BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION UNIT I

REPORT ON

PRIMARY CONTAINMENT INTEGRATED LEAK RATE TEST
SECOND PERIODIC TEST
AND
LOCAL LEAK RATE TESTS RESULTS
CONDUCTED
JANUARY THROUGH MAY, 1980

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CONTENTS

I. Purpose

The purpose of this report is to present an analysis and interpretation of second periodic Type A test conducted May 1980 and a summary of the last periodic Type B and C tests performed at Pilgrim Nuclear Power Station (PNPS) between 1977 and May 1980. PNPS is owned and operated by Boston Edison Company under License DPR-35.

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

II. Summary of Type A Test (PCILRT)

At 0500 hours on 5/5/80, pressurization commenced. Gross Water Leakage was identified at 0900 coming from the testable flange on the 8" RCIC turbine exhaust line. Bolts on the flange were tightened at 1000 hours in an attempt to repair the leak. Depressurization to repair the flange began at 1522 hours. At 1500 hours, an approximate 5 gpm leak was observed and packing tightened on valve 1001-3A in the RHR system. The Containment was depressurized at 0105 on 5/6/80. RCIC flange prerepair leakage was measured at 6.63 liters per minute, post repair leakage was 0.0 LPM, after gasket material was replaced.

Pressurization was commenced at 0630 and stabilization period began at 1200 hours 5/6/80. Stabilization criteria was satisfied at 1600 hours. Leakage inspection continued and discovered the valve AO5033A control switch was positioned to close to the valve, however position indicating lights showed the valve to be open. A local check of the AO5033A valve proved the valve to be actually open. The cause of this error was discovered to be incorrect piping to the solenoid to the valve's air operator. The piping arrangement was corrected and the valve closed as per procedure requirement at 1800 hours. At 0325 hours 5/7/80, the vent valve on the air supply to the drywell was closed to isolate leakage past AO4356 and AO5046. At 0525 hours 5/7/80, vent valve for CV 5065-23 on Oxygen Analyzer system closed. The PCILRT was terminated at 0301 hours 5/8/80 and supplemental test was begun using the superimposed leak method. Supplemental test was secured at 0703 hours 5/8/80, and local testing of valves isolated during the test was begun.

Leakage measured on valves isolated during the test were prior to repairs:

CV 5065-23	8.0 LPM
AO 4356 and check valve	3.0 LPM
AO 5033A	0.1 LPM
Total	11.1 LPM or 564.52 SCFD

This total was added as addition penalty to the Type A Test results.

III. Analysis of Type A Test (PCILRT)

A. Results of PCILRT

24 hour Leakage rate, by Mass point method	0.247%/day
Upper confidence limit	0.006%/day
Water Level Changes (drywell sumps)	0.020%/day
Type B penalties	0.000
Type C penalties (from initial test lineup)	0.04895%/day
Type C penalties (from isolations during test)	0.0815
Total Type A Leakage	0.4035%/day

B. Acceptance Criteria

Acceptance criteria as determined from PNPS Technical Specification 4.7.A.2.b states "The allowable test leak rate Lt(23) shall not exceed the lesser values established as follows: $Lt(23) = 1.0 \times \frac{(Lm(23))}{(Lm(45))}$ where: $Lm(23)/Lm(45) \leq 1.0$ - or - $Lt(23) = 1.0 \frac{(Pt(23))}{(Pt(45))}$ where Pt (23) and Pt(45) are measured in units of absolute pressure".

"The allowable operational leak rate, Lto(23)... shall not exceed 0.75 Lt (23)."

Since the ratio of LM(23)/LM(45) was greater than .7, the second relation of Lt(23) was used:

$$Lt(23) = 1.0 \frac{(Pt(23))}{(Pt(45))} \quad \text{or} \quad 1.0\left(\frac{(23.0 + 14.696)}{(45.0 + 14.696)}\right)^{\frac{1}{2}}$$

Lt(23) = 0.7946%/day

Allowable operational leakage Lto = .75 Lt(23) = .596% Day

The final result of Ltm + UCL + penalties of 0.4035%/day is well below the acceptance criteria of .596%/day and therefore this Type A test was successfully completed.

C. Supplemental Test

The superimposed method was used as the supplemental or verification test. A corrected flowrate of 14.88 SCFM was used as an imposed leak on the containment. This leak was converted o 3.081%/day leakage. The acceptance criteria for this method is that the relation: $Lot+Ltm - .25Lt \leq Lc \leq Lo + Lt_m + .25Lt$

Where Lo = the known superimposed leakage from direct measurements = 3.081%/day

Ltm = Type A test leakage rate from mass point analysis = .247%/day

.25Lt = acceptance band of 25% of maximum allowable preoperational leakage rate = 0.1986%/day.

Lc = The superimposed leak from the data acquisition and analysis system = 3.147

Since the relation: $3.081 + 0.247 - 0.1986 \leq 3.147 \leq 3.081 + 0.247 + 0.1986$ is true, then the PCILRT is validated.

IV. Summary Statement

This Type A test was observed by I&E inspectors under inspection 50-293/80-20. Two items of non-compliance were issued.

Item 50-293/80-20A:

"A. 10 CFR 50, Appendix J, Section III.A.1.(a), states that, "During the period between the initiation of the containment inspection and the performance of the type A test, no repairs or adjustments shall be made so that the containment can be tested in as close to the 'as is' conditon as practical."

Contrary to the above, during the type A test, one repair and one adjustment to the containment isolation boundary were made without measuring (qauntifying) the "as found" leakage. They are:

1. Attempted repair (tightening) of a leaking 8 inch pipe flange on the RCIC Turbine exhaust line on May 5, 1980.

2. Made adjustment by closure of valve AO 5033A in the Containment Atmospheric Control System on May 6, 1980."

Corrective action for this non-compliance will include procedure revisions to procedure 8.7.1.4 to clarify the allowable action to be taken by the PCILRT Test Director on identified leakages, and deviations from valve lineups. These items will be implemented prior to the next PCILRT.

Item 50-293/80-20B:

"B. 10 CFR 50, Appendix J, Section IV.A, requires that any modification or replacement of a component which is part of the primary reactor containment boundary be followed by the applicable type leakage rate test.

Paragraph VII.E of PNPS Procedure No. 8.7.1.3, Local Leak Rate Test, states that, "Whenever maintenance is performed on any of the tested valves, seals, or penetrations which affect their leak tight integrity, such valve, seal, or penetration must be retested..."

Contrary to the above, an 8 inch pipe flange on the RCIC Turbine exhaust line, which is part of the primary reactor containment boundary, was disassembled for maintenance on May 2, 1980 and not retested. Leakage from this flange subsequently contributed to the failure of the type A test to meet its acceptance criteria on May 5, 1980."

Corrective action for this item shall consist of providing to the Maintenance staff, guidance on which valves and seals require post work testing under procedure 8.7.1.3. This action is to be completed by August 30, 1980.

Additional Administrative controls shall be instituted on the LLRT program to check outage work performed on containment penetrations which are modified or repaired because of tasks outside the scope of the LLRT program. These controls will be established prior to the next refueling outage.

V. Edited Log Of Events PCILRT

This log was edited from the PCILRT Test Director's log book.

May 4, 1980

Final preparations for PCILRT underway. Inspection of interior of drywell complete at 1800 hours.

From final valve lineup, it was determined that the following penetrations would not be vented or process systems would remain in service. Therefore, the Type C test leakages would be used as penalties:

Penetration	Valves
9A	62A, 58A, F.W. check valves
9B	62B, 58B, F.W. check valves
41A	AO220-44, 220-45 - Rx sample
46A	Inboard & outboard check valves for Recirc pump A seal system
46B	Inboard & outboard check valves for Recirc pump B seal system
14	MO1201-2, 1201-5 RWCU inlet

May 5, 1980

Pressurization commenced 0500 hours.

0825 Investigation for leakage revealed gross leakage on RCIC turbine exhaust line flange.

0945 Leak on RCIC turbine exhaust line estimated at 20-30 gpm.

0945 to 1241 RCIC flange tightened.

1200 Decision to depressurize started in order to repair RCIC flange.

1522 Depressurization initiaited. Valve 1001-36A RHR system discovered to have a packing leak of approximately 1 gpm.

1630 Depressurization secured to adjust packing leak on valve 1001-36A.

1715 Pre repair leakage of 1001-36A measured at 0.5 gpm.

1730 Depressurization continued.

2302 Pumped drywell dumps to low level alarm. 220 gallons pumped over.

2305 Local Leak Test (Type B) of HPCI exhaust flange conducted at 51 psig to account for residual Containment pressure. Measured leakage was 0.0 SLM on both flanges.

NOTE: The HPCI flange was tested to ensure that an undiscovered leak as on RCIC flange did not exist.

May 6, 1980

0105 hrs Depressurization complete.

0245 hrs Stroked and timed MO1001-36A to ensure operation.

0315 hrs RCIC exhaust flange tested prerepair at 6.63 LPM.

0358 hrs HPCI exhaust flange seals replaced.

0505 hrs RCIC Exhaust flange repairs completed.

0515 hrs Drywell Floor and Equipment sump totalizers zeroed.

0540 hrs Meterological, fan current, and vessel and torus level readings reestablished.

0550 hrs HPCI flange tested as 0.1 LPM

0615 hrs RCIC flange tested as 0.1 LPM

0627 hrs Began pressurization

1043 hrs Air compressors secured

1152 hrs Pressurziation lines vented

1200 hrs Stabilization period in progress.

1330 hrs Inspections for leakage initiated.

1414 hrs Valves to supplemental test assembly opened and vented.

1600 hrs Stabilization criteria satisfied.

1628 hrs Valve V-27 in pressurization system incorrectly required to be open by procedure. It was found closed and remained so. To ensure that no containment leakage was masked, lines were vented downstreams of valves AO5030A and 5030B.

1700 hrs Test offically ready to begin.

1800 hrs After venting described for AO5030 A&B completed a small amount of air was leaking downstream of AO5033A. A check of the control room controls indicated that the control switch for AO5033A was in the closed position, but position indicating lights indicated open. A local check of this valve revealed that AO5033A was actually opened. The cause of this error was discovered to be improper piping of the air supply to the valve control soleniod. Air supply had been piped to both the inlet and exhaust ports of this solenoid. The piping was disconnected from the exhaust port and the valve closed.

May 6, 1980 (continued)

2230 hrs Inspection revealed a dual position indication on oxygen analyzer system valves 5065-11, 5065-23 and 5065-26.

May 7, 1980

0325 hrs Large leakage identified from drywell air supply valves AO5048 or AO 4356. Vent valve closed for this leakage path.

0440 hrs Leakage assessment for valves AO 5048 and AO 4356 initiated.

0445 hrs Outboard MSIV's checked for air supply to accumulators.

0525 hrs Oxygen analyzers valve 5065-23 leaking. Vent secured for this line.

0608 hrs Air pressure returned to outboard MSIV's.

0945 hrs Leakage on drywell air supply valves assessed at 5 LPM.

1045 hrs Pressure gauge installed downstream of AO4356 and 5046 to monitor for in leakage.

1321 hrs Analysis of data indicates total leakage of .517%/day.

1900 hrs Total leakage .464%/day.

May 8, 1980

0301 hrs PCILRT terminated and supplemental test begun. Lt = .247%/day.

0703 hrs Supplemental test secured.

0930 hrs Leakage on AO4356 and 3" check valve measured at 3.0 LPM.

Leakage on Oxygen Analyzer valve 5065-23 measured at 8.0 LPM
Leakage on AO5033A measured as 0.0 LPM but logged as 0.1 LPM for minimum instrument sensitivity.

1058 hrs Initiated depressurization

1230 hrs Test results: (not including drywell floor and equipment sumps)

$Lt + UCL + K_1 + K_2 = 0.3835\%/day.$

Where: Lt = calculated 24 leak rate by mass point method = 0.247%/day
UCL = mass point upper confidence limit = .006%/day
K_1 = pretest penalties for systems initially isolated from test pressure = 0.04895%/day.
K_2 = penalties for systems isolated during test and measured prior to repair = 0.0815%/day

1700 hrs Drywell sumps pumped. Floor sump 26 gallons. Equipment sump 1083 gallons. Calculated to be equal to 0.0200%/day.

1930 hrs Depressurization complete

Final PCILRT result including all corrections 0.4035%/day.

VI. Summary of Type B and C Testing (LLRT)

Attachments I, J, K and L summarize the LLRT Data which has been obtained from periodic testing performed since the last Type A Test.

Attachment G includes a summary of the 1980 LLRT valve failures and a valve failure report on each failure.

Attachment H contains the results of the testing conducted as a result of isolations which were made on valves during the ILRT in order to isolate leaks detected or to compensate for improper valve lineups. Also, pre and post-repair leakage on RCIC Steam to Torus (X-225) is recorded. This item caused stoppage of the initial ILRT attempt in order to repair.

The acceptance criteria for Type B and C testing are in accordance with 10CFR50, Appendix J. The Type B Leakage rate was found to be 10.755 SLM. There was one type B failure, the RCIC steam to torus (X-225)(see attachment IV.2). The Type C Leakage rate was found to be 62.557 SLM. They were 14 Type C failures (see attachment G). The Total Leakage rate is acceptable since it is less than 0.6 La or less than 129.391 SLM.

The Attachments for this section are:

G - 1980 Local Leak Rate TestingSummary of Valve Failures
H - 1980 Post-ILRT Testing Results
I - 1980 Type B and C Data Summary
J - 1979 Test Data Summary
K - 1978 Test Data Summary
L - 1977 Local Leak Rate Testing Summary

VII. Attachments

A. ILRT Plant Computer Data Log.
B. Supplemental Test Data
C. Data File PCILRT Timeshare Computer
D. PCILRT Test Results
E. Supplemental Test Results
F. PNPS Procedure 8.7.1.4.
   Includes prerequisites, instrument error analysis, and calculation method.
G. 1980 Local Leak Rate Testing - Summary of Valve Failures.
H. 1980 Post ILRT Testing Results
I. 1980 Type B and C Data Summary
J. 1979 Test Data Summary
K. 1978 Test Data Summary
L. 1977 Local Leak Rate Testing Data Summary

DATA SHEET 1.3
ILRT PLANT COMPUTER DATA
RECORDED EVERT 20 MINUTES
DURING THE ENTIRE TEST PERIOD

NT	Computer time	Ave. Drybulb Temp °F C0126	Ave Cont. Press psia C0141	Ave. Dewpoint temp. °F C0129	Calculate Average vapor pressure (psia)	Calculate Total Containment Mass. (LBM)	Mass Loss 20 min	Mass Loss HOUR
	1101	72.27	38.636	63.86	.293524	52528.260	—	—
	1121	72.75	38.703	66.33	.319901	52536.507	-8.247	—
	1141	72.96	38.711	67.47	.332760	52509.146	27.361	—
	1201	73.00	38.706	67.58	.334024	52496.633	12.513	31.627
	1221	72.96	38.690	67.54	.333564	52479.314	17.319	57.193
	1241	72.79	38.666	66.94	.326726	52472.579	6.735	36.567
	1301	72.62	38.646	66.41	.320789	52470.084	2.495	26.54
	1321	72.43	38.625	66.03	.316590	52465.809	4.275	13.505
	1341	72.30	38.607	65.57	.311572	52460.846	4.963	11.733
	1401	72.02	38.578	64.92	.304600	52458.280	2.566	11.804
	1421	71.97	38.573	64.94	.30481	52456.068	2.212	9.74
	1441	71.88	38.557	64.94	.30481	52443.014	13.054	17.852
	1501	71.80	38.546	64.79	.30322	52438.005	5.009	20.27
	1521	71.75	38.546	64.91	.30449	52441.195	-3.19	14.87
	1541	71.75	38.545	64.96	.30503	52439.095	2.1	3.919
	1601	71.80	38.540	64.90	.30439	52428.180	10.915	9.825
	1621	71.80	38.524	64.76	.30291	52408.274	19.906	32.92
	1641	71.81	38.526	64.80	.30333	52409.450	-1.176	28.64
1	5-6-86 1701	71.82	38.524	64.81	.30343	52405.577	3.873	22.60
2	1721	71.84	38.521	64.88	.30418	52398.475	7.102	9.79

DATA SHEET 1.3
ILRT PLANT COMPUTER DATA
RECORDED EVERY 20 MINUTES
DURING THE ENTIRE TEST PERIOD

	Computer time	Ave. Drybulb Temp °F C0128	Ave Cont. Press psia C0041	Ave. Dewpoint temp. °F C0129	Calculate Average vapor pressure (psia)	Calculate Total Containment Mass. (LBM)	Mass Loss 20 min	Mass Loss 4 HOUR
3	1741	71.84	38.516	64.85	.30386	52392.056	6.419	17.394
4	1801	71.83	38.512	64.82	.30054	52087.993	4.063	17.529
5	1821	71.82	38.509	64.82	.30065	52283.724	4.259	14.741
6	1841	71.82	38.505	64.89	.30428	52378.263	5.371	13.69
7	1901	71.83	38.504	64.89	.30428	52376.006	2.257	11.987
8	1921	71.90	38.507	65.15	.30705	52369.425	6.571	14.20
9	1941	71.99	38.515	65.70	.31298	52363.395	6.030	14.967
	2001	72.07	38.519	65.97	.31593	52356.959	6.436	19.047
1	2021	72.14	38.521	66.17	.31813	52349.794	7.165	19.63
2	2041	72.19	38.522	66.24	.31891	52345.183	4.611	18.212
3	2101	72.23	38.521	66.26	.32023	52338.056	7.127	18.403
4	2121	72.26	38.521	66.18	.31824	52337.833	.223	11.961
15	2141	72.28	38.520	66.45	.32123	52330.397	7.436	18.786
16	2201	72.33	38.521	66.40	.32068	52327.610	2.787	18.446
17	2221	72.35	38.521	66.51	.32190	52323.966	3.644	13.896
18	2241	72.38	38.518	66.70	.32402	52313.798	9.968	16.37
19	2301	72.39	38.516	66.42	.32090	52314.557	.559	13.05
20	2321	72.40	38.512	66.63	.32324	52306.257	8.300	17.72
	2341	72.41	38.511	66.40	.32068	52306.067	.210	7.95
22	5-9-88 0001	72.42	38.507	66.47	.32146	52298.879	6.158	17.66

DATA SHEET 1.3
ILRT PLANT COMPUTER DATA
RECORDED EVERT 20 MINUTES
DURING THE ENTIRE TEST PERIOD

	Computer time	Ave. Drybulb Temp °F C0128	Ave Cont. Press psia C041	Ave. Dewpoint temp. °F C0129	Calculate Average vapor pressure (psia)	Calculate Total Containment Mass. (LBM)	Mass Loss 20 min	Mass Loss HOUR
7-30								
3	0021	72.43	38.506	66.5	0.32179	52295.709	4.19	10.54E
4	0041	72.43	38.503	66.63	0.32324	52289.612	6.10	16.435
5	0101	72.43	38.500	66.56	0.32246	52286.575	3.04	13.314
6	0121	72.45	38.497	66.55	0.32235	52280.654	5.92	15.05
7	0141	72.52	38.506	66.75	0.32459	52283.036	[illegible]	[illegible]
8	0201	72.58	38.507	66.92	0.32650	52275.892	7.144	10.65
9	0221	72.60	38.505	67.06	0.32808	52269.021	6.871	11.63
0	0241	72.61	38.501	67.01	0.32752	52263.338	5.683	19.696
1	0301	72.61	38.497	67.01	0.32752	52257.862	5.476	18.03
2	0321	72.60	38.493	66.96	0.32695	52254.141	3.721	14.8
3	0341	72.59	38.487	67.00	0.32740	52246.289	7.852	17.05
4	0401	72.58	38.483	66.96	0.32695	52242.413	3.876	15.44
5	0421	72.56	38.479	66.97	0.32707	52238.744	3.669	15.397
6	0441	72.54	38.475	66.97	0.32707	52235.230	3.514	11.05
7	0501	72.53	38.470	66.74	0.32447	52232.913	2.317	9.50
8	0521	72.47	38.454	66.76	0.32470	52216.583	16.33	22.16
9	0541	72.40	38.447	66.42	0.32090	52219.068	[illegible]	16.16
40	0601	72.37	38.439	66.35	0.32012	52212.119	6.949	20.7
1	0621	72.33	38.434	66.18	0.31824	52211.772	0.347	4.81
42	0641	72.29	38.434	66.06	0.31692	52208.509	3.737	1.55

DATA SHEET 1.3
ILRT PLANT COMPUTER DATA
RECORDED EVERT 20 MINUTES
DURING THE ENTIRE TEST PERIOD

	Computer time	Ave. Drybulb Temp °F CO128	Ave Cont. Press psia CO41	Ave. Dewpoint temp. °F CO129	Calculate Average vapor pressure (psia)	Calculate Total Containment Mass. (LBM)	Mass Loss 20 min	Mass Loss HOUR
-50								
3	0701	72.25	38.426	66.04	0.31670	52210.777	6.732	1.342
4	0721	72.15	38.418	65.89	0.31506	52211.885	+1.108	+0.113
5	0741	72.02	38.407	65.68	0.31277	52212.712	+0.825	4.797
6	0801	71.92	38.398	65.42	0,30995	52214.055	+1.343	+3.278
7	0821	71.89	38.398	65.64	0.31233	52213.738	0.317	+1.953
8	0841	71.92	38.398	66.02	0.31648	52205.103	8.635	7.609
9	0901	71.91	38.396	65.99	0 31615	52 203.795	1.308	10.26
0	0921	71.90	38.394	66.10	0.31736	52 200 . 378	3.417	15.36
1	0941	71.89	38.392	65.93	0.31549	52201 .177	+0.799	3.926
2	1001	71.87	38.391	66.03	0.31659	52200 . 266	.911	3.529
3	1021	71.84	38.388	65.86	0.31473	52201.653	+1.387	+1.275
4	1041	71.80	38.383	65.80	0.31407	52199.624	2.029	1.55
5	1101	71.78	38.381	65.74	0.31342	52199.743	+0.119	0.523
6	1121	71.77	38.379	65.91	0.31527	52195.438	4.305	6.215
7	1141	71.76	38.377	65.97	0.31593	52192.776	2.662	6.848
8	1201	71.75	38.375	65.97	0.31593	52191.015	1.761	8.728
9	1221	71.74	38.375	65.96	.31582	52192.148	+1.133	3.29
0	1241	71.73	38.374	65.88	.31495	52192.960	+.812	+.184
1	1301	71.69	38.367	65.64	0.31233	52190.876	2.084	0.139
2	1321	71.66	38.364	65.69	0.31287	52188.962	1.914	3.186

DATA SHEET 1.3
ILRT PLANT COMPUTER DATA
RECORDED EVERT 20 MINUTES
DURING THE ENTIRE TEST PERIOD

	Computer time	Ave. Drybulb Temp °F CO128	Ave Cont. Press psia CO41	Ave. Dewpoint temp. °F CO129	Calculate Average vapor pressure (psia)	Calculate Total Containment Mass. (LBM)	Mass Loss 20 min	Mass Loss Δ/HOUR
3	1341	71.65	38.362	65.73	.31331	52186.604	2.358	6.356
4	1401	71.60	38.360	65.54	0.31125	52191.601	+4.991	+0.725
5	1421	71.62	38.364	65.65	0.31244	52189.372	2.229	+0.41
6	1441	71.69	38.363	65.77	0.31375	52183.449	5.923	2.155
7	1501	71.74	38.365	65.93	0.31549	52178.885	4.564	12.771
8	1521	71.79	38.366	65.87	0.31484	52176.248	2.637	13.124
9	1541	71.83	38.367	65.86	0.31473	52173.842	2.406	9.607
10	1601	71.86	38.368	65.87	0.31484	52172.119	1.723	6.766
11	1621	71.89	38.367	65.96	0.31582	52166.453	5.666	9.795
12	1641	71.90	38.368	65.88	0.31495	52168.043	+1.59	5.799
13	1701	71.93	38.368	65.74	0.31342	52167.193	0.850	4.926
14	1721	71.97	38.370	66.06	0.31692	52161.201	5.992	5.25
15	1741	72.00	38.372	66.02	0.31648	52161.611	+.410	4.842
16	1801	72.02	38.373	66.09	0.31725	52159.965	1.646	7.228
17	1821	72.06	38.375	66.27	0.31924	52156.060	3.905	5.141
18	1841	72.09	38.376	66.15	0.31791	52156.304	+.244	5.207
19	1901	72.12	38.376	66.17	0.31924	52151.546	4.758	8.41
20	1921	72.14	38.377	66.34	0.32001	52149.892	1.654	6.11
21	1941	72.17	38.379	66.29	0.31946	52150.450	+.558	5.8
22	2001	72.19	38.379	66.33	0.31990	52147.892	2.568	2.

DATA SHEET 1.3
ILRT PLANT COMPUTER DATA
RECORDED EVERT 20 MINUTES
DURING THE ENTIRE TEST PERIOD

Computer time	Ave. Drybulb Temp °F C0128	Ave Cont. Press psia C041	Ave. Dewpoint temp. °F C0129	Calculate Average vapor pressure (psia)	Calculate Total Containment Mass. (LBM)	Mass Loss 20 min	Mass Loss HOUR
2021	72.20	38.378	66.17	0.31813	52147.956	+.074	1.936
2041	72.22	38.378	66.38	0.32045	52142.811	5.145	7.639
2101	72.23	38.379	66.30	0.31957	52143.036	-.225	4.826
2121	72.25	38.379	66.33	0.31990	52142.000	1.046	5.956
2141	72.26	38.380	66.11	0.31747	52145.720	-3.720	-2.909
2201	72.28	38.380	66.36	0.32023	52139.974	5.746	3.072
2221	72.30	38.379	66.38	0.32046	52136.340	3.634	5.660
2241	72.31	38.378	66.45	0.32123	52132.923	3.417	12.797
2301	72.32	38.378	66.35	0.32012	52132.466	+.543	6.505
2321	72.36	38.380	66.38	0.32046	52131.830	1.636	4.510
2341	72.37	38.380	66.40	0.32068	52130.546	1.282	2.377
0001	72.38	38.380	66.37	0.32034	52130.022	.524	3.442
0021	72.40	38.380	66.36	0.32023	52128.215	1.807	3.615
0041	72.40	38.379	66.39	0.32057	52126.389	1.826	4.157
0101	72.40	38.378	66.54	0.32224	52122.733	3.656	7.289
0121	72.41	38.378	66.67	0.32369	52119.763	2.970	8.452
0141	72.41	38.376	66.60	0.32291	52118.096	1.667	8.293
0201	72.42	38.375	66.57	0.32257	52116.206	1.890	6.527
0221	72.40	38.373	66.49	0.32168	52119.387	-3.181	.376
0241	72.39	38.374	66.37	0.32034	52116.716	2.671	1.38

28,100

DATA SHEET 1.3
ILRT PLANT COMPUTER DATA
RECORDED EVERT 20 MINUTES
DURING THE ENTIRE TEST PERIOD

	Computer time	Ave. Drybulb Temp °F CO128	Ave Cont. Press psia CO41	Ave. Dewpoint temp. °F CO129	Calculate Average vapor pressure (psia)	Calculate Total Containment Mass. (LBM)	Mass Loss 20 min	Mass Loss HOUR
	0301	72.37	38.368	66.33	0.31990	52115.173	1.543	1P33
	OF SUPPLEMENTAL TEST 0321	72.34	38.345	66.30	0.31957	52087.062	28.111	32.325
5	0341	72.33	38.328	66.25	0.31902	52065.512	21.550	51.204
6	0401	72.34	38.313	66.33	0.31990	52042.773	22.74	73.4
7	0421	72.33	38.296	66.28	0.31935	52021.223	21.550	95.839
8	0441	72.34	38.280	66.21	0.31857	51999.389	21.834	66.123
9	0501	72.35	38.263	66.24	0.31890	51977.671	24.718	68.102
	0521	72.37	38.241	66.16	0.31802	51943.794	30.877	77.429
	0541	72.38	38.232	66.26	0.31913	51928.977	14.817	70.412
	0601	72.40	38.217	66.24	0.31890	51906.784	22.193	67.257
	0621	72.41	38.201	66.18	0.31824	51884.802	21.982	57.992
	0641	72.44	38.188	66.21	0.31857	51863.619	21.183	65.358
	0701	72.46	38.170	66.08	0.31714	51838.982	24.637	67.502

DATA SHEET 1.4
SUPPLEMENTAL TEST DATA
(FOR RECORDING DATA EVERY 5 MIN)

Time	Flow Devices SCFM #1	#2	#3	Total	Temp Ts (°F)	Pressure Ps (psig)	Initials
0301	5	5	5	15	78	22.90	RJM
0306	5	5	5	15	78	22.90	
0311	5	5	5	15	78	22.90	
0316	5	5	5	15	78	22.90	
0321	5	5	5	15	78	22.85	
0326	5	5	5	15	78	22.85	
0331	5	5	5	15	78	22.85	
0336	5	5	5	15	78	22.85	
0341	5	5	5	15	78	22.85	
0346	5	5	5	15	78	22.85	
0351	5	5	5	15	78	22.85	
0356	5	5	5	15	78	22.85	
0401	5	5	5	15	78	22.85	
0406	5	5	5	15	78	22.82	
0411	5	5	5	15	78	22.82	
0416	5	5	5	15	78	22.80	
0421	5	5	5	15	78	22.80	
0426	5	5	5	15	78	22.80	
0431	5	5	5	15	78	22.80	
0436	5	5	5	15	78	22.80	23.78

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DATA SHEET 1.4
SUPPLEMENTAL TEST DATA
(FOR RECORDING DATA EVERY 5 MIN)

Time	Flow Devices SCFM #1	#2	#3	Total	Temp Ts (°F)	Pressure Ps (psia)	Initials
0441	5	5	5	15	79	22.80	RJM
0446	5	5	5	15	79	22.80	
0451	5	5	5	15	79	22.78	
0456	5	5	5	15	79	22.78	
0501	5	5	5	15	79	22.78	
0506	5	5	5	15	79	22.78	
0511	5	5	5	15	79	22.78	
0516	5	5	5	15	79	22.78	
0521	5	5	5	15	79	22.78	
0526	5	5	5	15	79	22.78	
0531	5	5	5	15	79	22.78	
0536	5	5	5	15	79	22.78	
0541	5	5	5	15	79	22.78	
0546	5	5	5	15	79	22.78	
0551	5	5	5	15	79	22.76	
0556	5	5	5	15	79	22.76	
0601	5	5	5	15	79	22.76	
0606	5	5	5	15	79	22.76	
0611	5	5	5	15	79	22.76	
0616	5	5	5	15	79	22.70	

DATA SHEET 1.4
SUPPLEMENTAL TEST DATA
(FOR RECORDING DATA EVERY 5 MIN)

Time	Flow Devices SCFM #1	#2	#3	Total	Temp Ts (°F)	Pressure Ps (psia)	Initials
0621	5	5	5	15	79	22.70	RJM
0626	5	5	5	15	79	22.70	
0631	5	5	5	15	79	22.70	
0636	5	5	5	15	79	22.70	
0641	5	5	5	15	79	22.70	
0646	5	5	5	15	79	22.70	
0651	5	5	5	15	79	22.70	
0656	5	5	5	15	79	22.70	
0701	5	5	5	15	79	22.70	

Attachment C
page 1 of 2

PIT	TIME HHMM.SS	DRY BULB TEMP DEG F	DEW POINT PRESS PSIA	DEW POINT TEMP DEG F
1	1701.00	71.82	38.524	64.31
2	1721.00	71.91	38.521	64.88
3	1741.00	71.84	38.516	64.95
4	1801.00	71.83	38.512	64.92
5	1821.00	71.83	38.509	64.83
6	1841.00	71.82	38.505	64.89
7	1901.00	71.83	38.504	64.89
8	1921.00	71.90	38.507	65.15
9	1941.00	71.99	38.515	65.70
10	2001.00	72.07	38.519	65.97
11	2021.00	72.14	38.521	66.17
12	2041.00	72.19	38.522	66.24
13	2101.00	72.23	38.521	66.36
14	2121.00	72.26	38.521	66.18
15	2141.00	72.28	38.520	66.15
16	2201.00	72.33	38.521	66.40
17	2221.00	72.35	38.521	66.51
18	2241.00	72.38	38.518	66.70
19	2301.00	72.39	38.516	66.42
20	2321.00	72.40	38.513	66.63
21	2341.00	72.41	38.511	66.40
22	1.00	72.42	38.508	66.47
23	21.00	72.43	38.506	66.50
24	41.00	72.43	38.503	66.63
25	101.00	72.43	38.500	66.56
26	121.00	72.45	38.497	66.55
27	141.00	72.52	38.506	66.75
28	201.00	72.58	38.507	66.92
29	221.00	72.60	38.505	67.06
30	241.00	72.61	38.501	67.01
31	301.00	72.61	38.497	67.01
32	321.00	72.60	38.493	66.96
33	341.00	72.59	38.487	67.00
34	401.00	72.58	38.483	66.96
35	421.00	72.56	38.479	66.97
36	441.00	72.54	38.475	66.97
37	501.00	72.53	38.470	66.74
38	521.00	72.47	38.454	66.76
39	541.00	72.40	38.447	66.42
40	601.00	72.37	38.439	66.35
41	621.00	72.33	38.434	66.18
42	641.00	72.29	38.434	66.06
43	701.00	72.25	38.426	66.04
44	721.00	72.15	38.418	65.89
45	741.00	72.02	38.407	65.68
46	801.00	71.92	38.398	65.42
47	821.00	71.89	38.398	65.64
48	841.00	71.92	38.398	66.02
49	901.00	71.91	38.396	65.99
50	921.00	71.90	38.394	66.10
51	941.00	71.89	38.392	65.93
52	1001.00	71.87	38.391	66.03
53	1021.00	71.84	38.388	65.86
54	1041.00	71.80	38.383	65.80
55	1101.00	71.78	38.381	65.74
56	1121.00	71.77	38.379	65.91
57	1141.00	71.76	38.377	65.97
58	1201.00	71.75	38.375	65.97
59	1221.00	71.74	38.375	65.96
60	1241.00	71.73	38.374	65.88
61	1301.00	71.69	38.367	65.64

PNT	TIME HHH.SS	DRY BULB TEMP DEG F	DEW POINT PRESS PSIA	DEW POINT TEMP DEG F
60	1241.00	71.73	38.374	65.38
61	1301.00	71.69	38.367	65.64
62	1321.00	71.66	38.364	65.69
63	1341.00	71.65	38.362	65.73
64	1401.00	71.60	38.360	65.54
65	1421.00	71.62	38.361	65.65
66	1441.00	71.69	38.363	65.77
67	1501.00	71.74	38.365	65.93
68	1521.00	71.79	38.366	65.87
69	1541.00	71.83	38.367	65.96
70	1601.00	71.86	38.368	65.87
71	1621.00	71.89	38.367	65.96
72	1641.00	71.90	38.368	65.88
73	1701.00	71.93	38.368	65.74
74	1721.00	71.97	38.370	66.06
75	1741.00	72.00	38.372	66.02
76	1801.00	72.02	38.373	66.09
77	1821.00	72.06	38.375	66.27
78	1841.00	72.09	38.376	66.15
79	1901.00	72.12	38.376	66.27
80	1921.00	72.14	38.377	66.34
81	1941.00	72.17	38.379	66.29
82	2001.00	72.19	38.379	66.33
83	2021.00	72.20	38.378	66.17
84	2041.00	72.22	38.378	66.38
85	2101.00	72.23	38.378	66.30
86	2121.00	72.25	38.379	66.33
87	2141.00	72.26	38.380	66.11
88	2201.00	72.28	38.380	66.36
89	2221.00	72.30	38.379	66.38
90	2241.00	72.31	38.378	66.45
91	2301.00	72.32	38.378	66.35
92	2321.00	72.36	38.380	66.38
93	2341.00	72.37	38.380	66.40
94	1.00	72.38	38.380	66.37
95	21.00	72.40	38.380	66.36
96	41.00	72.40	38.379	66.39
97	101.00	72.40	38.378	66.54
98	121.00	72.41	38.378	66.67
99	141.00	72.41	38.376	66.60
100	201.00	72.42	38.375	66.57
101	221.00	72.40	38.373	66.49
102	241.00	72.39	38.371	66.37
103	301.00	72.37	38.368	66.33
104	321.00	72.34	38.365	66.30
105	341.00	72.33	38.328	66.25
106	401.00	72.34	38.313	66.33
107	421.00	72.33	38.296	66.28
108	441.00	72.34	38.280	66.21
109	501.00	72.35	38.263	66.24
110	521.00	72.37	38.241	66.16
111	541.00	72.38	38.232	66.26
112	601.00	72.40	38.217	66.24
113	621.00	72.41	38.201	66.18
114	641.00	72.44	38.188	66.21
115	701.00	72.46	38.170	66.08

Attachment D
page 1 of 2

PNT	TIME (HHMM.SS)	TEMP (DEG R)	PRESSURE (PSIA)	MEASURED MASS (LBM)	CALCULATED MASS (LBM)	MEAS-CALC MASS (LBM)	TOTAL TIME MEAS RATE (% PER DAY)
31	301.00	532.30	38.169	52257	52240	16	
32	321.00	532.29	38.166	52254	52239	14	.514
33	341.00	532.28	38.160	52246	52237	8	.797
34	401.00	532.27	38.156	52242	52235	6	.710
35	421.00	532.25	38.152	52238	52233	4	.659
36	441.00	532.23	38.148	52235	52232	3	.624
37	501.00	532.22	38.145	52232	52230	2	.574
38	521.00	532.16	38.129	52216	52228	-11	.813
39	541.00	532.09	38.126	52219	52226	-7	.660
40	601.00	532.06	38.119	52212	52224	-12	.701
41	621.00	532.02	38.116	52211	52223	-11	.636
42	641.00	531.98	38.117	52217	52221	-3	.506
43	701.00	531.94	38.109	52210	52219	-8	.541
44	721.00	531.84	38.103	52211	52217	-5	.468
45	741.00	531.71	38.094	52212	52215	-3	.445
46	801.00	531.61	38.089	52214	52214	-0	.403
47	821.00	531.58	38.086	52213	52212	1	.350
48	841.00	531.61	38.092	52205	52210	-5	.428
49	901.00	531.60	38.080	52203	52208	-4	.414
50	921.00	531.59	38.077	52200	52206	-6	.417
51	941.00	531.58	38.076	52201	52205	-3	.391
52	1001.00	531.56	38.074	52200	52203	-3	.378
53	1021.00	531.53	38.073	52201	52201	0	.352
54	1041.00	531.49	38.069	52199	52199	-0	.349
55	1101.00	531.47	38.068	52199	52198	1	.334
56	1121.00	531.46	38.064	52195	52196	-0	.344
57	1141.00	531.45	38.061	52192	52194	-1	.345
58	1201.00	531.44	38.059	52191	52192	-1	.341
59	1221.00	531.43	38.059	52192	52190	1	.323
60	1241.00	531.42	38.059	52192	52189	3	.308
61	1301.00	531.38	38.055	52190	52187	3	.308
62	1321.00	531.35	38.051	52188	52185	3	.306
63	1341.00	531.34	38.049	52186	52183	2	.307
64	1401.00	531.29	38.049	52191	52181	9	.277
65	1421.00	531.31	38.049	52189	52180	9	.278
66	1441.00	531.38	38.049	52183	52178	5	.293
67	1501.00	531.43	38.049	52178	52176	2	.302
68	1521.00	531.48	38.051	52176	52174	1	.304
69	1541.00	531.52	38.052	52173	52172	0	.305
70	1601.00	531.55	38.053	52172	52171	0	.303
71	1621.00	531.58	38.051	52166	52169	-2	.315
72	1641.00	531.59	38.053	52168	52167	0	.302
73	1701.00	531.62	38.055	52167	52165	1	.298
74	1721.00	531.66	38.053	52161	52164	-2	.310
75	1741.00	531.69	38.056	52161	52162	-0	.301
76	1801.00	531.71	38.056	52159	52160	-0	.300
77	1821.00	531.75	38.056	52156	52158	-2	.305
78	1841.00	531.78	38.058	52156	52156	-0	.298
79	1901.00	531.81	38.057	52151	52155	-3	.305
80	1921.00	531.83	38.057	52149	52153	-3	.304
81	1941.00	531.86	38.060	52150	52151	-1	.296
82	2001.00	531.88	38.059	52147	52149	-1	.297
83	2021.00	531.89	38.060	52147	52147	0	.291
84	2041.00	531.91	38.058	52142	52146	-3	.299
85	2101.00	531.92	38.058	52143	52144	-1	.293
86	2121.00	531.94	38.059	52141	52142	-0	.290
87	2141.00	531.95	38.063	52145	52140	4	.276
88	2201.00	531.97	38.060	52139	52138	0	.285
89	2221.00	531.99	38.059	52136	52137	-0	.289
90	2241.00	532.00	38.057	52133	52135	-2	.292
91	2301.00	532.01	38.058	52133	52133	-0	.286
92	2321.00	532.05	38.060	52131	52131	-0	.285
93	2341.00	532.06	38.059	52130	52130	0	.283
94	1.00	532.07	38.060	52129	52128	1	.280
95	21.00	532.09	38.060	52128	52126	1	.279
96	41.00	532.09	38.058	52126	52124	1	.279
97	101.00	532.09	38.056	52122	52122	-0	.282
98	121.00	532.10	38.054	52119	52121	-1	.284
99	141.00	532.10	38.053	52118	52119	-1	.283
100	201.00	532.11	38.052	52116	52117	-1	.283
101	221.00	532.09	38.051	52116	52115	0	.278
102	241.00	532.08	38.051	52116	52113	2	.274
103	301.00	532.06	38.048	52115	52112	3	.273

I INPUT VARIABLES

FREE AIR VOLUME = 270000 CUBIC FEET
MAXIMUM ALLOWABLE LEAKAGE RATE = .795 %/DAY
CONTAINMENT ISOLATION VALVE
LEAKAGE RATE = K = .049 %/DAY
BEGIN POINT NUMBER = 31
END POINT NUMBER = 103

II DATA REDUCTION SUMMARY

TOTAL TIME OF TEST = 24 HOURS
AVERAGE DELTA T = 0.333333 HOURS

REGRESSION LINE ANALYSIS

MASS POINT

MASS = M =AT + B

NUMBER OBSERVATIONS = 73

A TERM (LBM/HR) = -5.37
B TERM (LBM) = 52241.

MASS POINT LEAKAGE RATE
(%/DAY) = LTM = .247

MASS POINT UCL
(%/DAY) = .006

TOTAL TIME

LEAKAGE RATE =L =CT +D

NUMBER OBSERVATIONS = 72

C TERM (%/DAY.HR) = -.015310
D TERM (%/DAY) = .558

TOTAL TIME LEAKAGE RATE
(%/DAY) = LTT = .191

TOTAL TIME UCL
(%/DAY) = .033

III TEST ACCEPTANCE CRITERIA AND TEST RESULTS (%/DAY)

1. MAXIMUM ALLOWABLE LEAKAGE RATE = .795

LTM +MASS POINT UCL + K = .302
LTT + TOTAL TIME UCL+ K = .273

2. 75% OF MAXIMUM ALLOWABLE RATE = .596

LTM + K = .296
LTT + K = .239

NOTE 1. RESULTS FROM TOTAL TIME METHOD ARE NOT ACCEPTABLE FOR THE SATISFACTION OF TECHNICAL SPECIFICATIONS

USED 12.00 UNITS
BYE
00026.20 CRU 0000.27 TCH 0010.98 KC

OFF AT 03:27EDT 05/08/80

Attachment E
page 1 of 1

PNT	TIME (HHMM.SS)	TEMP (DEG R)	PRESSURE (PSIA)	MEASURED MASS (LBM)	CALCULATED MASS (LBM)	MEAS-CALC MASS (LBM)	TOTAL TIME MEAS RATE (% PER DAY)
103	301.00	532.06	38.048	52115	52111	3	
104	321.00	532.03	38.025	52087	52088	-1	3.883
105	341.00	532.02	38.009	52065	52065	-0	3.430
106	401.00	532.03	37.993	52042	52043	-0	3.334
107	421.00	532.02	37.977	52021	52020	0	3.245
108	441.00	532.03	37.961	51999	51997	1	3.199
109	501.00	532.04	37.944	51974	51974	-0	3.235
110	521.00	532.06	37.923	51943	51952	-8	3.382
111	541.00	532.07	37.913	51928	51929	-0	3.215
112	601.00	532.09	37.898	51906	51906	0	3.199
113	621.00	532.10	37.883	51884	51883	1	3.182
114	641.00	532.13	37.869	51863	51860	2	3.159
115	701.00	532.15	37.853	51838	51838	0	3.179

I INPUT VARIABLES

FREE AIR VOLUME = 270000 CUBIC FEET
MAXIMUM ALLOWABLE LEAKAGE RATE = .795 %/DAY
CONTAINMENT ISOLATION VALVE
LEAKAGE RATE = K = .049 %/DAY
BEGIN POINT NUMBER = 103
END POINT NUMBER = 115

II DATA REDUCTION SUMMARY

TOTAL TIME OF TEST = 4. HOURS
AVERAGE DELTA T = 0.333333 HOURS

REGRESSION LINE ANALYSIS

MASS POINT	TOTAL TIME
MASS = M = AT + B	LEAKAGE RATE = L = CT + D
NUMBER OBSERVATIONS = 13	NUMBER OBSERVATIONS = 12
A TERM (LBM/HR) = -68.32	C TERM (%/DAY.HR) = -.118281
B TERM (LBM) = 52111.	D TERM (%/DAY) = 3.560
MASS POINT LEAKAGE RATE (%/DAY) = LTM = 3.147	TOTAL TIME LEAKAGE RATE (%/DAY) = LTT = 3.087
MASS POINT UCL (%/DAY) = .055	TOTAL TIME UCL (%/DAY) = .149

III TEST ACCEPTANCE CRITERIA AND TEST RESULTS (%/DAY)

1. MAXIMUM ALLOWABLE LEAKAGE RATE = .795

LTM + MASS POINT UCL + K = 3.251
LTT + TOTAL TIME UCL + K = 3.284

2. 75% OF MAXIMUM ALLOWABLE RATE = .596

LTM + K = 3.196
LTT + K = 3.136

NOTE !! RESULTS FROM TOTAL TIME METHOD ARE NOT ACCEPTABLE FOR THE SATISFACTION OF TECHNICAL SPECIFICATIONS

USED 7.75 UNITS
EYE
0014.69 CPU 0000.11 TOT 0018.14 KC

OFF AT 07:14EDT 08/02/

PRIMARY CONTAINMENT

Integrated Leak Rate Test (ILRT) or (PCILRT)

1. Purpose The purpose of this surveillance procedure is to air test the primary containment at 23 psig. The primary containment shall be placed in a condition as would exist during a post-accident condition (i.e where practical, those portions of fluid systems which will be open directly to the containment atmosphere under post accident conditions are opened to the containment atmosphere during the test). The primary containment total leakage measured shall be less than the allowable limit as specified in appendex J to 10CFR50 and in the PNPS technical specifications.

2. References
2.1 Drawings

2.1.1.	M-215	P&ID, Cooling Water System Reactor Bld.
2.1.2.	M-220	P&ID, Compressed Air System
2.1.3.	M-227	P&ID, Containment Atmospheric Control System
2.1.4.	M-232	P&ID, Radwaste Collection System
2.1.5.	M-239	P&ID, Analyzer Systems
2.1.6.	M-241	Residual Heat Removal System
2.1.7.	M-242	Core Spray System
2.1.8.	M-243	HPCI System (sheet 1)
2.1.9.	M-244	HPCI System (sheet 2)
2.1.10.	M-245	Reactor Core Isolating Cooling System
2.1.11.	M-247	Reactor Water Clean-Up System
2.1.12.	M-249	Stand by Liquid Control System
2.1.13.	M-250	Control Rod Drive Hydraulic System
2.1.14.	M-251	Recirc Pump Instrumentation
2.1.15.	M-252	Nuclear Boiler (sheet 1)
2.1.16.	M-253	Nuclear Boiler (sheet 2)
2.1.17.	M-291	Drywell Atmosphere Cooling Air flow diagram

2.2 Documents

2.2.1 ILRT Final Reports

2.2.2 FSAR Chapter 14, Station Safety Analysis, June 11, 1970
2.2.3 FSAR, Chapter 5, Section 5.2-21; Surveillance Requirements June 11, 1970
2.2.4 Plant Technical Specification, Section 4.7, surveillance Requirements.

2.2.5 10 CFR-50, Appendix J, Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors, Sept. 12, 1975.

2.2.6 10 CFR-50, Appendix B Quality Assurance Criteria for Nuclear Power Plants, April 30, 1975.

2.2.7 ANSI, N45.4-1972; Leak-Rate Testing of Containment Structures.

2.2.8 ANSI, N274 Draft 3-July 1979; Containment System Leakage Testing requirements

3. MANNING REQUIREMENTS

3.1 An individual will be assigned to each manning station identified in Appendix Aa for each shift. The ILRT manning organization and the total no. of personnel required each 12 hr shift for performance of the ILRT is shown in figures of appendex Aa.

3.2 Barring any unforseen delays, the total time required for performance of the ILRT beginning with containment pressurization (Section 7) thru Depressurization (Section 10) is approximately 44 hours (continuous).

4. Prerequisites- All prerequisites shall be signed by the Test Director or his designated Alternate.

4.1 Test Equipment Specifications

4.1.1 Two (2) - Ingersol Rand "Whisperized" Portable Air Compressors on rental basis. Diesel driven, screw type, 120 CFM @ 125 psig each - Model No. DXL-1200S (furnished with 6 - 50 ft. length hoses w/threaded connections), or equivalent.

4.1.2 Eighteen (18) - Rosemont Platinum Resistance, Temperature Sensors (RTD's), with 4 leads each. Model No. 78-65-17 or 78-65-09. Repeatability and accuracy error $\pm .1^{o}F$. RTD's to be provided with connection heads.

4.1.3 Two (2) - Texas Instrument Precision Pressure Gage, Model No. 145-02 with Standard Read Out; 0-100 psia range. Capsule Assemble type 811 and Bulkhead Fitting kit to be included. Vacuum gage and thermocouple for the capsule assembly also to be provided. Accuracy error + .015% (full scale). Repeatability error + .002% (full scale) (One of these Texas Instruments is permanent Plant Equipment).

4.1.4 Ten (10) - Foxboro, Dewcels (Model No. 2701 RG) Range; 40-135 °F dew Pt; 60-150 °F operating temp. Accuracy + 1°F; Repeatability + .5°F.
(All of these dewcels are permanently installed plant instruments).

4.1.5 Deleted

4.1.6 Snoop.

4.1.7 Two (2) - Desk calculators.

4.1.8 One (1) - Temporary communications system between the Texas Instrument location (test center) and each of the following: Control Room, Supplemental Test Assembly and Contingency Data Reduction Center in the Computer Room.

4.1.9 Two (2) - Remotely operated position switch for valves P20A & (shown in fig. 2, Appendix Dd. Switch to be located at Supplemental Test Assembly.

4.1.10 One (1) - Pressure Gage; Wallace and Tiernan, Model FU-4882 Range 0-30 psig, graduation .05 psia; accuracy .1% full scale Repeatability - .03% full scale, sensitivity .01% full scale or equivalent.

4.1.12 As required - Temporary duct work to run from the exhaust of each drywell fan VAC-206 A&B to the existing vent going to the underside of the Reactor and CRD housings. Temporary duct work also to run between the suction of drywell fan VAC-205C and suction line of VAC-206B.

4.1.13 Two (2) - Rotameters; Brooks-Hi Accuracy, Model 1110-08F Range 0 to 11.8 SCFM. Accuracy & Retpeatability error + full scale. Test Assembly as shown in Appendix 4, Fig. also to be provided, or equivalent. TB

4.1.14 One (1) - Barometers; Wallace and Tiernan, Model FA-160, range 26 - 31.5 inches of mercury; Accuracy .33% full scale; sensitivity .2% full scale, or equivalent.

4.2 INSTRUMENT CALIBRATION REQUIREMENTS

4.2.1 All instruments listed in Appendex Bb have been calibrated within the last 6 months in accordance with their applicable calibration procedures. See Appendices

NOTE: The RTD calibration range should be ± 20 Deg. F around the expected primary containment ambient air temperature. Maintenance of the reactor vessel head flange temperature will influence the RTD ranges.

Signature K S Wollaver Date 5/4/80

4.2.2 All instruments listed on Appendex Bb have been installed and functionally checked in accordance with their applicable loop calibration procedures. See Appendices.

Signature K S Wollaver Date 5/2/80

4.2.3 Deleted

4.2.4 Deleted

4.3 Deleted

4.4 Test Equipment
4.4.1 The air compressors shall be installed and checked for operation in accordance with Appendix Dd.

Signature A.D. Wollmann Da.? 5/2/80

4.4.2 Deleted

4.4.3 Deleted

4.4.4 Deleted

4.4.5 The ventilation system temporary duct works shall be installed as described in Appendix Dd.

Signature A.D. Wollmann Date 4-30-80

4.4.6 The plant computer shall be programmed to peroidically trend the following every 10 minutes: time, 18 containment air temperatures, 10 containment dew pt. temperatures and containment pressure. One trend will record the instantaneous values of the ILRT sensors at a minimum of once every two minutes. Another trend will record the ~~ten~~ minute average of the containment pressure and the weighted averages of the containment temperature and dew point temperature. This log of averages will be trended every ten minutes.

is for 48 hrs

Signature S.S. Wollman Date 4/30/80

4.4.7 The GE - Mark ~~III~~ system shall be programmed to analyze ILRT test data using Mass Point method. Access to this program will be via the on-site Terminet 300 terminal. The program shall be test run on site prior to the ILRT to assure satisfactory operation.

Signature S.S. Wollman Date 4/28/80

4.4.8 A Test log will be maintained throughout the ILRT by the Test Director to record ILRT events, significant changes in plant status, etc. all entries shall use military clock time.

Signature S.S. Wollman Date 5/2/80

4.4.9 A communication system (of Para 4.1.8) shall be established between the Test Center and each of the following stations: Control Room, supplemental test panel, pressurizations, Control Station, and the Depressurization Control Station. Plant Page System

Signature S.S. Wollman Date 4/28/80

see SPO Chg Aff.

4.4.10 A Barometer (of Section 4.1.14) shall be installed inside the Reactor Bld. near the Texas Instrument Location. Thermometers (of section 4.1.17) shall also be installed inside the Reactor Bldg. and outside the plant.

Barometer not installed in R/B Bldg use Control room Barometer. S.S. Wollman Test Director

Signature S.S. Wollman Date 4/30/80

4.4.11 The Clamp-on Ameters of para 4.1.22 shall be installed at the appropriate Motor Control Centers to monitor motor currents on the Ventilation Fans VAC-206 A1, A2, B1, B2 & VEX 207A & B.

Signature [signature] Date 5/5/80

4.5 Prerequisite Tests, Inspections & Functional Checks

4.5.1 The reactor containment penetration and isolation valve leak test (type B & C tests) shall be completed and total accumulated leakage shall be within the limits established by the Plant Technical Specifications. If a type C test can not be completed, list it below. If the valve is required to be vented by Attachment N ~) the vents are closed, list the valve in paragraph 4.7 .

Pen. No.	1st Iso Valve	2nd Iso. Valve
~~9A~~	~~58A~~	~~61A~~
~~9B~~	~~58B~~	~~61B~~
See deviations as per		SRO change
EO-29	and data	1.5

Signature _____ Date _____

4.5.2 All modifications to the primary containment boundary shall have been completed from the containment boundary up to and including the isolation valve(s). Also the reactor pressure vessel hydro shall have been complete

Signature M. Wallman Date 5/4/80

4.5.3 All Repairs to the primary containment shall be completed. No repairs or adjustments shall be made after the Containment Inspection is conducted without first notifying the ILRT Test Director.

Signature M Wallmann Date 5/4/80

4.5.4 With ventilation system as modified for the ILRT in operating status, a containment air temperature survey shall be performed in accordance with Appendix Ee.

Signature M Wallmann Date 4/30/80

4.5.5 Upon completion of compressor installation, the pressurization system shall be functionally checked in accordance with Appendix Dd.

Note: Sufficient fuels and lubricants shall be available for support of the ILRT.

Signature P. A. [illegible] Date 5/5/80

4.6 EQUIPMENT PROTECTION

4.6.1 Blade angles of fans VAC-206A1,A2 & B1,B2 shall be changed to -10 setting to permit operation at test pressures.

Signature A.L. Wollmann Date 4/29/80

4.6.2 A satisfactory preliminaryinspection of the accessible interior and exterior surfaces of the primary containment structure and components shall be completed in accordance with Appendix Jj.

Signature A.L. Wollmann Date 5/5/80

4.6.3 Tip Indexers:

4.6.3.1 Each tip probe shall be withdrawn into its chamber shield ✓

4.6.3.2 Each tip drive shall be tagged out of service ✓

4.6.3.3 Disconnect tip tubing from the indexer at the input of each indexer. ✓

4.6.3.4 Instrument air and/or Nitrogen to the tip porge shall be secured ✓

Signature A.L. Wollmann Date 5/4/80

4.6.4 All non-permanent vessels containing pressurized gas or any instruments, portable equipment, monitoring equipment, etc., which cannot withstand an external or differential pressure of 23 psig shall be removed from the containment or placed in a vented condition to prevent damage.*

Signature A.L. Wollmann Date 5/4/80

4.6.5 During containment pressurized conditions, the running ventilation system fans must be monitored regularly for satisfactory operation to assure adequate protection against fire within the containment. Reference respective current limits of attachment B-1.

Signature [illegible] Date 5/5/80

* Verify that vent holes on Recirc Pump oil level switches are unobstructed. Note: All instruments exposed to the test pressure shall have been reviewed by I&C prior to the type A test to determine any recalibration requirements.

4.7 System Condition

4.7.1 The reactor vessel water level shall be maintained at normal level
Note: With the Reactor Mode switch in the "SHUTDOWN" position, the reactor vessel water level, and the high drywell pressure switches electrically disconnected, no other safe guard signals need be by passed for this test.

Signature [signature] Date 5/5/80

4.7.2 The condensate storage tank shall be in service with a minimum of 75,000 gallons.

Signature [signature] Date 5/5/80

4.7.3 The torus water level shall be at normal water level.
Note: Any decrease in water level will affect the ILRT leakage rate. All fill valves, crossties, and drain valves shall be verified closed per attachment N.

Signature [signature] Date 5/5/80

4.7.4 The reactor feedwater system shall be filled with water from the vessel back to the feedwater heaters.

Signature _____ Date _____

4.7.5 The following systems shall be filled with water: HPCI & RCIC suctionlines, RHR, Core Spray (keep fill systems operating)

Signature [signature] Date 5/5/80

4.7.6 The main steam system piping shall be drained.

Signature [signature] Date 5/5/80

4.7.7 The feedwater pumps shall be secured. Reactor vessel level shall be controlled with the RWCU and CRD systems

Signature A.W. Wollmann Date 5/4/80

4.7.8 Closure of primary containment isolation valves for the test shall be accomplished by the normal operational mode with repect to physical closing. (i.e. no preliminary exercising or adjustments after closing shall be permitted)

Signature A.W. Wollmann Date 4/5/80

4.7.9 ✓ Cool the torus water to as low as practical prior to the test using the RHR system.
Note: To avoid dewcell problems dueto saturated conditions it is desireable to maintain a dewpoint depression of approximately 15°F, below the drybulb temperature prior to pressurizing. This should ensure a 10°F depression after the primary containment has been pressurized.

Signature A.W. Wollmann Date 5/3/80

4.7.10 The recirc pump M-G sets shall be tagged out. Control of the Reactor Vessel temperature shall be done using RBCCW to RHR heat exchanger (s). Reactor vessel temperature shall be maintained reasonably constant through the duration of the PCILRT or as directed by the test director.

Signature A.W. Wollmann Date 5/5/80

4.7.11 Drywell floor and equipment sump pump activity shall be monitored before the test. Excessive activity shall be investigated and discovered leaks isolated or repaired.

Signature M Wallace Date 5/4/80

4.7.12 The only equipment operating in the drywell and torus shall be the ventilation system fans and possible sump pump operation.

Signature M Wallace Date 5/4/80

4.7.13 Deleted

4.7.14 Isolate, bleed and secure the following accumulators to the drywell atmosphere: MSIV accumulators and safety relief valve accumulators.

Signature M Wallace Date 5/5/80

8.7.1.4 A-12 Rev 2

4.7.15 Deleted

4.7.16 Valve PCV-5030B (in pressurization path) shall have its automatic pressure control feature disabled. (This valve will be in the full open position during containment pressurization). Relief valve PSV-5034B shall be disabled.

4.7.17 The Texas Instrument Pressure gages must be in operation 48 hours prior to the start of test.

Signature [signature] Date 5/3/80

4.7.18 The following systems and equipment should be in operation for about 2 days prior to commencement of this test to maintain the reactor building, and the primary containment at relatively stable temperatures.

4.7.18.1 Service Water System
4.7.18.2 Reactor Bldg. Cooling Water System
4.7.18.3 Reactor Bldg. Ventilation System (Minimum VAC-206 A&B, VEX-207 A,B)
4.7.18.4 Electrical Systems to support the above system operations.
4.7.18.5 Residual Heat Removal System (one pump).

Signature [signature] Date 4-30-80

4.7.19 Deleted

4.7.20 All systems penetrating the Containment shall be aligned as defined in Attachment N and sketches attachments O thru EE. Valves shall be tagged to prelude operation unless specifically authorized by the ILRT test director.

Signature [signature] Date 5/5/80

4.7.21 Just prior to containment pressurization and before securing and venting instrument air to the drywell, pump down the drywell floor and equipment drain sumps and record flow integrator readings, date and time in Appendix Hh.

EQUIP 68591 FLOOR 25772 at 2144 hrs 5/4

After pumps are secure, shut AO-7017 A&B and AO-7011 A&B.

Signature [signature] Date 5/4/80

4.7.22 Access to the Reactor Bldg. shall be minimized during the ILRT. During pressurization and leakage investigation, access to penetration areas shall be controlled by the ILRT test Director and Health Physics.

Signature [signature] Date 5/6/80

4.8 Plant Status

4.8.1 The refueling shall be completed and the drywell head in place with seals leak tested. The reactor vessel shall be vented through the head vent or an equivalent vent path. vented via relief VIV.

Signature D Wollmann Date 5/2/80

4.8.2 The following type B leak tests shall be completed:

CRD removal hatch	Date 4-30-80
Airlock inner & outer doors	Date 5/5/80
Torus access hatches	Date 5/4/80
Equipment hatch	Date 5/4/80

Note all of the above penetrations shall be closed and sealed using normal methods.

Signature [signature] Date 5/5/80

4.8.3 The drywell & Torus air temperature and humidity shall be controlled for as many days as feasable prior to the start of the ILRT. Drywell fans shall be running continuously and cooling water to the fans shall be under the administrative control of the test Director.

Signature D Wollmann Date 4/30/80

4.8.4 RPV temperature and level are to be controlled by operations within the band requested by the test Director.

Signature D. L. Wollmann DAte 4-30-80

4.8.5 Deleted

4.8.6 All non-essential electrical loads located within the drywell not required for the ILRT should be de-energized.

Signature [signature] Date 5/5/80

4.8.7 All high Drywell pressure trips shall be bypassed, tagged and recorded in the jumper log book.

Signature D Wollmann Date 5/4/80

4.9 Meteorological Conditions

4.9.1 Meteorological data shall be recorded prior to the test. Wind speed and direction, Reactor Building air temperature and Reactor building barometric pressure will be recorded every 8 hours begining about 3 days before the start of the ILRT, and every 4 hours during the ILRT. Data will be recorded on attachment FF.

Signature W A Williams Date 5/5/80

5. Limitations & Precautions

5.1 Radiological Control

5.1.1 A work permit and radiation work permit, when required, must be obtained before testing any components.

5.1.2 All radiological control and precautionary requirements (to include airborne radiation detection) shall be established as required by the Plant Health Physicis

5.2 Emergency Depressurization

5.2.1 In case emergency depressurization is required (e.g., a ruptured line or unexpected containment pressure increase) follow the procedure outlined in Section 10.2.

5.3 General

5.3.1 The average Drywell & Torus air temperature during the ILRT shall be held reasonably constant using the RBCCW to the RHR Heat exchangers in use. (RHR system in Shutdown Cooling Mode)

5.3.2 Containment depressurization rate will be limited to 5 psi/hr to prevent spalling of containment surfaces and provide equipment protection.

5.3.3 Approved ear protection shall be worn in high noise areas such as adjacent to the air charging line or the depressurization lines.

5.3.4 During the ILRT pressurization, access to restricted areas shall be as short as possible.

5.3.5 Containment Bld. pressure is to be increased or decreased only with the authorization of the test director.

5.3.6 Any failure of ILRT instrumentation shall be evaluated by the test Director to determine if the test duration requires extension. Reference Appendex Gg.

5.3.7 The range of each primary containment RTD shall be ± 20 DEGF around its expected subvolume ambient temperature. Control of the RPV temperature shall be established a few days prior to the test to stabalize the primary containment at a value inside the ILRT operating range. Control of RPV temperature shall continue throughout the ILRT interval.

5.3.8 The plant process computer shall be operable

5.3.9 The ILRT analysis programs on the time share system shall be operable.

5.3.10 The Torus, Containment sumps and RV water level shall be monitored during the test to assure thereis not change in free volume status which can affect Containment pressure.

5.3.11 The 20" Drywell and Torus Purge exhaust lines shall not be used to depressurize the primary containment until pressure is below 3 psig. SGTS fans should be running during depressurization.

5.3.12 Access to the primary containment shall not be permitted when the containment is pressurized unless absolutely necessary. If access is required, PNPS Health Physicist Procedures and the provisions of OSHA Section 1926803 shall be adhered to.

5.3.13 Frequently during initial pressurization and periodically thereafter, inspections shall be made of accessible areas where there are penetrations through the primary containment or where test affected piping terminates. Any suspected leakage shall be reported to the Test Director. No attempt will be made to repair suspected leakages unless specified by the Test Director.

5.3.? Operation of the plant emergency diesel generators or other internal combustion engines near the temporary air compressor intakes could result in forcing exhaust fumes into the primary containment. Care shall be taken to keep the temporary air compressor intakes free of fouled air.

5.3.15 During the period between the initiation of the containment inspection and the performances of the ILRT no repairs or adjustments shall be made so that the containment can be tested in as close to the "as is" condition as practical. An exception to this shall be if the penetration may be isolated or its venting isolated to cutoff leakage. After the test is completed, the penetration may be repaired and a local leak test performed. The results of this local leak test snall be added to the Total Calculated Integrated Leak Rate as a component of the K-factor. As per instructions of section 12.3.

4.1.15 One (1) - Hewlett Packard Multi Function Meter, Model 345A six digit integrating digital voltmeter/ohmeter. Accuracy (+.003% of reading + .004% of range).

4.1.16 One (1) Decade box; General Radio Model 1433-W; Range 0-1111.11 Accuracy .025.

4.1.17 Five (5) - Alcohol thermometers, 0-100°F, readability .5°F.

4.1.18 Two (2) - Hose fitting adapters to connect air compressor hoses (para 4.1.1) to threaded pipe outside Reactor Bldg. (see Fig. 2, Appendix Dd.)

4.1.19 One (1) - Psychrometer (Assman or Sling Type): Range 32°F to 100°F Dew pt. (min.); Accuracy ± 2°F Dew Pt. temp. - or Alnor type 7000 dew pointer; Accuracy ± 2°F Dew Pt. Temp.

4.1.20 One (1) - Wheatstone Bridge, L & N Model HP-8064 or equivalent. Accuracy .05% of reading or .005 whichever is larger.

4.1.22 Six (6) - Clamp-on Ammeters; range 0-100 Amp (max); Readability and minimum subdivision 1.0 amp.

4.1.23 One (1) - Fluke Digital Multimeter; Model 8000A, or equivalent.
Accuracy: DC Voltage ± (0.1% of reading + 1 digit);
DC Current ± (0.3% of reading + 1 digit);
AC Voltage ± (0.5% of reading + 2 digits);
AC Current ± (1.0% of reading + 2 digits)

6. ILRT Test Method

6.1. The Primary Containment will be pressurized at approximately 5 psi per hour using the Leak Rate Test Pressurization System.

6.2 After containment temperature has stabilized, the Absolute Method of Leakage Detection will be employed for at least 24 hours at test pressure. NOTE: The Absolute Method is described briefly in Appendix II.

6.3 Upon successful completion of the 24 hr. ILRT, either the Mass Pump back or the Superimposed Leakage Test shall be performed. The Mass Pump Back involves the metered removal or injection of a quantity of air from or into the containment over a short time interval. The Superimposed leak imposes a calibrated leak on the existing leaks in the primary Containment. See Data Sheets 1.4 and 1.5 for Applicable acceptance criteria.

6.4 The Containment shall be depressurized to 0 psig after successful completion of the Supplemental ILRT or as directed by the ILRT Test Director. The depressurization rate shall not exceed 5 psig per hour.

6.5 Time for each evolution is estimated below:

	Evolution	Time
1.	Pressurization to 23 psi	5 hrs.
2.	Stabilize Containment Bldg. Pressure at 23 psig	4 hrs.
3.	Perform 24 hour ILRT	24 hrs.
4.	Perform supplemental test	2 hrs.
5.	Reduce Containment Bldg. Pressure to 0 psig	5 hrs.
	Total Time	40 hrs.

12. Acceptance Criteria -- Reference Data Sheet 1.5

12.1 The acceptance criteria for the 24 hour primary containment leakage test is as follows:

$$L_{tm} + UCL + K < 0.75\ L_t$$

where L_{tm} = Leakage Rate, %/Day *
UCL = Upper Confidence Level, %/Day *
K = Adjustments made to the type A Results to correct for water level Changes, and type B & C retests, %/Day

12.2 The acceptance criteria for the supplemental test shall be in accordance with Data Sheet 1.5. Only one supplemental test head be performed.

12.3 If containment leakage exceeds the acceptance criteria of 12.1 above, proceed as follows:

1. Isolate excessive leakage path (s) by closing isolation valve (s) and complete ILRT.
2. Retest each isolated (isolation) valve using type C test method.
3. Repair isolation valve.
4. Retest, as in Step 2.
5. Add test results of step 4 to K and apply to acceptance criteria of Data Sheet 1.5.

INSTRUMENTATION ERROR ANALYSIS

$$L = 100\left[1 - \frac{P_2 T_1}{P_1 T_2}\right] \%/\text{day}$$

FOM = System Figure of Merit (over 24 hrs)

$$FOM^{*} = 100\left[2\left(\frac{e_{PT}}{P}\right)^2 + 2\left(\frac{e_{PV}}{P}\right)^2 + 2\left(\frac{e_T}{T}\right)^2\right]^{1/2}$$

where $e^{*} = \left[\left(\frac{E}{(\text{No. of instruments})^{1/2}}\right)^2 + \left(\frac{\mathcal{E}}{(\text{No. of readout devices})^{1/2}}\right)^2\right]^{1/2}$

e_{PT} = error associated with total pressure measurem

e_{PV} = error associated with vapor pressure measurem

e_T = error associated with temperature measureme

P = containment total pressure

T = CONTAINMENT average temperature

E = error associated with individual parameter

$\mathcal{E}$ = error associated with readout device (computer loop, display circuitry, etc.)

For Pilgrim Station ILRT:

$L_t = .536\ \%/\text{day}$

$P = 37.7$ psia

$T = 75^{\circ}F = 535^{\circ}R$

Parameter	No. of SENSORS	No. of CONVERTERS	No. of READOUT DEVICES
TOTAL PRESSURE	1	1	1
VAPOR PRESSURE	10	10	1
RTD's	18	18	1

* Deleveroment omitted; USAGE is recognized by ANSI

ILRT
INSTRUMENT ERROR (E)
TABLE

INSTRUMENT	ACCURACY	REPEATABILITY	SOURCE OF ERROR INFO.
PRECISION PRESS. GAGES (TI-1, TI-2)	± .015 psia (± .015% fs)	± .002 psia (± .002% fs)	VENDOR REP. & SPEC.
PRECISION PRESS. DISPLAY (W/ENCODER) (READABILITY) Note: NO COMPUTER LOOP ERROR ASSOCIATED WITH TEXAS INSTR.	± .0015 psia (± .0015% fs)	± .0015 psia (± .0015% fs)	VENDOR REP
DEWCELS	± 1.0 °F	± .5 °F	VENDOR (LATEST)
* DEWCEL CONVERTER	± 0.78 °F	± .38 °F	BECO
* DEWCEL COMPUTER	± .094 °F	± .015 °F	BECO
RTDs	± 0.1 °F	SENSITIVITY ± 0.1 °F	VENDOR (MAX ERROR SPEC.)
* RTD CONVERTER	± 0.18 °F	± .0016 °F	BECO
* RTD COMPUTER	± .0110 °F	± .053 °F	BECO
* MULTI-FUNCTION METER	RTD: ± 0.011 °F DEWCEL: ± 0.015 °F	RTD: ± 0.011 °F DEWCEL: ± 0.015 °F	BECO

* See RTD : DEWCEL LOOP ERROR DEVELOPMENT OF APPENDIX 8.8

1. REPEATABILITY ERROR ANALYSIS

(USING PLANT COMPUTER FOR INSTRUMENT READOUT)

TOTAL PRESSURE:

$$e_{pT} = \left(\left[\frac{.002 \text{ psia}}{\sqrt{1}} \right]^2 + \left[\frac{.0015 \text{ psia}}{\sqrt{1}} \right]^2 \right)^{1/2}$$

$$= \pm .0025 \text{ psia}$$

Vapor PRESSURE:

$$e_{Dewcel} = \left(\left[\frac{.5^\circ F}{\sqrt{10}} \right]^2 + \left[\frac{.38^\circ F}{\sqrt{10}} \right]^2 + \left[\frac{.015^\circ F}{\sqrt{1}} \right]^2 \right)^{1/2}$$

from steam tables, a change in dewpt. temp. (at 75°F) of ± 1°F is equal to a change in pressure of ± .0145 psia

$$\therefore \quad e_{pV} = \left(\left[\frac{.00725 \text{ psia}}{\sqrt{10}} \right]^2 + \left[\frac{.00551 \text{ psia}}{\sqrt{10}} \right]^2 + \left[\frac{.0002175 \text{ psia}}{\sqrt{1}} \right]^2 \right)$$

$$= \left(5.2562 \times 10^{-6} + 2.5513 \times 10^{-6} + .0473 \times 10^{-5} \right)^{1/2} \text{ psia}$$

$$= \pm .00280 \text{ psia}$$

DRYBULB TEMP:

$$e_T = \left(\left[\frac{.1^\circ F}{\sqrt{18}} \right]^2 + \left[\frac{.0016^\circ F}{\sqrt{18}} \right]^2 + \left[\frac{.053^\circ F}{\sqrt{1}} \right]^2 \right)^{1/2}$$

$$= \left(5.5555 \times 10^{-4} + 0.0014 \times 10^{-4} + 28.0900 \times 10^{-4} \right)^{1/2}$$

$$= \pm 0.058^\circ F = \pm 0.058^\circ R$$

$$FOM = \pm 100\left[2\left(\frac{.0025}{37.7}\right)^2 + 2\left(\frac{.00280}{37.7}\right)^2 + 2\left(\frac{.058}{535}\right)^2\right]^{1/2}$$

$$= \pm 100\left[87.95 \times 10^{-10} + 110.32 \times 10^{-10} + 235.06 \times 10^{-10}\right]^{1/2}$$

$$= \pm .02082\ \%/day$$

$.25(L_t) = .25(.536\ \%/day) = .134\ \%/day$
SINCE FOM IS LESS THAN $.25\ L_t$, THE MEASUREMENT SYSTEM IS SATISFACTORY

$$FOM = \pm 100\left(\frac{.02082}{.536}\right)\%\ \text{of}\ L_t = 3.88\ \%\ L_t$$

2. REPEATABILITY ERROR ANALYSIS

(USING MULTI-FUNCTION METER FOR INSTRUMENT READOUT.)

$$e_{Dewcel} = \left(\left[\frac{.5\,^\circ F}{\sqrt{10}}\right]^2 + \left[\frac{.38\,^\circ F}{\sqrt{10}}\right]^2 + \left[\frac{0.015\,^\circ F}{\sqrt{1}}\right]^2\right)^{1/2}$$

expressing in terms of vapor pressure:

$$e_{pv} = \left(\left[\frac{.00725\ psia}{\sqrt{10}}\right]^2 + \left[\frac{.00551\ psia}{\sqrt{10}}\right]^2 + \left[\frac{.0002175\ psia}{\sqrt{1}}\right]^2\right)^{1/2}$$

$$= \left(5.2562 \times 10^{-6} + 2.5513 \times 10^{-6} + .0473 \times 10^{-6}\right)^{1/2} psia$$

$$= \pm .00280\ psia$$

$$e_T = \left(\left[\frac{.1}{\sqrt{18}} \right]^2 + \left[\frac{.0016}{\sqrt{18}} \right]^2 + \left[\frac{.011}{\sqrt{1}} \right]^2 \right)^{1/2} {}^\circ F$$

$$= \left(5.5555 \times 10^{-4} + 0.0014 \times 10^{-4} + 1.2100 \times 10^{-4} \right)^{1/2}$$

$$= \pm .0260\,^\circ F = \pm .0260\,^\circ R$$

$$FOM = \pm 100 \left[2\left(\frac{.0025}{37.7}\right)^2 + 2\left(\frac{.00280}{37.7}\right)^2 + 2\left(\frac{.0260}{535}\right)^2 \right]^{1/2}$$

$$= \pm 100 \left[87.95 \times 10^{-10} + 110.32 \times 10^{-10} + 47.24 \times 10^{-10} \right]^{1/2}$$

$$= \pm .01567\ \%/day$$

$$= 2.92\ \%\ of\ L_t$$

3. REPEATABILITY ERROR ANALYSIS

(Worst case: computer FAILURE, 6 DEWCELS FAIL and 8 RTDs FAIL.

$$e_{PV} = \pm \left(\left[\frac{.00725\ psia}{\sqrt{4}} \right]^2 + \left[\frac{.00551\ psia}{\sqrt{4}} \right]^2 + \left[\frac{.0002175}{\sqrt{1}} \right]^2 \right)^{1/2}$$

$$= \pm \left(13.1406 \times 10^{-6} + 7.5900 \times 10^{-6} + .0473 \times 10^{-6} \right)$$

$$= \pm .004558\ psia$$

$$e_T = \pm \left(\left[\frac{.1\,^\circ F}{\sqrt{10}} \right]^2 + \left[\frac{.0016\,^\circ F}{\sqrt{10}} \right]^2 + \left[\frac{.011\,^\circ F}{\sqrt{1}} \right]^2 \right)^{1/2}$$

$$= \pm \left(10 \times 10^{-4} + .0025 \times 10^{-4} + 1.2100 \times 10^{-4} \right)^{1/2} {}^\circ F$$

$$= \pm .03349\,^\circ R$$

$$FOM = \pm 100\left[2\left(\frac{.0025}{37.7}\right)^2 + 2\left(\frac{.004558}{37.7}\right)^2 + 2\left(\frac{.03349}{535}\right)^2\right]^{1/2}$$

$$= \pm 100\left[87.95 \times 10^{-10} + 292.35 \times 10^{-10} + 78.37 \times 10^{-10}\right]$$

$$= \pm .02142\%/day$$

$$= 4.00\% \text{ of } L_t$$

4. Accuracy Error Analysis

(USING PLANT COMPUTER FOR INSTRUMENT READOUT)

$$e_{pT} = \pm\left(\left[\frac{.015 \text{ psia}}{\sqrt{1}}\right]^2 + \left[\frac{.0015}{\sqrt{1}}\right]^2\right)^{1/2}$$

$$= \pm .01507 \text{ psia}$$

$$e_{DEWCEI} = \pm\left(\left[\frac{1.0^\circ F}{\sqrt{10}}\right]^2 + \left[\frac{.78^\circ F}{\sqrt{10}}\right]^2 + \left[\frac{.094^\circ F}{\sqrt{1}}\right]^2\right)^{1/2}$$

$$e_{pv} = \pm\left(\left[\frac{.0145 \text{ psia}}{\sqrt{10}}\right]^2 + \left[\frac{.01131 \text{ psia}}{\sqrt{10}}\right]^2 + \left[\frac{.001363 \text{ psia}}{\sqrt{1}}\right]^2\right)^{1/2}$$

$$= \pm\left(21.025 \times 10^{-6} + 12.7916 \times 10^{-6} + 1.8578 \times 10^{-6}\right)^{1/2} \text{ psia}$$

$$= \pm .005973 \text{ psia}$$

$$e_T = \left(\left[\frac{0.1^\circ F}{\sqrt{18}}\right]^2 + \left[\frac{0.18^\circ F}{\sqrt{18}}\right]^2 + \left[\frac{.011^\circ F}{\sqrt{1}}\right]^2\right)^{1/2}$$

$$= \left(5.5555 \times 10^{-4} + 18.0000 \times 10^{-4} + 1.2100 \times 10^{-4}\right)^{1/2} {}^\circ F$$

$$= .04976^\circ R$$

$$FOM = \pm 100\left[2\left(\frac{.01507}{37.7}\right)^2 + 2\left(\frac{.005973}{37.7}\right)^2 + 2\left(\frac{.0497}{535}\right)^2\right]^{1/2}$$

$$= \pm 100\left[3195.76 \times 10^{-10} + 502.03 \times 10^{-10} + 173.01 \times 10^{-10}\right]$$

$$= \pm .06222\ \%/day$$

$$= \pm 11.67\ \%\ of\ L_t$$

5. ACCURACY ERROR ANALYSIS

(WORST CASE: COMPUTER FAILURE, 6 DSWCELS FAIL AND 8 RTD's FAIL)

$$e_{PV} = \left(\left[\frac{.0145\ psig}{\sqrt{4}}\right]^2 + \left[\frac{.01131\ psia}{\sqrt{4}}\right]^2 + \left[\frac{.0002175\ psia}{\sqrt{1}}\right]^2\right)^{1/2}$$

$$= \left(62.5625 \times 10^{-6} + 31.9790 \times 10^{-6} + .0473 \times 10^{-6}\right)^{1/2}$$

$$= \pm .009726\ psia$$

$$e_T = \pm\left(\left[\frac{.1}{\sqrt{10}}\ ^\circ F\right]^2 + \left[\frac{0.18}{\sqrt{10}}\ ^\circ F\right]^2 + \left[\frac{.011}{\sqrt{1}}\ ^\circ F\right]^2\right)^{1/2}$$

$$= \pm\left(10 \times 10^{-4} + 32.40 \times 10^{-4} + 1.21 \times 10^{-4}\right)^{1/2}\ ^\circ F$$

$$= \pm .06604\ ^\circ R$$

$$FOM = \pm 100\left[2\left(\frac{.0025}{37.7}\right)^2 + 2\left(\frac{.009726}{37.7}\right)^2 + 2\left(\frac{.06604}{535}\right)^2\right]^{1/2}$$

$$= \pm 100\left[87.95 \times 10^{-10} + 1331.12 \times 10^{-10} + 304.74 \times 10^{-10}\right]^{1/2}$$

$$= \pm .04152\ \%/day$$

$$= \pm 7.75\ \%\ of\ L_t$$

ACCEPTANCE CRITERIA CALCULATIONS

Lt = Max. allow. leakage rate at Pressure Pt.
Pt = Reduced test pressure (23.000 psig min)
Pa = Peak test pressure (45.000 psig min)
La = Max. allow leakage rate at Pressure Pa

$La \left(\frac{Ltm}{Lam}\right) > .7$

Since Ltm/Lam from 1972 Test > 0.7

1. $Lt = La\ (Pt/Pa)^{\frac{1}{2}}$

$= (1.00\%/Day)\left(\frac{23.00 + 14.696}{45.00 + 14.696}\right)^{\frac{1}{2}}$

$Lt = \underline{0.794648\ \%/Day}$

2. Lt in SCfm

$Lt = \left(\frac{0.00794648}{Day}\right)\left(270{,}000\ CFT\right)\left(\frac{23.00 + 14.696}{14.696}\right)$

$Lt = 5503.39\ SCFD$

$Lt = \underline{3.82\ SCFM}$ — 3.7

3. Acceptance criteria %/Day

0.75 Lt = (0.75) (0.794648) %/Day

0.75 Lt = 0.595986 %/Day

4. Acceptance criteria SCFM

(0.75) (3.82) Scfm = 2.865

.75 Lt = 2.865 Scfm

5. Acceptance criteria lbm/day; lbm/hr.

.75 Lt = (5503.39) (.75) = 4127.54 scfD

$$p \text{ at STP} = \frac{(1 \text{ lbm})}{(1 \text{ CFT})} = \frac{(144 \text{ in}^2)}{(\text{SFT})} \frac{(14.696)}{(53.25)} \left(\frac{1}{520^\circ R}\right)$$

$$p_{@ \text{ STP}} = 0.076 \frac{\text{lbm}}{\text{CFT}}$$

$$.75 \text{ Lt} \left(\frac{\text{lbm lost}}{\text{Day}}\right) = (4127.54)(0.076) = 314.85 \text{ lbmd}$$

.75 Lt = 314.85 lbm/day; DR 13.12 lbm/hr

1.00

12 00

20 scfm

2000/155

2/.275

NOTE: Since .75 LT $\cong$ 13 lbm/hr the GE MK III computer would not have to be run immediately to obtain leakage rate & confidence.

A plot of mass. vs. time and a decreasing rate of change of mass lost per hour (rate less than 13#/hr) would indicate a "sucessful" ILRT.

All adjustments to this rate would have to be considered (penalties, confidence factor).

This page replaces original
5/5/82

6. Supplemental Test Flow Requirements

a. Mass step change – Remove a metered mass equivalent to 75% – 125% of the daily allowable leakage

17.19 SCFM < RATE < 28.66 SCFM

NOTE: This is based on a 4 hour test with a total flowmeter capacity of 30 scfm.

b. Superimposed method

Impose leak on existing leak.

.75Lt < Rate < 125Lt

2.865 SCFM < Rate < 4.775 SCFM

Delete step 6 and add new page in its entirety 5/8/82

6. Supplemental test flow requirements

a. Mass step change - Remove between 75% to 100% Lt in one hour. What is flow rate? (SCFM)

.75Lt < Rate < Lt

4127.54 SCFD < Rate < 5503.39 SCFD

68.8 SCFM	< Rate Bleed off 1 hr <	91.7 SCFM	Min Time Air Bleed Off = 1 Hr.

b. Superimpossed method
Impose leak on existing lea - Leak imposed is equivalent to 75% to 125% Lt.

.75Lt < Rate < 125% Lt.

4127.54 SCFD < Rate < 6879.23 SCFD

÷ 60 min.
÷ 4 hr min.
Time period

17.19 SCFM	< Rate <	28.66 SCFM	Min Time Air Bleed Off = 4 Hr.

c Acceptance Criteria

1. 125 Lt = (5503.39 SCFD)(0.25) = 1375.84 SCFD

.25Lt = 104 lbm

2. Acceptance Criteria - Mass Step

$$\left(\begin{array}{c}\text{over}\\ \text{1 hr.}\\ \text{(Computer)}\end{array}\right) - \left(\begin{array}{c}\text{over}\\ \text{1 hr.}\\ \text{(Flow Device)}\end{array}\right) \leq .25Lt \text{ or } 104 \text{ lbm}$$

3. Acceptance Criteria - Superimposed

$$(Lo + Ltm - 0.25Lt) \leq Lc \leq (Lo + Ltm + 0.25Lt)$$

Flow rate from flow device	Leakage from 24 Hr. Test	1375 SCFD or 0.198662 %/Day	New leakage rate from GE Mark III

See ANSI N274 Appendix E for flowrate conversion.

7. Max Pressurization Time

$PV = NRT$

$N_1 = \text{Mass}_{@P_1} = \frac{PV}{RT} = \frac{(14.696)(270\,000)\ (144)}{(53.35)\ (540)}$

Use 80 DEGF as intital Temp.

$N_1 = 19\,833$ lbm

$N_2 = \text{Mass}_{@P_2} = \frac{PV}{RT} = \frac{(38.496)\ (270{,}000)\ (144)}{(53.35)\ (545)}$

Assume min. 5 DEGF temp. incr. due to pressurization

$N_2 = 51476$ lbm

$\Delta M = N_2 - N_1 = 51476 - 19833$

$\Delta M = 31643$ lbm

$\Delta M_{(SCFM)} = \frac{31643}{.076} = 416364.84$ SCFM

Time to Reach 23.8 psig $= \frac{416384.84 \text{ SCFM}}{(2)\ (1200)} = 173$ min

Time to reach 23.8 = 2.89 hrs with 2 compressors
= 5.78 hrs with 1 compressor

with two compressors rate = 8.23 psi/hr
with one compressors rate = 4.12 psi/hr

8. Change in water level during test.

Record all levels at beginning and at end of test.

Any decrease in level (end-begin<0) will be reflected in measured leak rate.

Any increase in level (end-begin>0) will mask the leak rate. Therefore volume calculations would have to be done to correct for this mask.

This stresses importance to maintain RPV level and Torus water level as constant as possible.

CALIBRATION CHECK REQUIREMENTS

1. Precision pressure gages

   Accuracy & display error $= \left([.015\,(100)]^2 + [.001]^2 \right)^{1/2}$

   $= \pm .015$

   Two TIs can vary by $2(\pm .015) = \pm .030$

2. Precision pressure gage and loop (encoder)

   Accuracy & display error $= \left([.015\,(100)]^2 + [.0015]^2 \right)^{1/2}$

   $= \pm .015$

   Two TIs (with loop) can vary by $2(\pm .015) = \pm .030$

3. RTDs

   RTD & Multi Function Meter $= \left([.1]^2 + [.12]^2 \right)^{1/2}$

   $= \pm .16\,^{\circ}F$

   Bath accuracy $= \pm \left([.1]^2 + [.12]^2 \right)^{1/2} = .16$

   $\therefore$ Maximum difference between Bath and RTD $= \pm .32\,^{\circ}F$

4. RTDs Loop

   RTD Computer accuracy $= \pm .011\,^{\circ}F$
   RTD Bridge accuracy $= \pm .18\,^{\circ}F$
   Decade box accuracy $= \pm .12\,^{\circ}F$

   $\therefore$ Maximum RTD Loop & Decade Box error $= \left([.011]^2 + [.18]^2 + [.12]^2 \right)^{1/2}$

   $= \pm .21\,^{\circ}F$

(Concluded)

5. Dewcels & Loop

Dewcel Accuracy = $\pm 1^{\circ}F$

Dewcel Converter = $\pm .78^{\circ}F$

Computer Accuracy = $\pm .094^{\circ}F$

Maximum Dewcel Loop accuracy = $\left([1.0]^2 + [.78]^2 + [.094\right.$

= $\pm 1.27^{\circ}F$

Psychrometer Accuracy = $\pm 2.0^{\circ}F$

Maximum difference between Dewcel(Loop) and Psychrometer = $\pm |1.27 + 2| = 3.2$

6. Dewcel Loop

for 20m

Fluke Accuracy 20 ma = $\pm 0.60^{\circ}F$

Fluke Accuracy 30 ma = $\pm .7125$

I/E Converter Accuracy = $\pm 0.188^{\circ}F$

Computer Accuracy = $\pm 0.094^{\circ}F$

Max difference (20 ma) = $\pm ([0.6]^2 + [.188]^2 + [.094]^2)^{\frac{1}{2}}$

= $\pm .635^{\circ}F$

Max difference (30 ma) = $\pm ([.7125]^2 + [.188]^2 + [.094]^2)^{\frac{1}{2}}$

= $\pm .742^{\circ}F$

7. Rotameters

Accuracy = $\pm$ 1% (FS)

= $\pm .01$ (11.8 SCFM) = $\pm .118$SCFM

∴ Total flow difference should not exceed
2 ($\pm .118$) = $\pm .24$ SCFM

8. Baromters

Accuracy = $\pm .009$ psia

TI error = $\pm .015$ psia

∴ Maximum pressure difference is $\pm .024$ psia

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BOSTON EDISON COMPANY

OFFICE MEMORANDUM

TO [illegible] FROM PAUL E. DIETZ DATE 4/1/81

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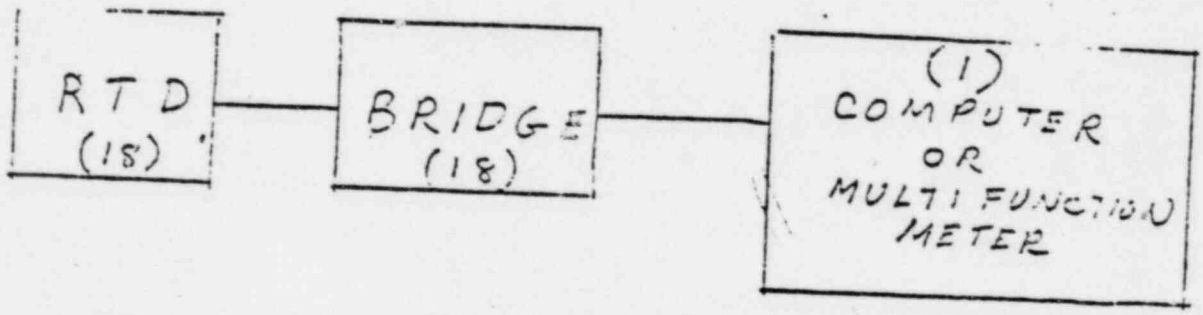
Subj: ERRORS ASSOCIATED WITH RTD and DEWCELL MEASUREMENT

1. RTD MEASUREMENT

There are Eighteen (18) RTDs located in Containment. Each RTD has its own bridge located in the computer termination cabinet.



TEMP	RTD RESISTANCE*	BRIDGE OUTPUT **
60°F	105.99Ω	12.457 mv
70°F	108.15Ω	7.615 mv
80°F	110.30Ω	2.789 mv
90°F	112.45Ω	-2.026 mv
100°F	114.60Ω	-6.839 mv

* ROSEMOUNT RTD MODEL 78 SER. NO. 2523

** METER READINGS

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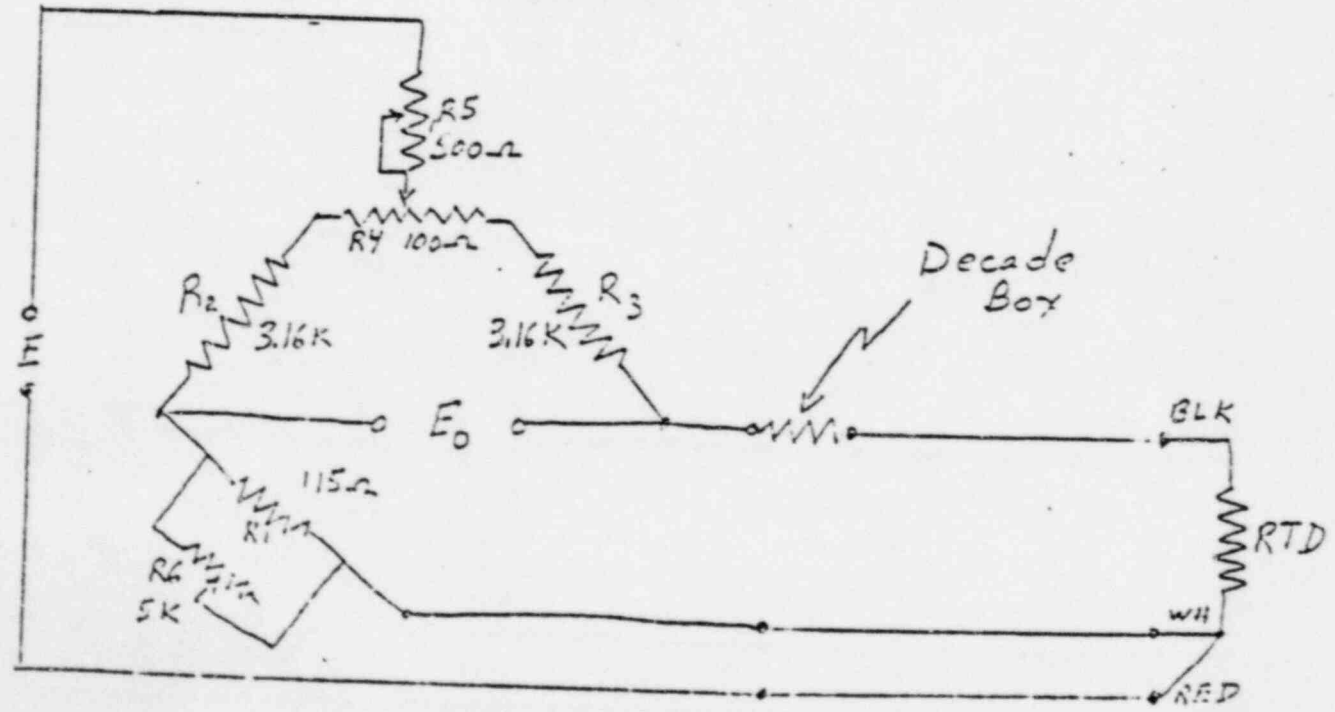
Between 60°F and 70°F each millivolt change causes the following change in Temperature:

$$\frac{70°F - 60°F}{(12.457 - 7.615)\,mv} = 2.06\,°F/mv \sim \underline{\underline{2.1\,°F/mv}}$$

Between 60°F and 70°F each ohm change in resistance causes the following change in Temperature:

$$\frac{70°F - 60°F}{(108.15 - 105.99)\,\Omega} = 4.63\,°F/\Omega \sim \underline{\underline{4.17\,°F/\Omega}}$$

BRIDGE ADJUSTMENTS



OFFICE MEMORANDUM

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FROM P. F. D

DATE 4/1/75

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Procedure

A. Short Black and White leads of RTD in the field

B. Adjust R_6 so that the parallel resistance of R_1 and R_6 is equal to the Resistance of the RTD at 85°F (ie ~ 111.4Ω)

C. Connect Decade Box as shown and set resistance to 111.46Ω (ie RTD@85°F plus lead resistance of .08Ω) for balancing the bridge. Adjust R_4 until E_o = 0.000mv ± .030mv.

D. Set decade box for 107.00Ω (~65°F) and adjust R_5 until E_o = 10.00mv ± .02mv

E. Repeat steps "C" and "D" until no further adjustments are needed

F. This adjusts the bridge so that a standard curve of Ω vs mv can be used if the computer fails

G. Run Computer program "IOROP" 30 and "CALB" To customize curves for each RTD.

Bridge Error Analysis

E_o = Bridge output

E_i = Bridge supply voltage

Errors

A. adjustment of E_i for $\Delta F_o = \pm .020$ mv

B. adjustment of [Bridge zero] for $\Delta E_o = \pm .030$ mv

C. Decade Box accuracy determined by measuring resistance with Multi Function Meter accuracy ±.025% BECO Cert.

∴ accuracy = ±.025Ω on 100Ω scale

Bridge sensitivity to Decade Box

$$\frac{\pm 4.7\ °F/\Omega}{\pm 2.1\ °F/mv} = 2.24\ mv/\Omega$$

This error is added to both A + B above

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GRUMMAN FROM P. E. D. DATE 4/1/71

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TOTAL BRIDGE ERROR $- e_B$

$$e_B = \left[2(.025 \times 2.24)^2 + (.020)^2 + (.030)^2\right]^{1/2} \text{ mv}$$

$$= 0.086 \text{ mv}$$

$$e_B = 0.18\ ^\circ F$$

The computer is set up to scan the RTD Bridges using the 10 mv Gain Range. This Range has the following errors:

Accuracy $\pm .005$ mv $= \pm (.005 \text{ mv} \times 2.1\ ^\circ F/\text{mv})$

$= \pm .0105\ ^\circ F \sim \underline{\pm .011\ ^\circ F}$

Repeatability $\pm .025$ mv $= \pm (.025 \times 2.1)$

$= \pm .0525\ ^\circ F \sim \underline{\pm .053\ ^\circ F}$

Note: No credit is taken in the above analysis for programming corrections to the RTD's to customize the curves for each RTD.

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FROM P. E. D DATE 4/11/75

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Using the "Analog Test Program" in the computer to scan the RTD input points produced a sigma of 3 counts. This is considered to be the repeatability of the bridge. On the 10 mv gain range

3 counts = .0075 mv

∴ Bridge repeatability = ± (.0075 × 2.1)

= ± .0016 °F

Using the Multi Function Meter to read the bridge instead of the computer has the following error associated with the measurement. It is assumed that the repeatability error is the same as the accuracy.

BECO Cert ± 0.005%

use 100 mv scale max signal 10 mv

Accuracy / Repeatability = ± 0.005 mv

= ± 0.0105 °F

.011

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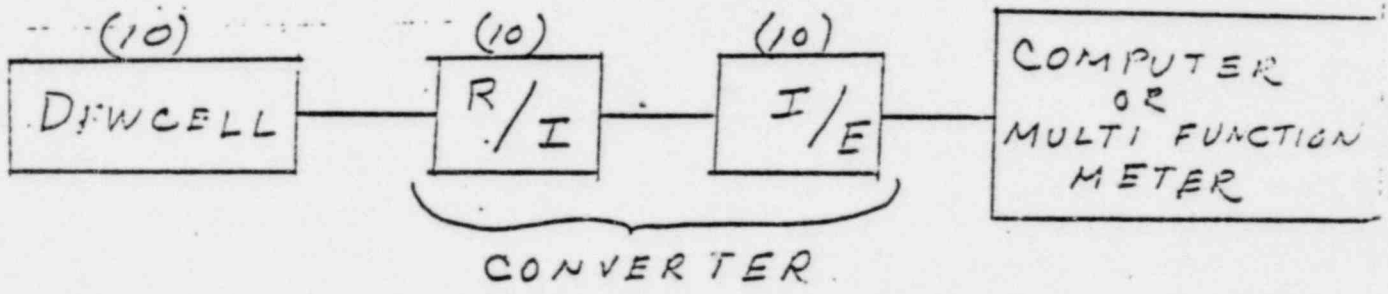
2. DEWCELL MEASUREMENT

There are Ten (10) Dewcells located in containment. Each one has a resistor to current converter and a current to voltage converter.



DEWCELL SENSITIVITY

R/I $\frac{(150-0)°F}{(50-10)\,ma} = \frac{150}{40}\,°F/ma = 3.75\,°F/ma$

I/E $1ma = 1.6\,mv$

$\therefore$ SENSITIVITY $= 2.35\,°F/mv$

R/I Accuracy from Foxboro Model 694A

Accuracy $= \pm \frac{1}{2}\%$ of span

span $= 150°F$

$\therefore$ Accuracy $= \pm 0.75°F$

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8

[illegible] FROM P.E.D. DATE

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It is assumed that the repeatability of the R/= is ½ the accuracy

∴ repeatability = ±.375°F

I/E droping resistor see G.E. DWG No.
PX2100ARIN1

accuracy = ±0.1%

Max Current = 50ma

$V = IR$

$\Delta V = 50ma\ (1.6\Omega)\ 0.1\%$

$= \pm .08mv$

Accuracy = 0.188°F

repeatability = ±0% accumption
(resistor)

COMPANY FILE TEMPORARY TRANSIENT

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∴ Total Converter Accuracy

$$\text{Accuracy} = \pm\left[(0.75°F)^2 + (0.188°F)^2\right]^{1/2}$$

$$= \pm .773°F \sim \pm .78°F$$

$$\text{Repeatability} = \pm\left[(0.375°F)^2 + (0°F)^2\right]^{1/2}$$

$$= \pm 0.375°F \sim \pm .38°F$$

The computer will read the Lewell voltage on either the 40mv or 80mv gain ranges. Largest error is associated with the 80mv range

$$\text{Accuracy} = \pm 0.04\text{mv}$$

$$= \pm .094°F$$

$$\text{Repeatability} = \pm .064\text{mv}$$

$$= \pm 0.15°F$$

OFFICE MEMORANDUM

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TO [illegible] FROM P. E. D. DATE 4/1/75

MAIL PHONE

using the Multi Function Meter to read the Bridge instead of the computer has the following error associated with the measurement. It is assumed that the repeatability error is the same as the accuracy.

BECO Cert ± 0.005%

Manufacturers statement of accuracy

± (.003% of reading + .004% of range)

range = 100 mv

max signal = 80 mv

Accuracy = ± (100 mv (.00004) + 80 mv (.00003))

= ± .0064 mv

= ± .015 °F

Repeatability = ± .015 °F

ABSOLUTE METHOD OF LEAK DETECTION

The absolute method of leakage rate measurement involves the application of the perfect gas law to determine the mass of air in the containment at each point in time during the test. A straight line least squares analysis is performed to estimate the leakage rate. The mass of air is determined from:

$$W = \frac{144V}{R} \quad \frac{(Pi - Pvi)}{Ti}$$

Where V is the containment free volume ft^3
R is the gas constant for air 53.35 ft-lbf/lbm$^\circ$R
Pi is the Toatal absolute pressure for ith point, psia
Pvi is partial pressure of water vapor for ith point, psia
Ti is containment absolute temperature, DEGR

Instantaneous values of containment temperature, containment dewpoint, and containment pressure are recorded every 10 minutes throughout the test period. A weighted average temperature and a weighted average dewpoint temperature are recorded every ten minutes.

Manual calculations of vapor pressure and mass are performed to provide a trend analysis, when sufficient data is gathered, the time shared computer is used to calculate vapor pressure, mass, leakage rate, and the upper confidence level.

The least squares fit equation is applied according to the equation:

$$W = At + B$$

Where A is the slope of the linear least squares fit line and B is the intercept of the linear least squares fit line.

$$A = \frac{n\,(\Sigma tiWi) - (\Sigma Wi)\,(\Sigma ti)}{n\,(\Sigma ti^2) - (\Sigma ti)^2}$$

$$B = \frac{(\Sigma wi)\,(\Sigma ti^2) - (\Sigma tiWi)\,(\Sigma ti)}{n\,(\Sigma ti^2) - (\Sigma ti)^2}$$

The leakage rate over 24 hours is expressed as:

$$Ltm = (-2400)\,(A/B)$$

The upper confidence limit (UCL) is expressed as the upper limit of the 95% confidence level on the leakage rate;

$$UCL = Ltm + 2400\ t.95\ \frac{SA}{B}$$

Where t.95 = 95th percentile of the student's T distribution

SA = Estimate of standard deviation of slope of least squares fit line.

1980 Local Leak Rate Testing

Summary Of Valve Failures

Valve Number	Valve Description	Valve Type	Final test Leak Rate at 45 PSIG		Date Passed
AO 203-1A	MSIV "A" inboard	20" globe	7.886	SLM	4/18/80
AO 203-1B	MSIB "B" inboard	20" globe	7.30	SLM	4/5/80
AO 203-1D	MSIV "D" inboard	20" globe	6.141	SLM	4/7/80
58A	F.W. check "A" inboard	18" check	1.0	SLM	4/26/80
62A	F.W. Check "A" outboard	18" check	3.867	SLM	4/26/80
58B	F.W. Check "B" inboard	18" check	0.1	SLM*	4/26/80
62B	F.W. Check "B" outboard	18" check	0.733	SLM	4/26/80
AO 4356	Service Air to Drywell	3" gate	3.5	SLM	3/11/80
-	Drywell Service Air	3" check	5.0	SLM	3/11/80
MO-1001-28A	"A" RHR Vessel inj.	18" globe	3.1	SLM	4/24/80
MO-1001-29B	"B" RHR Vessel inj.	18" gate	0.1	SLM*	2/7/80
AO-5036 A&B	Torus purge inlet	20" butfly.	1.2	SLM	4/1/80
AO-5040 A	Vacuum Breaker	20" butfly.	0.1	SLM*	3/17/80
AO-5042 A&B	Torus Vent Outlet	20" butfly.	7.0	SLM	3/17/80

* This value is the leak rate monitor minimum sensitivity based on a 0.5% of full scale error for low range readings form the calibration records.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-7A

Valve Name: 'A' Inboard MSIV AO 203-1A

Valve Type: 20" Globe Valve

Date of Failure: 1/19/80 Failure Rate: GNP - Could not Pressurize

Date of Passing: 4/18/80 Passing Rate: 7.886 SLM at 45 PSIG

Summary of Valve Repairs:

Valve was found to have worn poppet guides and some scoring of poppet and seat. The poppet guides were weld repaired and refinished. The poppet was repaired and the seat was reground.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-7C

Valve Name: 'C' Inboard MSIV A0 203 1C

Valve Type: 20" Globe Valve

Date of Failure: 1/9/80 Failure Rate: ≥20 SLM

Date of Passing: 4/5/80 Passing Rate: 7.30 SLM

Summary of Valve Repairs:

Valve was found to have worn poppet guides and some scoring of poppet and seat. The poppet guides were weld repaired and refinished. The poppet was repaired and the seat was reground.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-7D

Valve Name: 'D' Inboard MSIV AO 203 - 1D

Valve Type: 20" Globe Valve

Date of Failure: 1/9/80 Failure Rate: > 20 SLM

Date of Passing: 4/7/80 Passing Rate: 6.141 SLM

Summary of Valve Repairs:

Valve was found to have worn poppet guides and some scoring of poppet and seat. The poppet guides were weld repaired and refinished. The poppet was repaired and the seat was reground.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-22

Valve Name: Service Air To Drywell

Valve Type: 3" Check Valve

Date of Failure: 2/14/80 Failure Rate: 11.0 SLM

Date of Passing: 3/11/80 Passing Rate: 5.0 SLM

Summary of Valve Repairs:

Valve was found to have flarge leakage on drywell side of valve. The valve was removed and new flarge material installed.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-22

Valve Name: Service Air To Drywell AO 4356

Valve Type: 3" Gate Valve

Date of Failure: 2/14/80 Failure Rate: 9.4 SLM

Date of Passing: 3/11/80 Passing Rate: 3.5 SLM

Summary of Valve Repairs:

Valve had body to Bonnet leakage and packing leakage. The valve was unbolted and the body to Bonnet Gasket was replaced. Packing was replaced.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-51A

Valve Name: 'A' RHR Vessel Injection MO 1001-28A

Valve Type: 18" Globe Valve

Date of Failure: 3/3/80 Failure Rate: > 20 SLM

Date of Passing: 4/24/80 Passing Rate: 3.1 SLM

Summary of Valve Repairs:

This valve was found to have a packing leak. Packing was replaced.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-51B

Valve Name: 'B' RHR Vessel Injection MO 1001-29B

Valve Type: 18" Gate Valve

Date of Failure: 1/15/8[illegible] Failure Rate: > 20 SLM

Date of Passing: 2/7/80 Passing Rate: 0.1 *SLM

Summary of Valve Repairs:

This valve was found to have a packing leak. Packing was replaced.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-9A

Valve Name: Inboard Feedwater CK Valve 58A

Valve Type: 18" Check Valve

Date of Failure: 2/8/80 Failure Rate: >20 SLM CNP

Date of Passing: 4/26/80 Passing Rate: 1.0 SLM

Summary of Valve Repairs:

Valve seat was found by blueing not to be seating. Made soft seat modification to this valve.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-9A

Valve Name: Outboard Feedwater CK Valve 62A

Valve Type: 18" Check Valve

Date of Failure: 2/6/80 Failure Rate: $\geq$ 20 CNP SLM

Date of Passing: 4/26/80 Passing Rate: 3.867 SLM

Summary of Valve Repairs:

The soft seat in this valve (installed last outage) was found to be leaking. New soft seats were installed.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-9B

Valve Name: Inboard Feedwater CK Valve 58B

Valve Type: 18" Check Valve

Date of Failure: 2/8/80 Failure Rate: > 20 SLM (CNP)

Date of Passing: 4/26/80 Passing Rate: 0.1 SLM

Summary of Valve Repairs:

Valve seat was found by flueing not to be seating. Made soft seat modification to this valve.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-9B

Valve Name: Outboard Feedwater CK Valve 62B

Valve Type: 18" Check Valve

Date of Failure: 2/6/80 Failure Rate: >20 CNP SLM

Date of Passing: 4/26/80 Passing Rate: 0.733 SLM

Summary of Valve Repairs:

The soft seat in this valve (installed last outage) was found to be leaking. New soft seats were installed.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-205

Valve Name: Torus Purge Inlet AO 5036 A&B

Valve Type: 20" Butterfly Valves

Date of Failure: 1/18/80 Failure Rate: ≥20 SLM

Date of Passing: 4/1/80 Passing Rate: 1.2 SLM

Summary of Valve Repairs:

The metal flapper was found not to be seating on the rubber seating surface. The shims where adjusted on the rubber seating material in order to obtain satisfactory seating.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-227A

Valve Name: Vacuum Breaker AO 5040A

Valve Type: 20" Butterfly Valve

Date of Failure: 1/8/80 Failure Rate: > 20 CNP SLM

Date of Passing: 3/17/80 Passing Rate: 0.1 * SLM

* Minimum sensitivity of instrumentation.

Summary of Valve Repairs:

The metal flapper was found not to be seating on the rubber seating surface. The shims were adjusted on the rubber seating material in order to obtain satisfactory seating.

LOCAL LEAK RATE TESTING

VALVE FAILURE REPORT

Penetration Number: X-227

Valve Name: Torus Purge Exhaust AO 5042 A&B

Valve Type: 20" Butterfly Valves

Date of Failure: 1/8/80 Failure Rate: $\geq$ 20 SLM CNP

Date of Passing: 3/17/80 Passing Rate: 7.0 SLM

Summary of Valve Repairs:

The metal flapper was found not to be seating on the rubber seating surface. The shims were adjusted on the rubber seating material in order to obtain satisfactory seating.

1980 Post-Ilrt Testing Results

Penetration No.	Test Type	Equipment/Valves Tested	Post-Ilrt Leakage (SLM)	Remarks
X-22 Inst. Air to Drywell	C	3" Check Valve	4.0	No repairs were conducted
X-22 Inst. Air To Drywell	C	AO-4356	4.0	No repairs were conducted
X-26 Drywell Makeup Gas	C	AO-5033A	0.1 *	No repairs were conducted improper Ilrt valve lineup
X-46F Oxygen Analyzer	C	CV-5065-26	0.1 *	No repairs were conducted
X-46F Oxygen Analyzer	C	CV-5065-24	0.4	No repairs were conducted
X-205 Torus Makeup Gas	C	AO-5033C	0.2	No repairs were conducted improper Ilrt valve lineup
X-225 RCIC Steam	B	Double Gasketed	North 0.1* Pre-Repair 0.1* Post-Repair South 6.63 Pre-Repair 0.1* Post-Repair	'O' Rings were replaced for Ilrt
X-227 Oxygen Analyzer	C	CV-5065-23	8.0	No repairs were conducted

* This valve is the leak rate monitor minimum sensitivity based on a 0.5% of full scale error for low range readings from the calibration records.

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
8 Gibbs Manways	B	Double Gasketed Seals	0.1 (combined)	NA	
Drywell Head	B	Double Gasketed Seals	1.1	NA	
X-1 Equipment Hatch	B	Double Gasketed Seals	0.1	NA	
X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.1	0.1	Seals replaced after outage
X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	0.725	0.1	Seals replaced after outage
X-2 Airlock Integrated Test	B	Double Gasketed Seals	4.05	NA	Conducted Post-ILRT
X-4 Drywell Head Access Hatch	B	Double Gasketed Seals	0.1	NA	
X-6 CRD Drive Removal Hatch	B	Double Gasketed Seals	0.1	NA	
X-35A TIP Drive Flange (Inner and Outer)	B	Double Gasketed Seals	0.1 (combined)	0.1 (combined)	TIP tubing replaced
X-35B TIP Drive Flange (Inner and Outer)	B	Double Gasketed Seals	0.1 (combined)	0.1 (combined)	TIP tubing replaced
X-35C TIP Drive Flange (Inner and Outer)	B	Double Gasketed Seals	0.1 (combined)	0.1 (combined)	TIP tubing replaced

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-35 TIP Drive Flange (Inner and Outer)	B	Double Gasketed Seals	0.1 (combined)	0.1 (combined)	TIP Tubing Replaced
X-35E TIP Drive Flange (Inner and Outer)	B	Double Gasketed Seals	0.13	NA	
X-43 Drywell Test Connection	B	Double Gasketed Seals	0.3	NA	
X-47 Drywell Test Connection	B	Double Gasketed Seals	0.1	NA	
X-200A Torus Access Hatch (East)	B	Double Gasketed Seals	0.1	NA	
X-200B Torus Access Hatch (North)	B	Double Gasketed Seals	0.2	NA	
X-223 HPCI Steam To Torus	B	Double Gasketed Seals	0.1 (combined)	0.1 East 0.1 West	Replaced seals after repair to HPCI exhaust check valve
X-225 RCIC Steam To Torus	B	Double Gasketed Seals	0.1 (combined)	0.1 North 0.1 South	Replaced seals after found leaking during pressurization for ILRT.
X-230 Torus Test Connection	B	Double Gasketed Seals	0.1	NA	

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (S.M)	REMARKS
X-7A Main Steam	B	Bellows	0.1	NA	
X-7B Main Steam	B	Bellows	0.1	NA	
X-7C Main Steam	B	Bellows	0.1	NA	
X-7D Main Steam	B	Bellows	0.15	NA	
X-8 Main Steam Drain	B	Bellows	0.1	NA	
X-9A Feedwater	B	Bellows	0.1	NA	
X-9B Feedwater	B	Bellows	0.1	NA	
X-12 RHR Suction From Recirc	B	Bellows	0.1	NA	
X-14 Clean-up Supply	B	Bellows	0.1	NA	
X-16A Core Spray	B	Bellows	0.1	NA	
X-16B Core Spray	B	Bellows	0.1	NA	
X-17 Rx. Vessel Head Spray	B	Bellows	0.1	NA	
X-51A RHR Return to Recirc.	B	Bellows	0.1	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-51B RHR Return to Recirc.	B	Bellows	0.1	NA	
X-52 HPCI Steam to Turbine	B	Bellows	0.1	NA	
X-53 RCIC Steam to Turbine	B	Bellows	0.1	NA	
X-100A Neutron Monitoring	B	Bellows	0.0	NA	
X-100B Neutron Monitoring	B	Bellows	0.2	NA	
X-100C Neutron Monitoring	B	Bellows	0.0	NA	
X-100D Neutron Monitoring	B	Bellows	0.0	NA	
X-100E Neutron Monitoring	B	Bellows	0.0	NA	
X-101A Electrical	B	Bellows	0.0	NA	
X-101B Electrical	B	Bellows	0.0	NA	
X-101C Electrical	B	Bellows	0.0	NA	
X-102A Electrical	B	Bellows	0.0	NA	
X-102B Electrical	B	Bellows	0.0	NA	
X-103A Electrical	B	Bellows	0.0	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-103B Electrical	B	Bellows	0.0	NA	
X-104A CRD Position	B	Bellows	0.0	NA	
X-104B CRD Position	B	Bellows	0.0	NA	
X-104C CRD Position	B	Bellows	0.0	NA	
X-104D CRD Position	B	Bellows	0.0	NA	
X-104E CRD Position	B	Bellows	0.0	NA	
X-104F CRD Position	B	Bellows	0.0	NA	
X-104G CRD Position	B	Bellows	0.0	NA	
X-104H CRD Position	B	Bellows	0.0	NA	
X-104J CRD Position	B	Bellows	0.0	NA	
X-105A Electrical	B	Bellows	0.0	NA	
X-105B Electrical	B	Bellows	0.0	NA	
X-106B Drywell Humid and Temp.	B	Bellows	0.0	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-201A Vent Line	B	Bellows	0.1	NA	
X-201B Vent Line	B	Bellows	0.1	NA	
X-201C Vent Line	B	Bellows	0.1	NA	
X-201D Vent Line	B	Bellows	0.1	NA	
X-201E Vent Line	B	Bellows	0.1	NA	
X-201F Vent Line	B	Bellows	0.1	NA	
X-201G Vent Line	B	Bellows	0.1	NA	
X-201H Vent Line	B	Bellows	0.1	NA	
X-202A Electrical	B	Bellows	0.1	NA	
X-202B Electrical	B	Bellows	0.1	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-7A Main Steam	C	AO-203-1A	> 20	7.886	Poppet guides weld repaired Seat and poppet overhauled.
X-7A Main Steam	C	AO-203-2A	0.425	NA	
X-7B Main Steam	C	AO-203-1B	0.32	NA	
X-7B Main Steam	C	AO-203-2B	2.063	NA	
X-7C Main Steam	C	AO-203-1C	> 20	7.30	Poppet guides weld repaired Seat and poppet overhauled.
X-7C Main Steam	C	AO-203-2C	1.489	NA	
X-7D Main Steam	C	AO-203-1D	> 20	6.141	Poppet guides weld repaired Seat and poppet overhauled.
X-7D Main Steam	C	AO-203-2D	1.144	NA	
X-8 Main Steam Drain	C	MO-220-1 MO-220-2	2.4 (combined)	0.2 (combined)	Valve replaced during outage.
X-9A Cleanup System Return	C	MO-1201-80	0.2	NA	
X-9A RCIC Pump Discharge	C	MO-1301-48 MO-1301-49 MO-1301-53	0.3 (combined)	NA	

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-9B HPCI Pump Discharge	C	MO-2301-8 MO-2301-9 MO-2301-10	0.1 (combined)	NA	
X-12 RHR Suction from Recirc	C	MO-1001-47 MO-1001-50	0.1 (combined)	NA	
X-14 Cleanup System Inlet	C	MO-1201-2 MO-1201-5	0.1 (combined)	NA	
X-15E Hydrogen Analyzer	C	CV-5065-35	0.1	NA	
X-15E Hydrogen Analyzer	C	CV-5065-31	0.1	NA	
X-15F Hydrogen Analyzer	C	CV-5065-36	0.2	NA	
X-15F Hydrogen Analyzer	C	CV-5065-32	0.2	NA	
X-16A Core Spray to Reactor	C	MO-1400-24A MO-1400-25A	0.1 (combined)	NA	
X-16B Core Spray to Reactor	C	MO-1400-24B MO-1400-25B	0.1 (combined)	NA	
X-17 Reactor Head Spray	C	MO-1001-60 MO-1001-63	0.1 (combined)	NA	
X-18 Drywell Floor Drains	C	AO-7017A AO-7017B	0.1 (combined)	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-19 Drywell Equipment Drains	C	AO-7011A AO-7011B	0.1 (combined)	NA	
X-22 Inst. Air to Drywell	C	3" Check Valve	11.0	5.0	Valve flange gaskets replaced
X-22 Inst. Air to Drywell	C	AO-4356	9.4	3.5	Body to bonnet gasket replaced. Also packing replaced.
X-23 RBCCW Supply	C	6" Check Valve	9.1	NA	
X-24 RBCCW Return	C	MO-4002	0.1	NA	
X-25 Oxygen Analyzer	C	CV-5065-10	0.1	NA	
X-25 Oxygen Analyzer	C	CV-5065-17	0.4	NA	
X-25 Drywell Purge Exhaust	C	AO-5044A AO-5044B	7.1 (combined)	0.1 (combined)	Seating adjusted to improve seating
X-25 Drywell Vent Exhaust	C	AO-5043A AO-5043B	0.1 (combined)	NA	
X-26 Drywell Makeup Gas	C	1" Check Valve	0.15	NA	
X-26 Drywell Makeup Gas	C	AO-5033A	0.1	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-26 Drywell Purge Inlet	C	AO-5033B AO-5035A AO-5035B	0.7 (combined)	NA	
X-29D Oxygen Analyzer	C	CV-5065-12	0.1	NA	
X-29D Oxygen Analyzer	C	CV-5065-19	0.1	NA	
X-29E Hydrogen Analyzer	C	CV-5065-37	0.1	NA	
X-29E Hydrogen Analyzer	C	CV-5065-33	0.1	NA	
X-29F Hydrogen Analyzer	C	CV-5065-38	0.1	NA	
X-29F Hydrogen Analyzer	C	CV-5065-34	0.1	NA	
X-39A Containment Spray	C	MO-1001-23A MO-1001-26A	0.1 (combined)	NA	
X-39B Containment Spray	C	MO-1001-23B MO-1001-26B	0.2 (combined)	NA	
X-41 Recirc Pump B Discharge Header Sample	C	AO-220-44 AO-220-45	0.1 (combined)	NA	
X-42 Standby Liquid Control	C	1101-16	0.1	NA	
X-46A Recirc Pump Seal	C	#2 Inboard Check Valve	0.1	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-46A Recirc Pump Seal	C	Outboard Check Valve	0.2	NA	
X-46B Recirc Pump Seal	C	#2 Inboard Check Valve	0.1	NA	
X-46B Recirc Pump Seal	C	Outboard Check Valve	0.1	NA	
X-46F Oxygen Analyzer	C	CV-5065-26	0.2	NA	
X-46F Oxygen Analyzer	C	CV-5065-24	0.4	NA	
X-50ad Oxygen Analyzer	C	CV-5065-13	.1	NA	
X-50ad Oxygen Analyzer	C	CV-5065-20	.1	NA	
X-51A RHR Vessel Injection	C	MO-1001-28A MO-1001-29A	> 20 (combined)	3.1 (combined)	MO-1001-29A packing replaced
X-51B RHR Vessel Injection	C	MO-1001-28B MO-1001-29B	> 20 (combined)	0.1 (combined)	MO-1001-29B packing replaced
X-52 HPCI Steam To Turbine	C	MO-2301-4 MO-2301-5	0.1 (combined)	NA	
X-53 RCIC Steam to Turbine	C	MO-1301-16 MO-1301-17	0.1 (combined)	0.1 (combined)	MO-1301-16 repaired during outage.
X-9A Feedwater	C	Inboard Check Valve 58A	>20	1.0	Modified valve with soft seat.

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-9A Feedwater	C	Outboard Check Valve 62A	>20	3.867	Installed new soft seat
X-9A CRD Hydraulic	C	Return Line Check Valve	0.966	NA	
X-9B Feedwater	C	Inboard Check Valve 58B	> 20	0.1	Modified valve with soft seat
X-9B Feedwater	C	Outboard Check Valve 62B	> 20	0.733	Installed new soft seat
X-106ab Oxygen Analyzer	C	CV-5065-14	0.1	NA	
X-106ab Oxygen Analyzer	C	CV-5065-21	0.1	NA	
X-205 Torus Makeup Gas	C	1" Check Valve	0.3	NA	
X-205 Torus Makeup Gas	C	AO-5033C	0.2	NA	
X-205 Torus Purge Inlet	C	AO-5036A AO-5036B	> 20 (combined)	1.2 (combined)	Seat adjusted to improve seating.
X-211A RHR To Torus	C	MO-1001-34A MO-1001-36A MO-1001-37A	0.1 (combined)	NA	
X-211B RHR to Torus	C	MO-1001-34B MO-1001-36B MO-1001-37B	0.1 (combined)	NA	

1980 TYPE B AND C DATA SUMMARY

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-227A Torus Vacuum Breakers	C	AO-5040A X-212A	> 20 (combined)	0.1 (combined)	Seat adjusted to improve seating
X-227B Torus Vacuum Breakers	C	AO-5040B X-212B	0.27 (combined)	NA	
X-227 Torus Ex. Valve Bypass	C	AO-5041A AO-5041B	0.27 (combined)	NA	
X-227 Torus Main Exhaust	C	AO-5042A AO-5042B	> 20 (combined)	7.0 (combined)	Seat adjusted to improve seating
X-227 Oxygen Analyzer	C	CV-5065-16	0.1	NA	
X-227 Oxygen Analyzer	C	CV-5065-23	0.2	NA	
X-228C Oxygen Analyzer	C	CV-5065-15	0.1	NA	
X-228C Oxygen Analyzer	C	CV-5065-22	0.1	NA	
X-228J Oxygen Analyzer	C	CV-5065-11	0.1	NA	
X-228J Oxygen Analyzer	C	CV-5065-18	0.1	NA	
X-228K Oxygen Analyzer	C	CV-5065-25	0.1	NA	
X-228K Oxygen Analyzer	C	CV-5065-27	0.1	NA	

PENETRATION NO.	TEST TYPE	EQUIPMENT/VALVES TESTED	PRE-REPAIR LEAKAGE (SLM)	POST REPAIR LEAKAGE (SLM)	REMARKS
X-228E Air to Drywell Vacuum Breakers	C	Check Valve	0.1	NA	
X-228E Air to Drywell Vacuum Breakers	C	CV-5046	0.1	NA	

1979 Test Data Summary

Test Date	Penetration No.	Test Type	Equipment/Valve Tested	Leakage (SLM)	Remarks
3-28-79	X-53 RCIC Steam To Turbine	C	MO-1301-16 MO-1301-17	0.1 (Combined)	
3-28-79	X-200B Torus Access Hatch	B	Double Gasketed Seals	1.0	
3-29-79	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
3-29-79	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	1.926	
5-29-79	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.4815	
5-29-79	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	4.574	
6-17-79	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
6-17-79	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	0.722	
6-17-79	X-200B Torus Access Hatch	B	Double Gasketed Seals	0.1	
7-8- 79	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
7-8-79	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	0.722	
7-17-79	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
7-17-79	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	0.722	
7-30-79	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
7-30-79	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	0.963	
9-7-79	X-2 Airlock Integrated Test	B	Double Gasketed Seals	0.1	

1978 Test Data Summary

Test Date	Penetration No.	Test Type	Equipment/Valve Tested	Leakage (SLM)	Remarks
1-25-78	X-41 Recirc Pump B Discharge Header Sample	C	AO-220-44 AO-220-45	1.0 (Combined)	
2-3-78	X-52 HPCI Steam To Turbine	C	MO-2301-4 MO-2301-5	0.1 (Combined)	
2-4-78	X-53 RCIC Steam To Turbine	C	MO-1301-16 MO-1301-17	0.1 (Combined)	
2-4-78	X-6 CRD Drive Removal Hatch	B	Double Gasketed Seals	0.3	
2-4-78	X-200A Torus Access Hatch	B	Double Gasketed Seals	0.1	
2-6-78	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
2-6-78	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	1.21	
4-29-78	X-7D Main Steam	C	AO-203-1B	.212	
5-5-78	X-53 RCIC Steam To Turbine	C	MO-1301-16 MO-1301-17	.37 (Combined)	
5-5-78	X-1 Equipment Hatch	B	Double Gasketed Seals	0.1	
5-5-78	X-6 CRD Drive Removal Hatch	B	Double Gasketed Seals	0.1	
5-5-78	X-200A Torus Access Hatch	B	Double Gasketed Seals	0.1	
5-5-78	X-200B Torus Access Hatch	B	Double Gasketed Seals	0.1	
5-6-78	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
5-6-78	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	2.17	
10-26-78	X-200A Torus Access Hatch	B	Double Gasketed Seals	0.1	
10-28-78	X-2 Airlock Inner Door Seals	B	Double Gasketed Seals	0.24	
10-28-78	X-2 Airlock Outer Door Seals	B	Double Gasketed Seals	0.24	
11-22-78	X-2 Airlock Integrated Test	B	Double Gasketed	2.4	

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LOCAL LEAK RATE TEST SUMMARY
FOR
DOUBLE-GASKETED SEALS

PENETRATION NO.	DESCRIPTION				LEAK RATE SLM	DATE TESTED
NA	Gibs Manway @ 0°				0.1 NOTE 1	9/3/77
NA	Gibs Manway @ 45°				0.1 NOTE 1	9/3/77
NA	Gibs Manway @ 90°				0.1 NOTE 1	9/3/77
NA	Gibs Manway @ 135°				0.1 NOTE 1	9/3/77
NA	Gibs Manway @ 180°				0.1 NOTE 1	9/3/77
NA	Gibs Manway @ 225°				0.1 NOTE 1	9/3/77
NA	Gibs Manway @ 270°				0.1 NOTE 1	9/3/77
NA	Gibs Manway @ 315°				0.1 NOTE 1	9/3/77
NA	Drywell Head				0.1	11/13/77
1	Equipment Hatch				0.1	11/13/77
2	Airlock Inner Door Seals	0.1	@ 10 psig	0.24	@ 45 psig	11/16/77
2	Airlock Outer Door Seals	0.1	@ 10 psig	0.24	@ 45 psig	11/16/77
2	Airlock Integrated Test				0.1 NOTE 1	9/22/77
4	Drywell Head Access Hatch				3.95	9/9/77
6	CRD Drive Removal Hatch				0.5	11/13/77
35A	TIP Drive Flange (Inner)				0.1 NOTE 1	11/9/77
35A	TIP Drive Flange (Outer)				0.1 NOTE 1	11/9/77
35B	TIP Drive Flange (Inner)				0.1 NOTE 1	11/10/77
35B	TIP Drive Flange (Outer)				0.1 NOTE 1	11/10/77
35C	TIP Drive Flange (Inner)				0.1 NOTE 1	11/9/77
35C	TIP Drive Flange (Outer)				0.1 NOTE 1	11/9/77
35D	TIP Drive Flange (Inner)				0.1 NOTE 1	11/9/77
35D	TIP Drive Flange (Outer)				0.1	11/9/77
35E	TIP Drive Flange (Inner)				0.1	8/11/77
35E	TIP Drive Flange (Outer)				NOTE 2	8/11/77
43	Drywell Test Connection				0.1 NOTE 1	8/26/77
47	Drywell Test Connection				0.1 NOTE 1	8/23/77
200A	Torus Access Hatch				0.1 NOTE 1	8/23/77
200B	Torus Access Hatch				0.1 NOTE 1	8/26/77
223	HPCI Steam to Torus				0.1 NOTE 1	8/27/77
225	RCIC Steam to Torus				0.1 NOTE 1	9/1/77
230	Torus Test Connection				0.1 NOTE 1	8/27/77

Total Double-Gasketed Seal Leak Rate = 7.63 SLM

NOTES: 1. This value is the Volumetrics monitor minimum sensitivity based on a 0.5% of full scale error for low range readings from the calibration records for monitor S/N 122 dated 6/21/77.
2. Inboard and outboard TIP flanges for penetration 35E were tested together.

Technical Specification acceptance criteria satisfied:

Verified by G L Bolt Date 11/17/77

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LOCAL LEAK RATE TEST SUMMARY
FOR
ALL TESTABLE PENETRATIONS AND ISOLATION VALVES

1. Total Double-Gasketed Seal Leak Rate (from Attachment A) = 7.63 SLM

2. Other Type B Penetrations:

PENETRATION NO.	DESCRIPTION	LEAK RATE SLM	DATE TESTED
7A	Main Steam	0.23	8/7/77
7B	Main Steam	0.2	8/7/77
7C	Main Steam	0.1 NOTE 1	8/8/77
7D	Main Steam	0.3	7/26/77
8	Main Steam Drain	0.1	7/26/77
9A	Feedwater	0.1 NOTE 1	7/26/77
9B	Feedwater	0.1 NOTE 1	7/26/77
12	RHR Suction From Recirc.	0.1	8/9/77
14	Clean-up Supply	0.1 NOTE 1	8/8/77
16A	Core Spray	0.1	8/8/77
16B	Core Spray	0.1 NOTE 1	8/8/77
17	Rx. Vessel Head Spray	0.12	8/9/77
51A	RHR Return to Recirc.	0.1	8/9/77
51B	RHR Return to Recirc.	0.2	7/22/77
52	HPCI Steam to Turb.	0.1	7/22/77
53	RCIC Steam to Turb.	0.37	8/7/77
100A	Neutron Monitoring	0.1 NOTES 1,2	8/11/77
100B	Neutron Monitoring	0.1 NOTES 1,7	8/23/77
100C	Neutron Monitoring	0.17 NOTE 6	8/11/77
100D	Neutron Monitoring	0.8	8/11/77
100E	Neutron Monitoring	0.1 NOTE 3	8/13/77
101A	Electrical	NOTE 2	8/11/77
101B	Electrical	NOTE 2	8/11/77
101C	Electrical	0.1	8/12/77
102A	Electrical	0.23 NOTE 4	8/11/77
102B	Electrical	NOTE 3	8/13/77
103A	Electrical	NOTE 4	8/11/77
103B	Electrical	0.1 NOTES 1,5	8/13/77
104A	CRD Position	NOTE 5	8/13/77
104B	CRD Position	NOTE 3	8/13/77
104C	CRD Position	NOTE 5	8/13/77

PENETRATION NO.	DESCRIPTION	LEAK RATE SLM	DATE TESTED
104D	CRD Position	NOTE 7	6/23/77
104E	CRD Position	NOTE 2	6/11/77
104F	CRD Position	NOTE 7	6/23/77
104G	CRD Position	NOTE 6	6/11/77
104H	CRD Position	NOTE 4	6/11/77
104J	CRD Position	NOTE 6	6/11/77
105A	Electrical	NOTE 3	6/13/77
105B	Electrical	NOTE 6	6/11/77
106B	Drywell Humid and Temp.	NOTE 7	6/23/77
201A	Vent Line	0.6	8/13/77
201B	Vent Line	0.1 NOTE 1	8/24/77
201C	Vent Line	0.2	8/9/77
201D	Vent Line	0.2	8/9/77
201E	Vent Line	0.2	7/25/77
201F	Vent Line	0.1	7/25/77
201G	Vent Line	0.1 NOTE 1	7/25/77
201H	Vent Line	0.1 NOTE 1	8/9/77
202A	Electrical	0.1 NOTE 1	8/25/77
202B	Electrical	0.1 NOTE 1	8/26/77

3. Type C Tests:

PENETRATION NO.	SYSTEM	CONTAINMENT ISOLATION VALVE			LEAK RATE SLM		DATE TESTED
7A	Main Steam	AO-203-1A	0.1 NOTE 1 @23	psig	0.16 @45	psig	10/7/77
		AO-203-2A	0.172 @23	psig	0.27 @45	psig	9/16/77
7B	Main Steam	AO-203-1B	0.1 NOTE 1 @23	psig	0.16 @45	psig	10/15/77
		AO-203-2B	4.15 @23	psig	6.57 @45	psig	10/13/77
7C	Main Steam	AO-203-1C	0.1 NOTE 1 @23	psig	0.16 @45	psig	8/30/77
		AO-203-2C	0.1 NOTE 1 @23	psig	0.16 @45	psig	8/7/77
7D	Main Steam	AO-203-1D	0.1 NOTE 1 @23	psig	0.16 @45	psig	9/22/77
		AO-203-2D	NOTE 8 @23	psig	NOTE 8 @45	psig	9/22/77
8	Main Steam Drain	MO-220-1			0.3		10/17/77
		MO-220-2			NOTE 9		10/17/77

PENETRATION NO.	SYSTEM	CONTAINMENT ISOLATION VALVE	LEAK RATE SLM	DATE TESTED
9A	Cleanup System Return	MO-1201-80	0.18	8/31/77
9A	RCIC Pump Discharge	MO-1301-48, -49, -53	0.5	8/19/77
9B	HPCI Pump Discharge	MO-2301-8, -9, -10	0.2	8/19/77
12	RHR Suction from Recirc	MO-1001-47, -50	1.2	10/12/77
14	Cleanup System Inlet	MO-1201-2, -5	0.1 NOTE 1	8/31/77
15E	Hydrogen Analyzer	CV-5065-35	0.1 NOTE 1	8/30/77
15E	Hydrogen Analyzer	CV-5065-31	0.4	8/30/77
15F	Hydrogen Analyzer	CV-5065-36	0.1 NOTE 1	8/30/77
15F	Hydrogen Analyzer	CV-5065-32	0.1 NOTE 1	8/30/77
16A	Core Spray to Reactor	MO-1400-24A, -25A	4.5	9/7/77
16B	Core Spray to Reactor	MO-1400-24B, -25B	5.5	9/7/77
17	Reactor Head Spray	MO-1001-60,-63	0.1 NOTE 1	9/2/77
18	Drywell Floor Drains	AO-7017A, B	0.1 NOTE 1	9/13/77
19	Drywell Equipment Drains	AO-7011A, B	0.1 NOTE 1	8/24/77
22	Inst. Air to Drywell	Check Valve	0.1 NOTE 1	8/26/77
22	Inst. Air to Drywell	AO-4356	0.1 NOTE 1	8/25/77
23	RBCCW Supply	6" Check Valve	5.3	9/5/77
24	RBCCW Return	MO-4002	7.2	9/8/77
25	Oxygen Analyzer	CV-5065-10	0.9	9/16/77
25	Oxygen Analyzer	CV-5065-17	0.1	9/16/77
25	Drywell Purge Exhaust	AO-5044A, B	0.6	11/13/77
25	Drywell Vent Exhaust	AO-5043A, B	0.4	8/15/77
26	Drywell Makeup Gas	1" Check Valve	0.6 NOTE 10	8/13/77
26	Drywell Makeup Gas	AO-5033A	1.7 NOTE 11	8/13/77
26	Drywell Purge Inlet	AO-5033B,-5035A, B	2.98	8/13/77
29D	Oxygen Analyzer	CV-5065-12	7.6	8/16/77
29D	Oxygen Analyzer	CV-5065-19	2.6	8/16/77
29E	Hydrogen Analyzer	CV-5065-37	0.4	8/15/77
29E	Hydrogen Analyzer	CV-5065-33	0.2	8/15/77
29F	Hydrogen Analyzer	CV-5065-38	0.2	8/15/77
29F	Hydrogen Analyzer	CB-5065-34	0.6	8/15/77
36	CRD Hydraulic	301-95	REMOVED DURING REFUEL III	
39A	Containment Spray	MO-1001-23A,-26A	0.13	8/13/77
39B	Containment Spray	MO-1001-23B,-26B	0.1 NOTE 1	9/22/77
41	Recirc Pump B discharge Header Sample	AO-220-44, -45	0.2 NOTE 12	11/13/77
42	Standby Liquid Control	1101-16	0.1 NOTE 1	9/29/77
46A	Recirc Pump Seal	Inboard Check Valve	1.67	9/1/77
46A	Recirc Pump Seal	Outboard Check Valve	0.1 NOTE 1	9/2/77

PENETRATION NO.	SYSTEM	CONTAINMENT ISOLATION VALVE	LEAK RATE SLM	DATE TESTED
46B	Recirc Pump Seal	Inboard Check Valve	0.17	8/2/77
46B	Recirc Pump Seal	Outboard Check Valve	0.1 NOTE 1	9/2/77
46F	Oxygen Analyzer	CV-5065-26	2.45	8/12/77
46F	Oxygen Analyzer	CV-5065-24	0.5	8/12/77
50ad	Oxygen Analyzer	CV-5065-13	0.24	8/23/77
50ad	Oxygen Analyzer	CV-5065-20	0.23	8/23/77
51A	RHR Vessel Injection	MO-1001-28A,-29A	0.1 NOTE 1	9/13/77
51B	RHR Vessel Injection	MO-1001-28B, -29B	0.1 NOTE 1	10/11/77
52	HPCI Steam to Turbine	MO-2301-4, -5	0.1 NOTE 1	8/16/77
53	RCIC Steam to Turbine	MO-1301-16,-17	0.2	8/16/77
58A	Feedwater	Inboard Check Valve	0.1 NOTE 1	8/18/77
58B	Feedwater	Inboard Check Valve	0.25	8/18/77
62A	Feedwater	Outboard Check Valve	6.27	8/18/77
62B	Feedwater	Outboard Check Valve	3.0	8/16/77
106ab	Oxygen Analyzer	CV-5065-14	0.5	8/12/77
106ab	Oxygen Analyzer	CV-5065-21	0.1	8/12/77
205	Torus Makeup Gas	1" Check Valve	NOTE 10	8/13/77
205	Torus Makeup Gas	AO-5033C	NOTE 11	8/13/77
205	Torus Purge Inlet	AO-5036A, B	1.89	8/29/77
211A	RHR to Torus	MO-1001-34A, -37A	0.1 NOTE 1	9/13/77
211B	RHR to Torus	MO-1001-34B, -37B	0.1 NOTE 1	9/27/77
227A	Torus Vacuum Breakers	AO-5040A, X-212A	0.1 NOTE 1	9/15/77
227B	Torus Vacuum Breakers	AO-5040B, X-212B	0.17	8/10/77
227	Torus Ex. Valve Bypass	AO-5041A, B	0.4	8/12/77
227	Torus Main Exhaust	AO-5042A, B	0.95	11/4/77
227	Oxygen Analyzer	CV-5065-16	0.2	8/12/77
227	Oxygen Analyzer	CV-5065-23	0.3	8/12/77
228C	Oxygen Analyzer	CV-5065-15	5.33	8/25/77
228C	Oxygen Analyzer	CV-5065-22	0.1 NOTE 1	8/25/77
228J	Oxygen Analyzer	CV-5065-11	0.1 NOTE 1	8/26/77
228J	Oxygen Analyzer	CV-5065-18	0.1 NOTE 1	8/27/77
228K	Oxygen Analyzer	CV-5065-25	0.79	8/27/77
228K	Oxygen Analyzer	CV-5065-27	0.1 NOTE 1	8/27/77
228E	Air to Drywell Vacuum Breakers	Check Valve	0.1 NOTE 1	8/24/77
228E	Air to Drywell Vacuum Breakers	CV-5046	1.43	8/24/77

NOTES: SEE NEXT PAGE