.700	84.440	41.886	0.723	0.674	0.670
11	150	84.690	84.450	41.885	0.723	0.674	0.670
12	165	84.690	84.440	41.885	0.723	0.674	0.671
13	180	84.690	84.430	41.884	0.723	0.674	0.671
14	195	84.700	84.450	41.884	0.724	0.674	0.671
15	210	84.680	84.430	41.884	0.724	0.674	0.671
16	225	84.670	84.430	41.883	0.724	0.674	0.671
17	240	84.670	84.420	41.881	0.724	0.674	0.671
18	255	84.670	84.450	41.882	0.724	0.674	0.671
19	270	84.690	84.430	41.882	0.725	0.674	0.671
20	285	84.680	84.450	41.882	0.724	0.675	0.671
21	300	84.700	84.450	41.882	0.725	0.675	0.671
22	315	84.710	84.440	41.881	0.725	0.675	0.672
23	330	84.700	84.460	41.881	0.725	0.675	0.672
24	345	84.710	84.440	41.881	0.725	0.675	0.672
25	360	84.700	84.450	41.881	0.725	0.675	0.672
26	375	84.680	84.450	41.881	0.725	0.676	0.672
27	390	84.700	84.460	41.880	0.725	0.676	0.672
28	405	84.710	84.450	41.880	0.725	0.676	0.672
29	420	84.710	84.450	41.880	0.726	0.675	0.673
30	435	84.690	84.460	41.880	0.725	0.676	0.673
31	450	84.710	84.460	41.880	0.726	0.676	0.673
32	465	84.690	84.450	41.879	0.726	0.676	0.673
33	480	84.700	84.460	41.879	0.726	0.676	0.673
34	495	84.700	84.450	41.879	0.726	0.676	0.673
35	510	84.710	84.450	41.879	0.726	0.676	0.674
36	525	84.710	84.450	41.879	0.727	0.677	0.674
37	540	84.700	84.480	41.879	0.727	0.677	0.674
38	555	84.710	84.460	41.878	0.726	0.677	0.674
39	570	84.710	84.450	41.878	0.727	0.677	0.674
40	585	84.720	84.450	41.878	0.727	0.677	0.674
41	600	84.720	84.460	41.878	0.727	0.677	0.674
42	615	84.710	84.460	41.879	0.727	0.677	0.674
43	630	84.700	84.470	41.879	0.728	0.676	0.675
44	645	84.710	84.470	41.879	0.728	0.678	0.675
45	660	84.720	84.460	41.879	0.728	0.678	0.675
46	675	84.720	84.470	41.879	0.728	0.678	0.675
47	690	84.720	84.480	41.879	0.728	0.678	0.675
48	705	84.710	84.470	41.879	0.728	0.678	0.675
49	720	84.730	84.470	41.879	0.728	0.678	0.675
50	735	84.730	84.470	41.879	0.729	0.679	0.675

VARIABLE TABLE SUMMARY (CONTINUED)

SAMPLE NUMBER	DELTA MINS	TEMP 19 DEG. F	TEMP 20 DEG. F	PRES 1 PSIA	HUM 1 FRACTION	HUM 2 FRACTION	HUM 3 FRACTION
51	750	84.740	84.490	41.879	0.728	0.678	0.675
52	765	84.730	84.480	41.878	0.728	0.678	0.675
53	780	84.740	84.470	41.878	0.729	0.679	0.676
54	795	84.750	84.480	41.878	0.728	0.679	0.675
55	810	84.730	84.470	41.878	0.728	0.679	0.676
56	825	84.730	84.480	41.878	0.728	0.679	0.676
57	840	84.730	84.480	41.878	0.728	0.678	0.676
58	855	84.720	84.480	41.877	0.729	0.678	0.676
59	870	84.730	84.470	41.877	0.729	0.678	0.676
60	885	84.740	84.480	41.877	0.729	0.679	0.676
61	900	84.740	84.470	41.877	0.729	0.679	0.676
62	915	84.750	84.480	41.876	0.729	0.679	0.676
63	930	84.730	84.500	41.876	0.729	0.679	0.677
64	945	84.720	84.490	41.876	0.729	0.679	0.677
65	960	84.740	84.490	41.876	0.730	0.679	0.677
66	975	84.720	84.460	41.876	0.730	0.679	0.677
67	990	84.740	84.460	41.876	0.729	0.679	0.677
68	1005	84.730	84.480	41.876	0.729	0.679	0.677
69	1020	84.730	84.470	41.875	0.730	0.679	0.677
70	1035	84.730	84.470	41.875	0.730	0.679	0.677
71	1050	84.730	84.480	41.875	0.729	0.679	0.677
72	1065	84.740	84.470	41.875	0.730	0.679	0.677
73	1080	84.740	84.510	41.875	0.730	0.679	0.677
74	1095	84.720	84.500	41.875	0.729	0.680	0.677
75	1110	84.730	84.470	41.874	0.730	0.679	0.677
76	1125	84.730	84.500	41.874	0.730	0.679	0.677
77	1140	84.720	84.460	41.874	0.730	0.680	0.678
78	1155	84.730	84.470	41.873	0.730	0.680	0.677
79	1170	84.730	84.460	41.873	0.730	0.680	0.678
80	1185	84.740	84.470	41.873	0.730	0.680	0.678
81	1200	84.730	84.460	41.873	0.730	0.680	0.678
82	1215	84.730	84.460	41.873	0.731	0.680	0.678
83	1230	84.730	84.450	41.873	0.731	0.680	0.678
84	1245	84.730	84.440	41.872	0.731	0.679	0.678
85	1260	84.720	84.440	41.872	0.731	0.680	0.678
86	1275	84.710	84.430	41.872	0.731	0.680	0.678
87	1290	84.730	84.440	41.872	0.731	0.680	0.678
88	1305	84.720	84.420	41.871	0.731	0.680	0.679
89	1320	84.710	84.430	41.871	0.731	0.681	0.679
90	1335	84.730	84.430	41.871	0.731	0.681	0.679
91	1350	84.730	84.450	41.871	0.731	0.681	0.679
92	1365	84.700	84.440	41.871	0.731	0.680	0.679
93	1380	84.700	84.410	41.871	0.732	0.680	0.679
94	1395	84.700	84.440	41.871	0.732	0.681	0.679
95	1410	84.710	84.430	41.870	0.731	0.681	0.679
96	1425	84.700	84.440	41.870	0.732	0.681	0.679
97	1440	84.710	84.430	41.869	0.732	0.681	0.679

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	HUM 4 FRACTION	HUM 5 FRACTION	HUM 6 FRACTION
1	0	0.699	0.700	0.715
2	15	0.699	0.700	0.715
3	30	0.699	0.701	0.716
4	45	0.699	0.700	0.716
5	60	0.700	0.701	0.716
6	75	0.700	0.701	0.716
7	90	0.700	0.701	0.716
8	105	0.700	0.701	0.716
9	120	0.700	0.701	0.716
10	135	0.700	0.701	0.716
11	150	0.700	0.702	0.716
12	165	0.701	0.702	0.716
13	180	0.701	0.702	0.716
14	195	0.700	0.702	0.716
15	210	0.700	0.702	0.717
16	225	0.700	0.702	0.716
17	240	0.701	0.703	0.717
18	255	0.701	0.702	0.716
19	270	0.701	0.702	0.716
20	285	0.701	0.702	0.717
21	300	0.701	0.703	0.717
22	315	0.701	0.703	0.717
23	330	0.701	0.703	0.717
24	345	0.701	0.703	0.717
25	360	0.701	0.703	0.717
26	375	0.701	0.703	0.717
27	390	0.701	0.703	0.717
28	405	0.701	0.703	0.717
29	420	0.701	0.704	0.717
30	435	0.701	0.704	0.717
31	450	0.701	0.704	0.717
32	465	0.702	0.704	0.717
33	480	0.702	0.704	0.717
34	495	0.702	0.704	0.718
35	510	0.703	0.704	0.718
36	525	0.703	0.704	0.718
37	540	0.703	0.704	0.718
38	555	0.703	0.705	0.719
39	570	0.703	0.705	0.719
40	585	0.702	0.704	0.718
41	600	0.702	0.704	0.719
42	615	0.702	0.705	0.719
43	630	0.703	0.705	0.719
44	645	0.703	0.705	0.719
45	660	0.703	0.705	0.719
46	675	0.702	0.706	0.719
47	690	0.703	0.705	0.719
48	705	0.702	0.705	0.719
49	720	0.702	0.705	0.719
50	735	0.703	0.705	0.719

VARIABLE TABLE SUMMARY (CONTINUED)

SAMPLE NUMBER	DELTA MINS	HUM 4 FRACTION	HUM 5 FRACTION	HUM 6 FRACTION
51	750	0.702	0.705	0.719
52	765	0.703	0.705	0.719
53	780	0.703	0.706	0.720
54	795	0.703	0.706	0.720
55	810	0.703	0.706	0.719
56	825	0.703	0.706	0.719
57	840	0.703	0.706	0.720
58	855	0.703	0.706	0.720
59	870	0.703	0.706	0.720
60	885	0.703	0.706	0.720
61	900	0.703	0.707	0.720
62	915	0.703	0.706	0.720
63	930	0.704	0.707	0.721
64	945	0.704	0.707	0.721
65	960	0.704	0.708	0.720
66	975	0.704	0.707	0.721
67	990	0.704	0.707	0.721
68	1005	0.704	0.706	0.720
69	1020	0.703	0.707	0.720
70	1035	0.703	0.707	0.720
71	1050	0.703	0.707	0.720
72	1065	0.704	0.707	0.720
73	1080	0.703	0.707	0.720
74	1095	0.704	0.707	0.720
75	1110	0.704	0.707	0.721
76	1125	0.704	0.707	0.720
77	1140	0.704	0.707	0.721
78	1155	0.704	0.708	0.721
79	1170	0.704	0.708	0.721
80	1185	0.704	0.708	0.721
81	1200	0.704	0.707	0.721
82	1215	0.704	0.708	0.721
83	1230	0.704	0.708	0.721
84	1245	0.704	0.708	0.721
85	1260	0.704	0.708	0.721
86	1275	0.705	0.708	0.721
87	1290	0.705	0.709	0.721
88	1205	0.705	0.709	0.721
89	1320	0.705	0.708	0.721
90	1335	0.705	0.708	0.722
91	1350	0.705	0.709	0.721
92	1365	0.705	0.709	0.722
93	1380	0.705	0.709	0.722
94	1395	0.705	0.709	0.722
95	1410	0.705	0.709	0.722
96	1425	0.705	0.709	0.722
97	1440	0.706	0.709	0.722

END OF TABLE

END OF COMPUTER REPORT ON CONTAINMENT LEAK RATE TEST TO NRC

2.
CONTROLLED LEAK RATE TEST
(CLRT)

LEAK RATE COMPUTED USING TOTAL TIME METHOD
AS RECOMMENDED BY APPENDIX J FOR 10 CFR 50
(REACTOR CONTAINMENT LEAKAGE TESTING FOR WATER COOLED POWER REACTORS)

TEST PERIOD STARTED AT 0915 HOURS ON DECEMBER 3, 1975

A LEAST SQUARES FIRST ORDER FIT OF LEAK RATE TO TIME
SHOULD YIELD A SLOPE OF ZERO AND AN INTERCEPT EQUAL
TO THE LEAK RATE AS COMPUTED AT THE INITIAL START TIME
THE EQUATION HAS THE FORM - L=ST + R WHERE
L - CORRELATED LEAK RATE
S - SLOPE OF CORRELATION
T - TIME IN HOURS
R - INTERCEPT LEAK RATE

LEAK RATE = 0.002 HOURS + 0.126 PER CENT
MEAN = 0.131 PER CENT
ERROR COEFFICIENT = 0.013
WHERE COEFFICIENT OF 1.0 MEANS A PERFECT FIT &
COEFFICIENT OF 0.0 MEANS NO CORRELATION.

INITIAL CONTAINMENT AIR WEIGHT = 318709.3 LBS.
FINAL CONTAINMENT AIR WEIGHT = 318624.2 LBS.
LEAK RATE FOR 4.50 HOUR PERIOD IS 0.027 PER CENT BY WEIGHT.

MAXIMUM NRC LEAK RATE OF 0.128 PER CENT PER DAY
GIVEN FOR LOW PRESSURE TEST AT 41.868 PSIA

MAXIMUM PROBABLE TEMPERATURE LOOP ERROR = 0.054 DEGREES F.
MAXIMUM PROBABLE PRESSURE LOOP ERROR = 0.002 PSIA.
MAXIMUM PROBABLE HUMIDITY LOOP ERROR = 0.296 PERCENT.

INSTRUMENT ERROR CONTRIBUTES 0.015 PERCENT PER DAY
TO ESTABLISH 99.87 PERCENT CONFIDENCE BOUND

CONTROLLED LEAK RATE TEST (CLRT)
SUPPLEMENTAL VERIFICATION FOR ILRT
LEAKAGE OF 0.123 PERCENT AT 39.695 PSIA IS EQUIVALENT TO 3.372 SCFM.
SUPPLEMENTAL TEST (CLRT) DATA AND
PREVIOUS ILRT RESULTS PLUS INJECTED LEAKAGE
MUST BE WITHIN 25 PERCENT (0.843 SCFM) FOR VERIFICATION.

*** NOTE FOR GRAPHS ***

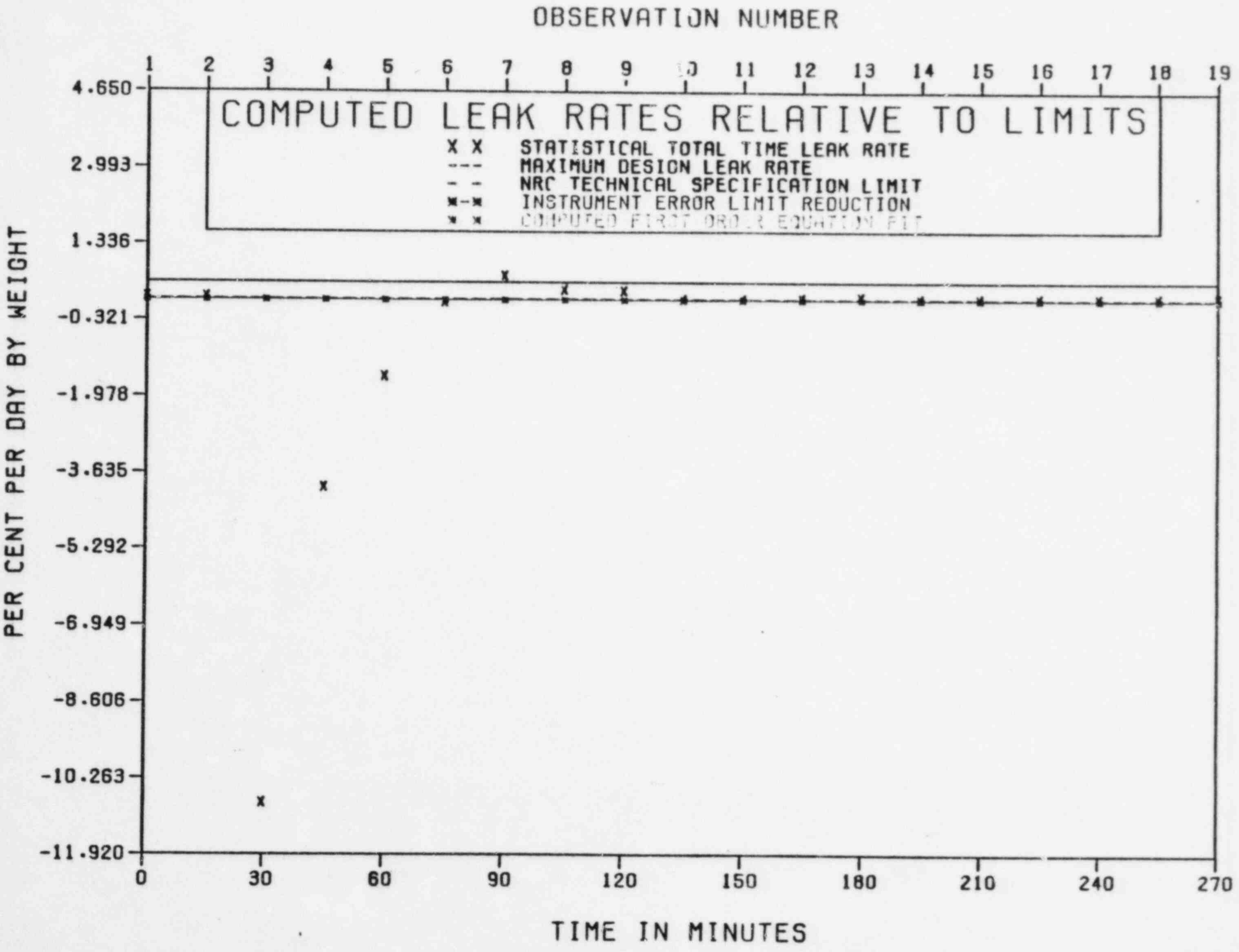
BOTH SAMPLE NUMBERS AND TIME ARE SHOWN.

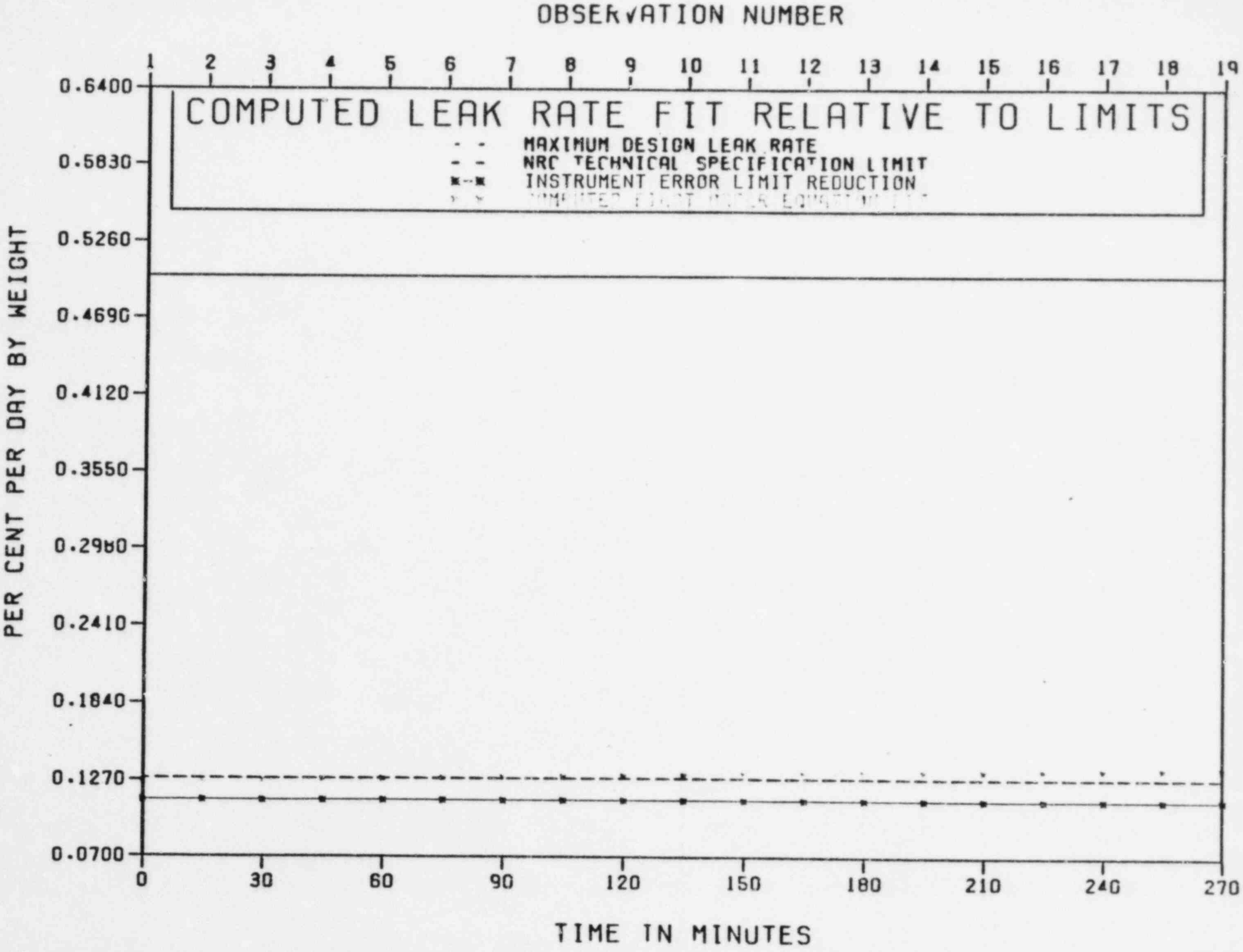
*** NOTE FOR TABULAR DATA ***

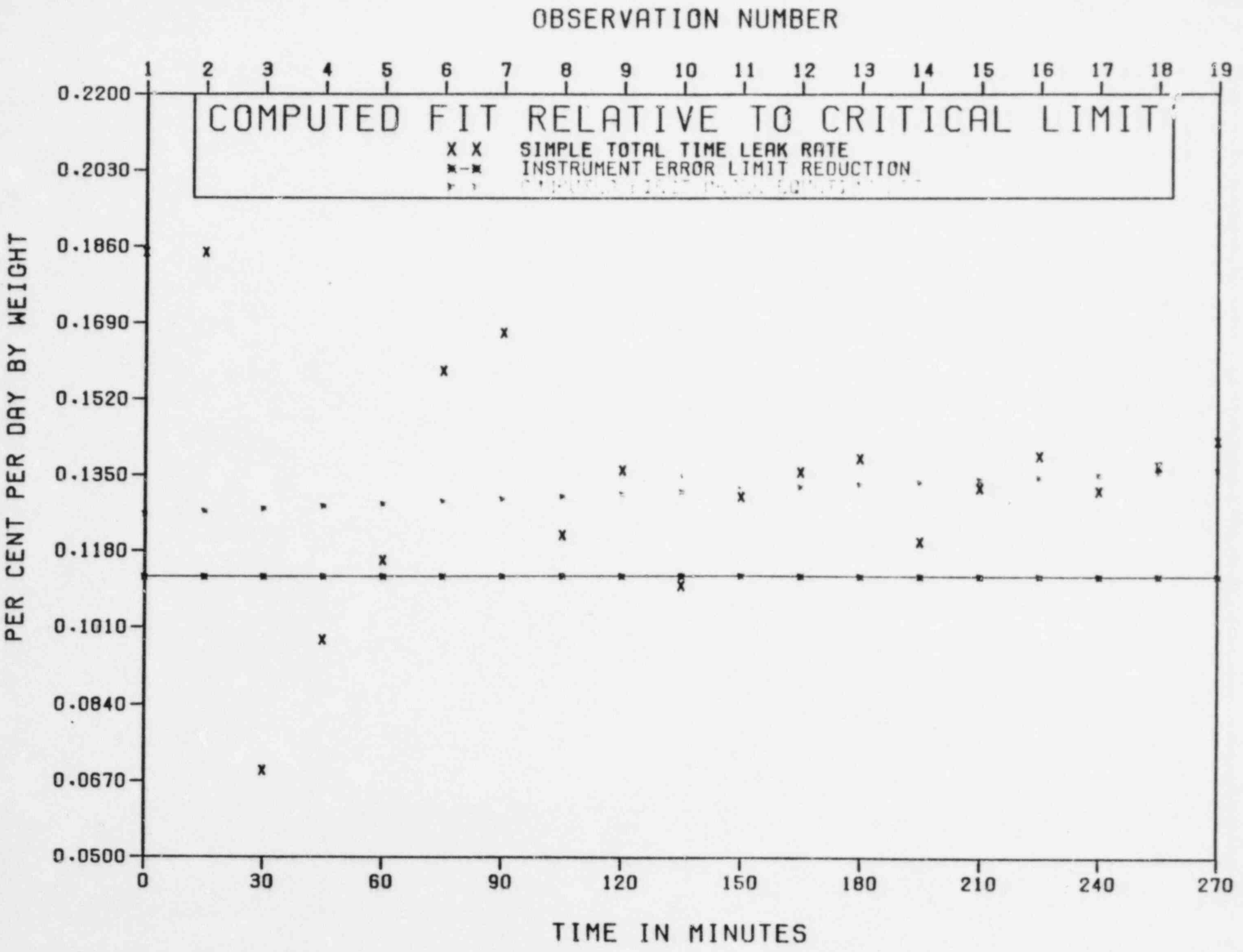
TABLE VALUES OF ZERO SIGNIFY EITHER
1. DATA IS NOT APPLICABLE TO THE CALCULATION OR
2. SENSOR HAS BEEN DELETED FROM MONITORING

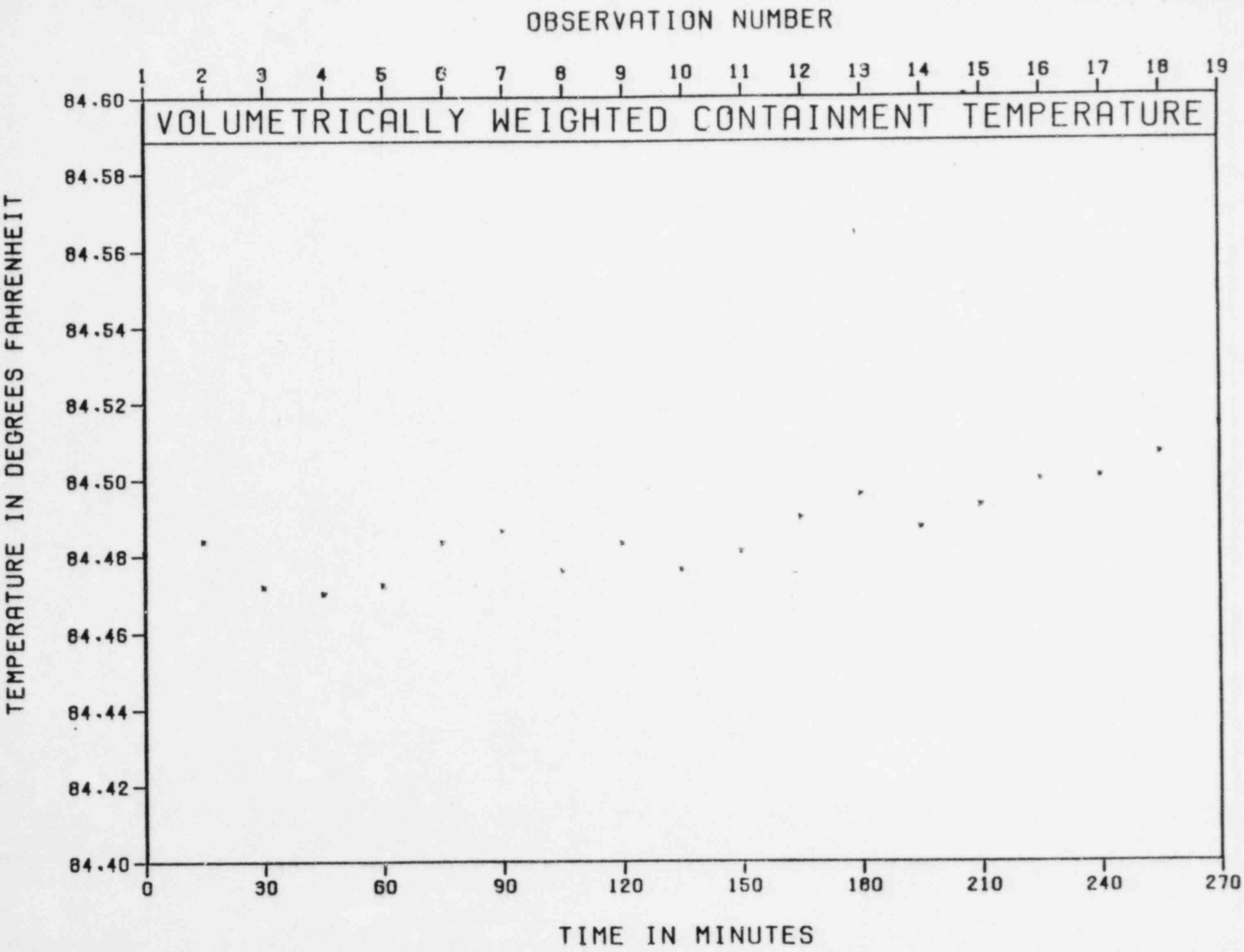
*** DESCRIPTION OF VARIABLES ***

AVG TEM	VOLUMETRICALLY WEIGHTED TEMPERATURE
AVG PRE	AVERAGE PRESSURE
VAP PRE	VOLUMETRICALLY WEIGHTED VAPOR PRESSURE
LEA COM	FIRST ORDER COMPUTED LEAK RATE
LEA TRA	STATISTICAL TOTAL TIME LEAK RATE
LEA SIM	SIMPLE TOTAL TIME LEAK RATE
ERROR	STATISTICAL TOTAL TIME LEAK RATE ERROR

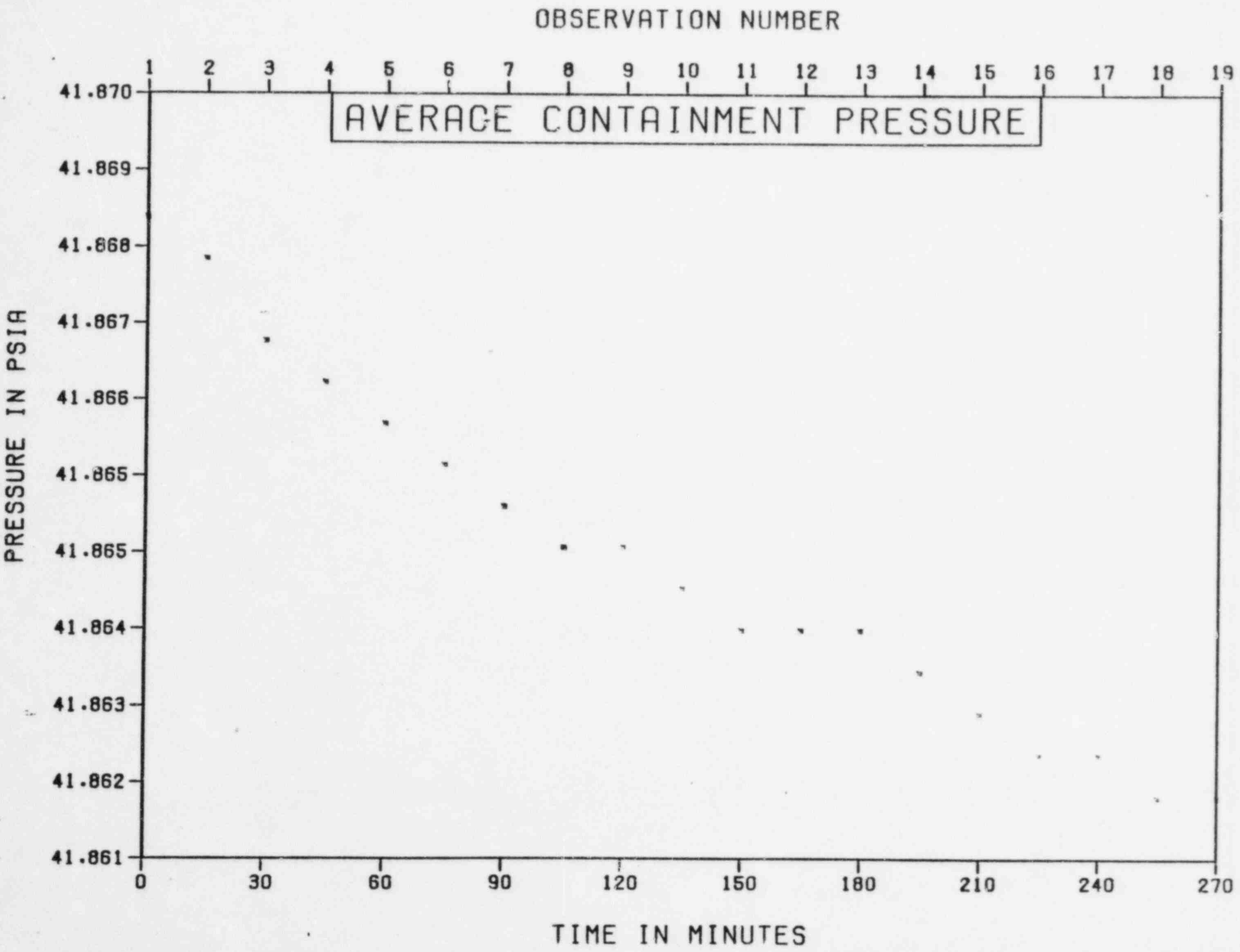

OBSERVATION NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
COMPUTED LEAK RATES RELATIVE TO LIMITS
X X STATISTICAL TOTAL TIME LEAK RATE
--- MAXIMUM DESIGN LEAK RATE
- - NRC TECHNICAL SPECIFICATION LIMIT
✱-✱ INSTRUMENT ERROR LIMIT REDUCTION
✱ ✱ COMPUTED FIRST ORDER EQUATION FIT
4.650
2.993
1.336
-0.321
-1.978
-3.635
-5.292
-6.949
-8.606
-10.263
-11.920
PER CENT PER DAY BY WEIGHT
0 30 60 90 120 150 180 210 240 270
TIME IN MINUTES

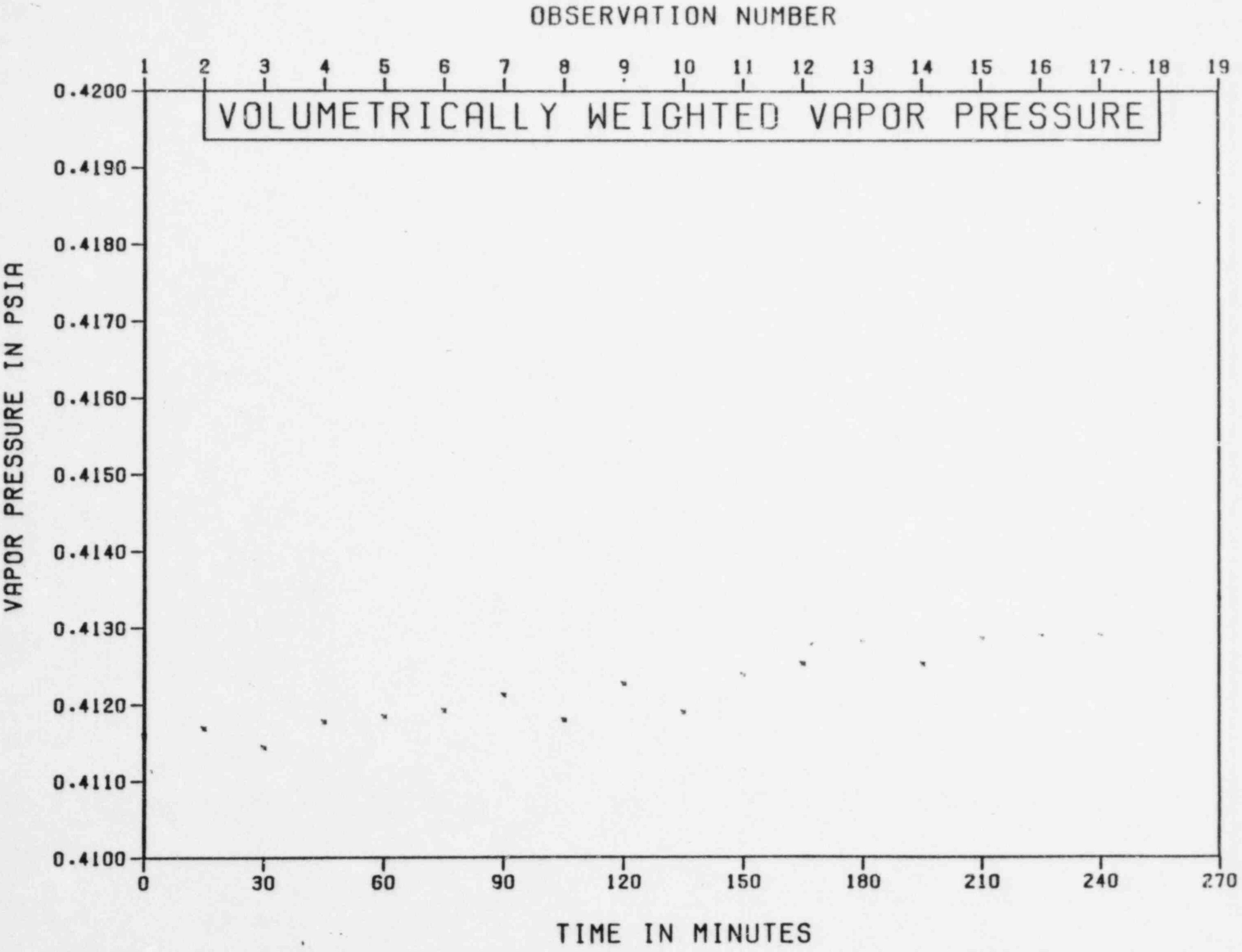

OBSERVATION NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
COMPUTED LEAK RATE FIT RELATIVE TO LIMITS
MAXIMUM DESIGN LEAK RATE
NRC TECHNICAL SPECIFICATION LIMIT
INSTRUMENT ERROR LIMIT REDUCTION
COMPUTED FIRST ORDER EQUATION FIT
PER CENT PER DAY BY WEIGHT
0.6400
0.5830
0.5260
0.4690
0.4120
0.3550
0.2980
0.2410
0.1840
0.1270
0.0700
0 30 60 90 120 150 180 210 240 270
TIME IN MINUTES


OBSERVATION NUMBER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
COMPUTED FIT RELATIVE TO CRITICAL LIMIT
X X SIMPLE TOTAL TIME LEAK RATE
- INSTRUMENT ERROR LIMIT REDUCTION
PER CENT PER DAY BY WEIGHT
0.2200
0.2030
0.1860
0.1690
0.1520
0.1350
0.1180
0.1010
0.0840
0.0670
0.0500
0
30
60
90
120
150
180
210
240
270
TIME IN MINUTES



OBSERVATION NUMBER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
VOLUMETRICALLY WEIGHTED CONTAINMENT TEMPERATURE
TEMPERATURE IN DEGREES FAHRENHEIT
84.60
84.58
84.56
84.54
84.52
84.50
84.48
84.46
84.44
84.42
84.40
0
30
60
90
120
150
180
210
240
270
TIME IN MINUTES


OBSERVATION NUMBER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
AVERAGE CONTAINMENT PRESSURE
PRESSURE IN PSIA
41.870
41.869
41.868
41.867
41.866
41.865
41.865
41.864
41.863
41.862
41.861
0
30
60
90
120
150
180
210
240
270
TIME IN MINUTES


OBSERVATION NUMBER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
VOLUMETRICALLY WEIGHTED VAPOR PRESSURE
VAPOR PRESSURE IN PSIA
0.4200
0.4190
0.4180
0.4170
0.4160
0.4150
0.4140
0.4130
0.4120
0.4110
0.4100
0
30
60
90
120
150
180
210
240
270
TIME IN MINUTES

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	AVG. TEM DEG. F	AVG. PRE PSIA	VAP. PRE PSIA	LEAK COM PER CENT	LEAK TRA PER CENT	ERROR(T) PER CENT
1	0	84.481	41.869	0.412	0.126	0.000	0.000
2	15	84.484	41.868	0.412	0.127	0.185	0.000
3	30	84.472	41.867	0.411	0.127	-10.782	0.127
4	45	84.470	41.867	0.412	0.128	-3.951	0.061
5	60	84.472	41.866	0.412	0.128	-1.543	0.026
6	75	84.483	41.866	0.412	0.129	0.065	0.000
7	90	84.486	41.865	0.412	0.130	0.646	0.007
8	105	84.476	41.865	0.412	0.130	0.344	0.002
9	120	84.483	41.865	0.412	0.131	0.313	0.002
10	135	84.476	41.864	0.412	0.131	0.127	0.000
11	150	84.481	41.864	0.412	0.132	0.133	0.000
12	165	84.490	41.864	0.413	0.132	0.159	0.000
13	180	84.496	41.864	0.413	0.133	0.183	0.001
14	195	84.487	41.863	0.413	0.133	0.140	0.000
15	210	84.493	41.863	0.413	0.134	0.145	0.000
16	225	84.500	41.862	0.413	0.134	0.163	0.000
17	240	84.500	41.862	0.413	0.135	0.159	0.000
18	255	84.506	41.862	0.413	0.136	0.166	0.001
19	270	84.514	41.862	0.413	0.136	0.179	0.002

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 1 DEG. F	TEMP 2 DEG. F	TEMP 3 DEG. F	TEMP 4 DEG. F	TEMP 5 DEG. F	TEMP 6 DEG. F
1	0	84.150	84.620	84.720	0.000	84.390	84.710
2	15	84.180	84.600	84.720	0.000	84.420	84.730
3	30	84.160	84.590	84.720	0.000	84.420	84.710
4	45	84.160	84.580	84.710	0.000	84.420	84.750
5	60	84.160	84.590	84.710	0.000	84.410	84.740
6	75	84.180	84.600	84.710	0.000	84.410	84.720
7	90	84.170	84.610	84.720	0.000	84.410	84.810
8	105	84.170	84.590	84.720	0.000	84.400	84.710
9	120	84.180	84.590	84.720	0.000	84.410	84.780
10	135	84.170	84.580	84.720	0.000	84.420	84.740
11	150	84.170	84.590	84.720	0.000	84.420	84.750
12	165	84.170	84.610	84.720	0.000	84.430	84.790
13	180	84.180	84.620	84.710	0.000	84.430	84.790
14	195	84.170	84.600	84.720	0.000	84.440	84.760
15	210	84.180	84.610	84.720	0.000	84.420	84.700
16	225	84.200	84.600	84.730	0.000	84.430	84.800
17	240	84.180	84.620	84.720	0.000	84.450	84.740
18	255	84.210	84.610	84.740	0.000	84.440	84.770
19	270	84.200	84.630	84.730	0.000	84.460	84.830

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 7 DEG. F	TEMP 8 DEG. F	TEMP 9 DEG. F	TEMP 10 DEG. F	TEMP 11 DEG. F	TEMP 12 DEG. F
1	0	84.800	84.710	85.270	85.030	84.750	84.340
2	15	84.810	84.700	85.270	85.030	84.750	84.320
3	30	84.790	84.710	85.260	85.020	84.760	84.300
4	45	84.790	84.720	85.250	85.020	84.770	84.320
5	60	84.820	84.710	85.260	85.020	84.750	84.320
6	75	84.790	84.690	85.280	85.010	84.760	84.330
7	90	84.800	84.690	85.260	85.010	84.780	84.340
8	105	84.800	84.700	85.280	85.030	84.770	84.340
9	120	84.820	84.700	85.280	85.020	84.770	84.340
10	135	84.780	84.690	85.280	85.030	84.780	84.340
11	150	84.800	84.710	85.260	85.040	84.780	84.350
12	165	84.800	84.690	85.260	85.060	84.770	84.360
13	180	84.800	84.720	85.270	85.050	84.760	84.340
14	195	84.800	84.710	85.290	85.040	84.780	84.330
15	210	84.820	84.720	85.250	85.040	84.780	84.330
16	225	84.810	84.710	85.290	85.050	84.780	84.360
17	240	84.830	84.720	85.290	85.050	84.790	84.360
18	255	84.800	84.720	85.270	85.060	84.800	84.350
19	270	84.810	84.720	85.290	85.050	84.790	84.360

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 13 DEG. F	TEMP 14 DEG. F	TEMP 15 DEG. F	TEMP 16 DEG. F	TEMP 17 DEG. F	TEMP 18 DEG. F
1	0	84.520	84.430	84.890	84.150	84.180	85.110
2	15	84.530	84.440	84.890	84.140	84.190	85.100
3	30	84.520	84.430	84.880	84.150	84.170	85.110
4	45	84.530	84.460	84.880	84.140	84.180	85.090
5	60	84.520	84.430	84.870	84.140	84.160	85.100
6	75	84.520	84.460	84.880	84.130	84.190	85.100
7	90	84.500	84.460	84.880	84.140	84.190	85.110
8	105	84.510	84.460	84.880	84.140	84.140	85.100
9	120	84.510	84.460	84.880	84.140	84.190	85.110
10	135	84.530	84.460	84.880	84.150	84.190	85.100
11	150	84.540	84.480	84.890	84.150	84.190	85.110
12	165	84.530	84.470	84.880	84.150	84.210	85.110
13	180	84.520	84.470	84.880	84.150	84.210	85.100
14	195	84.550	84.480	84.890	84.160	84.210	85.110
15	210	84.550	84.490	84.890	84.160	84.200	85.120
16	225	84.540	84.500	84.890	84.170	84.220	85.130
17	240	84.540	84.500	84.890	84.170	84.210	85.130
18	255	84.570	84.490	84.890	84.160	84.220	85.110
19	270	84.570	84.510	84.900	84.190	84.230	85.130

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	TEMP 19 DEG. F	TEMP 20 DEG. F	PRES 1 PSIA	HUM 1 FRACTION	HUM 2 FRACTION	HUM 3 FRACTION
1	0	84.720	84.430	41.869	0.732	0.681	0.679
2	15	84.710	84.430	41.868	0.732	0.682	0.679
3	30	84.700	84.420	41.867	0.733	0.681	0.680
4	45	84.700	84.430	41.867	0.733	0.682	0.680
5	60	84.690	84.440	41.866	0.733	0.682	0.680
6	75	84.700	84.470	41.866	0.733	0.682	0.680
7	90	84.720	84.460	41.865	0.733	0.682	0.680
8	105	84.680	84.440	41.865	0.733	0.681	0.680
9	120	84.700	84.490	41.865	0.733	0.683	0.680
10	135	84.730	84.490	41.864	0.733	0.682	0.681
11	150	84.700	84.480	41.864	0.734	0.683	0.681
12	165	84.710	84.520	41.864	0.734	0.683	0.681
13	180	84.710	84.510	41.864	0.734	0.683	0.681
14	195	84.720	84.530	41.863	0.734	0.683	0.681
15	210	84.700	84.570	41.863	0.734	0.684	0.681
16	225	84.730	84.530	41.862	0.734	0.683	0.681
17	240	84.740	84.540	41.862	0.734	0.683	0.681
18	255	84.720	84.560	41.862	0.734	0.683	0.681
19	270	84.730	84.550	41.862	0.735	0.684	0.681

END OF TABLE

VARIABLE TABLE SUMMARY

SAMPLE NUMBER	DELTA MINS	HUM 4 FRACTION	HUM 5 FRACTION	HUM 6 FRACTION
1	0	0.706	0.710	0.722
2	15	0.706	0.709	0.722
3	30	0.706	0.710	0.723
4	45	0.706	0.710	0.722
5	60	0.706	0.710	0.723
6	75	0.706	0.710	0.723
7	90	0.706	0.710	0.723
8	105	0.707	0.710	0.723
9	120	0.706	0.711	0.723
10	135	0.707	0.710	0.723
11	150	0.707	0.711	0.723
12	165	0.707	0.711	0.723
13	180	0.707	0.711	0.723
14	195	0.707	0.711	0.723
15	210	0.707	0.711	0.723
16	225	0.707	0.711	0.724
17	240	0.707	0.711	0.723
18	255	0.707	0.711	0.724
19	270	0.707	0.712	0.724

END OF TABLE

END OF COMPUTER REPORT ON CONTAINMENT LEAK RATE TEST TO NRC

APPENDIX B

Operating Procedure No. 13100.1
Integrated Leak Rate Test