REACTOR CONTAINMENT BUILDING
INTEGRATED LEAKAGE RATE TEST
TYPES A, B, AND C

PERIODIC TEST

BOSTON EDISON COMPANY
PILGRIM NUCLEAR POWER STATION
UNIT NO. 1

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REFERENCES

1. 10CFR50 Appendix J, Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors, as amended September 22, 1980

2. Procedure No. 8.7.1.4.1, Revision 1, Primary Containment Integrated Leak Rate Test Preparations, 1984

3. Procedure No. 8.7.1.4.2, Revision 1, Primary Containment Integrated Leak Rate Test, 1984

4. ANSI/ANS 56.8, Containment System Leakage Testing Requirements, February 19, 1981*

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

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

LIST OF ATTACHMENTS

SECTION 1

PURPOSE

This report describes and analyzes the surveillance Types A, B, and C Containment Leakage Rate Test results. Tests were conducted on Boston Edison Company's Pilgrim Nuclear Power Station, Unit No. 1 and reported as required by 10CFR50 Appendix J, Paragraph V.B (Reference 1).

Specifically, these tests were the December 1984 Containment Integrated Leakage Rate Test (ILRT) and the Types B and C tests performed from April 1982 through December 1984.

Stone & Webster Engineering Corporation provided engineering consultation services to BECO during their performance of these tests.

SECTION 2

SUMMARY

2.1 TYPE A SUMMARY

This is the first periodic ILRT successfully performed on initial pressurization at Pilgrim Station. Previous ILRTs at BECO have been successful but only after a significant leakage path was isolated, or after the containment boundary was inadvertently altered, or after the containment was depressurized to repair leaks. Thus, from a licensing aspect, previous ILRTs have not been considered successful even though the leak tightness of the primary containment was eventually demonstrated. The success of the December 1984 test is directly attributable to the excellent outage coordination and cooperation of the applicable management, engineering, maintenance/construction, operations and test groups. The coordination helped BECO overcome the additional problems of a major recirculation piping replacement effort, the incorporation of several plant design changes, as well as the previous problems associated with past ILRT failures. Sections 2.2B and 2.3 detail the specific items BECO implemented to make this ILRT a successful test.

Pressurization of the primary containment was delayed by two separate equipment problems. The first was the failure of the drywell airlock full volume leakage test. The cause of the failure was found when the inner airlock door was reopened for maintenance. Tie wraps, that had been used to support some temporary hoses and cables for some recent drywell work, were found across the O-rings and the door channels. These were removed. A subsequent local leakage rate test confirmed that this had been the cause of the failure. The second equipment problem was the improper loop calibration for the primary containment dewpoint sensors. Its discovery occurred when the dewpoint temperature was found to be higher than the corresponding drybulb temperature. The calibration error was corrected and verified by in-situ comparisons using plant test equipment.

Pressurization for the December ILRT was started at 0430 hours and was completed at 0928 hours on December 12, 1984.

At 0810 hours on 12/12/84 drywell circulation fan VAC 206B1 was running close to its current limit and was manually secured. Subsequent investigation revealed that, although current readings were high, the current limit had not actually been exceeded and the fan might not have had to be secured. At 1000 hours fan VAC 206A tripped on overload. These nonsafety-related fans are not intended to operate at the higher pressure accident condition. The blades had been reset for the ILRT to provide circulation. Loss of these two fans was not deemed significant

to the ILRT because there were still enough fans running to circulate air in the drywell.

During the temperature stabilization period, extensive leakage investigations were conducted. A water leakage path was identified at 1100 hours on December 12, 1984. This was identified as a cracked penetration weld on a high pressure coolant injection (HPCI) turbine exhaust line test connection. The leakage was quantified to be approximately 4.75 gallons per minute. No repairs or adjustments were performed. No other significant leakage paths were discovered.

Temperature stablization was achieved at 1330 hours on December 12, 1984. Initial trend data indicated an acceptable leakage rate even with the identified HPCI test connection leakage path. The 24-hour test period (required by the Pilgrim Technical Specifications) was completed at 1330 hours on December 13, 1984. The Upper Confidence Limit for this reduced pressure test was 0.346244 percent per day as compared to the 0.75 L_t limit of 0.595986 percent per day. A shorter duration test of approximately 6 to 8 hours could easily have been performed with essentially the same results. The mass versus time plot of Attachment 3.3E gives the stability in the mass trend and the corresponding leakage rate results of Attachment 3.3B.

The NRC required the superimposed leakage verification test be performed in lieu of the mass step change verification test. The verification test flow was started at 1352 hours on December 13, 1984. A consistent and stable leakage trend was achieved at 1510 hours and this was used as the start of the verification test. The procedural requirements were satisfied at 1910 hours. It is felt that the last 16 to 18 hours of the 24-hour test provided sufficient confidence in the test results. In this case, the superimposed leakage test did not provide any additional information. A potential 18 hours could have been reduced from the actual duration without substantially changing the test results or the confidence of these results. Depressurization was started at 2015 hours on December 13, 1984 and was completed during the early morning hours of December 14, 1984.

After the ILRT, the HPCI test connection weld was repaired under the BECO ASME XI Repair Program. Because this was a 3/4-inch penetration, the leakage test will be deferred until the next scheduled ILRT in accordance with the guideline of ASME XI IWE-5222.

2.2A LOCAL LEAKAGE RATE TESTS (TYPES B AND C)

The local leakage rate tests (LLRT) of containment isolation valves and primary containment penetrations were conducted as required in accordance with station surveillance procedures since the previous Type A test in February 1982.

In accordance with Appendix J, 10CFR50 paragraph V.B, data for the LLRTs are summarized in Section 4.

2.2B VALVE BETTERMENT PROGRAM

As part of a review of the historical LLRT seat leakage results, BECO instituted a valve betterment program. This program focused on containment isolation valves with a previous history of excessive seat leakage. Certain valves had been scheduled for major overhaul or in fact replacement during this 1984 outage. The following valves represent some of the valve betterment actions performed in 1984.

- Main steam isolation valves (MSIVs) were overhauled. New stems and poppets with extended nose pieces were installed, new valve guides were machined into the valve bodies, and the seats were rewelded, machined, and polished.

- The feedwater isolation check valves hinge pins were replaced and soft seats were replaced.

- Two reactor water cleanup (RWCU) isolation valves were replaced. The old valves had body to bonnet leaks.

- All the purge and vent valves were replaced. The new valves are butterfly valves with metallic seats.

- Several in-line solenoid valves were replaced with control valves in the H_2/O_2 analyzer system.

- Various other valves were reworked as described in Attachment 4C.

2.3 WORK CONTROL PROGRAM

To ensure a sucessful ILRT, a number of measures were taken to control work and maintain the containment boundary during the major maintenance and refueling outage. This included training, review of work performed, and daily monitoring of maintenance activites.

At the commencement of the outage, all test personnel received Appendix J training for the LLRTs and the ILRT. This included a general overview and specific training for Levels I, II, and III test personnel. At the beginning of the ILRT, all contract personnel received briefings on the importance of work control during the ILRT and the precautions to be observed when working about the containment or on matters related to the test. The test group reviewed all maintenance requests and plant design change packages to identify activities that could impact leakage rate testing or the containment boundary. For example, all of the work performed in regard to the H_2/O_2 pipe cracking problem was closely observed by the test group. This included extensive post-work and pre-ILRT walkdowns.

Morning and afternoon daily status meetings were attended by test group personnel. Previous to the ILRT, an additional Plant Testing Meeting was held daily to discuss and plan actions on items relating to the ILRT.

These programs enabled BECO to overcome the previous problems that had caused past ILRTs to be unsuccessful.

SECTION 3

TYPE A TEST

3.1 EDITED LOG OF EVENTS

12/11/84

0110 Drywell sumps pumped.

0330 Drywell inspection completed.

0600 Inner door of drywell closed, strongback on. LLRT of door seals started.

0630 LLRT of drywell door seals acceptable. Integrated airlock test started. Access to reactor building secured.

1100 Integrated airlock test failed at 21 SLM (standard liters per minute). Maintenance activity started.

1500 Contract personnel briefed on ILRT and precautions to be observed when working near containment.

1500 Tie wraps found across inner door seal and removed. Strongback installed.

1509 LLRT on drywell inner door completed with no leakage measured.

1513 Integrated airlock test started.

1800 Integrated airlock test completed. Leakage rate 4.9 SLM.

1810 Pressurization lineup and verification completed.

1900 Inconsistencies found on dewpoint readings. Dewpoint readings higher than dry bulb readings.

2000 Contractor night crew briefed on ILRT and precautions to be observed when working about containment.

2150 Plant computer calibration error discovered on dewcells.

2300 Drywell door opened to obtain psychrometer readings to verify dewcell readings.

12/12/84

0320 Drywell inner door reclosed and strongback installed.

0345 LLRTs on drywell doors commenced.

0420 LLRTs completed on drywell doors.

0430 Pressurization started.

0515 PCV 5030B disabled because it was closing and shutting off air supply to the drywell.

0810 VAC 206B1 fan, which was close to its current limit, secured.

0912 One compressor secured at 37.5 psia.

0928 Second compressor secured at 38.5 psia. Stabilization period started.

1000 VAC 206A tripped on overload.

1100 Water leak detected on a test connection on HPCI exhaust line.

1330 Thermal stabilization criteria satisfied, 24-hour test started.

1755 Leakage in torus room measured. Leakage rate approximately 4.75 gpm.

12/13/84

1330 24-hour ILRT completed.

1352 Commenced superimposed verification test by opening supplemental test connection valves.

1510 Superimposed test started.

1910 Superimposed test completed.

2015 Depressurization started.

12/14/84

0730 Depressurization complete.

1350 Drywell sumps pumped and measured.

3.2 GENERAL TEST DESCRIPTION

3.2.1 Prerequisites

In accordance with Pilgrim Unit No. 1, ILRT Procedure No. 8.7.1.4.1 (Reference 2), the following is a partial listing of the prerequisites completed and documented prior to containment pressurization.

1. General inspection of the accessible interior and exterior surfaces of the containment structure was performed.

2. All equipment and instrumentation that could be damaged or destroyed by test pressure were removed or protected.

3. Valve lineups, including venting and draining as required, were completed.

4. All instrumentation used for the test was calibrated within 6 months of the test.

5. The plant computer was operational and programmed for the ILRT.

6. The official Log of Events Book was established and available prior to the commencement of the test.

7. The reactor building ventilation system, with ductwork modified for the ILRT, was in operation for about 2 days prior to commencement of the test.

8. Site meteorological data was recorded every 8 hours for 3 days prior to the test and hourly during the test.

9. Prior to pressurization the drywell floor and equipment sumps were pumped down and flow integrator readings were recorded.

10. During pressurization and throughout the test, access to the reactor building was minimized and under the control of the Test Director and Health Physics.

11. All high drywell pressure trips were electrically bypassed, tagged, and recorded.

3.2.2 Equipment and Instrumentation

Pressurization of the containment was achieved by using two temporary air compressors. Air was piped through an aftercooler and moisture separator. The total capacity of the pressurization system utilized was rated at 2,400 scfm.

During the test, the necessary variables used to determine containment leakage were continuously monitored. Instrumentation consisted of platinum resistance temperature detectors (RTDs), dewcells for dewpoint indication, and an absolute pressure quartz manometer (Attachment 3.2A).

A calibrated rotometer was used during the superimposed verification test. Except for the rotometer, all test instrumentation readings were inputted to the plant computer for data acquisition and trending.

Prior to the December 1984 ILRT, a review of the containment weight factor calculations was performed. Two minor changes were made. The first change was to correct an error in the calculation of the volume below the vessel (Volume VIII). The second change was to subtract the internal volume of the vessel from normal water level to and including the head.

In February 1985, a correction to the revised December 1984 weight factor calculation added 1,312 cubic feet to the containment free volume, for a total of 263,520 cubic feet. This is less than a 3.1-percent change from the BECO Final Safety Analysis Report figure of 271,000 cubic feet.

To evaluate the effect the new February 1985 weight factors would have on the test results, the hourly data was recalculated. The resulting leakage rate was lower than the leakage rate reported in Attachment 3.3B. The confidence level was slightly higher; however, this is due to using only 25 of the 73 data sets available. Using all of the 73 data sets with the February 1985 weight factors would lower the reported test results. Since this difference was determined to be insignificant, the results of Attachment 3.3B will be reported as the test results. The February 1985 weight factors will be used on all future Type A tests.

3.2.3 Data Acquisition System

The Pilgrim Nuclear Power Station, Unit No. 1 ILRT used a General Electric PAC 4000 to scan, log, and perform data reduction on the test data received from the containment instrumentation.

Instantaneous values of the ILRT instruments were recorded every 2 minutes. The volume weighted absolute drybulb temperature and the volume weighted vapor pressure were calculated every 10 minutes. These calculations were from the latest instantaneous values of the drybulb and dewpoint temperatures.

3.2.4 Data Resolution System

After the appropriate data had been acquired using the plant computer system, the results were manually inputted to a dedicated computer system for leakage rate calculations using the absolute method of mass point analysis. The results presented in this report were run on a Stone & Webster HP-9826 computer.

The absolute method of mass point analysis consists of calculating air masses within the primary containment over a minimum of 24 hours using pressure, temperature, and dewpoint observations made during the ILRT. The masses are computed using the Ideal Gas Law as follows:

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

where:

M = air mass, lbm
P = total pressure, psia
Pv = average vapor pressure, psia
R = 53.35 ft-lbf/lbm°R (for air)
T = average containment temperature, °R
V = containment free volume, 262,208 ft^3

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

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

where:

A = the slope of the least-squares curve

B = the y-intercept

The sign convention is such that an outward leak is positive and the units are in percent/day. The air mass is computed separately, and the result is correlated as a function of time by means of a least-squares curve fit of the form:

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

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

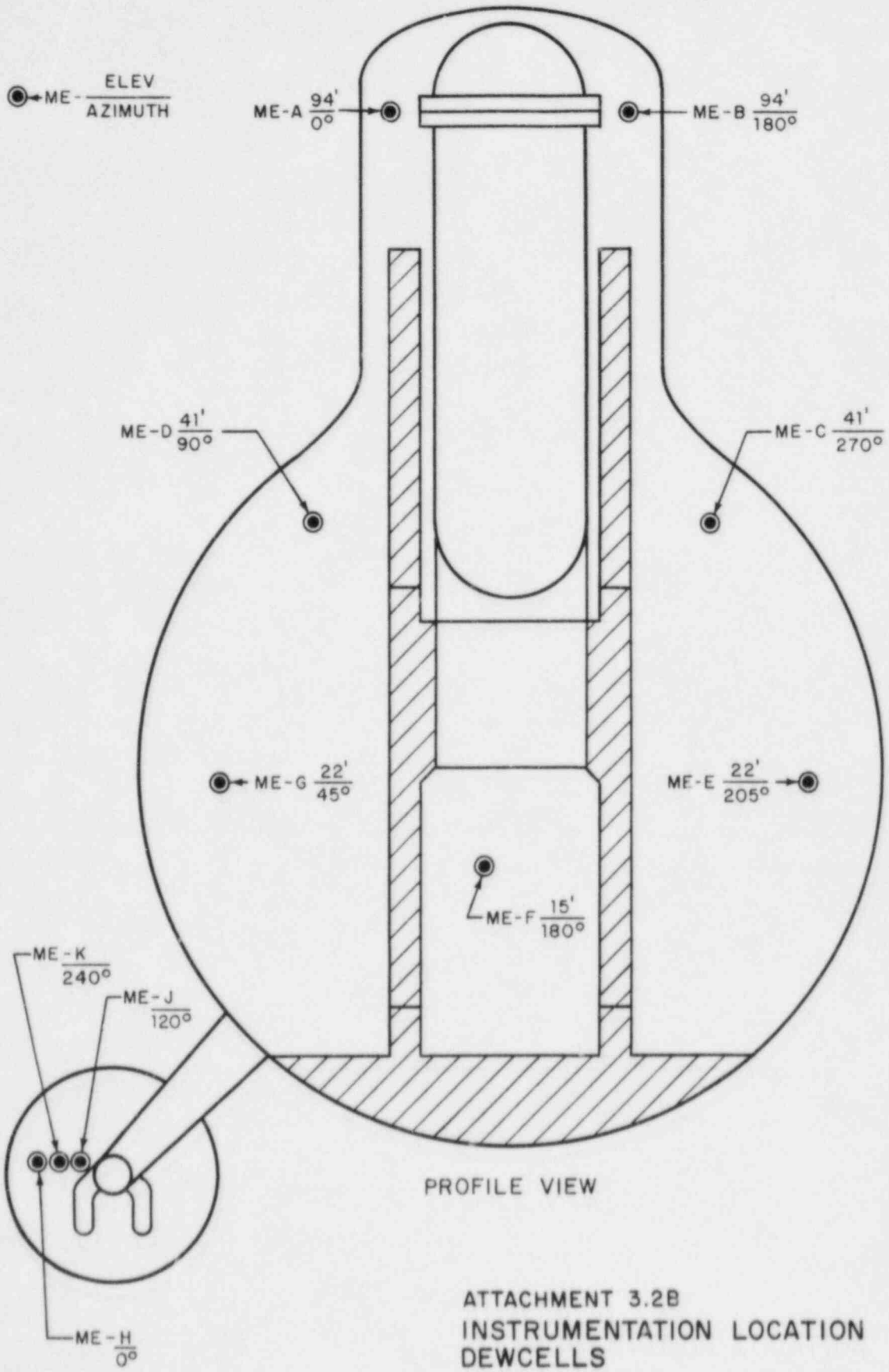
A 95 percent confidence interval is calculated using a students T distribution. The sum of the leakage rate and the 95 percent confidence interval is the upper confidence limit (UCL). The

measured leakage rate may be described as 95 percent accurate to within the value of the UCL.

ATTACHMENT 3.2A

INSTRUMENTATION

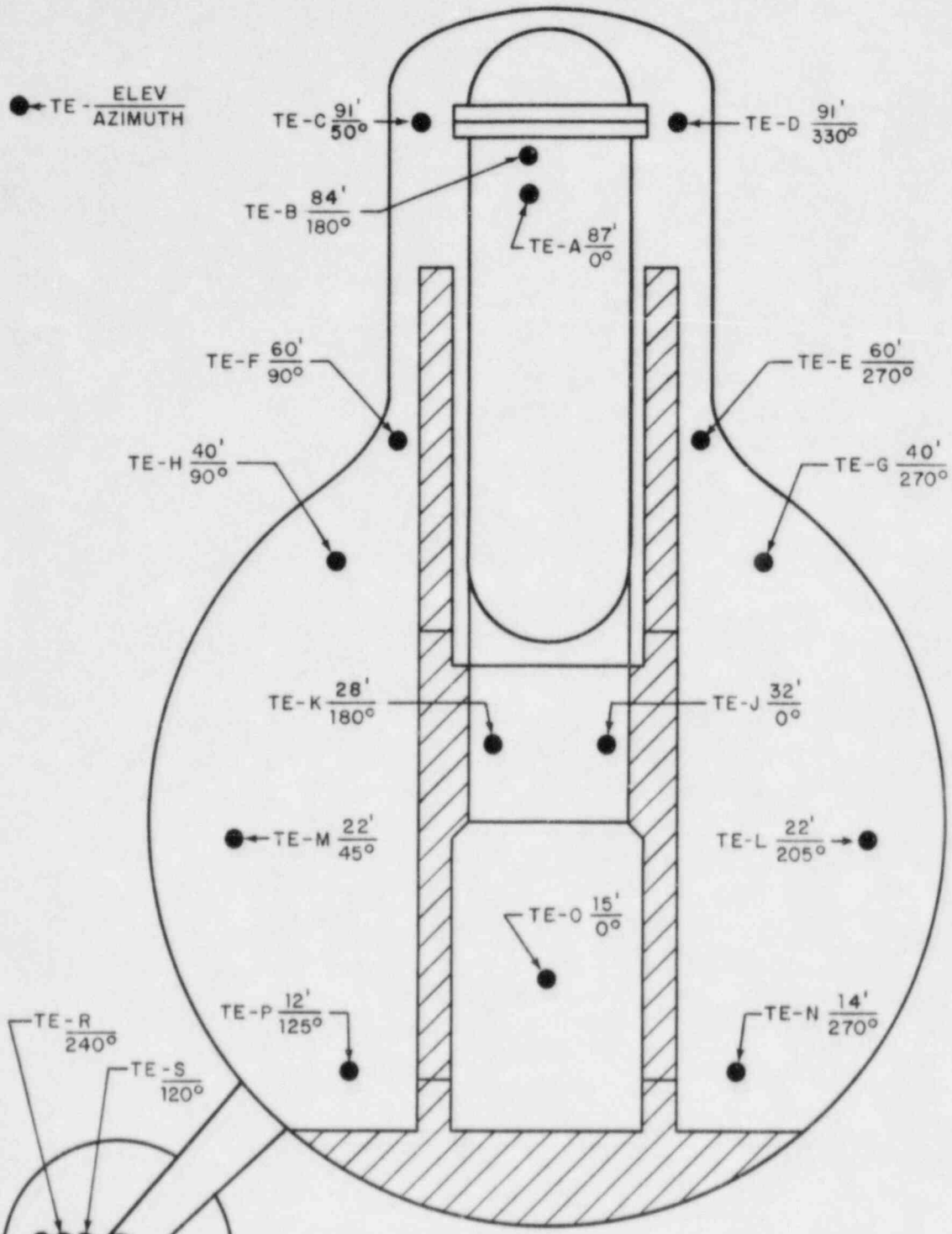
Instrument ID Numbers	Weight Factor	Zone	Range (°F)	Computer Point ID	Accuracy
TE-A	0.014751	I	60-120	M011	±0.1°F
TE-B	0.014752	I	60-120	M012	±0.1°F
TE-C	0.006657	II	60-120	M013	±0.1°F
TE-D	0.006657	II	60-120	M014	±0.1°F
TE-E	0.02605	III	60-120	M015	±0.1°F
TE-F	0.02605	III	60-120	M016	±0.1°F
TE-G	0.070051	IV	60-120	M017	±0.1°F
TE-H	0.070075	IV	60-120	M050	±0.1°F
TE-J	0.005356	VIII	60-120	M051	±0.1°F
TE-K	0.005356	VIII	60-120	M052	±0.1°F
TE-L	0.071851	V	60-120	M053	±0.1°F
TE-M	0.071852	V	60-120	M054	±0.1°F
TE-N	0.056749	VI	60-120	M055	±0.1°F
TE-O	0.020346	VII	60-120	M056	±0.1°F
TE-P	0.056749	VI	60-120	M057	±0.1°F
TE-Q	0.158907	IX	60-120	M018	±0.1°F
TE-R	0.158907	IX	60-120	M019	±0.1°F
TE-S	0.158907	IX	60-120	M020	±0.1°F
ME-A	0.021408	I, II	0-150	M021	±0.1°F
ME-B	0.021409	I, II	0-150	M022	±0.1°F
ME-C	0.096101	III, IV	0-150	M023	±0.1°F
ME-D	0.096101	III, IV	0-150	M024	±0.1°F
ME-E	0.128600	V, VI	0-150	M065	±0.1°F
ME-F	0.128601	VII, VIII	0-150	M066	±0.1°F
ME-G	0.031058	V, VI	0-150	M067	±0.1°F
ME-H	0.158907	IX	0-150	M068	±0.1°F
ME-J	0.158907	IX	0-150	M069	±0.1°F
ME-K	0.158907	IX	0-150	M070	±0.1°F
TI-1	N/A	N/A	0-100 psia	C041	±0.015 psia



ATTACHMENT 3.2B

INSTRUMENTATION LOCATION
DEWCELLS

PILGRIM NUCLEAR POWER STATION - UNIT 1
INTEGRATED LEAKAGE RATE TEST



PROFILE VIEW

ATTACHMENT 3.2C

INSTRUMENTATION LOCATION
RESISTANCE TEMPERATURE
DETECTORS (RTD)

PILGRIM NUCLEAR POWER STATION - UNIT 1
INTEGRATED LEAKAGE RATE TEST

3.3 TEST RESULTS

3.3.1 Presentation of Test Results

The December 1984 ILRT test data are based on a 24-hour period starting at 1330 hours on December 12, 1984. The leakage rate analysis used Boston Edison Company's ILRT program run on an HP-85. The test results in this report were run on a Stone & Webster HP-9826 computer. The reduced input data and mass point analysis are contained in Attachments 3.3A through 3.3D. Graphs of the mass point data and the leakage rate are contained in Attachments 3.3E and 3.3F.

The test instrumentation was verified by the superimposed leakage test. The mass point analysis test results satisfied the procedural acceptance criteria.

3.3.2 ILRT Results

The ILRT was conducted in accordance with Boston Edison Company's Procedure No. 8.7.1.4.2 (Reference 3). The ILRT results and the superimposed leakage test are as follows:

1. ILRT Mass Point Analysis Results

Item	% Per Day
Leakage Rate	0.342039
Confidence Level	0.004205
Type C Penalty	0.025703
Sump Water Inventory	0.00365
TOTAL	0.375597

2. Superimposed Leakage Results

Calculate superimposed leakage

$$L_o = L_I \sqrt{\frac{P_m}{P_c} \times \frac{T_c}{T_m}}$$

where:

P = pressure

T = temperature

c = calculation condition

m = test condition

$$L_o = 4.20 \sqrt{\frac{(23.20+14.7)\ (73.2+459.67)}{(45+14.7)\ (76.92+459.67)}}$$

L_o = 3.33 scfm

Convert L_o to percent per day

L_o = 0.712956 percent per day

The superimposed leakage rate test is acceptable if L falls within the following range:

$$(L_o + L_{am} - 0.25L_a) <= L_c <= (L_o + L_{am} + 0.25L_a)$$

where:

L_c = composite leakage rate calculated during the verification test

L_o = leakage rate imposed on containment using a flow measuring device

L_a = maximum allowable leakage rate for ILRT

L_{am} = total measured containment leakage rate

Mass Point

(0.712956 + 0.342039-0.198662)< = 0.934165< =

(0.712956 + 0.342039 + 0.198662)

0.856333< = 0.934165< = 1.253657

The superimposed leakage rate test results were acceptable in accordance with Appendix J.

3. Total Increase in Water Inventory

Correction due to RPV water level

+0.5 inch in 24 hr = 41.67 gal/day

Correction due to floor drain

$\frac{160 \text{ gal}}{84.67 \text{ hr}}$ x 24 hr = 45.35 gal/day

Correction due to equipment sump

$\frac{342 \text{ gal}}{84.67 \text{ hr}}$ x 24 hr = 96.94 gal/day

Total converted to percent per day

$$41.67 + 45.35 + 96.94 = 183.96 \text{ gal/day}$$

$$\frac{183.96 \text{ gal/day}}{7.48 \text{ gal/ft}^3} = 24.59 \text{ SCFM}$$

$$\frac{24.59 \text{ SCFM}}{5344.6 \text{ SCFM}} = \frac{X}{0.794648}$$

$$x = 0.00365\%/\text{day}$$

4. Type C penetration leakage to be added since these penetrations were not vented and drained

   The leakages assigned are the Type C recorded minimum pathway analysis.

Pen No.	Leakage (SLM)
9A	0.1
9B	0.1
14	3.0
46A	0.1
46B	0.1
Total	3.4 SLM

$$\frac{3.4 \text{ SLM}}{28.32 \text{ SLM/SCFM}} = 0.12 \text{ SCFM}$$

$$\frac{0.12 \text{ SCFM}}{3.71 \text{ SCFM}} = \frac{X}{0.794648}$$

$$X = 0.025703$$

ATTACHMENT 3.3A

CONTAINMENT INTEGRATED LEAKAGE RATE TEST
(from 1330 hours on 12/12/84 to 1330 hours on 12/13/84)

INPUT VARIABLES

Set	Time (hr)	Temperature (°F)	Moisture (°F)	Pressure (psia)
1	0.000	66.35	59.550	38.261
2	0.333	66.28	59.370	38.255
3	0.667	66.14	59.340	38.247
4	1.000	66.08	59.210	38.241
5	1.333	65.98	59.250	38.233
6	1.667	65.97	59.140	38.225
7	2.000	65.93	59.270	38.219
8	2.333	65.85	59.070	38.213
9	2.667	65.86	59.140	38.207
10	3.000	65.86	59.070	38.205
11	3.333	65.85	59.120	38.205
12	3.667	65.81	58.960	38.199
13	4.000	65.71	59.100	38.194
14	4.333	65.69	59.210	38.190
15	4.667	65.69	59.170	38.188
16	5.000	65.65	59.170	38.184
17	5.333	65.63	59.180	38.180
18	5.667	65.58	59.020	38.178
19	6.000	65.62	59.080	38.174
20	6.333	65.57	58.850	38.172
21	6.667	65.61	58.990	38.170
22	7.000	65.64	59.030	38.166
23	7.333	65.57	58.940	38.162
24	7.667	65.58	59.180	38.160
25	8.000	65.56	59.170	38.158
26	8.333	65.53	59.270	38.154
27	8.667	65.50	59.010	38.154
28	9.000	65.53	59.030	38.152
29	9.333	65.54	59.110	38.150
30	9.667	65.55	59.160	38.147

Set	Time (hr)	Temperature (°F)	Moisture (°F)	Pressure (psia)
31	10.000	65.51	59.140	38.146
32	10.333	65.50	59.100	38.144
33	10.667	65.50	59.100	38.142
34	11.000	65.53	59.060	38.142
35	11.333	65.50	59.070	38.140
36	11.667	65.51	59.390	38.140
37	12.000	65.57	59.130	38.138
38	12.333	65.56	59.170	38.138
39	12.667	65.57	59.130	38.136
40	13.000	65.50	59.130	38.130
41	13.333	65.45	59.070	38.124
42	13.667	65.38	58.970	38.120
43	14.000	65.38	59.360	38.114
44	14.333	65.37	59.280	38.114
45	14.667	65.39	59.210	38.114
46	15.000	65.36	59.160	38.108
47	15.333	65.36	58.980	38.104
48	15.667	65.30	58.970	38.101
49	16.000	65.31	58.870	38.099
50	16.333	65.39	58.850	38.099
51	16.667	65.35	59.010	38.099
52	17.000	65.33	59.060	38.099
53	17.333	65.39	59.130	38.097
54	17.667	65.41	58.940	38.095
55	18.000	65.37	59.210	38.093
56	18.333	65.37	59.120	38.093
57	18.667	65.40	59.040	38.091
58	19.000	65.40	59.010	38.091
59	19.333	65.45	59.020	38.089
60	19.667	65.44	59.200	38.089
61	20.000	65.45	58.880	38.087
62	20.333	65.46	58.930	38.087
63	20.667	65.47	59.090	38.087
64	21.000	65.47	59.240	38.083
65	21.333	65.48	59.170	38.083
66	21.667	65.51	59.000	38.081

ATTACHMENT 3.3A (Cont)

Set	Time (hr)	Temperature (°F)	Moisture (°F)	Pressure (psia)
67	22.000	65.50	59.330	38.079
68	22.333	65.57	59.220	38.079
69	22.667	65.56	59.220	38.079
70	23.000	65.56	59.290	38.079
71	23.333	65.55	59.340	38.077
72	23.667	65.53	59.330	38.077
73	24.000	65.56	59.280	38.077

ATTACHMENT 3.3B

CONTAINMENT INTEGRATED LEAKAGE RATE TEST
(from 1330 hours on 12/12/84 to 1330 hours on 12/13/84)

ABSOLUTE TEST METHOD, MASS POINT ANALYSIS

Set	Time (hr)	Mass (lbm)	Leakage (%/day)	Confidence (%/day)	Upper Confidence Limit (%/day)
1	0.000	51139.65	0.000000	0.000000	0.000000
2	0.333	51140.56	0.000000	0.000000	0.000000
3	0.667	51143.77	0.289633	0.534732	0.245099
4	1.000	51143.09	0.190253	0.215568	0.025315
5	1.333	51141.56	0.089487	0.172863	0.083376
6	1.667	51133.08	0.122660	0.285564	0.408224
7	2.000	51127.34	0.271937	0.258990	0.530927
8	2.333	51129.43	0.286878	0.186153	0.473031
9	2.667	51119.54	0.367530	0.166049	0.533579
10	3.000	51117.69	0.402802	0.135243	0.538045
11	3.333	51118.06	0.401331	0.108715	0.510047
12	3.667	51115.78	0.397406	0.089441	0.486847
13	4.000	51117.11	0.375786	0.078151	0.453938
14	4.333	51112.35	0.370600	0.066594	0.437194
15	4.667	51110.13	0.365760	0.057493	0.423253
16	5.000	51108.63	0.359104	0.050443	0.409546
17	5.333	51105.07	0.357329	0.044301	0.401630
18	5.667	51109.15	0.339738	0.043029	0.382767
19	6.000	51099.16	0.343999	0.038579	0.382578
20	6.333	51104.06	0.332326	0.036521	0.368846
21	6.667	51095.81	0.334449	0.033004	0.367452
22	7.000	51087.03	0.346736	0.032327	0.379063
23	7.333	51089.52	0.348509	0.029492	0.378001
24	7.667	51082.99	0.355581	0.027869	0.383451
25	8.000	51082.36	0.358624	0.025762	0.384386
26	8.333	51078.69	0.362369	0.024021	0.386391
27	8.667	51084.71	0.355734	0.023148	0.378882
28	9.000	51078.86	0.353879	0.021538	0.375417
29	9.333	51074.24	0.354429	0.020030	0.374458
30	9.667	51068.63	0.357686	0.018941	0.376626

Set	Time (hr)	Mass (lbm)	Leakage (%/day)	Confidence (%/day)	Upper Confidence Limit (%/day)
31	10.000	51071.41	0.355822	0.017790	0.373613
32	10.333	51070.16	0.353261	0.016847	0.370108
33	10.667	51067.47	0.351278	0.015927	0.367205
34	11.000	51065.03	0.349585	0.015066	0.364651
35	11.333	51065.13	0.346434	0.014522	0.360956
36	11.667	51060.32	0.345270	0.013750	0.359020
37	12.000	51054.91	0.346058	0.013018	0.359076
38	12.333	51055.41	0.345047	0.012362	0.357409
39	12.667	51052.22	0.344582	0.011728	0.356310
40	13.000	51050.94	0.343583	0.011176	0.354759
41	13.333	51048.43	0.342757	0.010654	0.353411
42	13.667	51051.04	0.339686	0.010571	0.350258
43	14.000	51038.28	0.341641	0.010251	0.351892
44	14.333	51040.21	0.341482	0.009781	0.351263
45	14.667	51039.11	0.340804	0.009364	0.350168
46	15.000	51034.54	0.341051	0.008955	0.350006
47	15.333	51031.29	0.341574	0.008585	0.350158
48	15.667	51033.20	0.340479	0.008291	0.348770
49	16.000	51030.72	0.339534	0.008002	0.347536
50	16.333	51023.18	0.340394	0.007724	0.348118
51	16.667	51025.17	0.339756	0.007443	0.347200
52	17.000	51026.52	0.338038	0.007345	0.345383
53	17.333	51017.15	0.338559	0.007083	0.345643
54	17.667	51014.78	0.339016	0.006833	0.345849
55	18.000	51012.74	0.339322	0.006589	0.345911
56	18.333	51013.82	0.338674	0.006382	0.345056
57	18.667	51009.17	0.338667	0.006156	0.344823
58	19.000	51009.53	0.337978	0.005979	0.343957
59	19.333	51001.85	0.338614	0.005807	0.344421
60	19.667	51000.67	0.338906	0.005619	0.344525
61	20.000	51000.82	0.338599	0.005441	0.344040
62	20.333	50999.82	0.338140	0.005283	0.343423
63	20.667	50996.38	0.337822	0.005123	0.342945

Set	Time (hr)	Mass (lbm)	Leakage (%/day)	Confidence (%/day)	Upper Confidence Limit (%/day)
64	21.000	50989.19	0.338505	0.005005	0.343510
65	21.333	50989.06	0.338679	0.004853	0.343532
66	21.667	50985.48	0.339062	0.004719	0.343781
67	22.000	50979.81	0.340017	0.004669	0.344685
68	22.333	50974.34	0.341439	0.004734	0.346173
69	22.667	50975.31	0.342148	0.004646	0.346794
70	23.000	50974.47	0.342528	0.004527	0.347056
71	23.333	50972.14	0.342860	0.004410	0.347270
72	23.667	50974.20	0.342442	0.004306	0.346748
73	24.000	50971.89	0.342039	0.004205	0.346244

ATTACHMENT 3.3C

SUPERIMPOSED LEAKAGE RATE TEST
(rrom 1510 hours on 12/13/84 to 1910 hours on 12/13/84)

INPUT VARIABLES

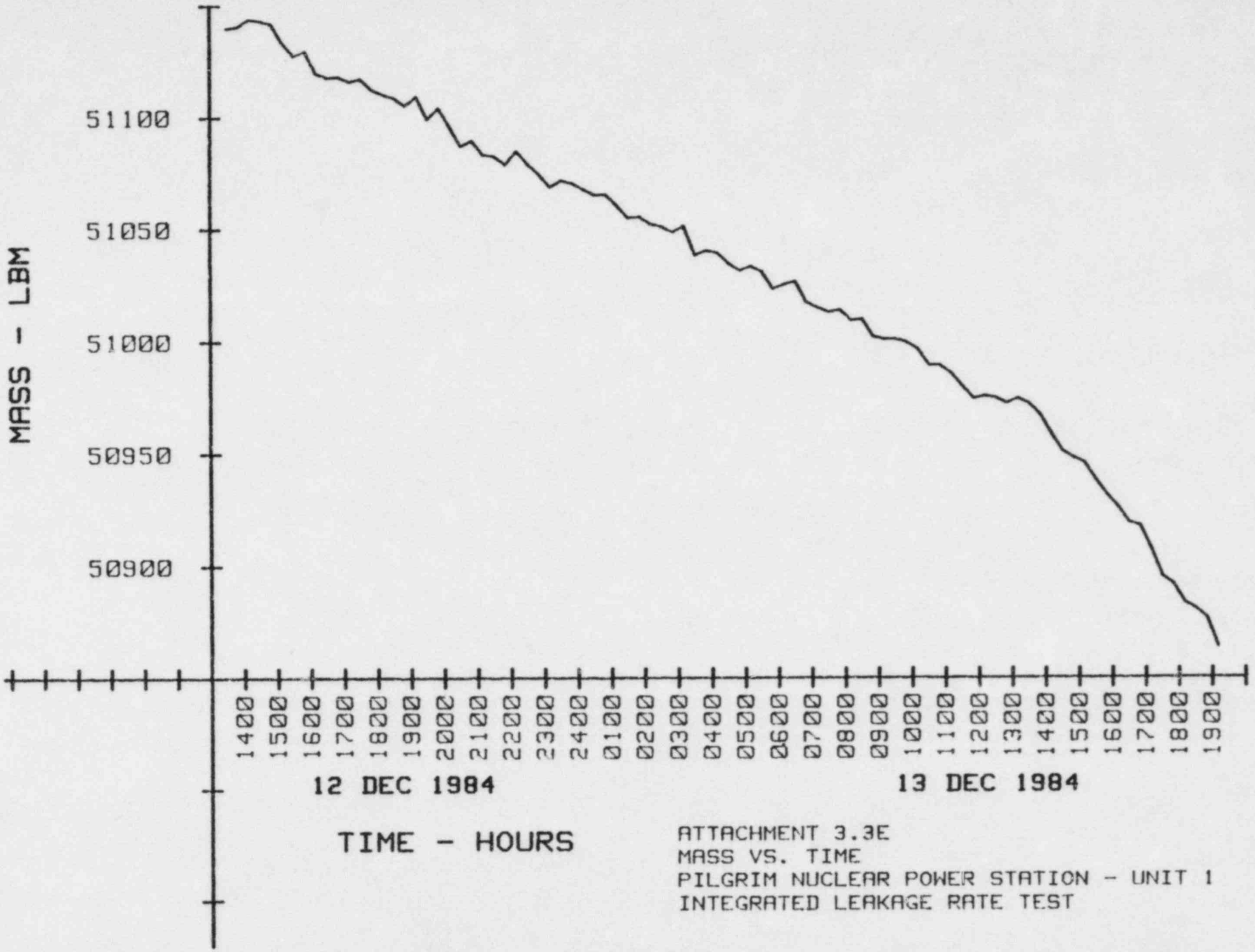
Set	Time (hr)	Absolute Pressure (psia)	Vapor Pressure (psia)	Temperature (°F)	Moisture (°F)
78	25.667	38.049	0.2499	65.44	59.310
79	26.000	38.043	0.2494	65.44	59.260
80	26.333	38.037	0.2499	65.42	59.310
81	26.667	38.031	0.2501	65.39	59.330
82	27.000	38.025	0.2506	65.37	59.390
83	27.333	38.019	0.2500	65.31	59.320
84	27.667	38.017	0.2506	65.38	59.390
85	28.000	38.011	0.2521	65.40	59.560
86	28.333	38.008	0.2518	65.40	59.520
87	28.667	38.003	0.2514	65.42	59.480
88	29.000	38.000	0.2512	65.41	59.460
89	29.333	37.996	0.2502	65.41	59.350
90	29.667	37.990	0.2512	65.44	59.460

ATTACHMENT 3.3D

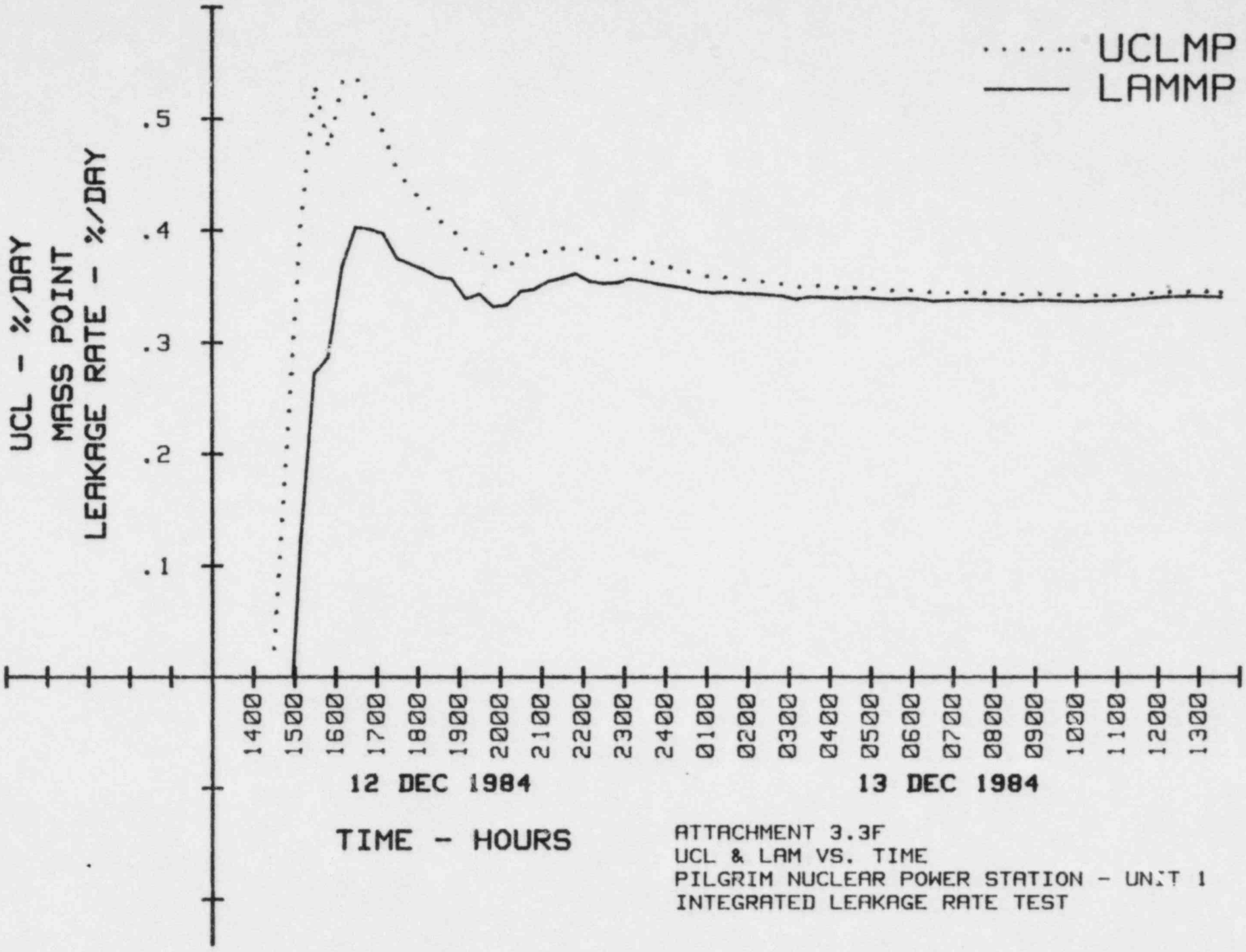
SUPERIMPOSED LEAKAGE RATE TEST
(from 1510 hours on 12/13/84 to 1910 hours on 12/13/84)

ABSOLUTE TEST METHOD, MASS POINT ANALYSIS

Set	Time (hr)	Mass (lbm)	Leakage (%/day)	Confidence (%/day)	Upper Confidence Limit (%/day)
78	0.000	50945.44	0.000000	0.000000	0.000000
79	0.333	50937.95	0.000000	0.000000	0.000000
80	0.667	50931.21	0.005811	0.171830	1.177641
81	1.000	50925.79	0.928587	0.141358	1.069945
82	1.333	50918.92	0.921641	0.066037	0.987678
83	1.667	50917.49	0.816792	0.137533	0.954326
84	2.000	50907.16	0.848211	0.098595	0.946805
85	2.333	50895.08	0.932901	0.119253	1.052154
86	2.667	50891.52	0.943768	0.090607	1.034374
87	3.000	50883.33	0.960978	0.073208	1.034187
88	3.333	50880.50	0.944892	0.061283	1.006175
89	3.667	50876.43	0.921366	0.056111	0.977476
90	4.000	50864.11	0.934165	0.048805	0.982970



ATTACHMENT 3.3E
MASS VS. TIME
PILGRIM NUCLEAR POWER STATION - UNIT 1
INTEGRATED LEAKAGE RATE TEST



ATTACHMENT 3.3F
UCL & LAM VS. TIME
PILGRIM NUCLEAR POWER STATION - UNIT 1
INTEGRATED LEAKAGE RATE TEST

SECTION 4

LOCAL LEAKAGE RATE TESTS (TYPES B AND C)

The LLRT data performed since the February 1982 Type A test is summarized below with details given in this section's attachments.

Attachment 4A - 1982/1983 Type B Test Data
Attachment 4B - 1983/1984 Type B Test Data
Attachment 4C - 1983/1984 Type C Test Data

The combined "as-left" leakage rate for all the valves and penetrations is well below the acceptance criterion of less than $0.6L_a$. The applicable surveillance procedure states the totals.

As indicated in Attachment 4C, four valves were removed prior to performance of "as-found" LLRTs. This outage maintenance activity resulted in no "as-found" values. Previous test results for these four particular valves reveal no evidence that they would have had any significant contribution to the total "as-found" leakage rate.

Under the extended outage maintenance, a valve betterment program was instituted to minimize local leakage rates. Fifteen valves were overhauled including extensive rework on all main steam isolation valves. Thirteen additional valves were replaced. Attachment 4C gives the details.

ATTACHMENT 4A

1982/1983 LOCAL LEAKAGE RATE TEST PENETRATION DATA
TYPE B

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As-Found Leakage/Date (SLM)	As-Left Leakage/Date (SLM)	Remarks
2	Airlock Outer Door	B	Double O-Ring	0.241/10-7-83	0.241/10-7-83	N/A
2	Airlock Inner Door	B	Double O-Ring	0.241/10-7-83	0.241/10-7-83	N/A
2	Airlock Outer Door	B	Double O-Ring	0.241/10-10-83	0.241/10-10-83	N/A
2	Airlock Inner Door	B	Double O-Ring	0.241/10-10-83	0.241/10-10-83	N/A
2	Airlock Inner Door	B	Double O-Ring	0.241/10-10-83	0.241/10-10-83	N/A
2	Airlock Outer Door	B	Double O-Ring	0.241/10-10-83	0.241/10-10-83	N/A
2	Airlock Integrated Test	-	-	1.05/10-4-83	1.05/10-4-83	@ 45 psig
2	Airlock Outer Door	B	Double O-Ring	0.241/8-2-83	0.241/8-2-83	N/A
2	Airlock Inner Door	B	Double O-Ring	0.241/8-2-83	0.241/8-2-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/8-2-83	0.241/8-2-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/8-2-83	0.241/8-2-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/7-29-83	0.241/7-29-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/7-29-83	0.241/7-29-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/7-3-83	0.241/7-3-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/7-3-83	0.241/7-3-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/7-2-83	0.241/7-2-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/7-2-83	0.241/7-2-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/6-27-83	0.241/6-27-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/6-27-83	0.241/6-27-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/6-15-83	0.241/6-15-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/6-15-83	0.241/6-15-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/6-14-83	0.241/6-14-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/6-14-83	0.241/6-14-83	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/6-11-83	0.241/6-11-83	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/6-11-83	0.241/6-11-83	NA
2	Airlock Integrated Test	-	-	1.5/3-18-83	1.5/3-18-83	@ 45 psig
	Airlock Inner Door	B	Double O-Ring	0.241/11-5-82	0.241/11-5-82	NA
	Airlock Outer Door	B	Double O-Ring	0.241/11-5-82	0.241/11-5-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/11-4-82	0.241/11-4-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/11-4-82	0.241/11-4-82	NA

ATTACHMENT 4A (Cont)

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As-Found Leakage/Date (SLM)	As-Left Leakage/Date (SLM)	Remarks
2	Airlock Inner Door	B	Double O-Ring	0.241/11-3-82	0.241/11-3-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/11-3-82	0.241/11-3-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/10-23-82	0.241/10-23-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/10-23-82	0.241/10-23-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/10-23-82	0.241/10-23-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/10-22-82	0.241/10-22-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/10-10-82	0.241/10-10-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/10-10-82	0.241/10-10-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/9-21-82	0.241/9-21-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/9-21-82	0.241/9-21-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/8-17-82	0.241/8-17-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/8-17-82	0.241/8-17-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/8-16-82	0.241/8-16-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/8-16-82	0.241/8-16-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/8-14-82	0.241/8-14-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/8-14-82	0.241/8-14-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/4-18-82	0.241/4-18-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/4-18-82	0.241/4-18-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/4-8-82	0.241/4-8-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/4-8-82	0.241/4-8-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/4-5-82	0.241/4-5-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/4-5-82	0.241/4-5-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/4-3-82	0.241/4-3-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/4-3-82	0.241/4-3-82	NA
2	Airlock Integrated Test	-	-	4.9/9-21-82	4.9/9-21-82	@ 45 psig
2	Airlock Integrated Test	-	-	0.1/4-1-82	0.1/4-1-82	@ 45 psig
2	Airlock Inner Door	B	Double-O-Ring	0.241/3-31-82	0.241/3-31-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/3-31-82	0.241/3-31-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/3-31-82	0.241/3-31-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/3-31-82	0.241/3-31-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/3-28-82	0.241/3-28-82	NA

ATTACHMENT 4A (Cont)

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As-Found Leakage/Date (SLM)	As-Left Leakage/Date (SLM)	Remarks
2	Airlock Outer Door	B	Double O-Ring	0.241/3-28-82	0.241/3-28-82	NA
2	Airlock Inner Door	B	Double O-Ring	0.241/3-25-82	0.241/3-25-82	NA
2	Airlock Outer Door	B	Double O-Ring	0.241/3-25-82	0.241/3-25-82	NA
200-B	Torus Hatch	B	Double O-Ring	0.1/8-16-82	0.1/3-16-82	@ 45 psig
7D	MSIV A0203-2D	B	Valve	0.79/10-14-82	0.79/10-14-82	No leakage on plug @ 23 psig
7D	MSIV A0203-2D Outboard	B	Valve	0.79/10-9-82	0.79/10-9-82	Water/leg on inboard side of A0203-1D @ 23 psig
7D	MSIV A0203-1D/A0203-2D	B	Valve Final Acceptance	3.00/10-22-82	3.00/10-22-82	@ 23 psig
7D	MSIV A0203-1D/A0203-2D	B	Valve Initial Test	150.1/10-10-82	150.1/10-10-82	A0203-1D Failed @ 23 psig

ATTACHMENT 4B

1983/1984 LOCAL LEAKAGE RATE TEST PENETRATION DATA
TYPE B

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As-Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks Notes
NA	Gib Manways @ 0°	B	Double O-Ring	0.1/12-21-83	0.1/12-21-83	(2)
NA	Gib Manways @ 45°	B	Double O-Ring			
NA	Gib Manways @ 90°	B	Double O-Ring			
NA	Gib Manways @ 135°	B	Double O-Ring			
NA	Gib Manways @ 180°	B	Double O-Ring			
NA	Gib Manways @ 225°	B	Double O-Ring			
NA	Gib Manways @ 270°	B	Double O-Ring			
NA	Gib Manways @ 315°	3	Double O-Ring			
NA	Drywell Head	B	Double O-Ring	0.1'/11-28-84	0.1'/11-28-84	NA
1	Equipment Hatch	B	Double O-Ring	0.1'/11-27-84	0.1'/11-27-84	NA
2	Airlock Inner Seal	B	Double O-Ring		0.241/12-12-84	NA
	Airlock Outer Seal	B	Double O-Ring		0.241/12-12-84	NA
	Airlock Integrated				5.0/12-11-84	NA
4	Drywell Head Access Hatch	B	Double O-Ring	0.1'/5-10-84	0.1'/5-10-84	NA
6	CRD Removal Hatch	B	Double O-Ring	0.2/11-26-84	0.2/11-26-84	NA
7A	Main Steam	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
7B	Main Steam	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
7C	Main Steam	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
7D	Main Steam	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
8	Main Steam Drain	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
9A	Feedwater	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
9B	Feedwater	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
12	RHR Suction From Recirculation	B	Bellows	0.4/1-3-84	0.4/1-3-84	NA
14	Cleanup Supply	B	Bellows	0.1'/12-6-83	0.1'/12-6-83	NA
16A	Core Spray	B	Bellows	0.1'/12-6-83	0.1'/12-6-83	NA
16B	Core Spray	B	Bellows	0.1'/12-6-83	0.1'/12-6-83	NA
17	Rx Vessel Head Spray	B	Bellows	0.1'/1-13-84	0.1'/1-13-84	NA
25	Inboard Flange	B	A05044A	0.1'/11-2-84	0.1'/11-2-84	(2)
	Inboard Flange	B	A05044B			
	Outboard Flange	B	A05044B			

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As-Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks Notes
26	Inboard Flange	B	A05035B	0.1'/11-1-84	0.1'/11-1-84	(2)
	Inboard Flange	B	A05035B			
	Outboard Flange	B	A05035A			
35A	Tip Drive Flange (Inner)	B	Double O-Ring	0.1'/12-22-83	0.1'/11-15-84	(2)
	Tip Drive Flange (Outer)	B	Double O-Ring			
35B	Tip Drive Flange (Inner)	B	Double O-Ring	0.1'/12-22-83	0.1'/11-15-84	(2)
	Tip Drive Flange (Outer)	B	Double O-Ring			
35C	Tip Drive Flange (Inner)	B	Double O-Ring	0.1'/12-22-83	0.1'/11-15-84	(2)
	Tip Drive Flange (Outer)	B	Double O-Ring			
35D	Tip Drive Flange (Inner)	B	Double O-Ring	0.1'/12-22-83	0.1'/11-17-84	(2)
	Tip Drive Flange (Outer)	B	Double O-Ring			
35E	Tip Drive Flange (Inner)	B	Double O-Ring	0.1'/12-22-83	0.1'/11-15-84	(2)
	Tip Drive Flange (Outer)	B	Double O-Ring			
43	Drywell Test Connection Flange	B	Double O-Ring	0.1'/2-8-84	0.1'/2-8-84	
47	ILRT Support Connection Flange	B	Double O-Ring	0.1'/3-20-84	0.1'/3-20-84	NA
51A	RHR Return to Recirculation	B	Bellows	0.1'/1-3-84	0.1'/1-3-84	NA
51B	RHR Return to Recirculation	B	Bellows	0.1'/12-5-83	0.1'/12-5-83	NA
52	HPCI Steam to Turbine	B	Bellows	0.1'/12-5-83	0.1'/12-5-83	NA
53	RCIC Steam to Turbine	B	Bellows	0.1'/12-2-83	0.1'/12-2-83	NA
100A	Neutron Monitoring	B	Double O-Ring	0.0'/1-3-84	0.0'/1-3-84	NA
100B	Neutron Monitoring	B	Double O-Ring	0.0'/1-4-84	0.0'/1-4-84	NA
100C	Neutron Monitoring	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
100D	Neutron Monitoring	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
100E	Neutron Monitoring	B	Double O-Ring	0.0'/1-6-84	0.0'/1-6-84	NA
101A	Electrical	B	Double O-Ring	0.0'/1-3-84	0.0'/1-3-84	NA
101B	Electrical	B	Double O-Ring	0.0'/1-4-84	0.0'/1-4-84	NA
101C	Electrical	B	Double O-Ring	0.0'/2-13-84	0.0'/2-13-84	NA
102A	Electrical	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
102B	Electrical	B	Double O-Ring	0.0'/1-6-84	0.0'/1-6-84	NA
103A	Electrical	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
103B	Electrical	B	Double O-Ring	0.0'/1-6-84	0.0'/1-6-84	NA
104A	CRD Position	B	Double O-Ring	0.0'/1-6-84	0.0'/1-6-84	NA
104B	CRD Position	B	Double O-Ring	0.0'/1-6-84	0.0'/1-6-84	NA

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As-Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks Notes
104C	CRD Position	B	Double O-Ring	0.0'/1-6-84	0.0'/1-6-84	NA
104D	CRD Position	B	Double O-Ring	0.0'/1-3-84	0.0'/1-3-84	NA
104E	CRD Position	B	Double O-Ring	0.0'/1-3-84	0.0'/1-3-84	NA
104F	CRD Position	B	Double O-Ring	0.0'/1-3-84	0.0'/1-3-84	NA
104G	CRD Position	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
104H	CRD Position	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
104J	CRD Position	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
105A	Electrical	B	Double O-Ring	0.0'/1-6-84	0.0'/1-6-84	NA
105B	Electrical	B	Double O-Ring	0.0'/12-30-83	0.0'/12-30-83	NA
106B	Drywell Humidity and Temperature	B	Double O-Ring	0.0'/1-3-84	0.0'/1-3-84	NA
200A	Torus Access Hatch (East)	B	Double O-Ring	0.1'/12-3-84	0.1'/12-3-84	NA
200B	Torus Access Hatch (North)	B	Double O-Ring			
201A	Vent Line	B	Double O-Ring	0.1'/12-5-83	0.1'/12-5-83	NA
201B	Vent Line	B	Double O-Ring	0.1'/12-5-83	0.1'/12-5-83	NA
201C	Vent Line	B	Double O-Ring	0.1'/1-3-84	0.1'/1-3-84	NA
201D	Vent Line	B	Double O-Ring	0.1'/1-3-84	0.1'/1-3-84	NA
201E	Vent Line	B	Double O-Ring	0.1'/12-30-83	0.1'/12-30-83	NA
201F	Vent Line	B	Double O-Ring	0.1'/12-30-83	0.1'/12-30-83	NA
201G	Vent Line	B	Double O-Ring	0.1'/12-5-83	0.1'/12-5-83	NA
201H	Vent Line	B	Double O-Ring	0.1'/12-5-83	0.1'/12-5-83	NA
202A	Vent Line	B	Double O-Ring	0.09/1-26-84	0.1/1-26-84	NA
202B	Vent Line	B	Double O-Ring	0.1/1-27-84	0.1/1-27-84	NA
205	Inboard Flange	B	A05036B	0.1'/11-1-84	0.1'/11-1-84	(2)
	Inboard Flange	B	A05036A			
	Outboard Flange	B	A05036A			
223	HPCI Steam to Torus (Inboard Flange)	B	Double O-Ring	-	-	
	HPCI Steam to Torus (Outboard Flange)	B	Double O-Ring			
	2301-74 Inboard Flange	B	Double O-Ring	0.1'/4-11-84	0.1'/4-11-84	(2)
	2301-74 Outboard Flange	B	Double O-Ring			
225	1301-64 Inboard Flange	B	Double O-Ring	0.1'/2-9-84	0.1'/2-9-84	(2)
	1301-64 Outboard Flange	B	Double O-Ring			
	RCIC Steam to Torus (Inboard Flange)	B	Double O-Ring	0.1'/2-16-84	0.1'/11-10-84	(2)
	RCIC Steam to Torus (Outboard Flange)	B	Double O-Ring			

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As-Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks Notes
227	Inboard Flange	B	A05040A	0.1[1]/12-27-83	0.1[1]/12-27-83	(2)
	Outboard Flange	B	A05040A			
	Outboard Flange	B	A05040B			
	Seat Flange	B	X212A			
	Seat Flange	B	X212B			
	Inboard Flange	B	A05042B	0.1[1]/11-1-84	0.1[1]/11-1-84	(2)
	Outboard Flange	B	A05042B	0.1[1]/11-1-84		
	Outboard Flange	B	A05042B	0.1[1]/11-1-84		
230	Torus Test Connection Flange	B	Double O-Ring	0.03/1-26-84	0.1[1]/1-26-84	

NOTES:

1. This value represents the minimum detectable reading of the instrument.
2. This value represents manifolded readings for these tests.
3. Electrical penetrations tested by pressure decay method are exempted from minimum detectable tolerances if the indicated leakage is zero.

ATTACHMENT 4C

1983/1984 LOCAL LEAKAGE RATE TEST PENETRATION DATA
TYPE C

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks (Notes)
7A	Main Steam	C	AO203-1A	1106/1-24-84	0.1'/1-16-84	(3) Extensive rework to all MSIVS
	Main Steam	C	AO203-2A	88.5/1-24-84	0.1'/11-17-84	
7B	Main Steam	C	AO203-1B	115/12-16-83	0.1'/11-16-84	(3)
	Main Steam	C	AO203-2B	18.96/12-16-83	0.1'/11-16-84	
7C	Main Steam	C	AO203-1C	281.8/12-16-83	0.1'/11-17-84	(3)
	Main Steam	C	AO203-2C	0.1'/12-16-83	0.1'/11-17-84	
7D	Main Steam	C	AO203-1D	>20 scfm/12-16-83	0.1'/11-16-84	(3)
	Main Steam	C	AO203-2D	55.3/1-11-84	0.1'/11-16-84	
8	Main Steam Drain	C	MO220-1	0.1/12-15-83	0.2/12-3-84	
		C	MO220-2	-	4.0/12-3-84	
9A	Feedwater	C	58A (Inboard Check)	>20 scfm/2-14-84	0.1/9-2-84	Replaced soft seats & hinge pin on check valves
	Cleanup Return	C	MO1201-80	215/2-23-84	0.1'/11-23-84	
	Feedwater	C	62A (Outboard Check)	>20 scfm/2-8-84	1.1/9-5-84	
	RCIC Pump Discharge	C	MO1301-49	0.1'/2-6-84	0.1'/2-6-84	
9B	HPCI Pump Discharge	C	MO2301-8	0.2/2-7-84	0.2/9-7-84	Replaced soft seats & hinge pin on check valves
	Feedwater	C	58B (Inboard Check)	>20 scfm/2-14-84	0.1'/9-7-84	
	Feedwater	C	62B (Outboard Check)	>20 scfm/2-8-84	0.1'/9-14-84	
12	RHR Suction From Recirculation	C	MO1001-47	0.1'/3-16-84	0.1'/3-16-84	
	RHR Suction From Recirculation	C	MO1001-50	3.5/2-16-84	1.5/11-11-84	
14	Cleanup Inlet	C	MO1201-2	2.0/3-16-84	3.0/11-23-84	
	Cleanup Inlet	C	MO1201-5	2.0/3-16-84	3.0/11-23-84	
15E	H_2/O_2 Analyzer B	C	SV5065-35B	0.1'/8-27-84	0.1'/8-27-84	
	H_2/O_2 Analyzer B	C	SV5065-31B	0.1'/8-27-84	0.1'/8-27-84	
	H_2/O_2 Analyzer B	C	CV5065-31,	0.1'/1-18-84	-	Valves replaced by B valves
			CV5065-35,	0.1'/1-18-84	-	
15F	H_2/O_2 Analyzer B	C	CV5065-32	0.1'/1-18-84	-	Abandoned
	H_2/O_2 Analyzer B	C	CV5065-36	0.1'/1-18-84	-	Abandoned
16A	Core Spray to Rx	C	MO1400-24A	0.1'/1-17-84	0.1'/1-17-84	(2)
	Core Spray to Rx	C	MO1400-25A			

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks (Notes)
16B	Core Spray to Rx	C	MO1400-24B	0.1'/1-10-84	0.1'/1-10-84	
	Core Spray to Rx	C	MO1400-25B	0.1'/1-10-84	0.1'/9-22-84	
17	Rx Head Spray	C	MO1001-60	0.1'/3-15-84	0.1'/12-5-84	
	Rx Head Spray	C	MO1001-63	0.1'/3-15-84	0.1'/12-5-84	
18	Drywell Floor Drain	C	AO7017A	2.1/3-5-84	2.1/3-5-84	
	Drywell Floor Drain	C	AO7017B	0.1'/3-5-84	0.1'/3-5-84	
19	Drywell Equipment Drain	C	AO7011A	3.1/3-5-84	3.1/3-5-84	
	Drywell Equipment Drain	C	AO7011B	12.8/3-5-84	0.1'/11-9-84	
22	Instrument Air to Drywell	C	31-203 (Check)	10/2-27-84	0.7/10-31-84	Valve Betterment
	Instrument Air to Drywell	C	AO4356	22//2-27-84	3.0/10-31-84	Valve Betterment
23	RBCCW Supply	C	30-305 (Check)	0.1'/6-5-84	0.1'/6-5-84	
24	RBCCW Return	C	MO4002	0.1'/6-5-84	0.1'/6-5-84	
25	Drywell Purge Exchange	C	AO5044A,B	4.6/12-17-83	1.5/10-30-84	Valve Betterement
	Drywell Vent Exchange	C	AO5043A,B	0.1/1-13-84	0.4'/1-13-84	(2)
	Post-Accident Purge and Vent	C	SV5082A			
		C	SV5081B	0.1'/1-13-84	0.1'/1-13-84	(2)
	Post-Accident Purge and Vent	C	SV5081A			
		C	SV5082B	0.1/1-13-84	0.1/1-13-84	(2)
		C	CV5065-10	0.1/1-27-84	-	Abandoned
		C	CV5065-17	0.1/1-27-84	-	Abandoned
26	Post-Accident Purge and Vent	C	SV-5086A	0.1'/1-22-84	0.1'/2-22-84	(2)
		C	SV-5085B			
	Post Accident Purge and Vent	C	SV-5085A	0.1'/2-22-84	0.1'/2-22-84	(2)
		C	SV-5086B			
	Drywell Makeup Gas	C	9-301A (Check)	0.1'/2-22-84	0.1'/2-22-84	
	Drywell Makeup Gas	C	AO5033A	1.1/2-22-84	1.1/2-22-84	
	Drywell Purge Inlet	C	AO5033B	9.8/12-17-83	6.2/11-10-84	(2) Valve Betterment
	Drywell Purge Inlet	C	AO5035A,B			
29E	H_2/O_2 Analyzer A	C	SV5065-37A	1.6/8-27-84	1.6/8-27-84	
	H_2/O_2 Analyzer A	C	SV5065-33A	0.1'/8-27-84	0.1'/8-27-84	
	H_2/O_2 Analyzer A	C	CV5065-33	0.1'/1-18-84	-	Valves replaced
	H_2/O_2 Analyzer A	C	CV5065-37	0.1'/1-17-84	-	by A valves

ATTACHMENT 4C (Cont)

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks (Notes)
29F	H_2/O_2 Analyzer A	C	CV5065-34	0.1/1-18-84	-	Abandoned
		C	CV5065-38	0.1/1-17-84	-	Abandoned
32A	C-19 Return to Drywell	C	CV5065-91	0.1'/10-5-84	0.1'/10-5-84	
	C-19 Return to Drywell	C	CV5065-92	0.1'/10-5-84	0.1'/10-5-84	
35A	Tip Ball Valve A	C	45-300A	0.1'/12-16-83	0.1'/11-17-84	
35B	Tip Ball Valve B	C	45-300B	0.1'/12-16-83	0.1'/11-17-84	
35C	Tip Ball Valve C	C	45-300C	0.5/12-16-83	0.5/11-17-84	
35D	Tip Ball Valve D	C	45-300D	0.1/12-16-83	0.1'/11-17-84	
35E	Tip N_2 Supply	C	CV-1 (Check)	0.1'/11-17-84	0.1'/11-17-84	
39A	Containment Spray	C	MO1001-23A,26A	-	0.2/10-13-84	Inoperable - No "as found", lubricated stem
39B	Containment Spray	C	MO1001-23B,26B	0.1'/1-7-84	4.6/12-5-84	
40Aa	Jet Pump Sensing (Pass)	C	SV5065-63	0.1'/8-27-84	0.1'/8-27-84	
40Bb	Jet Pump Sensing (Pass)	C	SV5065-64	0.1'/8-27-84	0.1'/8-27-84	
40Cc	Jet Pump Sensing (Pass)	C	SV5065-85	0.1'/8-28-84	0.1'/8-28-84	
40Dd	Jet Pump Sensing (Pass)	C	SV5065-86	0.1'/8-28-84	0.1'/8-28-84	
41	Recirc Pump B Discharge Sample	C	AO220-44	-	5.2/11-25-84	Inoperable -
	Recirc Pump B Discharge Sample	C	AO220-45	0.1'/2-15-84	0.1'/2-15-84	No "as found"
42	Standby Liquid Control	C	1101-16	0.1'/3-9-84	0.1'/3-8-84	
43	Drywell Test Connection	C	1-inch Globe	0.1'/2-8-84	0.1'/2-8-84	
46A	Recirculation Pump Seal	C	301-208A (F013A)	0.1'/2-14-84	0.1'/11-12-84	
	Recirculation Pump Seal	C	301-208A (F017A)	0.1'/2-14-84	0.1'/11-12-84	
46B	Recirculation Pump Seal	C	301-208B (F013B)	0.1'/2-14-84	0.1'/11-12-84	
	Recirculation Pump Seal	C	301-205B (F017B)	0.1'/2-14-84	0.1'/11-12-84	
46F	H_2/O_2 Analyzer A Return	C	SV5065-26A	0.1'/8-27-84	0.1'/8-27-84	
	H_2/O_2 Analyzer B Return	C	SV5065-24A	0.1'/8-27-84	0.1'/8-27-84	
	H_2/O_2 Analyzer B Return	C	CV5065-24	0.4'/1-18-84	-	Valves replaced
	H_2/O_2 Analyzer A Return	C	CV5065-26	0.3'/1-18-84	-	by A valves
47	Drywell Test Connection	C	P-14A,-14B	0.1/3-2-84	0.1/3-2-84	
	Drywell Test Connection	C	P-13A	0.1/3-2-84	1.6/3-2-84	
	Drywell Test Connection	C	P-13B	0.1'/3-2-84	0.1'/3-2-84	

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks (Notes)
50Ad	H_2/O_2 Analyzer B	C	SV5065-13B	0.1'/8-25-84	0.1'/8-25-84	
	H_2/O_2 Analyzer B	C	SV5065-20B	0.1'/8-25-84	0.1'/8-25-84	
	H_2/O_2 Analyzer B	C	CV5065-13,-20	-	-	Valves replaced by B valves Valves replaced before "as found"
51A	RHR Vessel In	C	M01001-28A	0.1'/3-16-84	0.1'/3-16-84	
	RHR Vessel In	C	M01001-29A	0.1'/3-16-84	0.1'/3-16-84	
51B	RHR Vessel In	C	M01001-28B	1.9/1-7-84	1.9/1-7-84	
	RHR Vessel In	C	M01001-29B	13.73/1-7-84	0.1'/11-29-83	
52	HPCI Steam Turbine	C	M02301-4,-5	0.1'/12-21-83	0.1'/12-21-83	
53	HPCI Steam Turbine	C	M01301-16,-17	0.1'/12-21-83	0.1'/12-21-83	
106Ab	H_2/O_2 Analyzer A	C	SV5065-14A	0.1'/8-27-84	0.1'/8-27-84	
	H_2/O_2 Analyzer A	C	SV5065-21A	0.1'/8-27-84	0.1'/8-27-84	
	H_2/O_2 Analyzer A	C	CV5065-21	-	-	Valves replaced by A valves
	H_2/O_2 Analyzer A	C	CV5065-14	-	-	Valves replaced before "as found"
205	Torus Makeup Gas	C	9-301C (Check)	0.1'/2-22-84	0.1'/2-22-84	(2)
	Post-Accident Purge and Vent	C	SV5087A			
	Post-Accident Purge and Vent	C	SV5088B			
	Torus Makeup Gas	C	A05033C	0.1'/2-22-83	0.1'/2-22-84	
	Torus Makeup Gas	C	A05036A,B	1.2/12-17-84	0.1'/11-8-84	(2)
	Post-Accident Purge and Vent	C	SV5087B	0.1/2-22-84	0.1/2-22-84	(2)
	Post-Accident Purge and Vent	C	SV5088A			
211A	RHR to Torus	C	M01001-34A,37A	0.1'/3-16-84	0.1'/3-16-84	
211B	RHR to Torus	C	M01001-34B,37B	0.1'/1-7-84	0.1'/1-7-84	
227A	Torus Vacuum Breaker	C	A05040A, X212A	0.1'/12-22-83	0.1'/12-22-83	
227B	Torus Vacuum Breaker	C	A05040B, X212B	0.1'/12-22-83	0.1'/12-22-83	
227	Torus Exhaust Bypass	C	A05041A,B	0.7/12-22-83	0.7/12-22-83	(2)
	Torus Main Exhaust	C	A05042A,B	4.8'/12-22-83	0.2/10-30-84	(2)
	Post-Accident Purge and Vent	C	SV5084A			
	Post-Accident Purge and Vent	C	SV5083B	0.7/12-27-83	0.17/12-27-83	(2)

Pen No.	Pen Description	Type Test	Equipment/Valves Tested	As Found Leakage/Date (SLM)	As Left Leakage/Date (SLM)	Remarks (Notes)
	Post-Accident Purge and Vent	C	SV5083A			
	Post-Accident Purge and Vent	C	SV5084B	0.1'/12-27-83	0.1'/12-27-83	(2)
		C	CV5065-16	0.1'/1-27-83	-	Valves
		C	CV5065-23	0.1'/1-27-83	-	Abandoned
228C	H_2/O_2 Analyzer B	C	SV5065-15B	0.1'/8-25-84	0.1'/8-25-84	
	H_2/O_2 Analyzer B	C	SV5065-22B	0.1'/8-25-84	0.1'/8-25-84	
	H_2/O_2 Analyzer B	C	CV5065-15	0.4/1-27-84	-	Valves replaced
	H_2/O_2 Analyzer B	C	CV5065-22	0.1'/1-27-84	-	by B valves
228E	Air to Torus Vacuum Breaker	C	CV5046	0.8/2-29-84	0.8/2-29-84	
	Air to Torus Vacuum Breaker	C	31-225 (Check)	0.1'/2-29-84	0.1'/2-29-84	
228G	Gas Sample Return (Pass)	C	SV5065-77	0.1'/8-24-84	0.1'/8-24-84	
	Gas Sample Return (Pass)	C	SV5065-78	0.1'/8-24-84	0.1'/8-24-84	
228H	Gas Sample Return (Pass)	C	SV5065-71	0.1'/2-9-84	0.1'/8-24-84	
	Gas Sample Return (Pass)	C	SV5065-72	0.1'/2-9-84	0.1'/8-24-84	
228J	H_2/O_2 Analyzer A	C	SV5065-11A	0.1'/8-24-84	0.1'/8-24-84	
	H_2/O_2 Analyzer A	C	SV5065-18A	0.1'/8-24-84	0.1'/8-24-84	
	H_2/O_2 Analyzer A	C	CV5065-11	0.2/1-19-84	-	Valves replaced
	H_2/O_2 Analyzer A	C	CV5065-18	0.1'/1-19-84	-	by A valves
228K	H_2/O_2 Analyzer B Return	C	SV5065-25B	2.1/1-26-84	0.2/8-25-84	
	H_2/O_2 Analyzer B Return	C	SV5065-27B	0.1'/1-19-84	0.2/8-25-84	
	H_2/O_2 Analyzer B Return	C	CV5065-25	2.1/1-26-84	-	Valves replaced
	H_2/O_2 Analyzer B Return	C	CV5065-27	2.1/1-26-84	-	by B valves

NOTES:

1. This represents the minimum detectable reading of the instruments.
2. This value represents valves tested together.
3. Rework on the main steam isolation valves included new poppets with extended nose pieces, machining of new guide area below the seats, new stems, installation of antirotation devices on stem, rewelding of body guides, seats, and polishing of seats.