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Carolina Power & Light Company

MAY 3 1991

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United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
INTEGRATED LEAK RATE TEST RESULTS

Gentlemen:

In accordance with the requirements of 10 CFR 50, Appendix J, Paragraph V.B.1 and V.B.3, Carolina Power & Light Company hereby submits the results of the Brunswick Steam Electric Plant, Unit 1 Integrated Leak Rate Test performed February 3-4, 1991.

Please refer any questions regarding this submittal to Mr. W. R. Murray at (919) 546-4661.

Yours very truly,

W. R. Oatts for SDF

S. D. Floyd
Manager
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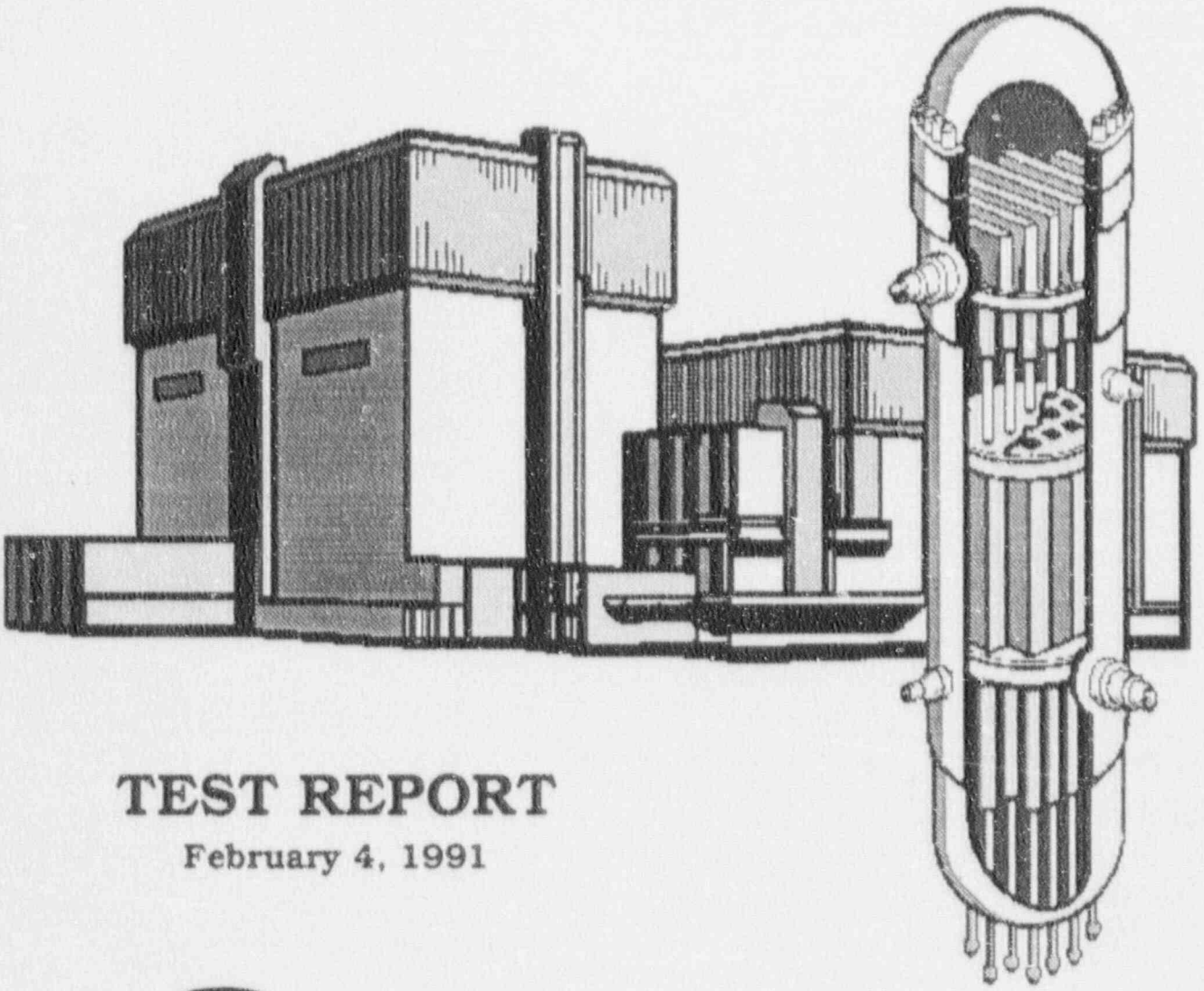
BRUNSWICK
NUCLEAR PROJECT

REACTOR CONTAINMENT BUILDING
INTEGRATED LEAKAGE RATE



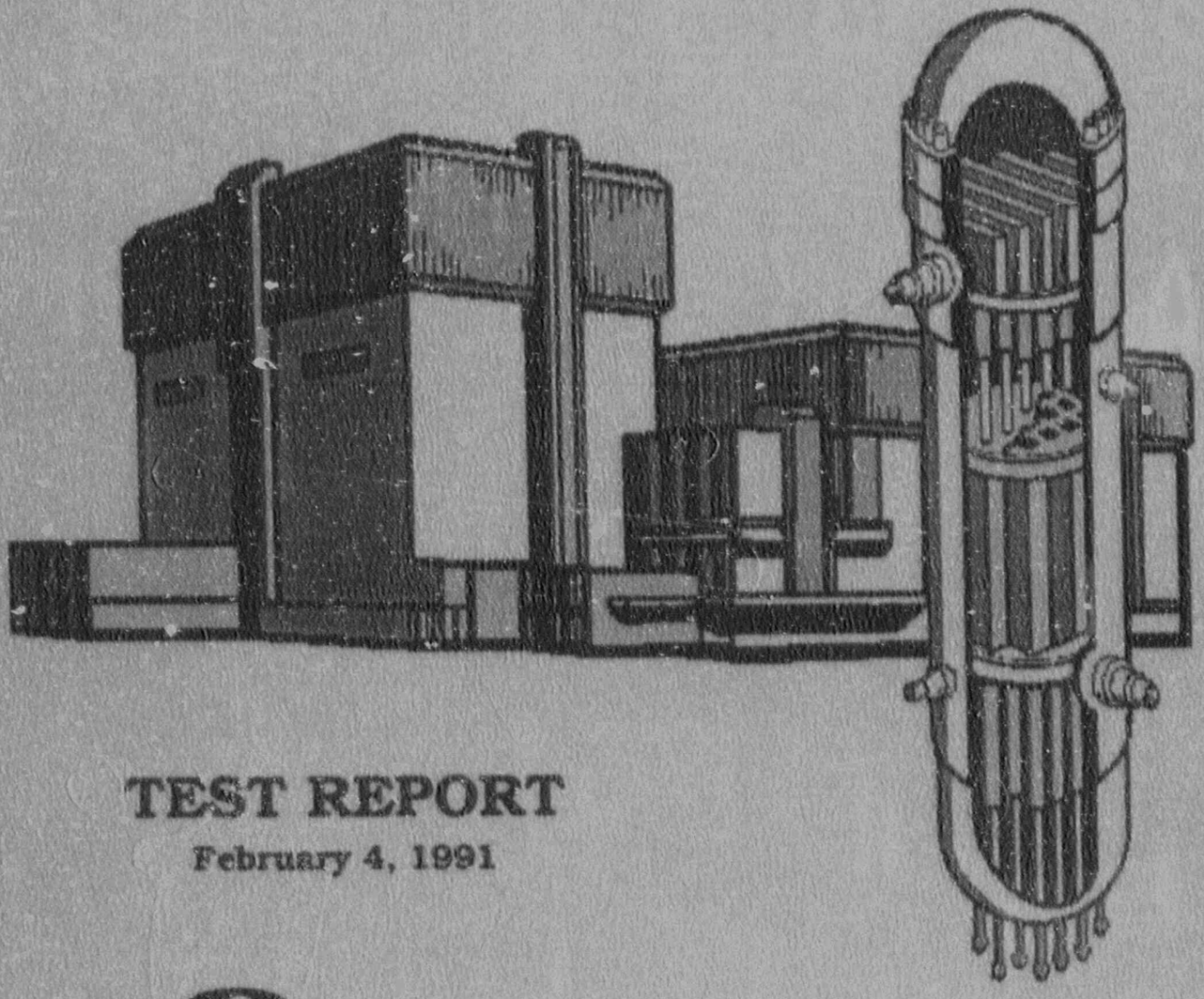
TEST REPORT

February 4, 1991

General Physics Corporation

BRUNSWICK
NUCLEAR PROJECT

REACTOR CONTAINMENT BUILDING
INTEGRATED LEAKAGE RATE



TEST REPORT

February 4, 1991

General Physics Corporation

CAROLINA POWER & LIGHT COMPANY

Brunswick Nuclear Project

Unit 1

REACTOR CONTAINMENT BUILDING INTEGRATED LEAKAGE RATE TEST REPORT

February 4, 1991

GENERAL PHYSICS CORPORATION
GP-R-263106

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I. INTRODUCTION

The Reactor Building Integrated Leakage Rate "Type A" Test is performed to demonstrate that leakage through the primary reactor containment systems and components penetrating primary containment do not exceed the allowable leakage rates specified in the Plant Technical Specifications.

The purpose of this report is to provide information pertinent to the activities related to the preparation, test performance, and reporting of the Brunswick Nuclear Project Unit 1 Integrated Leakage Rate Test (ILRT).

Highlights of activities and events which occurred prior to and during the ILRT are presented in Section II, Test Synopsis.

Section III, Test Data Summary, contains data and results necessary to demonstrate containment atmosphere stabilization, acceptable leakage rate, and successful verification test. In addition, plots provided in Appendices B and C supply a visual history of containment atmospheric conditions beginning with the 6.5-hour ILRT test period and ending with the verification test.

Information in Section IV, Analysis and Interpretation, supplies the technical details associated with the ILRT computer program and its associated hardware as well as the instrumentation used during the ILRT.

Section V, References, lists the documents used for the conduct of the ILRT.

The successful periodic Type A and verification test were performed according to the requirements of the Brunswick Unit 1 Technical Specifications and 10CFR50,Appendix J. The test method used is the Absolute Method described in ANSI/ANS 56.8-1987, "Containment System Leakage Testing Requirements".

Leakage rates were calculated using the Total Time Analysis equations from BN-TOP-1, Rev. 1, 1972, during the Type A and verification tests. Mass Point Analysis as described in ANSI/ANS 56.8-1987, was run concurrently for informational purposes. The test results are reported in accordance with the requirements of 10CFR50, Appendix J, Section V.B.3.

II. TEST SYNOPSIS

Prior to containment pressurization on February 3, 1991, site personnel were engaged in prerequisite activities for the conduct of the ILRT. Local leakage rate testing was completed and those components with excessive leakage were repaired and retested. The results of the local leakage rate tests are presented in Appendix G.

The following discussion highlights some of the activities that were essential to the successful and timely completion of the ILRT. These items are presented in chronological order.

A. Pre-pressurization Activities

These activities included completing local leakage rate tests, ILRT procedure review and finalization, ILRT computer program checkout and linkup to the Fluke Data Acquisition System, ILRT instrumentation operability checks, and containment subvolume weighting factor and sensor failure analysis calculation.

The ILRT test procedure was reviewed against the requirements of the Plant Technical Specifications; 10CFR50, Appendix J; BN-TOP-1, Rev. 1, 1972; and ANSI/ANS 56.8-1987.

The ILRT instrumentation was calibrated prior to the ILRT as recommended by ANSI N45.4-1972, Section 6.2 and 6.3. Final ILRT instrumentation operability checks and in-situ checks, as specified in ANSI/ANS 56.8-1987, Section 4.2.3.1, were performed to ensure that all instrumentation was operating correctly. Calibration records for the ILRT instrumentation system components are retained at the plant.

B. Test Summary Time-Line

Phase	Timeframe	Duration
Pressurization	From: 0530 on 2/3/91 To: 1333 on 2/3/91	8.05 hours
Stabilization	From: 1345 on 2/3/91 To: 2145 on 2/3/91	8 hours
iLRT Test	From: 2200 on 2/3/91 To: 0430 on 2/4/91	6.5 hours
Verification Test Stabilization	From: 0445 on 2/4/91 To: 0545 on 2/4/91	1 hour
Verification Test	From: 0545 on 2/4/91 To: 0945 on 2/4/91	4 hours

C. Containment Pressurization

Containment pressurization started at 0530 on February 3, 1991 using two 1500 scfm portable diesel-driven 100% oil-free air compressors. The pressurization rate was maintained at approximately 7 psi per hour until containment pressure reached 45 psig. At this time the pressurization rate was reduced to approximately 3 psi per hour. The compressors were stopped when containment pressure reached approximately 50.3 psig at 1333 on February 3, 1991. This was within the procedural limits of 49 +2,-0 psig.

During pressurization, a containment walkdown was performed to identify potential leakage. No measurable leakage was observed. The pressurization, ILRT, and verification test were performed without the use of containment fans. No temperature stratification was observed.

D. Containment Atmosphere Stabilization

The stabilization phase was started at 1345 on February 3, 1991. By 1745 on February 3, 1991, the temperature stabilization criteria of BN-TOP-1 and ANSI/ANS 56.8 had been met. In addition, the containment air mass had also stabilized with consistent mass changes of approximately 10 pounds per hour. With the reactor vessel level dropping at a rate of approximately 1 inch per hour, the current inventory would be insufficient without makeup for a 24 hour ILRT. To allow for a 24 hour test without makeup to the reactor vessel, it was decided to add water to the reactor vessel at this time. Vessel makeup was started at 1920 on February 3, 1991 and was completed within one hour. Additional stabilization data was taken until 2145 on February 3, 1991 which showed that the containment temperature and air mass were still stable.

E. ILRT Test Period

The ILRT was officially started with the next data point at 2200 on February 3, 1991 after the stabilization criteria had been met. After approximately 4 hours, the containment leakage rate, as determined by both the Mass Point and Total Time Analyses, had stabilized at a value of approximately 0.28 % wt. per day.

The ILRT was successfully completed at 0430 on February 4, 1991. The maximum allowable leakage rate (L_a) for the containment is 0.5 % wt. per day with a test acceptance limit of 0.375 % wt. per day (0.75 L_a). The Mass Point and Total Time Analyses were run concurrently on the General Physics ILRT Computer Program. The containment leakage rate data met all the requirements of BN-TOP-1, Rev. 1, necessary to end the test in less than 24 hours. During the ILRT and verification test, sensor data was continuously monitored and plotted in order to detect sensor malfunctions. The leakage rate results are as follows:

	Mass Point Analysis % wt./day	Total Time Analysis % wt./day
Calculated Leakage Rate	0.2923*	0.2894*
95 % Upper Confidence Leakage Rate	0.2967*	0.3251*
20 Point Mean Calculated		0.2832
20 Point Mean Measured		0.2869

* Does not include penalties for nonstandard alignments and water level changes

F. Verification Test

A successful verification test was conducted following the ILRT. At 0442 on February 4, 1991, a leakage rate of 4.33 scfm was imposed on the primary containment and allowed to stabilize for one hour. The verification phase started at 0545 on February 4, 1991 and was completed at 0945 on the same day. The 4.33 scfm leakage imposed (L_o) on the existing containment leakage was slightly less than L_a (0.500 % wt./day) at 0.4829 % wt. per day.

At approximately 0900 on February 4, 1991 during the latter stages of the verification test, temperature sensor RTD No. 19 dropped by 0.5 degrees F. This sensor is located in the Torus where conditions were extremely stable as indicated by the 5 other temperature sensors. None of the other sensors showed any significant temperature change. As a result, temperature sensor RTD No. 19 was removed (by use of the weighting factors) from the verification data. After reviewing the temperature data form the ILRT test phase which showed excellent agreement among all temperature sensors in the Torus, it was decided not to remove temperature sensor RTD No. 19 from the ILRT data. Subsequent analysis indicated that the ILRT and verification test results would be acceptable in either case.

The verification test results are presented below:

	Mass Point Analysis % wt./day	Total Time Analysis % wt./day
Leakage Rate (L_{am})	0.2923	0.2894
Imposed Leak (L_o)	0.4829	0.4829
Lower Limit: $L_O + L_{am} - 0.25\ L_a$	0.6502	0.6474
Composite Leakage (L_c)	0.7398	0.7156
Upper Limit: $L_o + L_{am} + 0.25\ L_a$	0.9002	0.8974

III. TEST DATA SUMMARY

A.	Plant Information Owner	Carolina Power & Light Company
	Plant	Brunswick Unit 1
	Location	Southport, North Carolina
	Containment Type	BWR Mark I
	NSSS Supplier, Type	General Electric BWR-4
	Containment Description	Steel lined, reinforced concrete, "light bulb" shaped drywell with torus shaped suppression chamber connected by a vent system. Vacuum breakers are provided between the suppression chamber and both the drywell and reactor building.
	Date Test Completed	February 4, 1991
B.	Technical Data	
	Containment Net Free Volume	294,981 cubic feet
	Design Pressure	62 psig
	Design Temperature	300^0 F Drywell, 220^0 F Torus
	Calculated Peak Accident Pressure	49.0 psig
	Calculated Peak Accident Temperature	297^0 F
C.	Test Results - Type A	
	Test Method	Absolute
	Test Pressure	49.0 psig

Integrated Leakage Rate Total Time Analysis (Calculated per BN-TOP-1) Test Results:

Calculated Leakage Rate, L_{am}	0.2894 % wt./day
95% Upper Confidence Limit Leakage Rate	0.3251 % wt./day

Integrated Leakage Rate Mass Point Analysis Test Results (Presented for information only):

Calculated Leakage Rate, L_{am}	0.2923 % wt./day
95% Upper Confidence Limit Leakage Rate	0.2967 % wt./day
Maximum Allowable Leakage Rate, L_a	0.500 % wt./day
ILRT Acceptance Criteria, 0.75 L_a	0.375 % wt./day
Verification Test Imposed Leakage Rate, L_o	4.33 scfm or 0.4829 % wt./day

Verification Test Total Time Analysis Results and Limits

Upper Limit ($L_o + L_{am} + 0.25\ L_a$)	0.8974 % wt./day
Calculated Composite Leakage Rate, L_c	0.7156 % wt./day
Lower Limit ($L_o + L_{am} - 0.25\ L_a$)	0.6474 % wt./day

Verification Test Mass Point Analysis results and Limits (Presented for information only)

Upper Limit ($L_o + L_{am} + 0.25\ L_a$)	0.9002 % wt./day

Calculated Composite Leakage Rate, L_c	0.7398 % wt./day
Lower Limit ($L_o + L_{am} - 0.25\ L_a$)	0.6502 % wt./day

Report Printouts

The report printouts of the ILRT and verification test calculations are provided for the Total Time and Mass Point Analyses in Appendices B and C. Stabilization data is also provided in Appendix A.

D. Test Results - Type B and C Tests

A summary of local leakage rate test results since the ILRT in 1987 are included in Appendix G.

E. Integrated Leakage Rate Measurement System

1. Absolute Pressure

Quantity	1
Manufacturer	Heise
Type	Series 10, Quartz Manometer
Range	0-75 psia
Accuracy	+/- 0.006% reading + 0.0027% f. s.
Sensitivity	+/- 0.001 psia
Repeatability	+/- 0.001 psia
Resolution	0.001 psia

2. Drybulb Temperature

Quantity	24
Manufacturer	Rosemount
Type	78-S 100 ohm platinum resistance temperature detectors (RTD)
Range, calibrated	32 - 120 ^{o} F
Accuracy	+/- 0.2 ^{o} F
Sensitivity	+/- 0.01 ^{o} F

3. Dewpoint Temperature

Quantity	10
Manufacturer	Foxboro
Type	Model 2781 Dewcell
Range, calibrated	-32 - 93 ^{o} F dewpoint
Accuracy	+/- 1.5 ^{o} F
Sensitivity	+/- 0.01 ^{o} F

4. Verification Flow

Quantity	1
Manufacturer	Brooks
Type	Model 1110 Rotameter
Range	1.0 - 10.0 scfm
Accuracy	+/- 1% full scale

5. Readout Device

Quantity	1
Manufacturer	Fluke
Type	Model 2285B
Repeatability	+/- 0.54 ^{o} F
Resolution	+/- 0.01 ^{o} F

The Instrumentation Selection Guide (ISG) value from ANSI/ANS 56.8-1987 based on the above ILRT instrumentation configuration and a 6.5 hour test is 0.018 % wt./day. (Refer to Appendix D for calculations)

The sensor locations and volume fractions as installed for the ILRT are shown in Appendix H.

F. Information Retained at Plant

The following information is available for review at the Brunswick Nuclear Project site:

1. Access control procedures used to control access to the containment during testing.
2. A listing of containment penetrations, including the total number, penetration size, and function.
3. A listing of normal operating instrumentation used for the leakage rate test.
4. A system lineup (at time of test), showing required valve positions and status of piping systems.
5. A log of events from initial survey of containment to restoration of tested systems.
6. Documentation of instrumentation calibrations and standards, including a sensor failure analysis.

7. Data to verify temperature stabilization criteria as established by test procedure (Appendix A).
8. The working copy of the test procedure that includes signature sign-offs of procedural steps.
9. The procedure and data that verifies completion of penetration and valve testing, including as-found leak rates, corrective action, and final leak rates.
10. Computer printouts of ILRT data and automated data acquisition printouts along with a summary description of the computer program.
11. A listing of test exceptions including changes in the containment system boundaries.
12. Description of sensor malfunctions, repairs, and methods used to redistribute volume weighting fractions to operating instrumentation.
13. A review of confidence limits of test results with accompanying computer printouts.
14. Description of the method of leakage rate verification.
15. ILRT data plots obtained during the test.
16. The P&IDs of pertinent systems.

IV. ANALYSIS AND INTERPRETATION

The upper 95% confidence limit (UCL) Total Time and Mass Point leakage rates calculated during the ILRT were less than the test acceptance criteria of 0.75 L_a (0.375 % wt./day). Additions to the calculated leakage rates must be made to account for penetration paths not exposed to the ILRT pressure and for changes in the net free containment volume due to changes in containment water levels. These additions are discussed below.

A. Type C Penalties

Penetration paths not exposed to the ILRT pressure and the corresponding minimum pathway leakage rates are as follows:

System	Containment Isolation Valves	Leakage Rate (SCFH)
Drywell Drains	1G16-F003/F004	0.00
Drywell Drains	1G16-F019/F020	0.19
Feedwater (RCIC Injection Line B)	1B21-F032B,F010B, 1E51-V88	0.00
Feedwater (HPCI Injection Line A)	1B21-F032A,F010A, 1E41-F006	0.00
Reactor Building Cooling Water	1RCC-V28/V52 RXS-SV1222B/C	7.70 0.00
CRD Purge to Reactor Recirc	1B32- V24/V22 1B32-V32/V30	0.00 0.00
Recirc Sample	1B32-F019/F020	0.50
RHR Suction	1E11-F008/F009	0.00
Reactor Water Cleanup	1G31-F001/F004	0.00

The total applicable local leakage rate Type C penalty addition is 8.39 scfh which is equivalent to 0.0157% wt. per day.

B. Volume Change Corrections

The following volumes were monitored for liquid level changes which would affect the containment net free volume:

Vessel	Level Change	Volume Change
Reactor Vessel	- 8 inches	+ 172.8 ft^3
Torus	0 inches	0
Drywell Floor Drain Tank	0 gallons	0
Drywell Equip. Drain Tank	0 gallons	0

This represents a net increase in containment net free volume which is accounted for in the calculated leakage rates and no additional correction is required.

C. As Left ILRT Results

The as left ILRT leakage rate including the required additions is as follows:

	Mass Point Analysis (% wt./day)	Total Time Analysis (% wt./day)
95% UCL Leakage Rate	0.2967	0.3251
Type C Penalties	0.0157	0.0157
Volume Change	0.0	0.0
As Left 95% UCL Leakage Rate	0.3124	0.3408

The as left Total Time and Mass Point 95% UCL leakage rates are less than the test acceptance criteria value of 0.75 L_a (0.375 % wt./day).

D. As Found ILRT Results

The leakage savings due to repairs and/or adjustments to containment penetrations and isolation valves prior to performance of the ILRT was calculated to be 82.835 scfh or 0.1548% wt. per day. (Refer to Appendix G)

The as found ILRT leakage rate is as follows:

	Mass Point Analysis (% wt./day)	Total Time Analysis (% wt./day)
As Left 95% UCL Leakage Rate	0.3124	0.3408
Leakage Savings	0.1548	0.1548
As found 95% UCL Leakage Rate	0.4672	0.4956

The as found Total Time and Mass Point 95% UCL leakage rates are less than the maximum allowable leakage rate L_a of 0.500% wt. per day.

V. REFERENCES

A. Brunswick Unit 1 Periodic Test Procedure, PT-20.5, Integrated Primary Containment Leak Rate Test.

B. Brunswick Unit 1 Technical Specifications.

C. Brunswick Unit 1 Updated Final Safety Analysis Report

D. Code of Federal Regulations, Title 10, Part 50, Appendix J, Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors.

E. ANSI N45.4-1972, Leakage-Rate Testing of Containment Structures for Nuclear Reactors.

F. Bechtel Topical Report BN-TOP-1, Rev. 1, 1972, Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants.

G. ANSI/ANS 56.8-1987, Containment System Leakage Testing Requirements.

APPENDIX A

STABILIZATION PHASE DATA

STABLIZATION MODE

TIME : 2200

OPTIONS

1 - MANUAL DATA ENTRY
2 - PARAMATER GRAPHS
3 - SENSOR PLOTS
4 - SENSOR DIFFERENTIALS
5 - ANSI STABILIZATION CRITERIA
6 - BN-TOP-1 STAB.CRITERIA
7 - ANSI CRITERIA PRINTOUT
8 - BN-TOP-1 CRITERIA PRINTOUT
9 - REPRINT CURRENT DATA POINT
P - PASS WORD MENU
0 - FLASH OFF

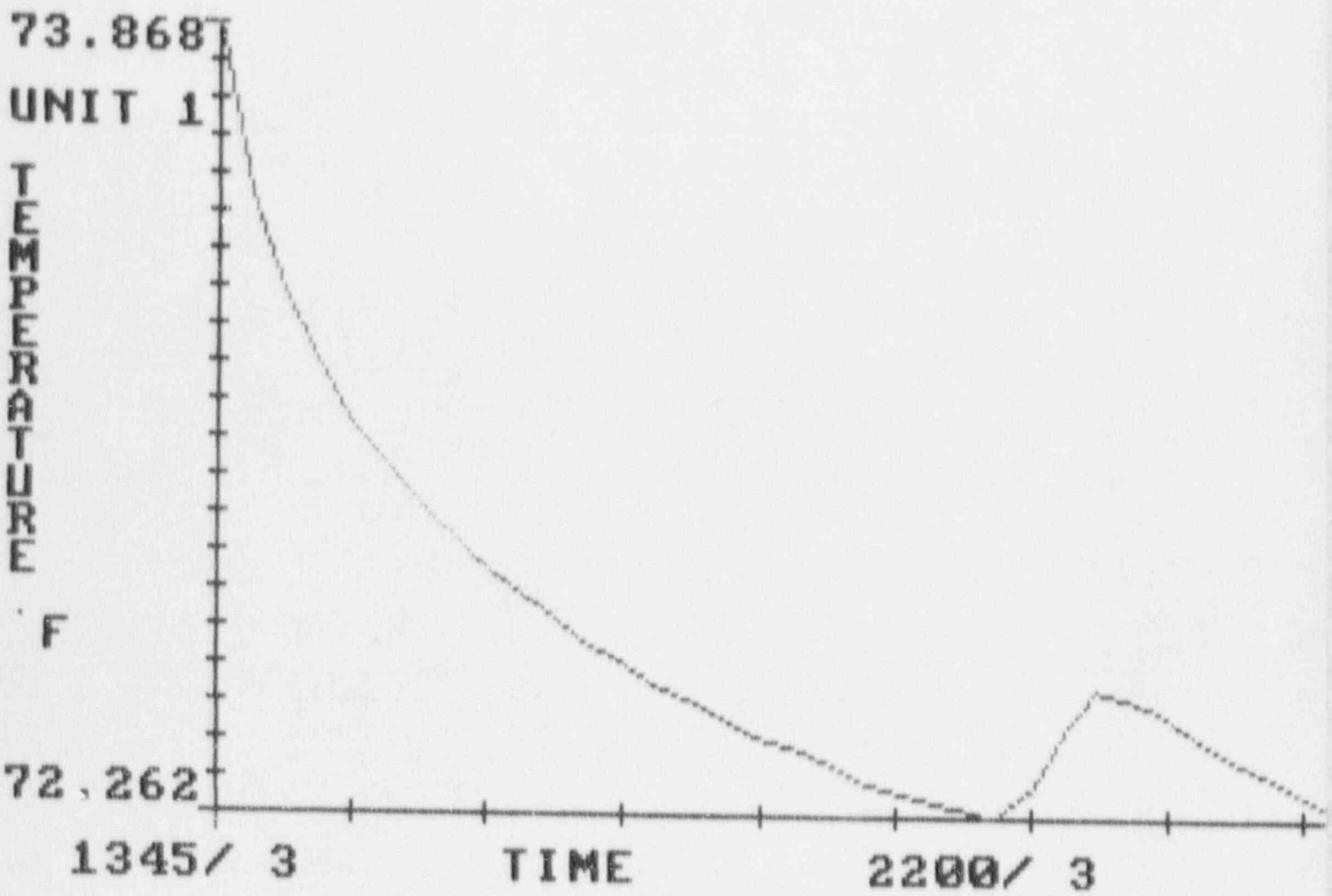
MODE SUMMARY

# OF DATA POINTS =	34
MODE DURATION (IN HRS) =	6.25
TOT TIME MEASURED LEAK =	-.1353
TOT TIME CALCULATED LEAK =	0.0561
TOT TIME 95% UCL =	0.5936
MASS PT LEAK =	-.1163
MASS PT 95% UCL =	-.0379

ANSI PRESSURE/TEMPERATURE STABLE CRITERIA MET
BN-TOP TEMPERATURE CRITERIA MET

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	72.29/ -0.032	AVG PRESS:	64.561/ -0.005
MASS:	96630.29/ -2.172	AVG DEW PRESS:	0.3552/+0.0001



AVG. DATA VALUES UNIT # 1

DATE	TIME	T(I)	P(I)	DT(I)	VP(I)	MASS(I)
3	0.00	73.87	64.72	69.46	0.356	96585.36
3	0.25	73.52	64.69	69.50	0.357	96595.38
3	0.50	73.32	64.67	69.40	0.356	96600.77
3	0.75	73.19	64.65	69.44	0.356	96601.17
3	1.00	73.07	64.64	69.46	0.356	96599.44
3	1.25	72.99	64.62	69.44	0.356	96596.14
3	1.53	72.90	64.61	69.39	0.355	96594.84
3	1.75	72.84	64.60	69.43	0.356	96590.83
3	2.00	72.78	64.59	69.44	0.356	96588.55
3	2.25	72.72	64.58	69.40	0.356	96586.69
3	2.50	72.67	64.58	69.38	0.355	96583.73
3	2.75	72.62	64.57	69.41	0.356	96580.97
3	3.00	72.58	64.56	69.42	0.356	96576.85
3	3.25	72.54	64.55	69.36	0.355	96575.77
3	3.50	72.50	64.55	69.41	0.356	96571.06
3	3.75	72.46	64.54	69.34	0.355	96570.40
3	4.00	72.43	64.54	69.36	0.355	96566.16
3	4.25	72.41	64.53	69.36	0.355	96562.70
3	4.50	72.38	64.52	69.34	0.355	96560.47
3	4.75	72.34	64.52	69.32	0.355	96558.31
3	5.00	72.32	64.51	69.34	0.355	96554.66
3	5.25	72.30	64.51	69.25	0.354	96552.27
3	5.50	72.28	64.50	69.33	0.355	96547.38
3	5.75	72.26	64.51	69.32	0.355	96561.77
3	6.00	72.33	64.54	69.39	0.355	96594.52
3	6.25	72.45	64.57	69.32	0.355	96621.13
3	6.50	72.53	64.60	69.37	0.355	96643.27
3	6.75	72.51	64.59	69.38	0.355	96637.36
3	7.00	72.47	64.59	69.37	0.355	96635.85
3	7.25	72.43	64.58	69.44	0.356	96633.00
3	7.50	72.39	64.58	69.35	0.355	96635.16
3	7.75	72.36	64.57	69.41	0.356	96631.77
3	8.00	72.32	64.57	69.36	0.355	96632.46
3	8.25	72.29	64.56	69.37	0.355	96630.29

BN-TOP-1 STABLIZATION CRITERIA

TIME	TEMP	BN dT	BN dT2
8.25	72.2896	0.0264	-0.0796
8.00	72.3212	0.1807	-0.0022
7.75	72.3634	0.2054	0.0507
7.50	72.3871	0.1125	0.0512
7.25	72.4329	0.0628	0.0649
7.00	72.4734	0.0226	0.0749
6.75	72.5127	-0.0068	0.0854
6.50	72.5304	-0.0558	0.0767
6.25	72.4489	-0.0840	0.0216
6.00	72.3256	-0.0967	-0.0522
5.75	72.2619	-0.1131	-0.1006
5.50	72.2846	-0.1278	-0.1087
5.25	72.3032	-0.1303	-0.1162
5.00	72.3236	-0.1459	-0.1276
4.75	72.3418	-0.1582	-0.1412
4.50	72.3769	-0.1720	-0.1484
4.25	72.4057	-0.1812	-0.1586
4.00	72.4300	-0.1923	-0.1727
3.75	72.4631	-0.2207	-0.1904
3.50	72.5020	-0.2611	-0.2162
3.25	72.5355	-0.2666	-0.2264
3.00	72.5789	-0.2904	-0.2466
2.75	72.6242	-0.3489	-0.2814
2.50	72.6737	-0.4137	-0.3239
2.25	72.7229	-0.5429	-0.3981
2.00	72.7755	-0.8299	-0.5451
1.75	72.8439	0.0000	0.0000
1.53	72.8990	0.0000	0.0000
1.25	72.9907	0.0000	0.0000
1.00	73.0744	0.0000	0.0000
0.75	73.1892	0.0000	0.0000
0.50	73.3237	0.0000	0.0000
0.25	73.5213	0.0000	0.0000
0.00	73.8680	0.0000	0.0000

STABILIZATION ANSI 56.8

TIME	TEMP	56.8 1 HR F/HR	56.8 4 HR F/HR	4-1 HR	PRESS	56.8 dP PSI/HR
8.25	72.29	0.14	0.03	-0.11	64.56	-.0192
8.00	72.32	0.15	0.03	-0.12	64.57	-.0207
7.75	72.36	0.15	0.03	-0.12	64.57	-.0219
7.50	72.39	0.14	0.03	-0.11	64.58	-.0228
7.25	72.43	0.02	0.03	0.01	64.58	0.0060
7.00	72.47	0.14	0.03	-0.11	64.59	0.0455
6.75	72.51	0.25	0.03	-0.22	64.59	0.0809
6.50	72.53	0.25	0.04	-0.21	64.60	0.0939
6.25	72.45	0.15	0.07	-0.08	64.57	0.0637
6.00	72.33	0.01	0.11	0.10	64.54	0.0269
5.75	72.26	0.08	0.15	0.07	64.51	-.0074
5.50	72.28	0.10	0.16	0.06	64.50	-.0199
5.25	72.30	0.09	0.17	0.08	64.51	-.0194
5.00	72.32	0.11	0.19	0.08	64.51	-.0206
4.75	72.34	0.12	0.21	0.09	64.52	-.0228
4.50	72.38	0.12	0.24	0.12	64.52	-.0222
4.25	72.41	0.13	0.28	0.15	64.53	-.0245
4.00	72.43	0.15	0.36	0.21	64.54	-.0252
3.75	72.46	0.16	0.00	0.00	64.54	-.0266
3.50	72.50	0.17	0.00	0.00	64.55	-.0293
3.25	72.54	0.18	0.00	0.00	64.55	-.0300
3.00	72.58	0.20	0.00	0.00	64.56	-.0317
2.75	72.62	0.22	0.00	0.00	64.57	-.0332
2.50	72.67	0.24	0.00	0.00	64.58	-.0348
2.25	72.72	0.27	0.00	0.00	64.58	-.0388
2.00	72.78	0.29	0.00	0.00	64.59	-.0435
1.75	72.84	0.35	0.00	0.00	64.60	-.0488
1.53	72.90	0.41	0.00	0.00	64.61	-.0555
1.25	72.99	0.53	0.00	0.00	64.62	-.0639
1.00	73.07	0.80	0.00	0.00	64.64	-.0869
0.75	73.19	0.00	0.00	0.00	64.65	0.0000
0.50	73.32	0.00	0.00	0.00	64.67	0.0000
0.25	73.52	0.00	0.00	0.00	64.69	0.0000
0.00	73.87	0.00	0.00	0.00	64.72	0.0000

APPENDIX B

ILRT TEST DATA AND PLOTS

TEST MODE

PLEASE SELECT THE OPTION
YOU WISH TO USE:

1 - MANUAL DATA ENTRY
2 - PARAMETER GRAPHS
3 - SENSOR PLOTS
4 - TREND ANALYSIS
5 - REPRINT CURRENT DATA PT
6 - SENSOR DIFFERENTIALS

P - PASS WORD MENU

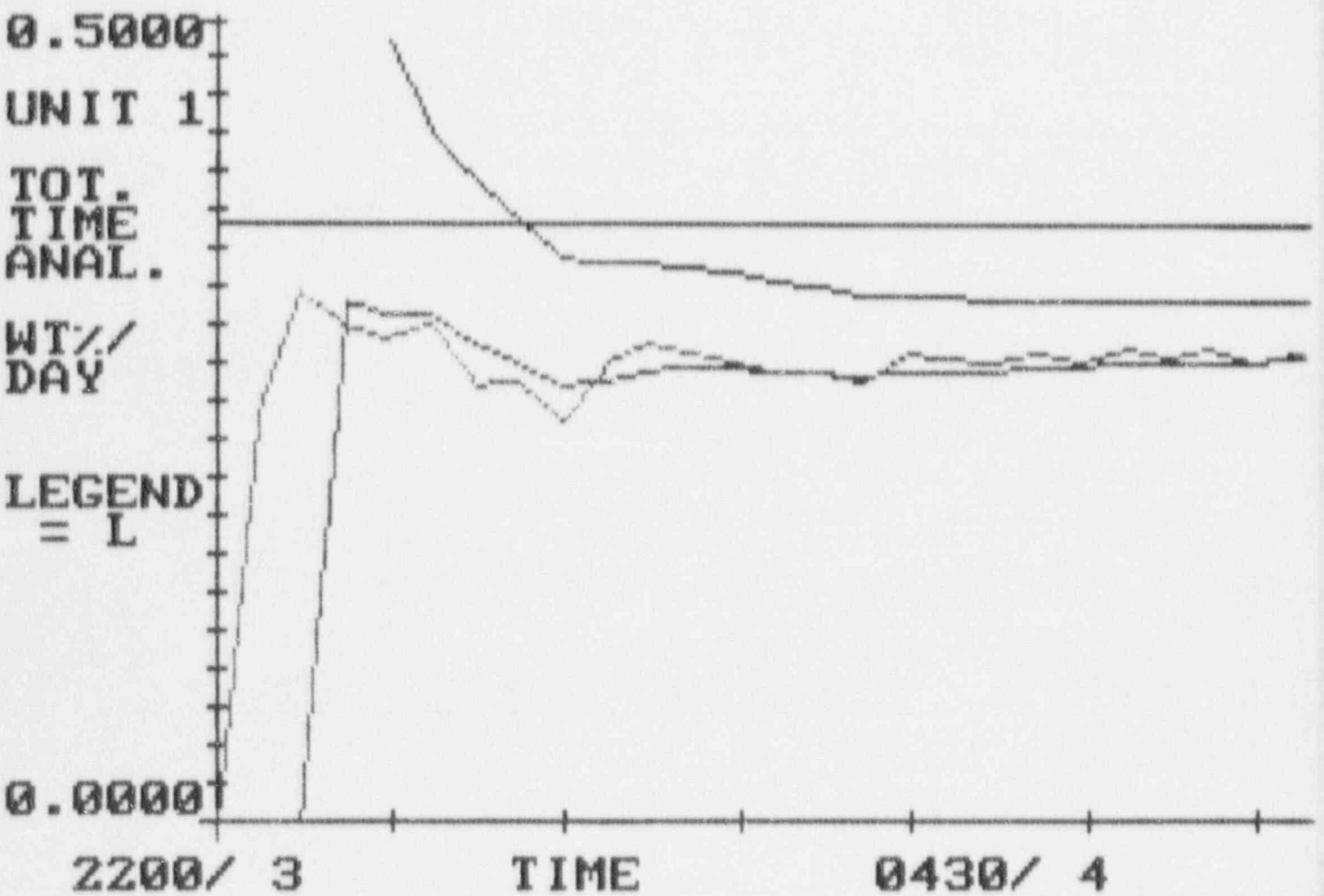
SELECTED OPTION=

TEST DATA 0430

# OF DATA POINTS	= 27
MODE DURATION (IN HOURS)	= 6.5
TOT TIME MEASURED LEAK	= 0.2925
TOT TIME CALCULATED LEAK	= 0.2894
TOT TIME 95% UCL	= 0.3251
MASS POINT LEAK	= 0.2923
MASS POINT 95% UCL	= 0.2967
75% La	= .375
MASS	= 96553.75

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	72.00 / -0.004	AVG PRESS:	64.47 / -0.002
MASS:	96553.75 / -2.578	AVG DEW PRESS:	0.3551 /+0.0000



TEST MODE

PLEASE SELECT THE OPTION
YOU WISH TO USE:

1 - MANUAL DATA ENTRY
2 - PARAMETER GRAPHS
3 - SENSOR PLOTS
4 - TREND ANALYSIS
5 - REPRINT CURRENT DATA PT
6 - SENSOR DIFFERENTIALS

P - PASS WORD MENU

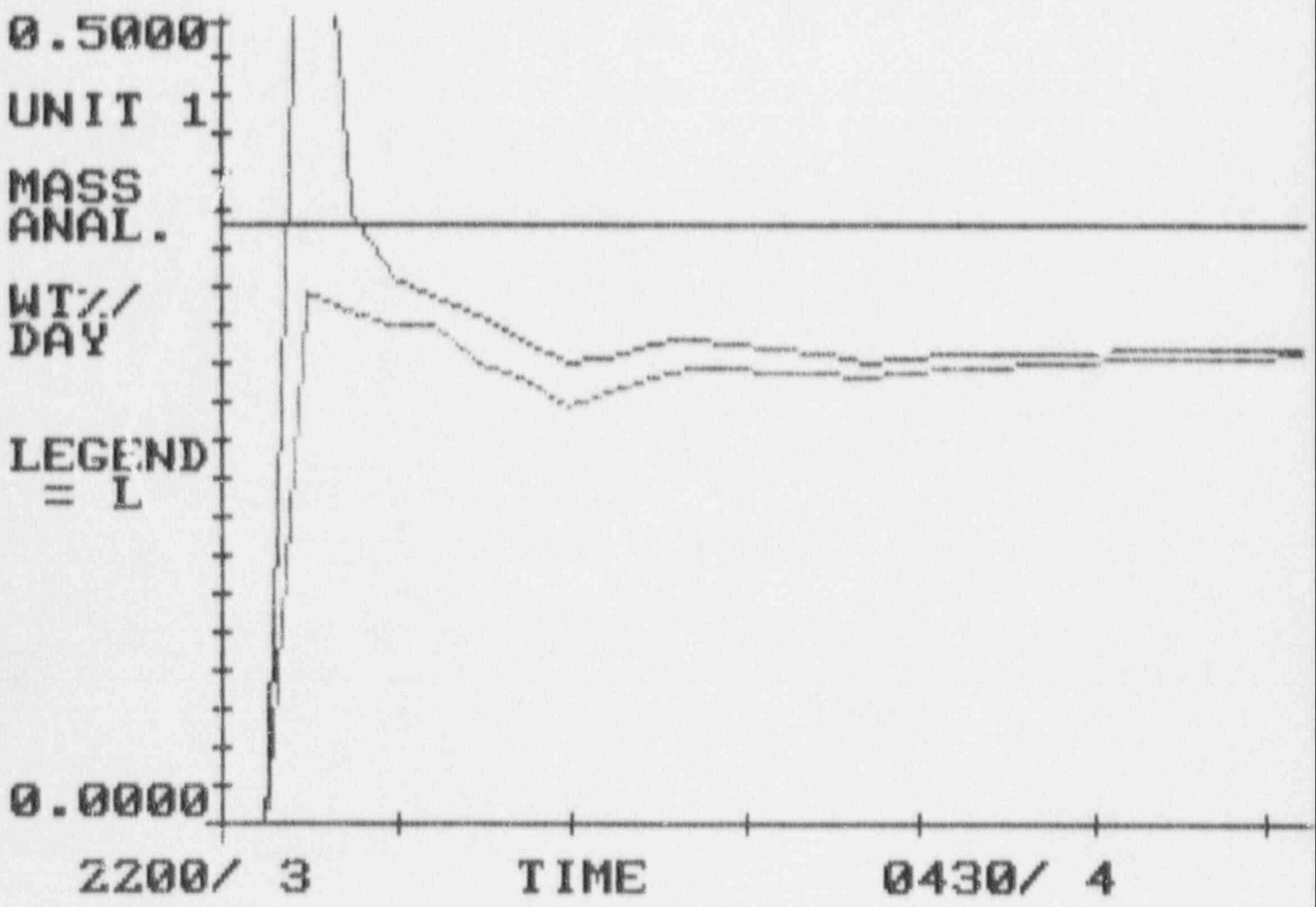
SELECTED OPTION=

TEST DATA 0430

OF DATA POINTS = 27
MODE DURATION (IN HOURS) = 6.5
TOT TIME MEASURED LEAK = 0.2925
TOT TIME CALCULATED LEAK = 0.2894
TOT TIME 95% UCL = 0.3253
MASS POINT LEAK = 0.2923
MASS POINT 95% UCL = 0.2967
75% La = .375
MASS = 96553.75

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP: 72.00 / -0.004 AVG PRESS: 64.47 / -0.002
MASS: 96553.75 / -2.578 AVG DEW PRESS: 0.3551 /+0.0000



HOURS OF TEST	# OF DATA POINTS	MEASURED LEAK RATE	CALCULATED LEAK RATE	CHG IN CALC LEAK RATE
6.50	27	+0.2925	+0.2894	+0.0005
6.25	26	+0.2939	+0.2889	+0.0008
6.00	25	+0.2879	+0.2881	-0.0001
5.75	24	+0.2967	+0.2882	+0.0015
5.50	23	+0.2914	+0.2868	+0.0007
5.25	22	+0.2960	+0.2861	+0.0017
5.00	21	+0.2882	+0.2843	+0.0004
4.75	20	+0.2922	+0.2839	+0.0014
4.50	19	+0.2870	+0.2825	+0.0004
4.25	18	+0.2914	+0.2821	+0.0016
4.00	17	+0.2921	+0.2805	+0.0021
3.75	16	+0.2741	+0.2784	-0.0025
3.50	15	+0.2814	+0.2809	-0.0010

20 DATA POINT MEAN CALCULATED LEAKAGE = .2832307

20 DATA POINT MEAN MEASURED LEAKAGE = .2869355

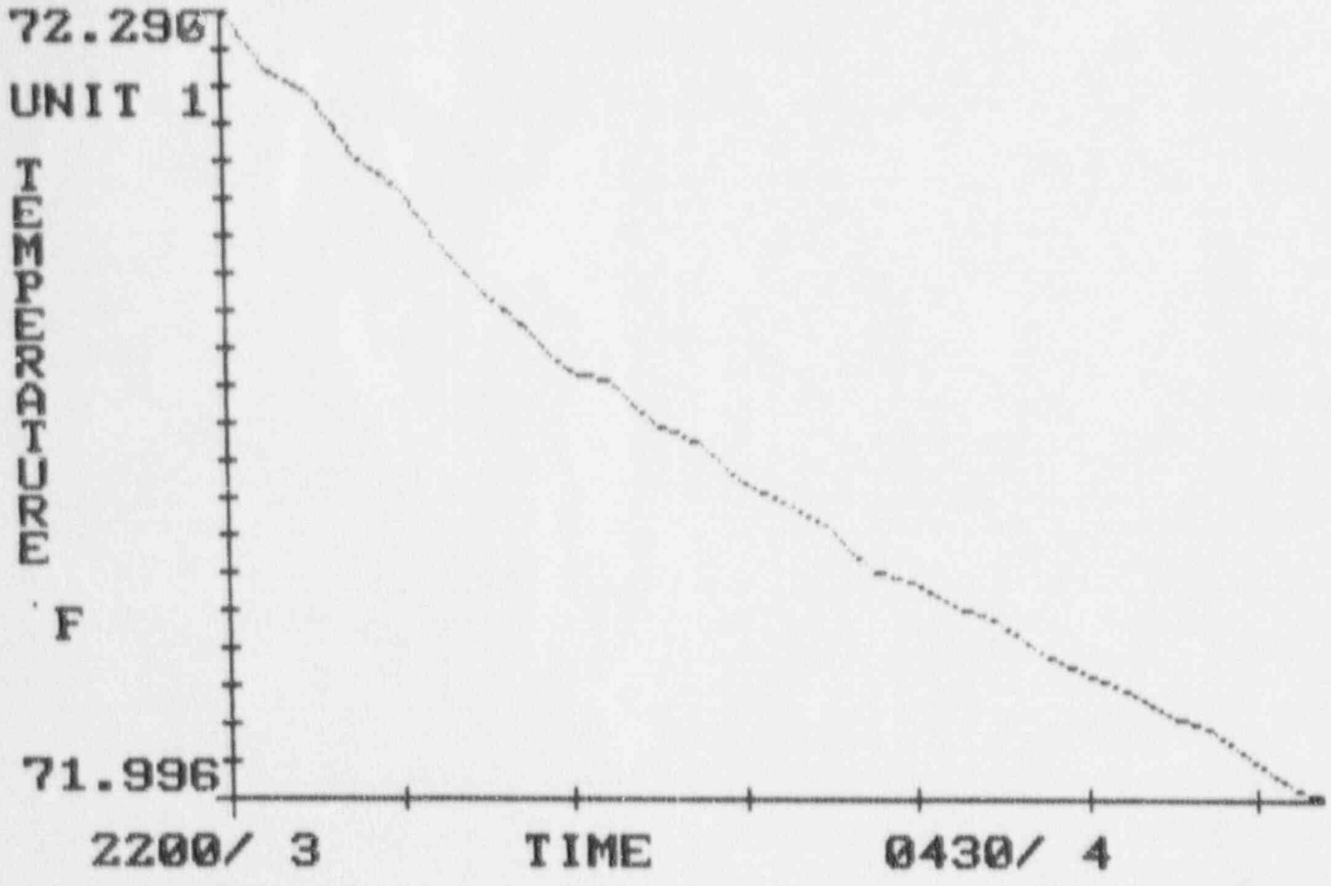
PRESS ANY KEY TO CONTINUE

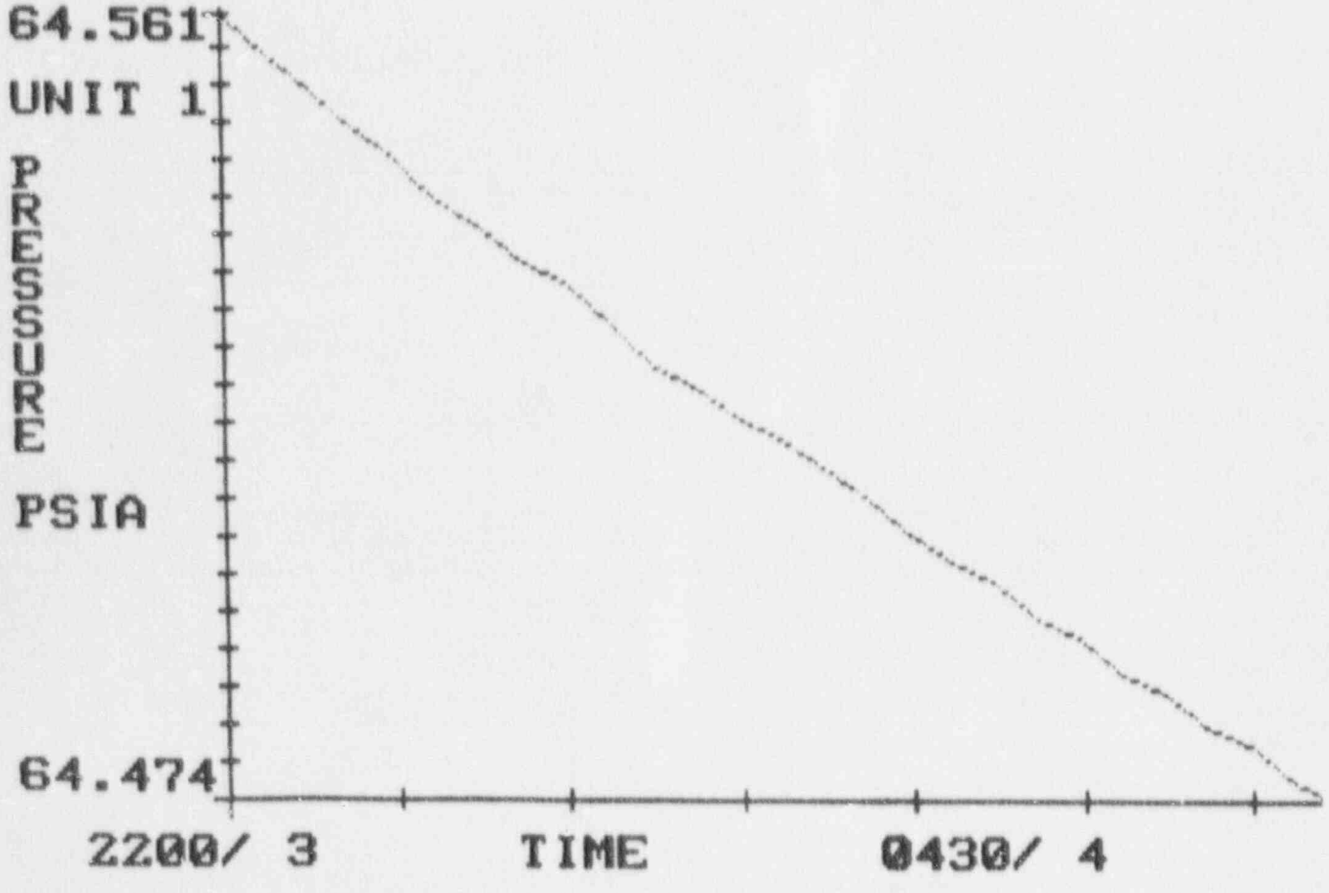
TREND REPORT UNIT # 1

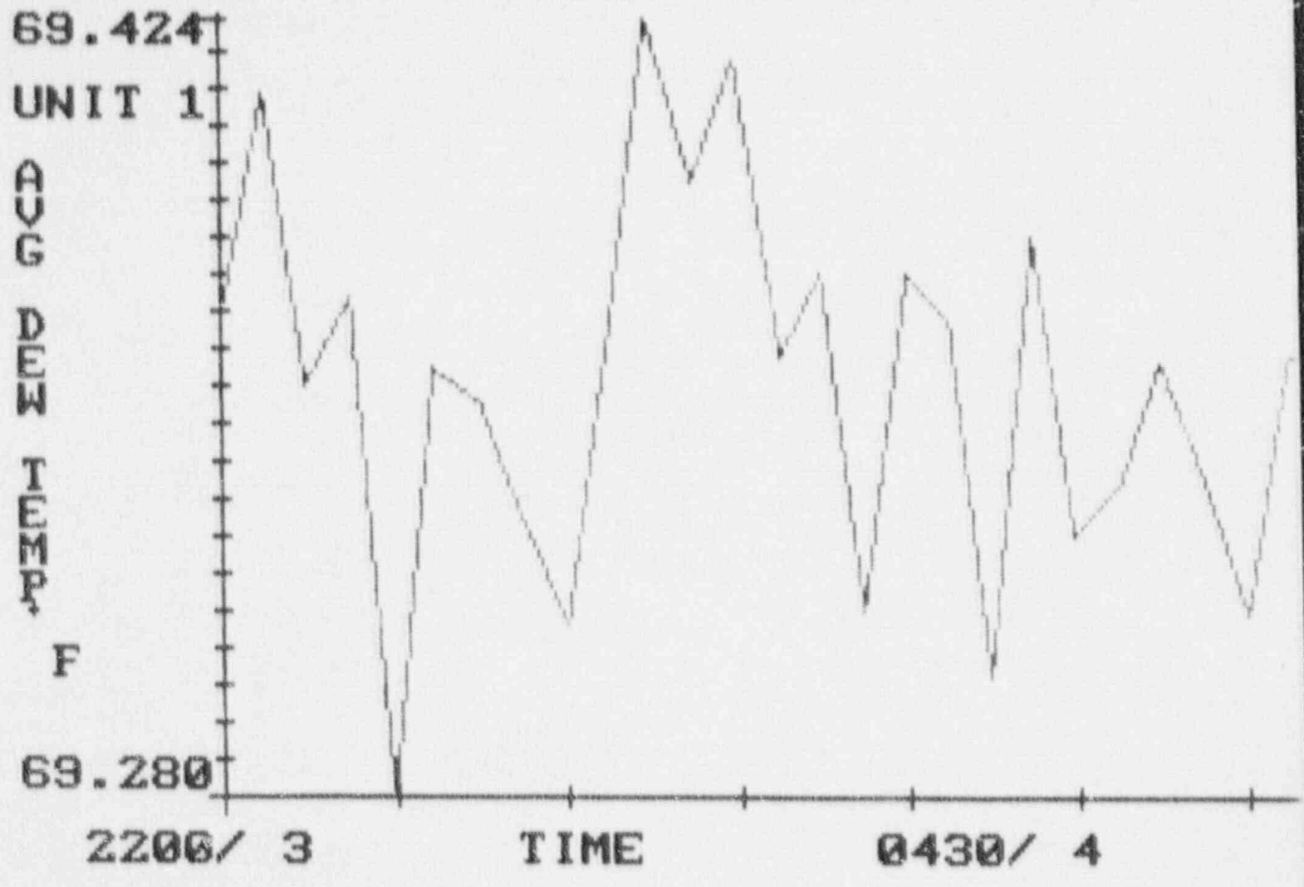
DATE	TIME	TTLM	LMCALC	SL	LAM	L95
3	0.00	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.25	0.2550	0.0000	0.0000	0.0000	0.0000
3	0.50	0.3307	0.0000	0.0000	0.3312	0.6993
3	0.75	0.3098	0.3259	0.7076	0.3204	0.3800
3	1.00	0.303.	0.3102	0.4887	0.3100	0.3404
3	1.25	0.3094	0.3178	0.4294	0.3113	0.3293
3	1.50	0.2731	0.2983	0.4023	0.2879	0.3174
3	1.75	0.2757	0.2881	0.3764	0.2785	0.3022
4	2.00	0.2527	0.2722	0.3538	0.2616	0.2873
4	2.25	0.2874	0.2750	0.3490	0.2697	0.2916
4	2.50	0.2980	0.2807	0.3504	0.2795	0.3000
4	2.75	0.2922	0.2831	0.3476	0.2835	0.3009
4	3.00	0.2878	0.2835	0.3435	0.2842	0.2988
4	3.25	0.2803	0.2818	0.3379	0.2825	0.2951
4	3.50	0.281.	0.2809	0.3336	0.2812	0.2921
4	3.75	0.27 41	0.2784	0.3284	0.2785	0.2884
4	4.00	0.7921	0.2805	0.3288	0.2817	0.2911
4	4.25	0.29?	0.2821	0.3287	0.2840	0.2927
4	4.50	0.28.	0.2825	0.3273	0.2847	0.2925
4	4.75	0.292	0.2839	0.3273	0.28o6	0.2938
4	5.00	0.2882	0.2843	0.3262	0.2868	0.2934
4	5.25	0.2960	0.2861	0.3269	0.2892	0.2955
4	5.50	0.2914	0.2868	0.3264	0.2898	0.2956
4	5.75	0.2967	0.2882	0.3270	0.2916	0.2972
4	6.00	0.2879	0.2881	0.3258	0.2911	0.2963
4	6.25	0.2939	0.2889	0.3257	0.2920	0.2968
4	6.50	0.2925	0.2894	0.3253	0.2923	0.2967

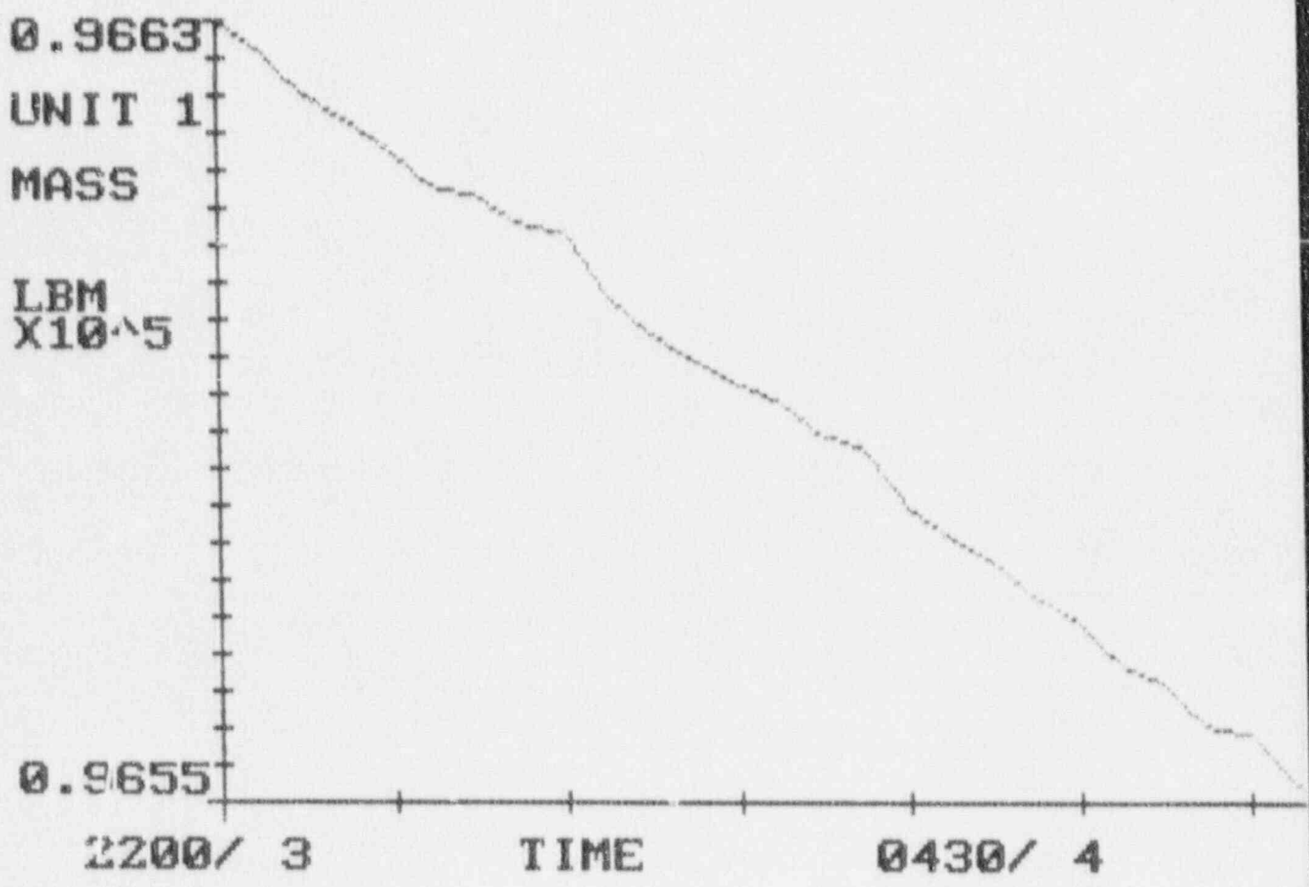
AVG. DATA VALUES UNIT # 1

DATE	TIME	T(I)	P(I)	DI(I)	VP(I)	MASS(I)
3	0.00	72.29	64.56	69.37	0.355	96630
3	0.25	72.27	64.56	69.41	0.356	96628
3	0.50	72.26	64.55	69.36	0.355	96624
3	0.75	72.24	64.55	69.37	0.353	96621
3	1.00	72.23	64.54	69.28	0.354	96618
3	1.25	72.21	64.54	69.36	0.355	96615
3	1.50	72.19	64.54	69.35	0.355	96614
3	1.75	72.17	64.53	69.33	0.355	96611
4	2.00	72.16	64.53	69.31	0.354	96610
4	2.25	72.15	64.53	69.36	0.355	96604
4	2.50	72.14	64.52	69.42	0.356	96600
4	2.75	72.13	64.52	69.39	0.355	96598
4	3.00	72.12	64.52	69.42	0.356	96596
4	3.25	72.11	64.51	69.36	0.355	96594
4	3.50	72.10	64.51	69.38	0.355	96591
4	3.75	72.08	64.51	69.31	0.355	96589
4	4.00	72.08	64.50	69.38	0.355	96583
4	4.25	72.07	64.50	69.37	0.355	96580
4	4.50	72.06	64.50	69.30	0.354	96578
4	4.75	72.05	64.49	69.38	0.355	96574
4	5.00	72.04	64.49	69.33	0.355	96572
4	5.25	72.04	64.49	69.34	0.355	96568
4	5.50	72.03	64.49	69.36	0.355	96566
4	5.75	72.02	64.48	69.34	0.355	96562
4	6.00	72.01	64.48	69.31	0.355	96561
4	6.25	72.00	64.48	69.36	0.355	96556
4	6.50	72.00	64.47	69.36	0.355	96554


72.296
UNIT 1
TEMPERATURE
F
71.996
2200/ 3
TIME
0430/ 4


64.561
UNIT 1
PRESSURE
PSIA
64.474
2200/ 3
TIME
0430/ 4


69.424
UNIT 1
AVG DEW TEMP, F
69.280
2200/ 3
TIME
0430/ 4


0.9663
UNIT 1
MASS
LBM X10^5
0.9655
2200/ 3
TIME
0430/ 4

APPENDIX C

VERIFICATION TEST DATA AND PLOTS

VERIFICATION MODE

TIME= 0945

OPTIONS:

1 - MANUAL DATA ENTRY
2 - PARAMETER GRAPHS
3 - SENSOR PLOTS
4 - TREND ANALYSIS
5 - REPRINT CURRENT DATA PT
6 - SENSOR DIFFERENTIALS

P - PASS WORD MENU

SELECTED OPTION =

TEST SUMMARY

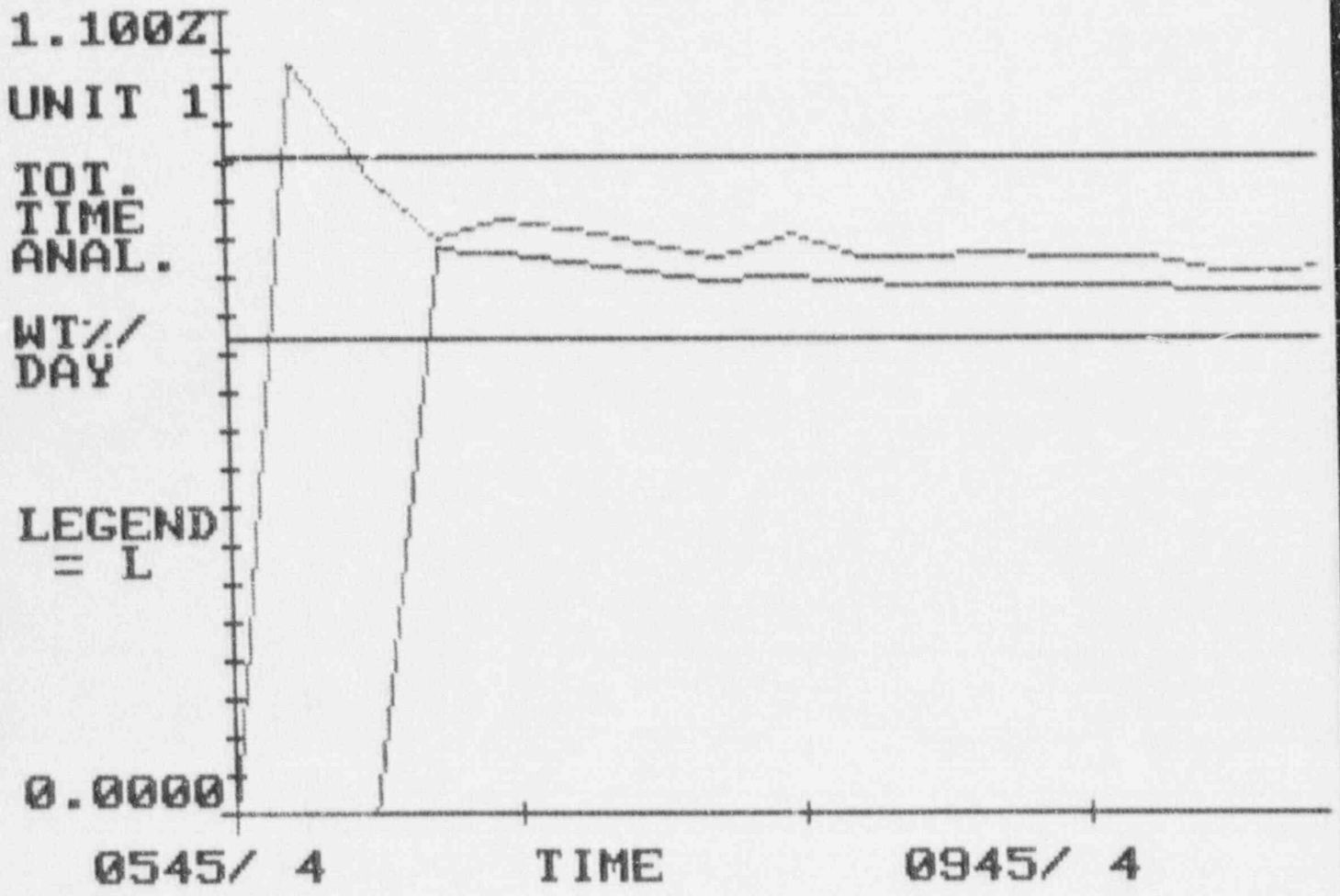
# OF DATA POINTS =	17
MODE DURATION (IN HOURS) =	4
TOT TIME MEASURED LEAK =	0.7575
TOT TIME CALCULATED LEAK =	0.7156
MASS PT LEAK =	0.7398
IMPOSED LEAK =	0.4829
TOT TIME UPPER LIMIT =	0.8974
TOT TIME LOWER LIMIT =	0.6474
MASS PT UPPER LIMIT =	0.9002
MASS PT LOWER LIMIT =	0.6502

TOT TIME VERIFICATION CRITERIA HAS BEEN MET

MASS PT VERIFICATION CRITERIA HAS BEEN MET

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	71.95/ -0.004	AVG PRESS:	64.760/ -0.007
MASS:	96391.47/ -9.484	AVG DEW PRESS:	0.3542/+0.0008



VERIFICATION MODE TIME= 0945

OPTIONS:

1 - MANUAL DATA ENTRY
2 - PARAMETER GRAPHS
3 - SENSOR PLOTS
4 - TREND ANALYSIS
5 - REPRINT CURRENT DATA PT
6 - SENSOR DIFFERENTIALS

P - PASS WORD MENU

SELECTED OPTION =

TEST SUMMARY

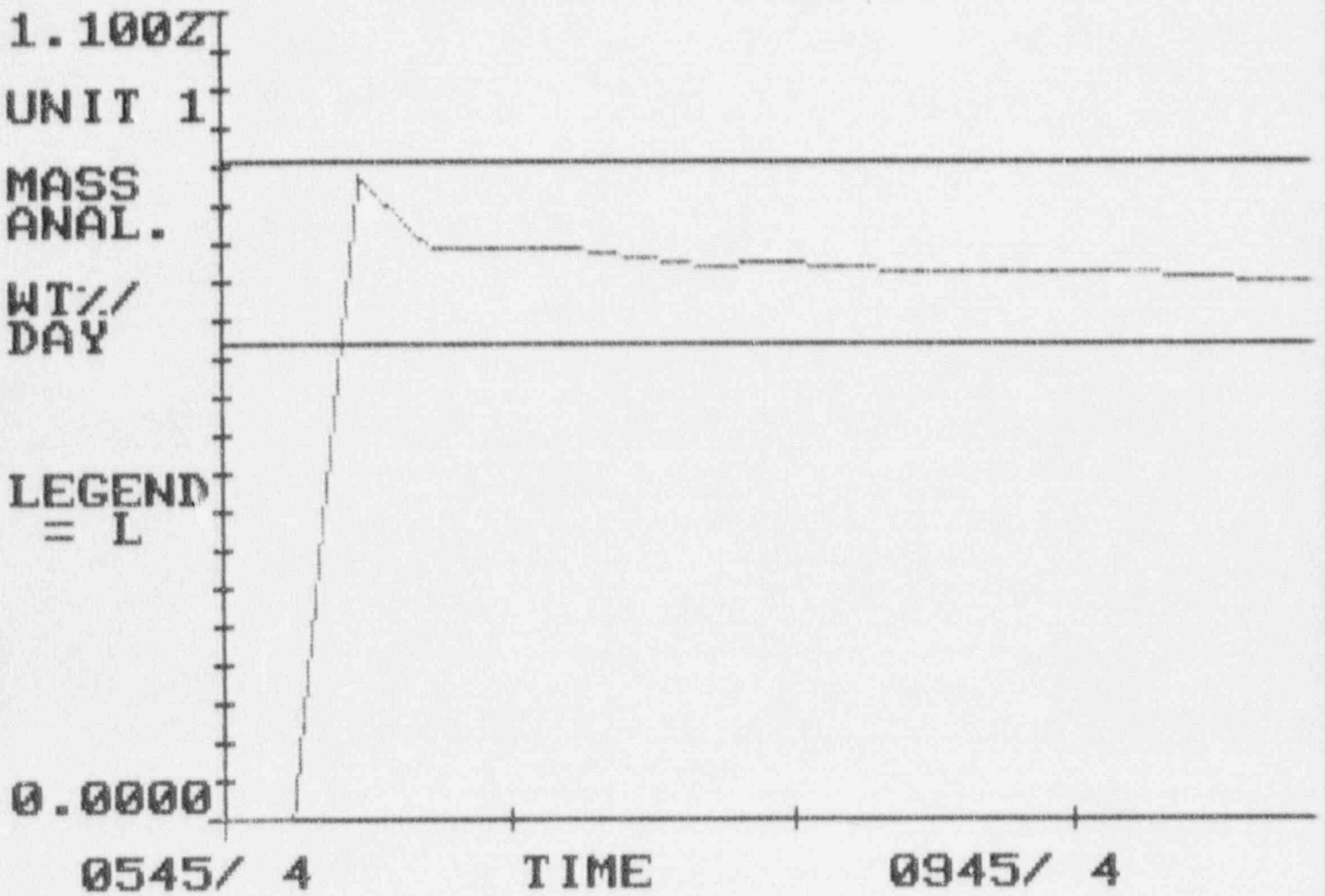
# OF DATA POINTS =	17
MODE DURATION (IN HOURS) =	4
TOT TIME MEASURED LEAK =	0.7575
TOT TIME CALCULATED LEAK =	0.7156
MASS PT LEAK =	0.7398
IMPOSED LEAK =	0.4829
TOT TIME UPPER LIMIT =	0.8974
TOT TIME LOWER LIMIT =	0.6474
MASS PT UPPER LIMIT =	0.9002
MASS PT LOWER LIMIT =	0.6502

TOT TIME VERIFICATION CRITERIA HAS BEEN MET

MASS PT VERIFICATION CRITERIA HAS BEEN MET

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	71.95/ -0.004	AVG PRESS:	64.360/ -0.007
MASS:	96391.47/ -9.484	AVG DEW PRESS:	0.3542/+0.0008

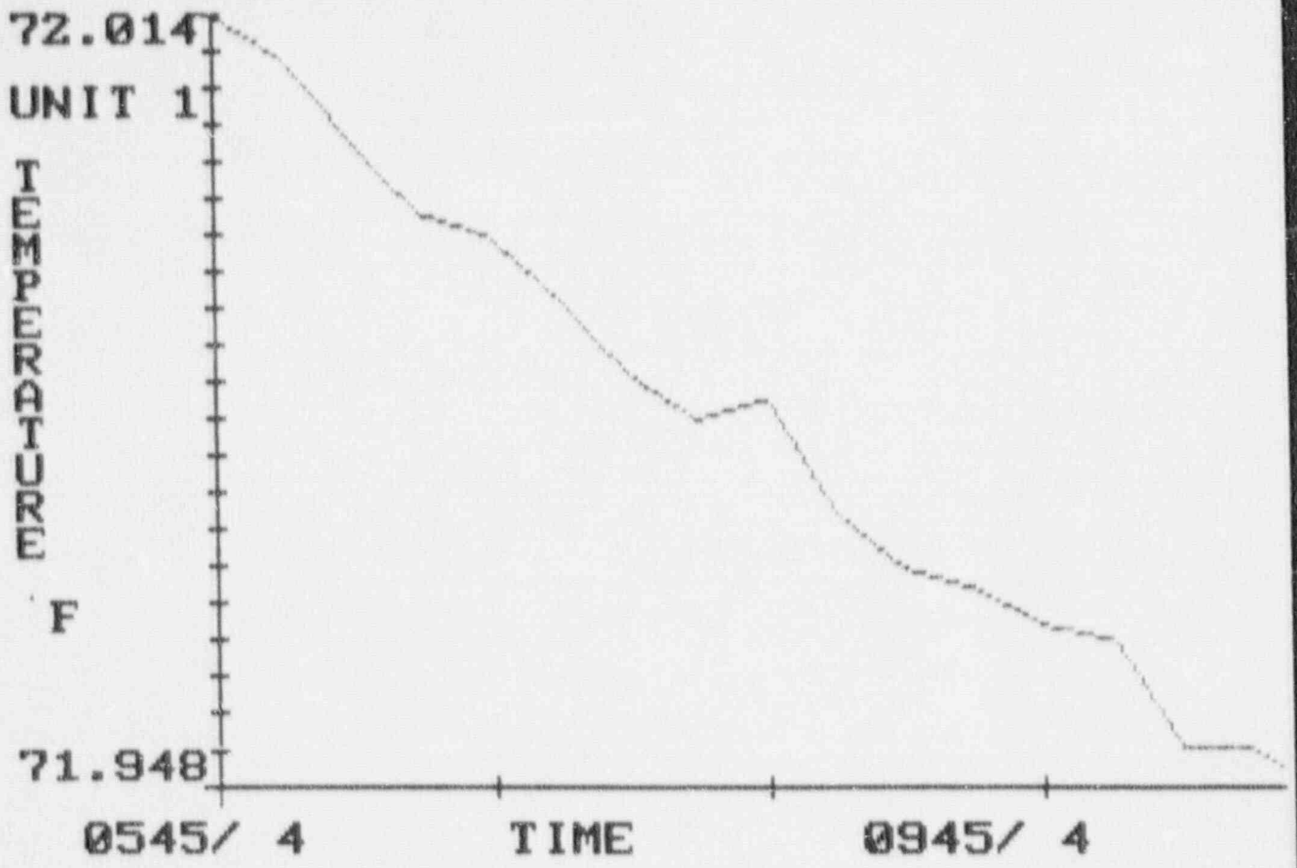


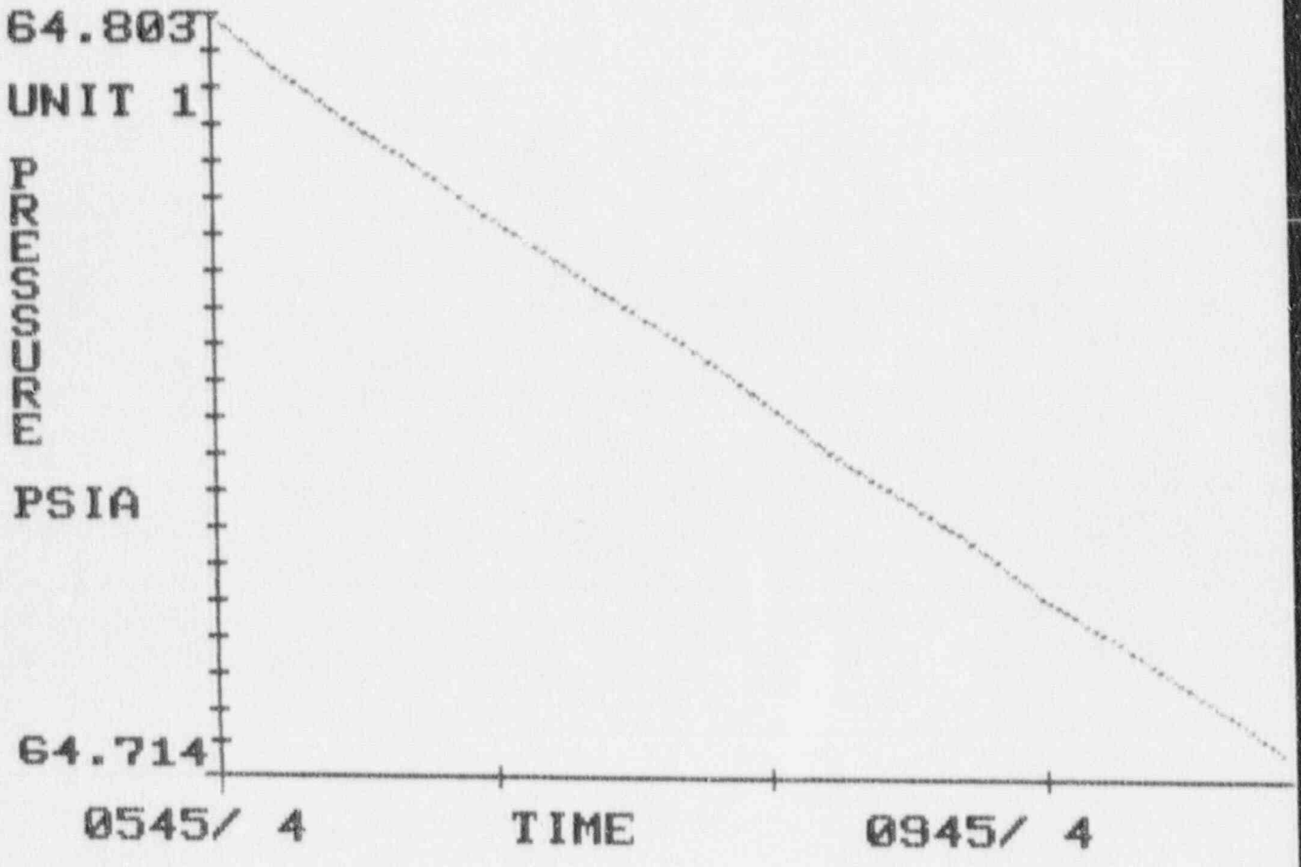
TOTAL TIME UNIT # 1

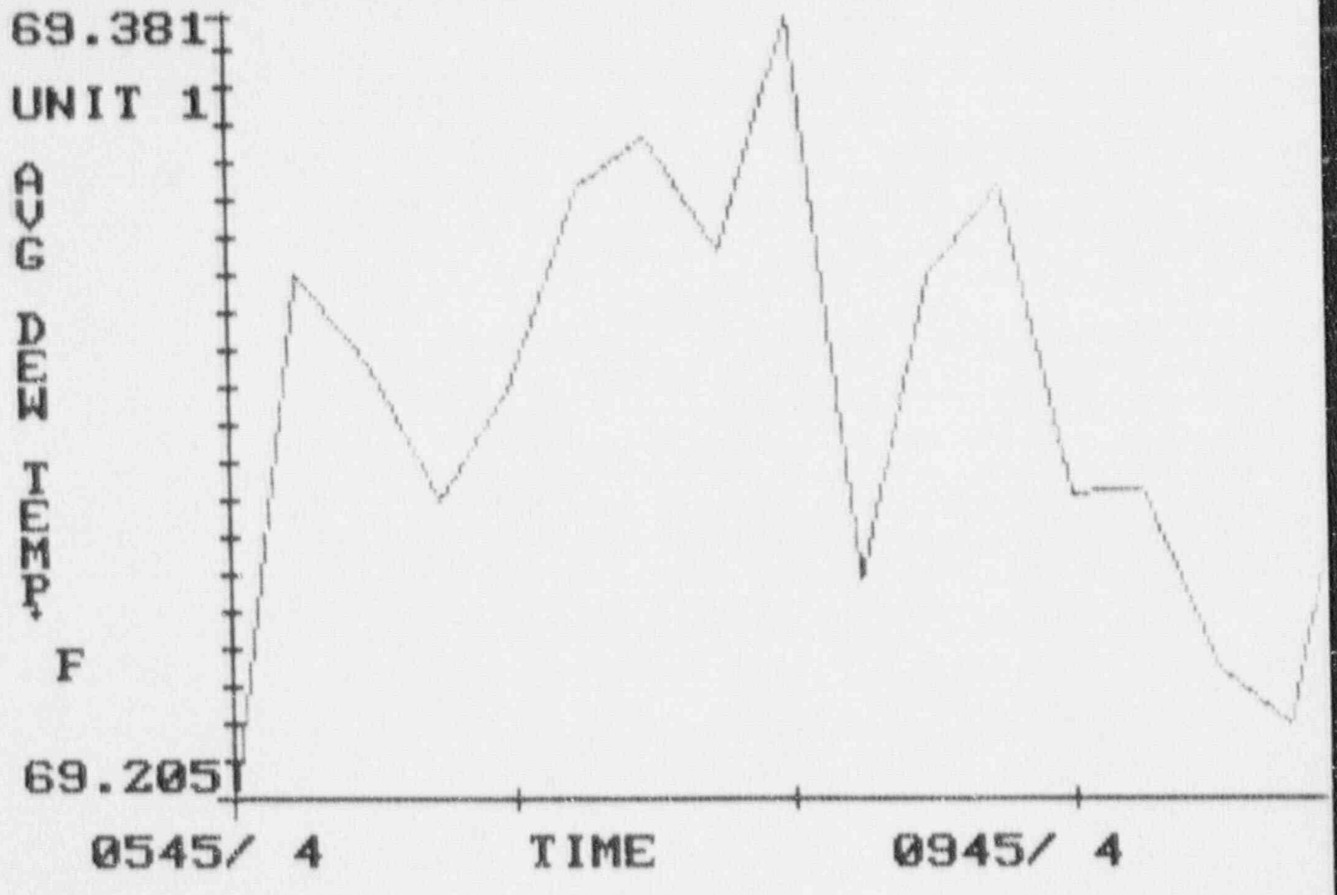
DATE	TIME	TTLM	LMCALC	SL	LAM	L95
4	0.00	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.25	1.0338	0.0000	0.0000	0.0000	0.0000
4	0.50	0.8780	0.0000	0.0000	0.8786	1.6464
4	0.75	0.7877	0.7768	1.0357	0.7908	0.9834
4	1.00	0.8149	0.7666	1.0942	0.7848	0.8785
4	1.25	0.8028	0.7584	1.0178	0.7815	0.8372
4	1.50	0.7819	0.7457	0.9601	0.7689	0.8087
4	1.75	0.7644	0.7321	0.9177	0.7549	0.7878
4	2.00	0.7947	0.7377	0.9198	0.7648	0.7920
4	2.25	0.7612	0.7297	0.8961	0.7543	0.7780
4	2.50	0.7658	0.7267	0.8836	0.7517	0.7710
4	2.75	0.7675	0.7258	0.8760	0.7517	0.7676
4	3.00	0.7616	0.7239	0.8677	0.7493	0.7629
4	3.25	0.7613	0.7229	0.8615	0.7480	0.7596
4	3.50	0.7449	0.7183	0.8505	0.7423	0.7541
4	3.75	0.7452	0.7151	0.8424	0.7384	0.7494
4	4.00	0.7575	0.7156	0.8405	0.7398	0.7495

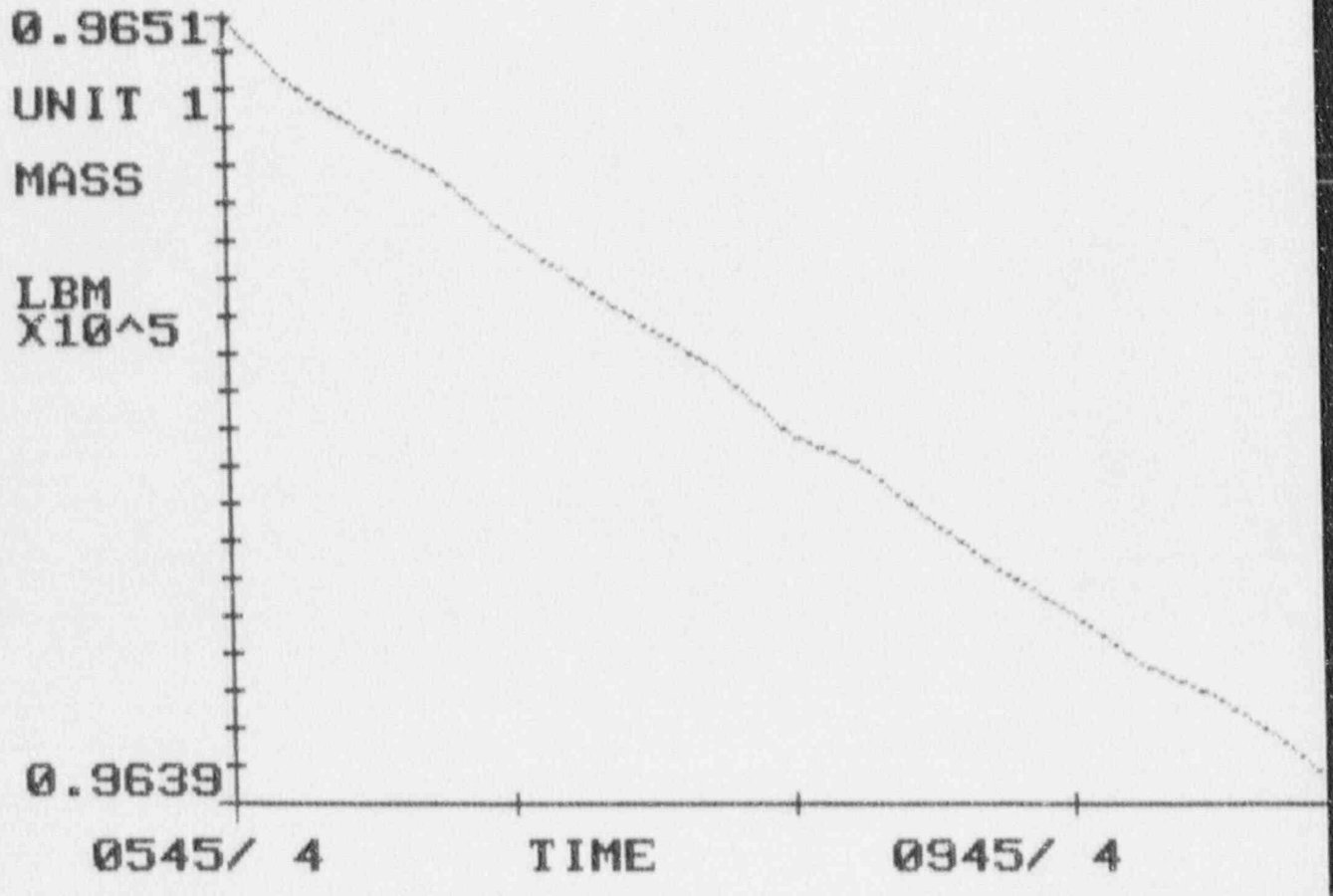
AVG. DATA VALUES UNIT # 1

DATE	TIME	T(I)	P(I)	DT(I)	VP(I)	MASS(I)
4	0.00	72.01	64.45	69.20	0.353	96513.32
4	0.25	72.01	64.44	69.32	0.355	96502.93
4	0.50	72.00	64.44	69.30	0.354	96495.66
4	0.75	72.00	64.43	69.27	0.354	96489.56
4	1.00	72.00	64.43	69.30	0.354	96480.55
4	1.25	71.99	64.42	69.34	0.355	96472.96
4	1.50	71.98	64.41	69.35	0.355	96466.15
4	1.75	71.98	64.41	69.33	0.355	96459.53
4	2.00	71.98	64.40	69.38	0.355	96449.40
4	2.25	71.97	64.40	69.25	0.354	96444.45
4	2.50	71.97	64.39	69.32	0.355	96436.33
4	2.75	71.97	64.39	69.34	0.355	96428.45
4	3.00	71.96	64.38	69.27	0.354	96421.44
4	3.25	71.96	64.38	69.27	0.354	96413.81
4	3.50	71.95	64.37	69.24	0.354	96408.48
4	3.75	71.95	64.37	69.22	0.353	96400.95
4	4.00	71.95	64.36	69.29	0.354	96391.47


72.014
UNIT 1
TEMPERATURE
F
71.948
0545/ 4
TIME
0945/ 4


64.803
UNIT 1
PRESSURE
PSIA
64.714
0545/ 4
TIME
0945/ 4


69.381
UNIT 1
AVG DEW TEMP, F
69.205
0545/ 4
TIME
0945/ 4


0.9651
UNIT 1
MASS
LBM
X10^5
0.9639
0545/ 4
TIME
0945/ 4

APPENDIX D

INSTRUMENT SELECTION GUIDE CALCULATION

INSTRUMENT SELECTION GUIDE CALCULATION

A. TEST PARAMETERS

La = 0.5%/day
P = 64.9 psia
T = 532° R
T_{dp} = 69.4° F
t = 6.5 hours

B. INSTRUMENT PARAMETERS

1. Total Absolute Pressure

No. of Sensors = 1
Range: 0 - 75 psia
Sensor sensitivity error (E): +/- 0.001 psia
Measurement system error (*e*):
Resolution: 0.001 psia
Repeatability: +/- 0.001 psia

$$e = +/- ((0.001)^2 + (0.001)^2)^{1/2}$$
$$e = +/- 0.001414 \text{ psia}$$

$$e_p = +/- ((0.001)^2 + (0.001414)^2)^{1/2} /(1)^{1/2}$$
$$e_p = +/- 0.00173 \text{ psia}$$

2. Water Vapor Pressure

No. of Sensors = 10
Sensor sensitivity error (E): +/- 0.01° F
Measurement system error (*e*):
Resolution: 0.01° F
Repeatability: +/- 0.054° F

$$e = +/- ((0.01)^2 + (0.054)^2)^{1/2}$$
$$e = +/- 0.055^\circ \text{ F}$$

At a dewpoint of 69.4° F, the equivalent water vapor pressure change (as determined from steam tables) is 0.0118 psia/° F.

E = +/- 0.01° F (0.0118 psia/° F)
E = +/- 0.00012 psia

e = +/- 0.055° F (0.0118 psia/° F)
e = +/- 0.00065 psia

$e_{pv} = +/- ((0.00012)^2 + (0.00065)^2)^{1/2} /(10)^{1/2}$
e_{pv} = +/- 0.00021 psia

3. Temperature

No. of Sensors = 24
Sensor sensitivity error (E): +/- 0.01° F
Measurement system error (e):
Resolution: 0.01° F
Repeatability: +/- 0.054°F

$e = +/- ((0.01)^2 + (0.054)^2)^{1/2}$
e = /- 0.055° F = +/- 0.055° R

$e_T = +/- ((0.01)^2 + (0.055)^2)^{1/2} /(24)^{1/2}$
e_T = /- 0.01141° R

4. Instrumentation Selection Guide Formula

$$ISG = +/- 2400/t\ (2(e_p/P)^2 + 2(e_{pv}/P)^2 + 2(e_T/T)^2)^{1/2}$$

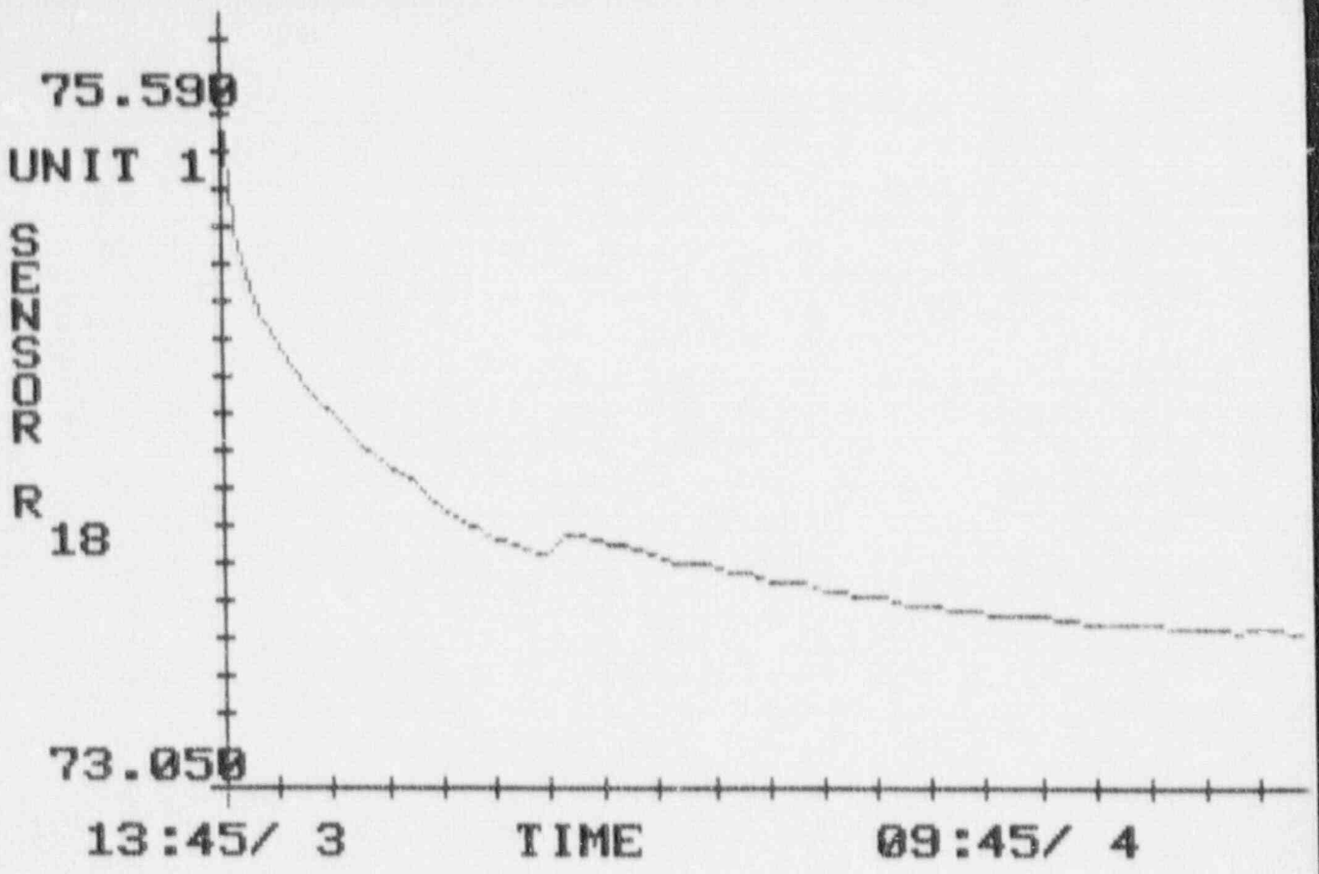
$$ISG = +/- (2400/6.5)\ (2(0.00173/64.9)^2 + 2(0.00021/64.9)^2 + 2(0.01141/532)^2)^{1/2}$$

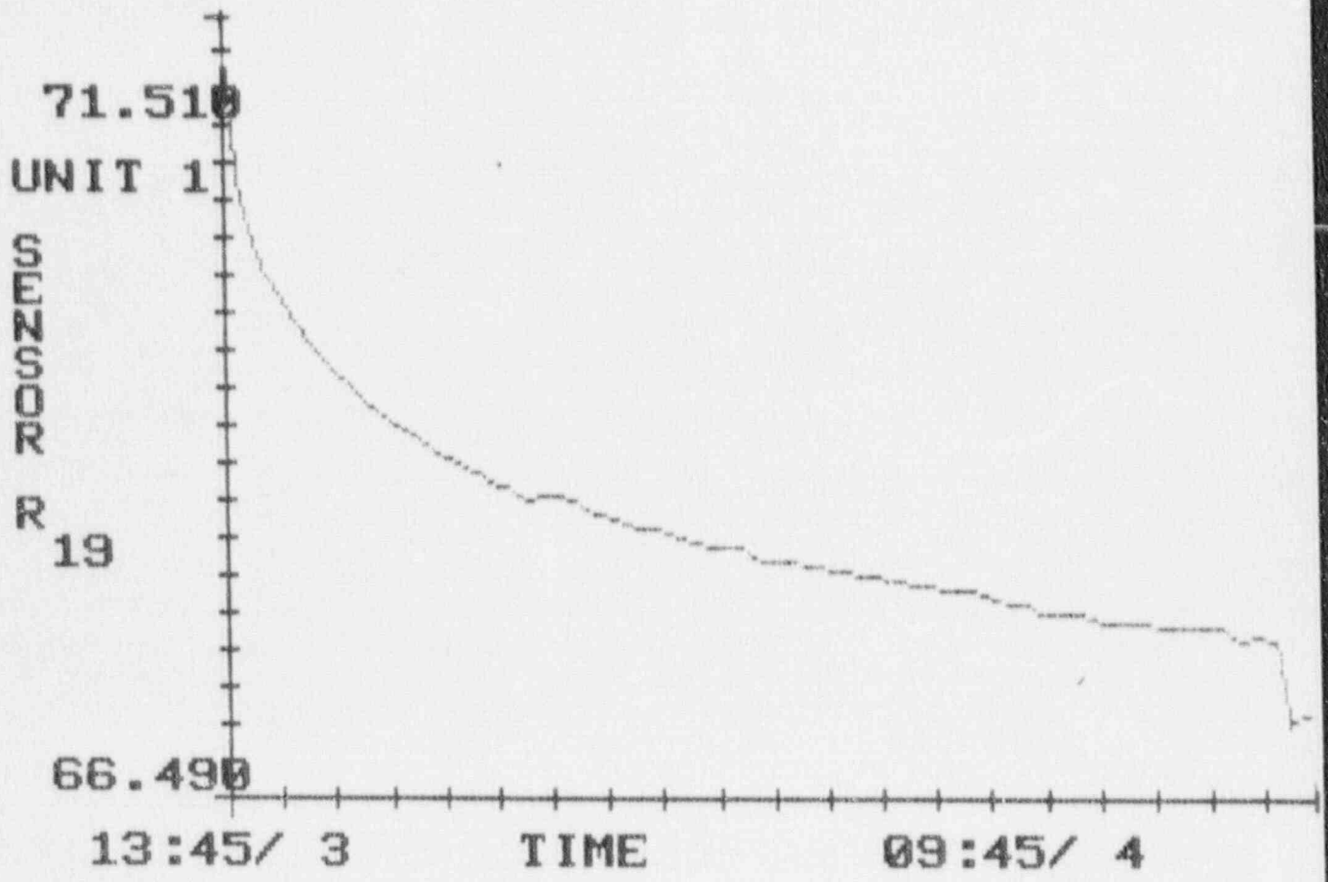
$$ISG = +/- 0.018\ \%/day$$

Due to the deletion of RTD 19 during the verification phase, the ISG was recalculated using the remaining 23 RTDs and the ISG value remains unchanged at 0.018%/day. In each case, the ISG value is substantially less than the value of 0.25 L_a (0.125 %/day).

APPENDIX E

SENSOR FAILURE DATA AND PLOTS


75.590
UNIT 1
SENSOR
R
18
73.050
13:45/ 3
TIME
09:45/ 4


71.510
UNIT 1
SENSOR
R
19
66.490
13:45/ 3
TIME
09:45/ 4

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK UNITS 1 & 2

SENSOR FAILURE ANALYSIS DOCUMENT

Failed Sensor #	Original WF	Redistributed WF
TE 19	.0701	TE 19 - 0, TE 20 - .0841 TE 21 - .0841, TE 22 - .0841 TE 23 - .0841, TE 24 - .0842
TE 20	.0701	TE 19 - .0841, TE 20 - 0 TE 21 - .0841, TE 22 - .0841 TE 23 - .0841, TE 24 - .0842
TE 21	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - 0, TE 22 - .0841 TE 23 - .0841, TE 24 - .0842
TE 22	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - .0841, TE 22 - 0 TE 23 - .0841, TE 24 - .0842
TE 23	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - .0841, TE 22 - .0841 TE 23 - 0, TE 24 - .0842
TE 24	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - .0841, TE 22 - .0841 TE 23 - .0842, TE 24 - 0
DPE 1	.0527	DPE 1 - 0, DPE 2 - .0753 DPE 3 - .0649
DPE 2	.0489	DPE 1 - .0772, DPE 2 - 0 DPE 3 - .0630
DPE 3	.0386	DPE 2 - .0682, DPE 3 - 0 DPE 4 - .0776
DPE 4	.0583	DPE 3 - .0678, DPE 4 - 0 DPE 5 - .1793
DPE 5	.1502	DPE 4 - .1334, DPE 5 - 0 DPE 6 - .3060
DPE 6	.2309	DPE 5 - .3811, DPE 6 - 0

APPENDIX F

GENERAL PHYSICS ILRT COMPUTER PROGRAM DESCRIPTION

DESCRIPTION OF GENERAL PHYSICS ILRT COMPUTER PROGRAM

The following paragraphs describe the various features and attributes of the General Physics ILRT Computer Program and the process used to certify it for each application.

REDUNDANCY

The General Physics ILRT team was equipped with two fully operational IBM compatible microcomputers during the ILRT and for on site data reduction and analysis. The computer software and hardware interfaced directly with the ILRT Measurement System Data Acquisition System (Fluke 2285B).

Two computers were brought on site for 100% redundancy, and each computer and its software is capable of independently performing the ILRT. The General Physics ILRT Computer Software is also capable of accepting manual input of raw sensor data and performing all required sensor data conversions if the data logger should cease to function. Each computer was equipped with back-up discs in the unlikely event of a disc "crash."

SECURITY

The General Physics ILRT Computer Program is written in IBM's BASICA. BASICA is a high level programming language which combines programming ease with user oriented command functions to create an easy to use and understand program. In order to increase speed of operation the program was then compiled into an executable command file. Compiling was accomplished using the IBM Basic Compiler. In addition to execution speed, this had the added benefit of making the program more secure as compiled programs cannot be edited or changed. The program requires a password to change modes of operation, start times, or enter the data editing routine to safeguard the integrity of the raw data files.

FEATURES

The program itself is designed to be a menu driven program consisting of five separate, menu driven operating modes. These are the:

1. Pressurization Mode
2. Stabilization Mode
3. Test Mode
4. Verification Mode
5. Depressurization Mode

These modes also correspond to the phases of the ILRT. Menu driven means that the user is presented with a list of options that the program can perform and from which the user can choose. It allows for interactive information exchange between the user and the computer and prevents invalid information or user mistakes from crashing the program. Program organization consists of a master menu which controls access to the five operating modes chained to the individual menus which control these modes. The data processing, information display capabilities and function of each mode is as follows:

1. Pressurization Mode: All data reduction, graphic displays of average temperature, dewpoint, and corrected pressure.

2. Stabilization Mode: All data reduction, automatic comparison of data against ANSI 56.8 and BN-TOP-1 temperature stabilization criteria, notification when criteria is met, graphic displays of average temperature, dewpoint, and corrected pressure.

3. Test Mode: All data reduction, calculation of leakage rates using mass point, total time and point-to-point analysis techniques, display of trend report information required by BN-TOP-1, graphic display of average temperature, dewpoint, pressure and mass, as well as graphic display of mass point measured leakage, 95% UCL; total time measured and calculated leakage and the total time leakage rate at the 95% UCL (as calculated by BN-TOP-1), including a superimposed acceptance criteria line).

4. Verification Test Mode: With input of imposed leakage in SCFM automatically calculates and displays on graph and trend report the acceptance criteria band, plus all graphics displays available in test mode.

5. Depressurization Mode: All data and graphics capabilities of Pressurization Mode. In programs for BWR units, this mode also includes a Drywell to Suppression Chamber Bypass Test routine.

Other reduction and analysis capabilities of the General Physics ILRT computer program include:

1. Containment total pressure conversion from counts to psia (if required), and averaging.

2. Containment drybulb temperature weighted averaging and conversion to absolute units.

3. Containment dewpoint temperature weighted averaging (conversion from Foxboro dewcell element temperature to dewpoint temperature if required) and conversion to partial pressure of water vapor (psia).

4. Data storage of ILRT measurement system inputs for each data point.

5. Weight (mass) point calculations using the ideal gas law.

6. Automated Data Acquisition and/or Manual Data Entry.

7. Sensor performance and deviation information for sensor failure criteria, graphic display of individual sensor performance for selected operating mode.

8. Calculation of ISG formula at beginning of test; acceptance criteria based on number of sensors remaining and actual test duration.

9. Computer System Error Functions automatically checks for error in incoming data, printer or disk drive faults.

The computer program used by General Physics has been previously certified for six tests at the San Onofre Nuclear Generating Station and over a dozen other ILRTs. The initial certification required verification of the program through hand calculations and an independent review by Bechtel Power Corporation. After certification was completed, a calibration set of raw data was used to verify software of the program prior to usage. Additionally, once the computer was linked to the data acquisition system and a complete data stream was available, the input function of each mode of the program was verified by comparing the data acquisition system output to the computer printout data point summary.

General Physics supplied CP&L with certification documents for the ILRT microcomputer software for the ILRT in accordance with paragraph 4.2 of CLRT Project Procedures Manual and CP&L's Work Authorization Document.

APPENDIX G

LOCAL LEAKAGE RATE TEST SUMMARIES

BSEP UNIT 1
LOCAL LEAKAGE RATE TEST SUMMARIES

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3B	Personnel Airlock	11/12/87	1.305
		05/13/88	0.096
		11/08/88	10.450
		04/03/89	7.236
		09/11/89	0.0
		04/02/90	9.711
PT-20.3C	Personel Airlock, Exterior Door	06/09/87	0.568
		06/13/87	0.545
		06/13/87	0.546
		06/19/87	0.0
		06/22/87	0.0
		06/22/87	0.0
		07/02/87	0.0
		07/05/87	0.317
		10/31/87	0.0
		02/16/88	5.540
		02/16/88	8.630
		02/17/88	0.0
		02/22/88	0.0
		05/13/88	0.0
		10/23/88	0.166
		04/03/89	2.088
		04/06/89	0697
		04/08/89	0.716
		04/14/89	0.386
		06/23/89	0.0
		06/29/89	0.0
		09/11/89	0.0
		09/26/89	7.182
		09/26/89	0.064
		09/27/89	0.064
		11/17/89	0.000
		11/18/89	0.185
		04/02/90	0.0
		06/07/90	0.0
		06/09/90	0.106
PT-20.3C	Personel Airlock, Interior Door	06/09/87	0.0
		06/13/87	0.0
		06/13/87	0.0
		06/19/87	0.0
		06/22/87	0.0
		06/22/87	0.0
		07/02/87	0.0
		07/05/87	0.0
		10/31/87	0.0
		02/16/88	0.0

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3C(cont)	Personel Airlock, Interior Door	02/17/88	0.0
		02/22/88	0.0
		10/23/88	0.0
		04/03/89	0.107
		04/06/89	0.0
		04/08/89	0.0
		04/14/89	0.0
		06/23/89	0.0
		06/29/89	0.0
		09/26/89	0.0
		09/27/89	0.0
		11/17/89	0.002
		11/18/89	0.0
		06/07/90	0.0
		06/09/90	0.106
PT-20.3-A1	B21-F022A, F028A	11/13/88	0.0
PT-20.3-A2	B21-F022B, F028B	11/13/88	WNP
		11/15/88	WNP
		11/17/88	WNP
		12/09/88	0.0
PT-20.3-A3	B21-F022C, F028C	11/13/88	0.0
PT-20.3-A4	B21-F022D, F028D	11/13/88	47.507
		11/15/88	WNP
		12/09/88	0.0
PT-20.3-001	Electrical Penetration X100A	11/12/88	0.0
PT-20.3-002	Electrical Penetration X100B	11/12/88	0.0
PT-20.3-003	Electrical Penetration X100C	11/12/88	0.0
PT-20.3-004	Electrical Penetration X103A	11/12/88	0.0
PT-20.3-005	Electrical Penetration X100D	11/12/88	0.0
PT-20.3-006	Electrical Penetration X104A	11/12/88	0.0
PT-20.3-007	Electrical Penetration X102C	11/12/88	0.0
PT-20.3-008	Electrical Penetration X104B	11/22/88	0.0
PT-20.3-009	Electrical Penetration X102B	11/22/88	0.0
PT-20.3-010	Electrical Penetration X101A	11/22/88	0.0
PT-20.3-011	Electrical Penetration X101C	11/22/88	0.0
PT-20.3-012	Electrical Penetration X105D	11/22/88	0.0

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3-013	Electrical Penetration X105E	11/22/88	0.0
PT-20.3-014	Electrical Penetration X102C	11/16/88	0.0
PT-20.3-015	Electrical Penetration X104C	11/16/88	0.0
PT-20.3-016	Electrical Penetration X105H	11/16/88	0.0
PT-20.3-017	Electrical Penetration X105G	11/16/88	0.0
PT-20.3-018	Electrical Penetration X102E	12/03/88	0.0
PT-20.3-019	Electrical Penetration X104E	12/03/88	0.0
PT-20.3-020	Electrical Penetration X100F	12/03/88	0.0
PT-20.3-021	Electrical Penetration X100E	12/03/88	0.0
PT-20.3-022	Electrical Penetration X100C	12/02/88	0.0
PT-20.3-023	Electrical Penetration X100H	12/02/88	0.0
PT-20.3-024	Electrical Penetration X102F	12/02/88	0.0
PT-20.3-025	Electrical Penetration X104F	12/02/88	0.0
PT-20.3-026	Electrical Penetration X103B	12/01/88	0.0
PT-20.3-027	Electrical Penetration X104G	12/01/88	0.0
PT-20.3-028	Electrical Penetration X102H	12/01/88	0.0
PT-20.3-029	Electrical Penetration X105J	12/01/88 11/30/89	0.915 0.917
PT-20.3-030	Electrical Penetration X105K	12/01/88	0.0
PT-20.3-031	Electrical Penetration X101F	12/01/88	0.0
PT-20.3-032	Electrical Penetration X101D	12/01/88	0.0
PT-20.3-033	Electrical Penetration X105C	11/12/88	0.0
PT-20.3-034	Electrical Penetration X105B	11/12/88	0.0
PT-20.3-035	Electrical Penetration X232B	12/10/88	0.0
PT-20.3-036	Electrical Penetration X232C	12/11/88	0.0
PT-20.3-037	Electrical Penetration X232A	12/10/88	0.0
PT-20.3-038	Electrical Penetration X232D	12/11/88	0.0

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3-039	Equipment Hatch	11/12/88	0.0
		03/17/89	0.0
PT-20.3-040	Pers. Lock To Drywell Liner Seal	11/12/88	0.707
PT-20.3-041	Drywell Head Blank	11/29/88	0.0
PT-20.3-042	Drywell Head Access Hatch	11/29/88	0.0
PT-20.3-043	CRD Hatch	06/21/87	0.0
		11/11/88	0.0
		03/30/89	0.0
PT-20.3-044	South Torus Access Hatch	11/11/88	0.0
PT-20.3-045	North Torus Access Hatch	02/16/88	0.0
		11/11/88	0.0
		03/30/89	0.0
		11/16/89	0.0
		11/17/89	0.0
PT-20.3-046	Drywell To Drywell Head Seal	11/11/88	0.0
		02/26/89	0.0
PT-20.3-047	CAC-V49 Inboard O-Rings	11/29/88	0.0
PT-20.3-048	CAC-V5 Inboard O-Rings	11/30/88	0.0
PT-20.3-049	CAC-V6 Inboard O-Rings	11/30/88	0.0
PT-20.3-050	CAC-V7 Inboard O-Rings	11/29/88	2.240
PT-20.3-051	CAC-V9 Inboard O-Rings	11/29/88	0.0
PT-20.3-052	CAC-V16 Inboard O-Rings	11/30/88	0.0
PT-20.3-053	CAC-V17 Inboard O-Rings	11/30/88	0.0
		01/22/89	0.0
PT-20.3-054	B21-F010A	11/15/88	WNP
		01/15/89	0.0
PT-20.3-055	B21-F010B	11/20/88	WNP
		01/11/89	0.0
PT-20.3-056	B21-F032A, E41-F006	11/19/88	5.469
		01/19/89	6.356
PT-20.3-057	B21-F032B, E51-V88	11/21/88	0.0
		01/07/89	12.143
		01/09/89	8.125

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3-058	B21-F016, F019	11/24/88	54.292
		01/06/89	74.479
		01/16/89	0.616
PT-20.3-059	B32-V22, V30	01/19/89	13.388
		02/20/89	0.0
PT-20.3-060	B32-F019, F020	12/29/88	2.607
PT-20.3-061	B32-V24	12/15/88	0.0
PT-20.3-062	B32-V32	12/12/88	0.0
PT-20.3-063	C41-F006	12/05/88	1.316
		12/16/88	0.098
PT-20.3-064	C41-F007	12/04/88	0.0
		12/16/88	0.920
PT-20.3-065	CAC-V170, V160, V162	11/29/88	0.097
PT-20.3-066	CAC-V171, V161, V163	11/29/88	1.606
PT-20.3-067A	CAC-V4, V5, V6, V15	02/11/88	11.465
		12/05/88	6.792
PT-20.3-067B	CAC-V55, V56	12/01/88	2.514
PT-20.3-068A	CAC-V7, V8	11/28/88	0.0
PT-20.3-068B	CAC-V22	12/09/88	0.0
PT-20.3-069A	CAC-V9, V10, V23	03/03/89	9.820
PT-20.3-069C	CAC-V172	12/09/88	0.0
PT-20.3-070	CAC-X20A, V16	02/11/88	2.716
		12/02/88	WNP
		01/17/89	1.316
PT-20.3-071	CAC-X20B, V17	02/11/88	5.490
		11/23/88	22.400
		01/03/89	0.0
PT-20.3-072A	CAC-V49	6/10/87	0.0
		11/30/88	0.616
PT-20.3-072B	CAC-V50	11/30/88	0.0
PT-20.3-073	CAC-SV-1200B	12/02/88	1.811
PT-20.3-074	CAC-SV-1261	12/08/88	0.0

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3-078A	CAC-SV-1227E	12/01/88	0.0
PT-20.3-079	CAC-SV-1260	11/26/88	0.0
PT-20.3-081	CAC-SV-3440	12/08/88	0.0
PT-20.3-082	CAC-SV-1225B	12/08/88	0.0
PT-20.3-083	CAC-SV-1211F	11/26/88	0.0
PT-20.3-084	CAC-SV-1262	12/01/88	0.0
PT-20.3-089	CAC-SV-1211E	12/09/88	0.0
PT-20.3-090	CAC-SV-3439	12/09/88	0.0
PT-20.3-108	E11-F008, F009	12/26/88 01/21/89	83.645 6.958
PT-20.3-111A	E11-F015A	12/15/88 02/11/89	0.0 0.0
PT-20.3-111B	E11-F015B	11/20/88 01/27/89 01/29/89 02/09/89	4.547 9.820 0.0 0.0
PT-20.3-112A	E11-F017A	12/16/88 01/21/89	0.0 2.721
PT-20.3-112B	E11-F017B	11/20/88 01/16/89	0.814 0.0
PT-20.3-113	E11-F016A, F021A	12/17/88	2.656
PT-20.3-114	E11-F016B, F021B	11/19/88	0.814
PT-20.3-117	E11-F022, F023	12/04/88	0.0
PT-20.3-118	E11-F024A, F027A, F028A	12/22/88 01/30/89	0.0 8.998
PT-20.3-119	E11-F024B, F027B, F028B	01/31/88 11/23/88 01/31/89	0.0 WNP 0.0
PT-20.3-142A	E21-F005A	12/28/88 10/11/90	0.218 1.040
PT-20.3-142B	E21-F005B	11/24/88	1.723
PT-20.3-143A	E21-F004A	12/27/88	0.0

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3-143B	E21-F004B	11/22/88	0.0
PT-20.3-148	E41-F002, F003	11/14/88	41.050
		01/18/89	19.790
		01/28/89	0.0
PT-20.3-153	E41-F075, F079	11/13/88	0.0
PT-20.3-156	E51-F007, F008	11/14/88	1.205
		01/28/89	2.088
PT-20.3-161	E51-F062, F066	11/14/88	0.0
PT-20.3-162	G16-F003, F004	11/30/88	0.0
PT-20.3-163	G16-F019, F020	11/27/88	0.0
PT-20.3-164	G31-F001, F004	11/22/88	56.057
		12/18/88	17.368
		01/07/89	1.878
		10/13/90	28.900
PT-20.3-165	G31-F042, E51-F013	11/23/88	WNP
		01/10/89	2.505
		06/16/89	0.0
		10/17/90	43.070
		12/26/90	0.0
PT-20.3-166	RCC-V28, V52	01/17/89	WNP
		03/11/89	1.326
PT-20.3-167A	RCC-SV-1222B, 1222C	03/11/89	0.0
		01/13/91	0.0
PT-20.3-168	RNA-SV-5262	12/07/88	0.0
		10/22/90	0.0
PT-20.3-168A	RNA-V351	10/23/90	19.000
		01/06/91	19.600
PT-20.3-169	RNA-SV-5261	12/05/88	0.0
		10/25/90	0.0
PT-20.3-169A	RNA-V350	10/25/90	0.0
PT-20.3-170	RNA-SV-5251	12/06/88	1.628
		10/26/90	1.040
PT-20.3-171	RNA-SV-5253	12/07/88	0.0
PT-20.3-172	RXS-SV-4186	11/17/88	0.0
PT-20.3-173	RXS-SV-4187	11/17/88	0.0

TEST	COMPONENT	DATE	LEAKAGE
PT-20.3-174	RXS-SV-4188	11/20/88	0.0
PT-20.3-175	RXS-SV-4189	11/20/88	0.0
PT-20.3-179	TIP-V1	11/20/88	0.0
PT-20.3-180	TIP-V2	11/20/88	0.0
PT-20.3-181	TIP-V3	11/20/88	0.0
PT-20.3-182	TIP-V4	11/20/88	0.0
PT-20.3-183	TIP N2 CHECK	11/20/88	0.0
PM 86-007	Pen X49A	03/03/89	0.0
	Pen X49B	03/04/89	0.0

Reviewed By _____ Date 4/9/91

Reviewed By _____ Date 4/9/91

UNIT ONE "AS FOUND" MNPLR SUMMATION REPORT

"AS FOUND" MNPLR TOTAL= 114.506 SCFH*

*SEE ENP-16.8 IF TOTAL OR A PENETRATION EXCEEDS 159.78 SCFH

Penetration#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR	*"As Found" MNPLR per Penetration	Basis Code
X100A	ELEC. PENET. X100A	0.000	0.284	0.000	0.000	A
X100B	ELEC. PENET. X100B	0.000	0.284	0.000	0.000	A
X100C	ELEC. PENET. X100C	0.000	0.284	0.000	0.000	A
X103A	ELEC. PENET. X103A	0.190	0.284	0.190	0.190	A
X100D	ELEC. PENET. X100D	0.000	0.284	0.000	0.000	A
X104A	ELEC. PENET. X104A	0.000	0.284	0.000	0.000	A
X102A	ELEC. PENET. X102A	0.000	0.284	0.000	0.000	A
X104B	ELEC. PENET. X104B	0.000	0.284	0.000	0.000	A
X102B	ELEC. PENET. X102B	0.000	0.284	0.000	0.000	A
X101A	ELEC. PENET. X101A	0.000	0.284	0.000	0.000	A
X101C	ELEC. PENET. X101C	0.000	0.284	0.000	0.000	A
X105D	ELEC. PENET. X105D	0.000	0.284	0.000	0.000	A
X105E	ELEC. PENET. X105E	0.000	0.284	0.000	0.000	A
X102C	ELEC. PENET. X102C	0.000	0.284	0.000	0.000	A
X104C	ELEC. PENET. X104C	0.000	0.284	0.000	0.000	A
X105H	ELEC. PENET. X105H	0.000	0.284	0.000	0.000	A
X105G	ELEC. PENET. X105G	0.000	0.284	0.000	0.000	A
X102E	ELEC. PENET. X102E	0.000	0.284	0.000	0.000	A
X104E	ELEC. PENET. X104E	0.000	0.284	0.000	0.000	A
X100F	ELEC. PENET. X100F	0.000	0.284	0.000	0.000	A
X100E	ELEC. PENET. X100E	0.000	0.284	0.000	0.000	A
X100G	ELEC. PENET. X100G	0.000	0.284	0.000	0.000	A
X100H	ELEC. PENET. X100H	0.000	0.284	0.000	0.000	A
X102F	ELEC. PENET. X102F	0.000	0.284	0.000	0.000	A
X104F	ELEC. PENET. X104F	0.000	0.284	0.000	0.000	A
X103B	ELEC. PENET. X103B	0.000	0.284	0.000	0.000	A
X104G	ELEC. PENET. X104G	0.000	0.284	0.000	0.000	A
X102H	ELEC. PENET. X102H	0.000	0.284	0.000	0.000	A
X105J	ELEC. PENET. X105J	3.690	0.284	3.690	3.690	A
X105K	ELEC. PENET. X105K	0.000	0.284	0.000	0.000	A
X101F	ELEC. PENET. X101F	0.000	0.284	0.000	0.000	A
X101D	ELEC. PENET. X101D	0.000	0.284	0.000	0.000	A
X105C	ELEC. PENET. X105C	0.000	0.284	0.000	0.000	A
X105B	ELEC. PENET. X105B	0.000	0.284	0.000	0.000	A
X232B	ELEC. PENET. X232B	0.000	0.284	0.000	0.000	A
X232C	ELEC. PENET. X232C	0.000	0.284	0.000	0.000	A
X232A	ELEC. PENET. X232A	0.000	0.284	0.000	0.000	A
X232D	ELEC. PENET. X232D	0.000	0.284	0.000	0.000	A
X1	EQUIP. HATCH	0.000	0.284	0.000	0.000	E
X2	PER. LOCK TO DW SEAL	0.000	0.284	0.000	0.000	E
X3A	DRYWELL HEAD BLANK	0.000	0.284	0.000	0.000	E
X4	DW HEAD ACCESS HATCH	0.000	0.284	0.000	0.000	E
X6	CRD HATCH	0.000	0.284	0.000	0.000	E
X200A	S. TORUS HATCH	0.000	0.284	0.000	0.000	E
X200B	N. TORUS HATCH	0.000	0.284	0.000	0.000	E
N/A	DW TO DW HEAD SEAL	2.910	0.284	1.455	1.455	C

UNIT ONE "AS FOUND" MNPLR SUMMATION REPORT

"AS FOUND" MNPLR TOTAL= 114.506 SCFH*

*SEE ENP-16.8 IF TOTAL OR A PENETRATION EXCEEDS 159.78 SCFH

Penetration#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR	*"As Found" MNPLR per Penetration	Basis Code
X3E	CAC-V49	2.800				
	CAC-V50	0.590	0.284	0.590	0.590	C
X25	CAC-V6,V171,V161,V163	0.000	0.284	0.000		
	CAC-V4,V15,V16,V17	78.200				
	CAC-V55,V56	0.000			0.000	F
X205	CAC-V5,V170,V160, V162,X20A,X20B	44.900				
	CAC-V4,V15,V16,V17	78.200	0.284	4.800		
	CAC-V55,V56	0.000	0.284	0.000	4.800	G
X220	CAC-V7,V172	24.800				
	CAC-V8,V22	0.000	0.284	0.000	0.000	C
X26	CAC-V9	32.200				
	CAC-V10,V23	1.740	0.284	1.740	1.740	C
X9A	B21-F010A	WNP				
	B21-F032A,E41-F006	6.300	1.580	6.500	6.500	C
X9B	B21-F010B	WNP				
	B21-F032B,E51-V88	18.500	1.580	18.500		
	G31-F042,E51-F013	62.200			18.500	B
X8	B21-F016,B21-F019	0.000	0.284	0.000	0.000	E
X62A	B32-V22	0.000	0.284	0.000		
	B32-V24	0.5.			0.000	C
X78A	B32-V32	16.100				
	B32-V30	0.000	0.284	0.000	0.000	C
X56E	B32-F019,F020	9.800	0.284	0.500	0.500	E/E1
X42	C41-F006	0.490	0.296	0.490		
	C41-F007	1.680			0.490	C
X49B	CAC-SV-1200B	4.130				
	CAC-SV-1261	0.000	0.284	0.000	0.000	C
X73E	CAC-SV-1260	0.000	0.284	0.000		
	CAC-SV-1227E	0.000			0.000	C
X76B	CAC-SV-3440	0.000				
	CAC-SV-1225B	0.000	0.284	0.000	0.000	C

UNIT ONE "AS FOUND" MNPLR SUMMATION REPORT

"AS FOUND" MNPLR TOTAL= 114.506 SCFH*

*SEE ENP-16.8 IF TOTAL OR A PENETRATION EXCEEDS 159.78 SCFH

Penetration#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR	*"As Found" MNPLR per Penetration	Basis Code
X54F	CAC-SV-1211F	0.000				
	CAC-SV-12e2	0.000	0.284	0.000	0.000	C
X54E	CAC-SV-1211E	0.000				
	CAC-SV-3439	0.000	0.284	0.000	0.000	C
X12	E11-F008,F009	0.000	0.284	0.000	0.000	E
X13A	E11-F015A	0.000	0.284	0.000		
	E11-F017A	2.910			0.000	C
X13B	E11-F015B	0.350				
	E11-F017B	0.000	0.284	0.000	0.000	C
X39A	E11-F021A	17.500				
	E11-F016A	8.800	1.580	8.800	8.800	C
X39B	E11-F021B	0.000	0.284	0.000		
	E11-F016B	4.020			0.000	C
X17	E11-F022,F023	0.000	0.284	0.000	0.000	E
X210A/X211A	E11-F024A,F027A,F028A	11.100	1.580	5.550	5.550	E
X210B/X211B	E11-F024B,F027B,F028B	0.000	0.284	0.000	0.000	E
X16A	E21-F005A	1.040				
	E21-F004A	1.040	0.284	1.040	1.040	C
X16B	E21-F005B	8.800				
	E21-F004B	0.000	0.284	0.000	0.000	C
X11	E41-F002,F003	4.309	0.284	2.155	2.155	E
X214/X218	E41-F075,F079	0.000	0.284	0.000	0.000	E
X10	E51-F007,F008	41.710	3.908	20.855	20.855	E
X212/X216	E51-F062,F066	0.000	0.284	0.000	0.000	E
X18	G16-F003	0.000	0.284	0.000		
	G16-F004	0.590			0.000	C
X19	G16-F019	0.880				
	G16-F020	0.190	0.284	0.190	0.190	C
X14	G31-F001,F004	28.900	1.880	14.450	14.450	E

UNIT ONE "AS FOUND" MNPLR SUMMATION REPORT

"AS FOUND" MNPLR TOTAL= 114.506 SCFH*
*SEE ENP-16.8 IF TOTAL OR A PENETRATION EXCEEDS 159.78 SCFH

Penetration#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR	*"As Found" MNPLR per Penetration	Basis Code
X23/X24	RCC-V28,V52	7.700	2.075	7.700	7.700	A
X77B/X77C	RCC-SV-1222B,1222C	0.000	0.284	0.000	0.000	A
X55	RNA-SV-5262	0.000	0.284	0.000		
	RNA-V351	19.000			0.000	C
X71	RNA-SV-5261	0.000				
	RNA-V350	0.000	0.284	0.000	0.000	C
X83B	RNA-SV-5251	1.040	0.284	1.040	1.040	A
X52A	RNA-SV-5253	0.000	0.284	0.000	0.000	A
X209A-B	RXS-SV-4186	0.000				
	RXS-SV-4187	0.000	0.284	0.000	0.000	C
X209A-D	RXS-SV-4188	0.600				
	RXS-SV-4189	0.000	0.284	0.000	0.000	C
X35A	TIP V1	0.110	0.284	0.110	0.110	A
X35B	TIP V2	1.740	0.284	1.740	1.740	A
X35C	TIP V3	0.000	0.284	0.000	0.000	A
X35D	TIP V4	0.460	0.284	0.460	0.460	A
X35E	TIP N2 CHECK	0.590	0.284	0.590	0.590	A
N/A	PERSONNEL AIRLOCK	9.711	1.605	4.856	4.856	E
	TOTAL	561.910	6.516	107.990	107.990	

Reviewed By: _____ Date: 4.2.91

Reviewed By: _____ Date: 4-2-91

UNIT ONE 'AS FOUND' SAVING REPORT

'AS FOUND' SAVING TOTAL= 81.813 SCFH

Penetration#	Component#	'As Found' Leakage	'As Found' MNFLR	'As Left' Leakage	'As Left' MNFLR	Equipment Error	'As Found' Saving	Data Code
X100A	ELEC. PENET. X100A	0.000	0.000	0.000	0.000	0.284	0.000	A
X100B	ELEC. PENET. X100B	0.000	0.000	0.000	0.000	0.284	0.000	A
X100C	ELEC. PENET. X100C	0.000	0.000	0.000	0.000	0.284	0.000	A
X103A	ELEC. PENET. X103A	0.190	0.190	0.190	0.190	0.284	0.000	A
X100D	ELEC. PENET. X100D	0.000	0.000	0.000	0.000	0.284	0.000	A
X104A	ELEC. PENET. X104A	0.000	0.000	0.000	0.000	0.284	0.000	A
X102A	ELEC. PENET. X102A	0.000	0.000	0.000	0.000	0.284	0.000	A
X104B	ELEC. PENET. X104B	0.000	0.000	0.000	0.000	0.284	0.000	A
X102B	ELEC. PENET. X102B	0.000	0.000	0.000	0.000	0.284	0.000	A
X101A	ELEC. PENET. X101A	0.000	0.000	0.000	0.000	0.284	0.000	A
X101C	ELEC. PENET. X101C	0.000	0.000	0.000	0.000	0.284	0.000	A
X105D	ELEC. PENET. X105D	0.000	0.000	0.000	0.000	0.284	0.000	A
X105E	ELEC. PENET. X105E	0.000	0.000	0.000	0.000	0.284	0.000	A
X102C	ELEC. PENET. X102C	0.000	0.000	0.000	0.000	0.284	0.000	A
X104C	ELEC. PENET. X104C	0.000	0.000	0.000	0.000	0.284	0.000	A
X109H	ELEC. PENET. X109H	0.000	0.000	0.000	0.000	0.284	0.000	A
X109G	ELEC. PENET. X109G	0.000	0.000	0.000	0.000	0.284	0.000	A
X102E	ELEC. PENET. X102E	0.000	0.000	0.000	0.000	0.284	0.000	A
X104E	ELEC. PENET. X104E	0.000	0.000	0.000	0.000	0.284	0.000	A
X100F	ELEC. PENET. X100F	0.000	0.000	0.000	0.000	0.284	0.000	A
X100E	ELEC. PENET. X100E	0.000	0.000	0.000	0.000	0.284	0.000	A
X100G	ELEC. PENET. X100G	0.000	0.000	0.000	0.000	0.284	0.000	A
X100H	ELEC. PENET. X100H	0.000	0.000	0.000	0.000	0.284	0.000	A
X102F	ELEC. PENET. X102F	0.000	0.000	0.000	0.000	0.284	0.000	A
X104F	ELEC. PENET. X104F	0.000	0.000	0.000	0.000	0.284	0.000	A
X103E	ELEC. PENET. X103E	0.000	0.000	0.000	0.000	0.284	0.000	A
X104G	ELEC. PENET. X104G	0.000	0.000	0.000	0.000	0.284	0.000	A
X102H	ELEC. PENET. X102H	0.000	0.000	0.000	0.000	0.284	0.000	A
X105J	ELEC. PENET. X105J	3.690	3.690	3.690	3.690	0.284	0.000	A
X109K	ELEC. PENET. X109K	0.000	0.000	0.000	0.000	0.284	0.000	A
X101F	ELEC. PENET. X101F	0.000	0.000	0.000	0.000	0.284	0.000	A
X101D	ELEC. PENET. X101D	0.000	0.000	0.000	0.000	0.284	0.000	A
X105C	ELEC. PENET. X105C	0.000	0.000	0.000	0.000	0.284	0.000	A
X105B	ELEC. PENET. X105B	0.000	0.000	0.000	0.000	0.284	0.000	A
X232B	ELEC. PENET. X232B	0.000	0.000	0.000	0.000	0.284	0.000	A
X232C	ELEC. PENET. X232C	0.000	0.000	0.000	0.000	0.284	0.000	A
X232A	ELEC. PENET. X232A	0.000	0.000	0.000	0.000	0.284	0.000	A
X232D	ELEC. PENET. X232D	0.000	0.000	0.000	0.000	0.284	0.000	A
X1	EQUIP. HATCH	0.000	0.000	0.000	0.000	0.284	0.000	E
X2	PER. LOCK TO DW SEAL	0.000	0.000	0.000	0.000	0.284	0.000	E
M3A	DRYWELL HEAD FLANG	0.000	0.000	0.000	0.000	0.284	0.000	E
X4	DW HEAD ACCESS HATCH	0.000	0.000	0.000	0.000	0.284	0.000	E
X5	CRD HATCH	0.000	0.000	0.000	0.000	0.284	0.000	E
X200A	S. TORUS HATCH	0.000	0.000	0.000	0.000	0.284	0.000	E
X200B	N. TORUS HATCH	0.000	0.000	0.000	0.000	0.284	0.000	E
N/A	DW TO DW HEAD SEAL	2.919	1.455	0.000	0.000	0.284	1.455	E

UNIT ONE 'AS FOUND' SAVING REPORT

'AS FOUND' SAVING TOTAL= 82.832 SCFH

Penetration#	Component#	'As Found' Leakage	'As Found' MNFLR	'As Left' Leakage	'As Left' MNFLR	Equipment Error	'As Found' Saving	Basis Code
X3B	CAC-V49	2.800		2.800				
	CAC-V50	0.590	0.590	0.590	0.590	0.284	0.000	C
X25	CAC-V6,V171,V161,V163	0.000	0.000	1.870	1.870	0.284		
	CAC-V4,V15,V16,V17	78.200		4.800				
	CAC-V55,V56	0.000	0.000	0.000			0.000	T
X205	CAC-V5,V170,V160, V162,X20A,X20B	44.900		0.000	0.000	0.284		
	CAC-V4,V15,V16,V17	78.200	4.800	4.800				
	CAC-V55,V56	0.000	0.000	0.000			4.800	G
X270	CAC-V7,V172	24.000		0.000				
	CAC-V8,V22	0.000	0.000	0.000	0.000	0.284	0.000	C
X26	CAC-V9	22.200		0.000	0.000	0.284		
	CAC-V10,V23	1.740	1.740	1.740			1.740	C
X9A	B21-P010A	WNP		0.000	0.000	0.284		
	B21-P033A,B41-P006	6.500	6.500	3.240			6.500	C
X9B	B21-P010B	WNP		0.000	0.000	0.284		
	B21-P033B,B51-V86	18.500	18.500	8.800				
	G31-P042,B51-P013	62.240		0.000			18.500	T
X8	B21-P018,B21-P019	0.000	0.000					X
	B21-P016			0.000				
	B21-P019			0.000	0.000	0.284	0.000	C
X62A	B32-V22	0.000	0.000	0.000				
	B32-V24	O.B.		0.000	0.000	0.284	0.000	C
X70A	B32-V32	16.100		0.640				
	B32-V30	0.000	0.000	0.000	0.000	0.284	0.000	C
X56E	B32-P019,P020	9.800	0.500	0.500	0.500	0.284	0.000	B,E1
X42	C41-P006	0.490	0.490	0.490	0.490	0.284		
	C41-P007	1.680		1.680			0.000	C
X49B	CAC-BV-1206B	4.130		0.000				
	CAC-BV-1261	0.000	0.000	0.000	0.000	0.284	0.000	C
X73E	CAC-BV-1261	0.000		0.000				
	CAC-BV-1227E	0.000	0.000	0.000	0.000	0.284	0.000	C

UNIT ONE 'AS FOUND' SAVING REPORT

'AS FOUND' SAVING TOTAL= 81.935 SCFM

Penetrations	Components	'As Found' Leakage	'As Found' MAPLR	'As Left' Leakage	'As Left' MAPLR	Equipment Error	'As Found' Saving	Basis Code
X76B	CAC-SV-3440	0.000		0.000				
	CAC-SV-1215B	0.000	0.000	0.000	0.000	0.184	0.000	C
X54F	CAC-SV-1211F	0.000		0.000				
	CAC-SV-1262	0.000	0.000	0.000	0.000	0.184	0.000	C
X54E	CAC-SV-1211E	0.000		0.000				
	CAC-SV-3439	0.000	0.000	0.000	0.000	0.184	0.000	C
X12	E11-F004,F005	0.000	0.000	0.000	0.000	0.184	0.000	E
X13A	E11-F015A	0.000	0.000	0.000	0.000	0.184		
	E11-F017A	2.910		2.910			0.000	C
X13B	E11-F015B	0.350		0.350				
	E11-F017B	0.000	0.000	0.000	0.000	0.184	0.000	C
X39A	E11-F021A	17.300		0.000	0.000	0.184		
	E11-F016A	8.800	8.800	8.800			8.800	C
X39B	E11-F021B	0.000	0.000	0.000	0.000	0.184		
	E11-FC16B	4.020		10.400			0.000	C
X17	E11-F022,F023	0.000	0.000	0.000	0.000	0.184	0.000	E
X210A/X211A	E11-F024A,F027A,F028A	11.100	5.550	11.100	5.550	1.380	0.000	E
X210B/X211B	E11-F024B,F027B,F028B	0.000	0.000	0.000	0.000	0.184	0.000	E
X16A	E21-F005A	1.040		1.040				
	E21-F004A	1.040	1.040	1.040	1.040	0.184	0.000	C
X16B	E21-F005B	5.800		5.800				
	E21-F004B	0.000	0.000	0.000	0.000	0.184	0.000	C
X15	E41-F002,F003	4.389	2.195					E
	E41-F002			6.500				
	E41-F003			0.460	0.460	0.276	1.695	C
X214/X219	E41-F075,F079	0.000	0.000	0.000	0.000	0.184	0.000	E
X10	E51-F007,F006	41.710	20.855					E
	E51-F007			0.000	0.000	0.184		
	E51-F006			2.560			20.855	C
X211/X216	E51-F062,F066	0.000	0.000	0.000	0.000	0.184	0.000	E

UNIT ONE "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL= 61.835 SCFH

Penetration#	Component#	"As Found" Leakage	"As Found" MNPLR	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Data Code
X18	G16-F003	0.000	0.000	0.000	0.000	0.284		
	G16-F004	0.590		0.590			0.000	C
X19	G16-F019	0.880		0.880				
	G16-F020	0.190	0.190	0.190	0.190	0.284	0.000	C
X14	G31-F003,F004	28.900	14.450					E
	G31-F001			0.000				
	G31-F004			0.001	0.000	0.284	14.450	C
X13/X24	RCC-V28,V51	7.700	7.700	7.700	7.700	1.075	0.000	A
X77B/X77C	RCC-BV-12220,12220	0.000	0.000	0.000	0.000	0.284	0.000	A
X55	RNA-BV-5262	0.000	0.000	0.000	0.000	0.284		
	RNA-V351	19.000		0.000			0.000	C
X72	RNA-BV-5261	0.000		0.000				
	RNA-V350	0.000	0.000	0.000	0.000	0.284	0.000	C
X83B	RNA-BV-5251	1.040	1.040	1.040	1.040	0.284	0.000	A
X52A	RNA-BV-5253	0.000	0.000	0.000	0.000	0.284	0.000	A
X109A-B	RCB-BV-4186	0.000		0.000				
	RCB-BV-4187	0.000	0.000	0.000	0.000	0.284	0.000	C
X109A-D	RCB-BV-4188	0.000		0.000				
	RCB-BV-4189	0.000	0.000	0.000	0.000	0.284	0.000	C
X35A	TIP V1	0.110	0.110	0.110	0.110	0.284	0.000	A
X35B	TIP V2	1.740	1.740	1.740	1.740	0.284	0.000	A
X35C	TIP V3	0.000	0.000	0.000	0.000	0.284	0.000	A
X35D	TIP V4	0.460	0.460	0.460	0.460	0.284	0.000	A
X35E	TIP N2 CHECK	0.590	0.590	0.590	0.590	0.284	0.000	A
N/A	PERSONNEL AIRLOCK	9.711	4.855	11.100	0.555	1.085	0.000	E
	TOTAL	561.810	107.691	113.450	21.761	4.049	78.795	

Reviewed By: [signature] Date: 4-2-91

Reviewed By: [signature] Date: 4-2-91

UNIT ONE
PENETRATION MINIMUM PATHWAY LEAKAGE RATE BASIS DOCUMENT

The "As Found" MNPLR Total shall equate to the sum of the **Penetration MNPLR Total** plus **Equipment Error Total**.

The **Penetration MNPLR Total** shall equate to the sum of the as found MNPLR for each penetration.

The **Equipment Error Total** shall equate to the square root of the sum of the square of the appropriate equipment error.

CODE	ANALYSIS
A	The MNPLR is equal to the "as found" leakage rate.
B	The MNPLR is equal to the "as found" leakage rate past the best valve(s) of the following two barriers (i.e, smallest leakage of the two tests): B21-F010B B21-F032B,E51-V88
C	The MNPLR is equal to the "as found" leakage rate past the best valve(s) of the two leakage barriers (i.e., smallest leakage of the two tests).
D	The MNPLR is equal to the sum of the "as found" leakage rate of both valves.
E	The MNPLR is equal to one half of the "as found" leakage rate. The MNPLR may be reduced by repairing one of the two valves and retesting. After the retest, the MNPLR can be the "as left" leakage rate or the "as found" leakage rate, whichever is smaller.
E1	The B32-F020 valve was repaired and this period test was tested again. The "as left" leakage was 0.500 SCFH after retesting. Thus, the leakage of 9.300 SCFH can be associated with the F020 valve.

UNIT ONE
PENETRATION MINIMUM PATHWAY LEAKAGE RATE BASIS DOCUMENT

CODE	ANALYSIS
F	If no repairs are made, the MNPLR is equal to the "as found" leakage rate past the CAC-V6/V171/V161/V163 valves or CAC-V4/V15/V16/V17 valves plus leakage past the V55/V56 valves, whichever has the lowest leakage. If repairs are made, the MNPLR may be re-evaluated after repairing one or more of the valves and retesting. This evaluation shall become part of this document.
G	If no repairs are made, the MNPLR is equal to the "as found" leakage rate past the CAC-V5/V170/V160/V162/X20A/X20B valves or V4/V15/V16/V17 valves plus leakage past the V55/V56 valves, whichever has the lowest leakage. If repairs are made, the MNPLR may be re-evaluated after repairing one or more of the valves and retesting. This evaluation shall become part of this document. Evaluation: When the CAC-V5/V170/V160/V162/X20A/X20B valves were tested, a leakage rate of 44.900 SCFH was found and the test was considered unsatisfactory. To determine which valve was failing, the following troubleshooting was performed: 1) The CAC-X20A and X20B valves were bubble tested and no leakage was observed. 2) The CAC-V165 valve was checked (vent for the V160/V162 valves) and a small amount of leakage was observed. Based on the results of the troubleshooting and past history of the butterfly valves, the CAC-V5 valve was considered the failure and was reworked. When the CAC-V4/V5/V16/V17 valves were tested, a leakage rate of approximately 78.200 was found and the test was considered unsatisfactory. To determine which valve was failing, the following troubleshooting was performed: 1) The CAC-V153 valve (vent for the CAC-V4 valve) was checked and leakage observed. 2) The CAC-V16's valve disk was bubble tested and leakage was observed 360 degrees around the disk.

UNIT ONE
PENETRATION MINIMUM PATHWAY LEAKAGE RATE BASIS DOCUMENT

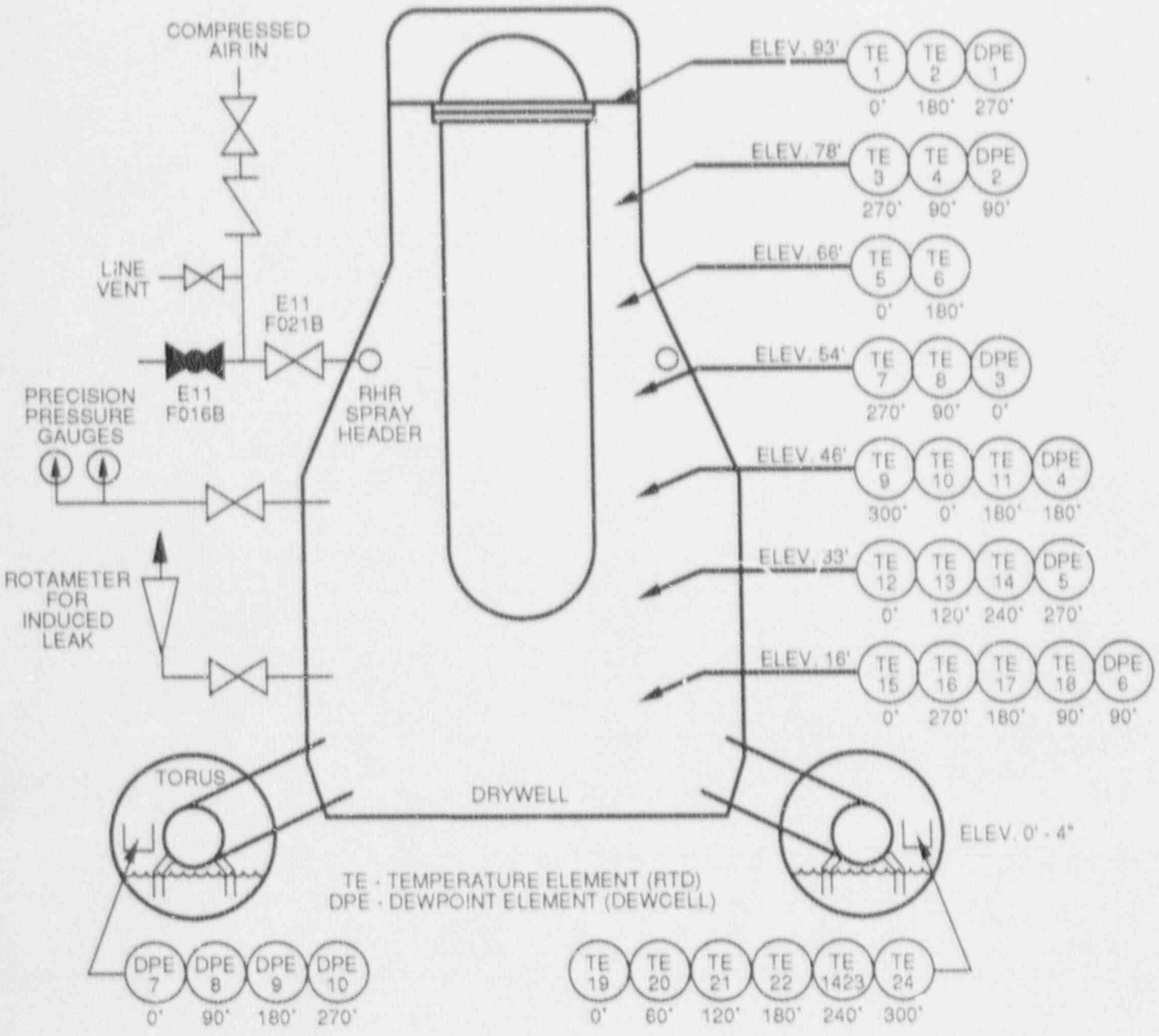
CODE	ANALYSIS
G	(Continued) 3) Small packing leak was observed at the CAC-V6 valve. 4) No leakage was observed at the CAC-V45 (vent for the CAC-V17 valve) nor at the valve disk Since the CAC-V57/V58 valves normally leak by, CAC-V16 was considered the failure and was reworked. After the CAC-V16 and the CAC-V5 valves were reworked, the tests were performed again and the result was 4.800 SCFH and 0.000, respectively. These results mean that 73.400 SCFH was leaking by the V16 valve and the remaining valves associated with the V5 were leak tight. Since the X20A valve was demonstrated to be leak tight, the MNPLR for this pathway was 0.000 SCFH; therefore, the remaining leaking had to be leaking by the CAC-V4 or CAC-V15 valves. For this reason, the "as found" and the "as left" MNPLR for the X205 penetration is 4.800 SCFH.

Reviewed By: _____ Date: 4.2.91

Reviewed By: _____ Date: 4-2-91

APPENDIX H

SENSOR LOCATIONS AND VOLUME FRACTIONS


COMPRESSED AIR IN
LINE VENT
E11 F021B
E11 F016B
PRECISION PRESSURE GAUGES
RHR SPRAY HEADER
ROTAMETER FOR INDUCED LEAK
ELEV. 93'
TE 1
TE 2
DPE 1
0° 180° 270°
ELEV. 78'
TE 3
TE 4
DPE 2
270° 90° 90°
ELEV. 66'
TE 5
TE 6
0° 180°
ELEV. 54'
TE 7
TE 8
DPE 3
270° 90° 0°
ELEV. 46'
TE 9
TE 10
TE 11
DPE 4
300° 0° 180° 180°
ELEV. 33'
TE 12
TE 13
TE 14
DPE 5
0° 120° 240° 270°
ELEV. 16'
TE 15
TE 16
TE 17
TE 18
DPE 6
0° 270° 180° 90° 90°
TORUS
DRYWELL
ELEV. 0' - 4"
TE - TEMPERATURE ELEMENT (RTD)
DPE - DEWPOINT ELEMENT (DEWCELL)
DPE 7
DPE 8
DPE 9
DPE 10
0° 90° 180° 270°
TE 19
TE 20
TE 21
TE 22
TE 1423
TE 24
0° 60° 120° 180° 240° 300°

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK UNITS 1 & 2

SENSOR FAILURE ANALYSIS DOCUMENT

Failed Sensor #	Original WF	Redistributed WF
TE 1	.0264	TE 1 - 0, TE 2 - .0352 TE 3 - .0275, TE 4 - .0275
TE 2	.0264	TE 1 - .0352, TE 2 - 0 TE 3 - .0275, TE 4 - .0275
TE 3	.0187	TE 1 - .0301, TE 2 - .0301 TE 3 - 0, TE 4 - .0224 TE 5 - .0153, TE 6 - .0153
TE 4	.0187	TE 1 - .0301, TE 2 - .0301 TE 3 - .0224, TE 4 - 0 TE 5 - .0153, TE 6 - .0153
TE 5	.0115	TE 3 - .0210, TE 4 - .0210 TE 5 - 0, TE 6 - .0138 TE 7 - .0159, TE 8 - .0159
TE 6	.0115	TE 3 - .0210, TE 4 - .0210 TE 5 - .0138, TE 6 - 0 TE 7 - .0159, TE 8 - .0159
TE 7	.0136	TE 5 - .0137, TE 6 - .0137 TE 7 - 0, TE 8 - .0159 TE 9 - .0217, TE 10 - .0217 TE 11 - .0217
TE 8	.0136	TE 5 - .0137, TE 6 - .0137 TE 7 - .0159, TE 8 - 0 TE 9 - .0217, TE 10 - .0217 TE 11 - .0217
TE 9	.0194	TE 7 -.0163, TE 8 - .0163 TE 9 - 0, TE 10 - .0222 TE 11 - .0222, TE 12 - .0528 TE 13 - .0528, TE 14 - .0528
TE 10	.0194	TE 7 - .0163, TE 8 - .0163 TE 9 - .0222, TE 10 - 0 TE 11 - .0222, TE 12 - .0528 TE 13 - .0528, TE 14 - .0528

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK UNITS 1 & 2

SENSOR FAILURE ANALYSIS DOCUMENT

Failed Sensor #	Original WF	Redistributed WF
TE 11	.0194	TE 7 - .0163, TE 8 - .0163 TE 9 - .0222, TE 10 - .0222 TE 11 - 0, TE 12 - .0528 TE 13 - .0528, TE 14 - .0528
TE 12	.0500	TE 9 - .0250, TE 10 - .0250 TE 11 - .0250, TE 12 - 0 TE 13 - .0556, TE 14 - .0556 TE 15 - .0632, TE 16 - .0632 TE 17 - .0632, TE 18 - .0632
TE 13	.0500	TE 9 - .0250, TE 10 - .0250 TE 11 - .0250, TE 12 - .0556 TE 13 - 0, TE 14 - .0556 TE 15 - .0632, TE 16 - .0632 TE 17 - .0632, TE 18 - .0632
TE 14	.0500	TE 9 - .0250, TE 10 - .0250 TE 11 - .0250, TE 12 - .0556 TE 13 - .0556, TE 14 - 0 TE 15 - .0632, TE 16 - .0632 TE 17 - .0632, TE 18 - .0632
TE 15	.0577	TE 12 - .0596, TE 13 - .0596 TE 14 - .0596, TE 15 - 0 TE 16 - .0673, TE 17 - .0673 TE 18 - .0674
TE 16	.0577	TE 12 - .0596, TE 13 - .0596 TE 14 - .0596, TE 15 - .0673 TE 16 - 0, TE 17 - .0673 TE 18 - .0674
TE 17	.0577	TE 12 - .0596, TE 13 - .0596 TE 14 - .0596, TE 15 - .0673 TE 16 - .0673, TE 17 - 0 TE 18 - .0674
TE 18	.0577	TE 12 - .0596, TE 13 - .0596 TE 14 - .0596, TE 15 - .0673 TE 16 - .0673, TE 17 - .0674 TE 18 - 0

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK UNITS 1 & 2

SENSOR FAILURE ANALYSIS DOCUMENT

Failed Sensor #	Original WF	Redistributed WF
TE 19	.0701	TE 19 - 0, TE 20 - .0841 TE 21 - .0841, TE 22 - .0841 TE 23 - .0841, TE 24 - .0842
TE 20	.0701	TE 19 - .0841, TE 20 - 0 TE 21 - .0841, TE 22 - .0841 TE 23 - .0841, TE 24 - .0842
TE 21	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - 0, TE 22 - .0841 TE 23 - .0841, TE 24 - .0842
TE 22	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - .0841, TE 22 - 0 TE 23 - .0841, TE 24 - .0842
TE 23	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - .0841, TE 22 - .0841 TE 23 - 0, TE 24 - .0842
TE 24	.0701	TE 19 - .0841, TE 20 - .0841 TE 21 - .0841, TE 22 - .0841 TE 23 - .0842, TE 24 - 0
DPE 1	.0527	DPE 1 - 0, DPE 2 - .0753 DPE 3 - .0649
DPE 2	.0489	DPE 1 - .0772, DPE 2 - 0 DPE 3 - .0630
DPE 3	.0386	DPE 2 - .0682, DPE 3 - 0 DPE 4 - .0776
DPE 4	.0583	DPE 3 - .0678, DPE 4 - 0 DPE 5 - .1793
DPE 5	.1502	DPE 4 - .1334, DPE 5 - 0 DPE 6 - .3060
DPE 6	.2309	DPE 5 - .3811, DPE 6 - 0

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK UNITS 1 & 2

SENSOR FAILURE ANALYSIS DOCUMENT

Failed Sensor #	Original WF	Redistributed WF
DPE 7	.1051	DPE 7 - 0, DPE 8 - .1402 DPE 9 - .1401, DPE 10 - .1401
DPE 8	.1051	DPE 7 - .1402, DPE 8 - 0 DPE 9 - .1401, DPE 10 - .1401
DPE 9	.1051	DPE 7 - .1401, DPE 8 - .1401 DPE 9 - 0, DPE 10 - .1402
DPE 10	.1051	DPE 7 - .1401, DPE 8 - .1401 DPE 9 - .1402, DPE 10 - 0