NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

UNIT 2

REACTOR CONTAINMENT BUILDING

INTEGRATED LEAK RATE TEST

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NORTHERN STATES POWER COMPANY

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UNIT 2

Reactor Containment Building Integrated Leak Rate Test

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1.0 SUMMARY

The periodic Integrated Leak Rate Test (ILRT) of Prairie Island Unit 2 Containment was completed March 27, 1981. The testing program was performed in accordance with Technical Specification 4.4.A which, in turn, references requirements of 10CFR 50, Appendix J and ANSI N45.4-1972. Additionally, ANS N274, Draft 3-July, 1979, was used as a guide.

The test was performed at reduced pressure, P_t, equal to 23 psig. After initial pressurization, the containment was allowed to stabilize for four hours followed by a 24 hour ILRT and a three hour and 40 minute verification test. Test data was collected at 20 minute intervals and entered into redundant computer systems.

For a reduced pressure test, 0.75 L_t as determined during preoperational testing (see Reference 6.1) is 0.13258 wt %/day. The 1981 ILRT on Unit 2 containment yielded a least squares curve fit of 0.0147 wt %/day and a corresponding 95% upper confidence level of 0.0206 wt %/day.

2.0 DESIGN INFORMATION

2.1 Containment Vessel Design

The original design parameters of the Unit 2 Containment Vessel are described in Reference 6.1.

Additionally, the following containment modifications have been made in accordance with TMI requirements:

The Safety Injection lines were re-routed which necessitated changing penetration location in the Shield Building. The containment isolation valves were relocated from the Auxiliary Building to the Shield Building. The containment vessel penetrations remain unaffected. This project was performed according to Prairie Island Design Change 80Y127.

Two electrical penetrations were installed in spare nozzles in the containment vessel. These redundant instrumentation penetrations are designed to accomodate high range radiation monitors and reactor incore thermocouples. All work was performed in accordance with Design Change 80Y116.

2.2 ILRT Instrumentation System

The test instrumentation is described in Reference 6.2.

2.3 ILRT Pressurization System

The pressurization system is as described in Reference 6.4.

2.4 Computer System

The computer system, except for insertion of current instrument calibration correction factors, is as described in Reference 6.2.

3.0 PRE-TEST CONSIDERATIONS

3.1 ILRT Instrumentation

All instrumentation utilized during the test was shipped to vendors with NSP approved Quality Assurance programs. These instruments, all calibrated within six months prior to the test, have calibration certification traceable to the National Bureau of Standards.

Sensor calibration correction factors along with system calibration factors were summed and a composite correction factor was entered in the computer program for each instrument.

The containment fire detection system was modified by temporarily installing 12 photoelectric fire detectors in place of the existing ionization type. This was done to avoid spurrious fire alarms during pressurization. No fire alarms were received during the duration of the test.

Containment pressure was monitored by Control Room personnel by leaving one of the containment pressure signal channels in service. The remaining five channels were defeated by opening the test jack switches in the analog protection racks.

3.2 Venting and Draining Criteria

The following criteria was used to determine the ILRT valve lineup:

a. From 10CFR50 Appendix J:

(1) "Those portions of the fluid systems that are part of the reactor cooling pressure boundary and are open directly to the containment atmosphere under post-accident conditions and become an extension of the boundary of the containment shall be opened or vented to the containment atmosphere prior to and during the test.

(2) "Portions of closed systems inside containment that penetrate containment and rupture as a result of a loss of coolant accident shall be vented to the containment atmosphere.

(3) "All vented systems shall be drained of water or other fluids to the extent necessary to assure exposure of the system containment isolation valves to containment air test pressure and to assure they will be subjected to the post-accident differential pressure.

(4) "Systems that are required to maintain the plant in a safe condition during the test shall be operable in their normal mode, and need not be vented.

(5) "Systems that are normally filled with water and operating under post-accident conditions, such as the containment heat removal system, need not be vented."

b. Other Criteria:

(1) All isolation valves which shut automatically on a safeguards signal, which are shut manually as a part of the post-accident safeguards sequence, or which are normally shut during power operation (except venting lineups) shall be shut during the ILRT.

(2) Lines penetrating containment are to be vented to the outside atmosphere, if they are normally or potentially vented during power operation or if they could be vented after some phase of the safeguards sequence. Normally closed systems outside of the containment shall also be vented unless they are Seismic Class 1.

c. Pressure vessels inside containment vented to containment atmosphere during the ILRT:

(1) RCS via Pressurizer vent
(2) Reactor Coolant Drain Tank
(3) Pressurizer Relief Tank
(4) Power Operated Relief Valves Accumulators (2 trains)
(5) No. 21 & 22 SI Accumulators
(6) No. 21 & 22 Steam Generator Snubber Accumulators

d. Electrical penetration venting

All of the electrical penetrations, including those on the airlocks, were depressurized to 10 $\pm$ 5 psig prior to the ILRT. Any penetration indicating greater than 15 psig would require investigation. During the ILRT, none were observed to be greater than 15 psig.

3.3 Local Leak Rate Testing Program

The local leak rate test program was performed during each refueling outage as required by 10CFR50, Appendix J and Prairie Island Technical Specification 4.4.A. A summary of these results are presented in Appendices A, B & C. The 1981 results reflect the "as left" conditions for the 1981 Unit 2 Type A test. Those local leak rate tests failing to meet acceptance criteria are discussed in Appendix D.

The acceptance criteria for type B, C & H tests are as follows:

a. If the total leakage of all local leakage testing exceeds 60% of L_a, repairs and retests shall be performed to reduce leakage below that value.

b. Total leakage past isolation valves in systems in the Auxiliary Building Special Ventilation Zone (ABSVZ) shall be less than 0.1 wt %/day at P_a.

c. Total leakage past isolation valves in systems exterior to both the ABSVZ and Shield Building shall be less than 0.01 wt %/day at P_a.

d. Airlock leakage shall be less than 236 SCCM for door seals and 409 SCCM for inner volume tests.

3.4 Containment Inspection

A general inspection of the accessible interior and exterior surfaces of the containment and components was performed prior to the ILRT as required by 10CFR50, Appendix J, Section V. There was no evidence found of structural degradation.

Additionally, the inspection revealed no pressurized containers, fire hazards or containment wall growth interferences. There were no wet surfaces exposed to containment atmosphere and the general cleanliness was very good.

The annulus area was also inspected for wall growth interferences; none were found.

4.0 CONDUCT OF ILRT

4.1 Acceptance Criteria of Type A Test

The Leak Rate at the reduced pressure (P_t) shall not exceed the maximum allowable Leak Rate (L_t) as follows:

$$L_t = 0.25\% \left| {}^{L_{tm}}/_{L_{am}} \right| \text{ if } \left| {}^{L_{tm}}/_{L_{am}} \right| \leq 0.7$$

$$L_t = 0.25\% \left({}^{P_t}/_{P_a} \right)^{1/2} \text{ if } \left| L_{tm/L_{am}} \right| > 0.7$$

The test acceptance criterion is that the measured leak rate (L_{tm}) shall be less than 0.75 L_t.

Based upon the preoperation ILRT on Unit 2 in August, 1974,

L_{tm} = 0.0152 %/day, L_{am} = -0.0002 %/day, and

$$L_{tm/L_{am}} = \left| \frac{.0152}{-.0002} \right| = 76$$

Since 76 > 0.7, $L_t = 0.25 \left(\frac{P_t}{P_a} \right)^{1/2} = 0.25 \left(\frac{23}{46} \right) = 0.17678$ %/day

$$0.75\ L_t = 0.75\ (.17678) = 0.13258 \text{ %/day}$$

4.2 Acceptance Criteria for Verification Test

The Verification Test shall be considered acceptable if the measured composite leak rate, L_c, equal to the containment vessel leakage rate, L_{tm}, plus the superimposed leak rate, L_o, is equal within $\pm$ 0.25 L_t, or:

$$L_c = L_{tm} + L_o \pm 0.25\ L_t$$

4.3 ILRT & Verification Test Results and Conclusions

Data was collected at 20 minute intervals and entered into the computer. The least squares leak rate, Ltm, at the final data point after 24 hours of data collection was 0.0147 wt %/day with a corresponding upper 95 percent confidence level of 0.0206 wt %/day. Ltm was 0.08 L_t or 11.1 percent of maximum allowable, 0.75 Lt.

The upper 95 percent confidence level of 0.0206 wt %/day was 0.12 Lt or 16 percent of maximum allowable, 0.75 Lt.

A superimposed leak rate, Lo of 1.2 CFM equal to 0.04931 wt %/day was initiated for the supplemental test. Data points were again collected at 20 minute intervals and the final measured composite leak rate was 0.0501 wt %/day with a corresponding upper 95 percent confidence level of 0.1495 wt %/day.

4.3 Continued

The measured composite leak rate, L_c, equal to Ltm + Lo fell within 0.079 Lt; acceptance band is $\pm$ 0.25 Lt.

The containment atmosphere conditions remained very stable for the duration of the test. The data point exhibiting the maximum dew point variation was 1.004°F about an average of 57.573°F and resulted in a 0.00862 psi vapor correction.

The containment temperature decreased 1.325°F during the ILRT. This decrease was very uniform with respect to time indicating that diurnal changes had no apparent affect on containment temperature.

During the conduct of the ILRT, the containment pressure decreased 0.112 psi over 24 hours.

4.4 Abnormal Conditions During Test

During the pressurization period, one of the dew cells (ME-5) gradually drifted high and finally off scale. The dew point weighting factors were changed according to Prairie Island Procedure SP 2071 (6) and the ME-5 readings were discarded. The dew point indication on ME-5 were monitored periodically during the ILRT and found to occasionally drift on scale only to soon drift off scale again.

Subsequent investigation indicated that a loose connection on the dew cell head may have caused the failure. The instrument will receive a full functional test prior to the next use.

The Figure of Merit (FOM) was calculated to be 0.01306 %/day based on 24 RTD's, 2 pressure instruments, 5 dew cells and a 24 hour test period. See Reference 6.4 for sample calculations.

5.0 SPECIAL TESTING

5.1 Shield Building Testing

Section IV, paragraph B of 10CFR50, Appendix J, "Special Testing Requirements" and Technical Specification 4.4.A.7 require testing of multiple barrier containments. Unit 2 Shield Building is functionally tested at quarterly intervals according to NSP Surveillance Procedure SP 2073. The Shield Building is functionally

5.1 Continued

tested when each redundant train of the special ventilation system is tested to determine if it meets drawdown performance computed for the test condition with 75% of the Shield Building inleakage specified in Technical Specification Figure TS 4.4.1. None of these quarterly tests on Unit 2 Shield Building has failed to meet acceptance criteria due to Shield Building degradation.

5.2 Electrical Penetration Installation Testing

Redundant electrical penetrations were installed at locations A-10 & D-11. These penetrations were installed and tested at 52 psig according to Design Change 80Y116. The nozzle weld and the glass sealed connector modules were included in the test boundary. IEEE 317-1976 restricts leakage to less than 10^{-2} SCCS for field installed electrical penetrations; both of these penetrations had acceptable leakage rates. The leak testing was witnessed by the resident NRC inspector and the Authorized Nuclear Inspector.

5.3 Containment Ventilation Penetrations Testing

Penetrations 25A & B, Containment Purge Exhaust & Supply and Penetrations 42B & 43A, Containment In-Service Purge Supply & Exhaust, were tested between refuelings as indicated as a corrective action in Reportable Occurrence 75-45. A preventive maintenance program was initiated, requiring increased seat replacement frequency.

All of the leak tests performed between refuelings were found acceptable. During the 1978 refueling outage, penetrations 28A and 28B were found unacceptable. Reference Appendix D for details.

5.4 Containment Airlock Volumetric Testing

The Unit 2 Personnel and maintenance airlocks are tested at Pa at six month intervals according to Technical Specification 4.4.A.2. All of these tests since the last Type A test were found acceptable.

6.0 REFERENCES

6.1 Unit #2 Reactor Containment Building Integrated Leak Rate Test, August, 1974

Transmitted by letter dated January 31, 1975, from Mr. L.O. Mayer, NSP, to Mr. A. Giambusso, Directorate of Licensing, USNRC.

6.2 Unit #1 Reactor Containment Building Integrated Leak Rate Test, July, 1973

Transmitted by letter dated October 4, 1973, from Mr. L.O. Mayer, NSP, to Mr. J. F. O'Leary, Directorate of Licensing, USAEC.

6.3 Supplement No. 1 to Unit 1 Reactor Containment Building Integrated Leak Rate Test, July 1973

Transmitted by letter dated June 6, 1974, from Mr. L. O. Mayer, NSP, to Mr. J. F. O'Leary, Directorate of Licensing, USAEC

6.4 Unit #1 Reactor Containment Building Integrated Leak Rate Test, October 1980

Transmitted by letter dated December 22, 1981, from Mr. L. O. Mayer, NSP, to Director, NRR.

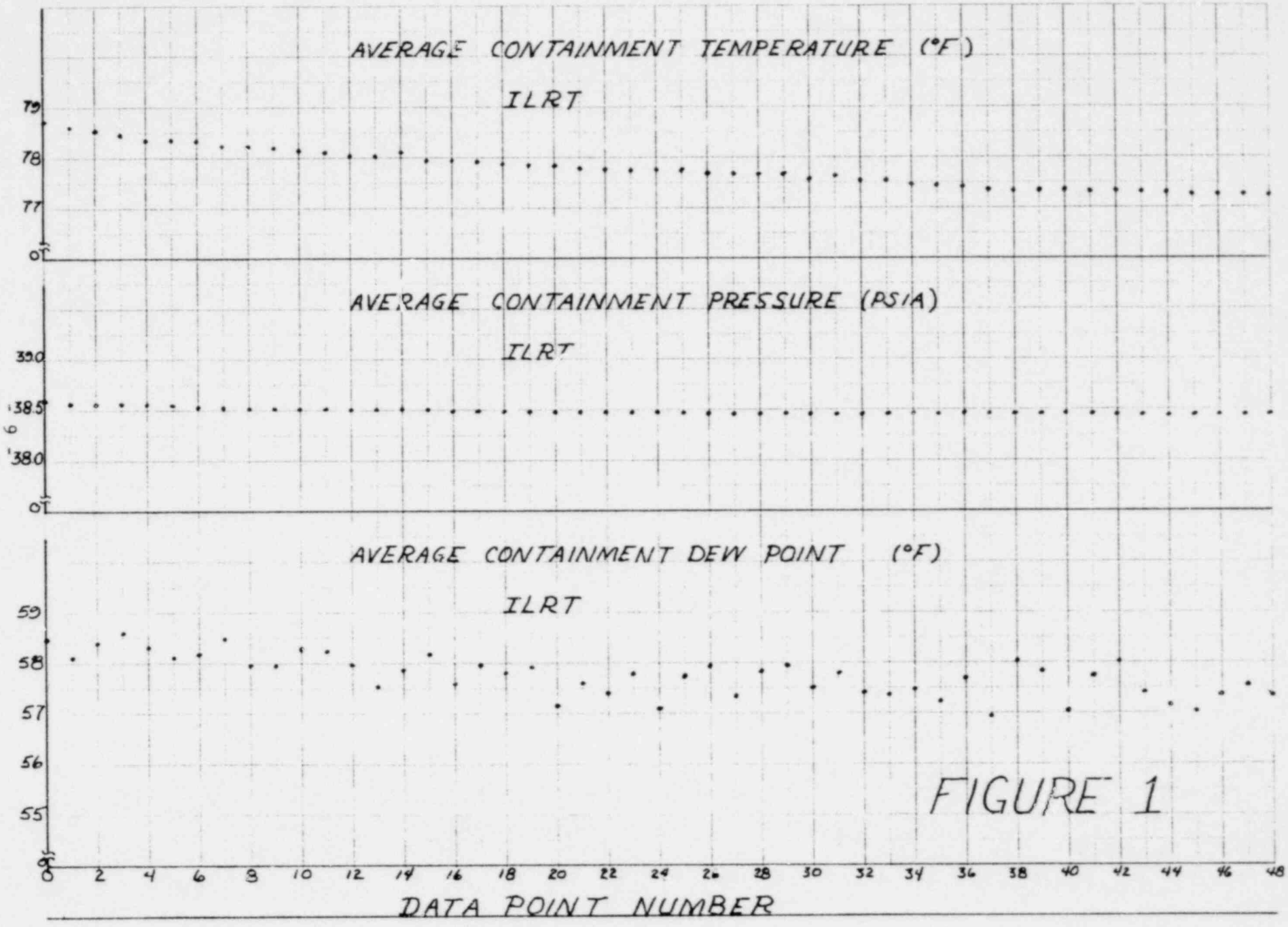
AVERAGE CONTAINMENT TEMPERATURE (°F)
ILRT
79
78
77
0
AVERAGE CONTAINMENT PRESSURE (PSIA)
ILRT
390
385
380
0
AVERAGE CONTAINMENT DEW POINT (°F)
ILRT
59
58
57
56
55
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
DATA POINT NUMBER

FIGURE 1

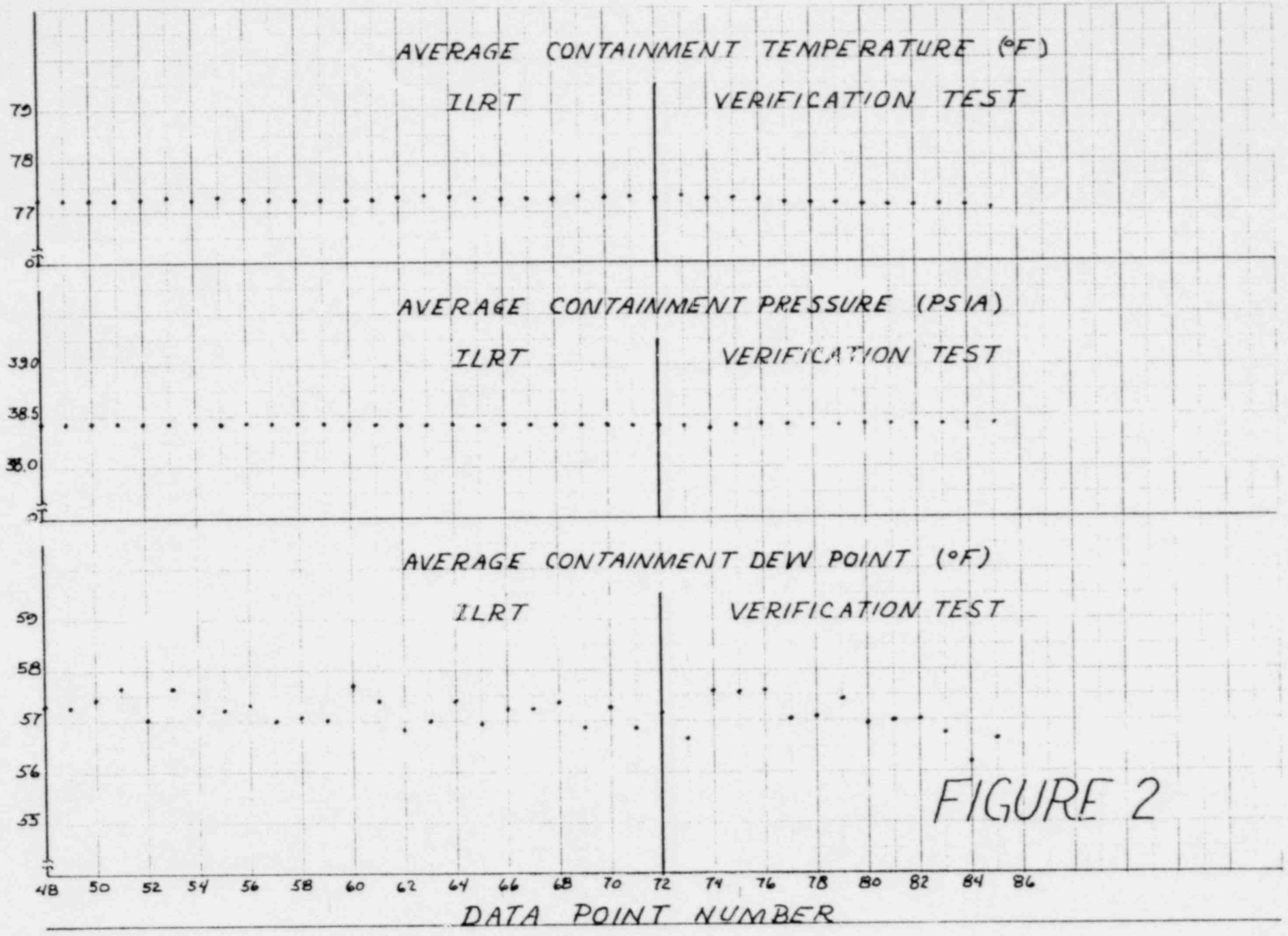
AVERAGE CONTAINMENT TEMPERATURE (°F)
ILRT
VERIFICATION TEST
79
78
77
AVERAGE CONTAINMENT PRESSURE (PSIA)
ILRT
VERIFICATION TEST
39.0
38.5
38.0
AVERAGE CONTAINMENT DEW POINT (°F)
ILRT
VERIFICATION TEST
59
58
57
56
55
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86
DATA POINT NUMBER

FIGURE 2

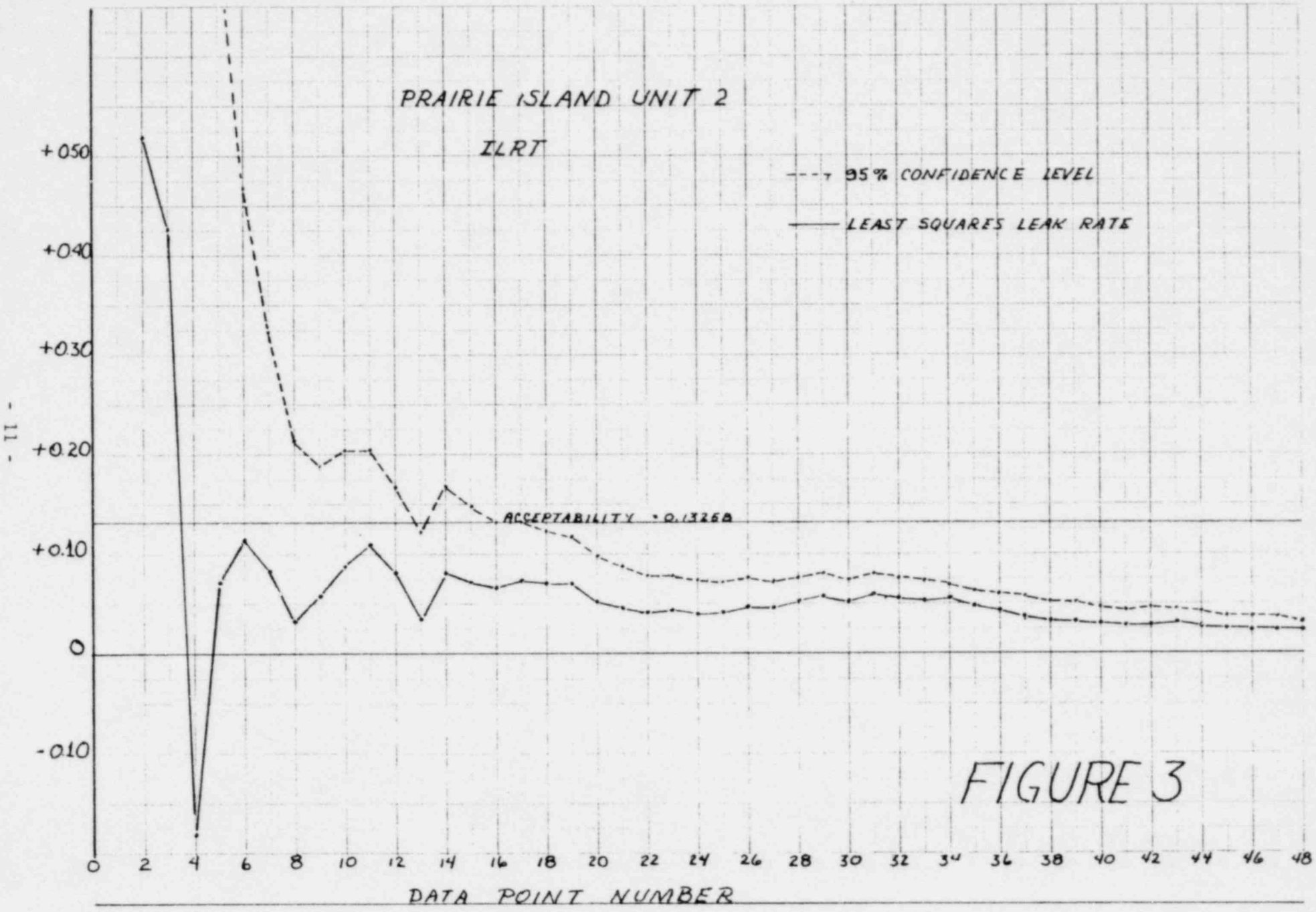
PRAIRIE ISLAND UNIT 2
ILRT
95% CONFIDENCE LEVEL
LEAST SQUARES LEAK RATE
ACCEPTABILITY = 0.1326
+0.50
+0.40
+0.30
+0.20
+0.10
0
-0.10
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
DATA POINT NUMBER

FIGURE 3

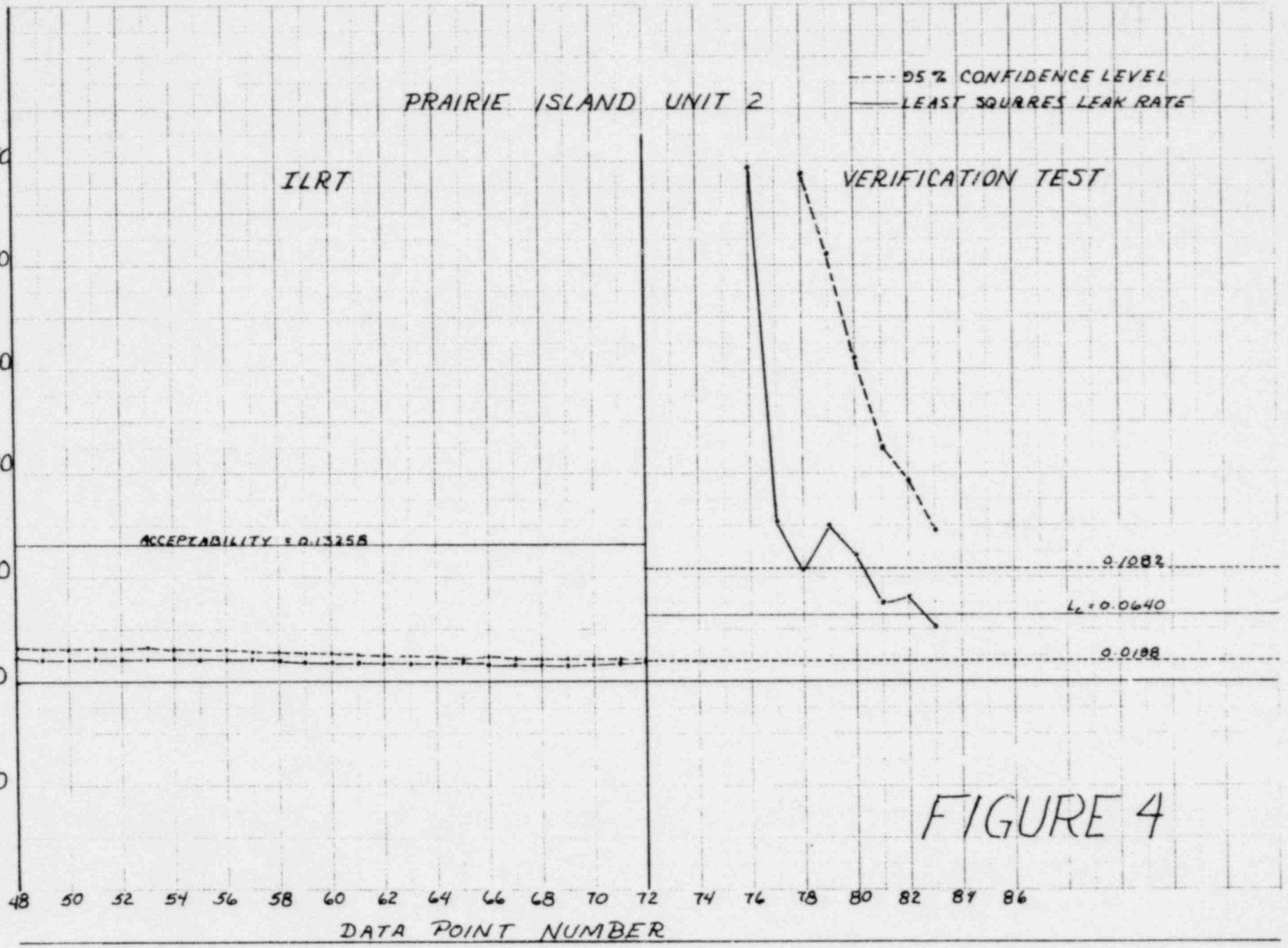
PRAIRIE ISLAND UNIT 2
95% CONFIDENCE LEVEL
LEAST SQUARES LEAK RATE
ILRT
VERIFICATION TEST
+050
+0.40
+0.30
+0.20
+0.10
0
-0.10
ACCEPTABILITY = 0.1325 B
0.1082
L_a = 0.0640
0.0188
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86
DATA POINT NUMBER

FIGURE 4

APPENDIX A

Type B and C test Results - 1978 Refueling Outage

Each penetration is tested according to Surveillance Procedure 2072 and Technical Specification Table 4.4-1. Type H tests are normally performed using air, thus no water/air conversion factor is used. In cases where water is used for the type H test, a water/air conversion ratio of 1.0/68.55 is used.

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max
1	Pressure Relief Tank Sample to GA	C	-	0	0
4	Primary Vent Header	C	-	0	0
5	Reactor Coolant Drain Tank Pump Discharge	C	-	0	0
11	Letdown Line	C	[0] 3500	50	50
12	Charging Line	H	35	125	125
13A	No. 21 RCP Seal Water Supply	H	265	275	275
13B	No. 22 RCP Seal Water Supply	H	0	310	310
14	RCP Seal Water Return	H	0	0	0
15	Pressurizer Stm Sample	C	270	233	270
16	Pressurizer Liquid Smpl	C	[3300] 5300	0	3300
17	Loop B Hot Leg Sample	C	11.4	[0] 10.8	11.4
18	Fuel Transfer Tube	B	0	0	0
19	Service Air	B	0	0	0
[illegible]	Reactor Coolant Drain Tank Gas to GA	C	34	0	34
22	Cntmt Air Sample In	C	14.6	0	14.6
23	Cntmt Air Sample Out	C	0	11.2	11.2

ABSVZ PENETRATIONS

Measured Leakage-SCCM

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max
25A	Cntmt Purge Exhaust	C	-	-	[574] (Note 1) 14.9×10^6 (Note 4)
25B	Cntmt Purge Supply	C	-	-	[435] (Note 1) 20.4×10^6 (Note 4)
26	Cntmt Sump "A" Dischg	C	-	0	0
27 C-1	ILRT Pressure Instrument	B	0	0	0
27 C-2	ILRT Pressure Instrument	B	0	0	0
28A	Cold Leg Safety Injection	H	-	20	20
28B	Hot Leg Safety Injection	H	-	110	110
29A	Internal Containment Spray	H	-	365	365
29B	Internal Containment Spray	H	-	0	0
30A	Containment Sump B Suction Line	H	-	2600	2600
30B	Containment Sump B Suction Line	H	-	76	76
35	Safety Injection & Accumulator Test Line	H	-	-	- (Note 2)
42E	Containment Heating Condensate	B	0	0	0
42E	Containment Heating Vent	B	0	0	0
44	ILRT Pressurization	B	0	185	185
45	Reactor Makeup Water to Pressurizer Relief Tank	C	260	0	260
48	Low Head Safety Injection	H	10	0	10

ABSVZ PENETRATIONS

Pen. No.	Penetration	Test Type	Measured Leakage-SCCM Inside	Outside	As Left Max	
51	Fire Protection Water	B	0	0	0	
52	In-Service Purge Exhaust	C	-	-	0	(Note 1)
53	In-Service Purge Supply	C	-	-	310	(Note 1)
54	Containment Heating Steam	B	0	88	88	
55	Demin Water	B	0	0	0	

EXTERIOR PENETRATIONS

2	Pressurizer Relief Tank N_2 Supply	C	960	0	960	
20	Instrument Air	C	[910] 1435	1190	1190	
31	N_2 to Accumulator	C	-	115	115	
42A	Post LOCA Hydrogen Control Air Supply	C	80	275	275	
42A	Post LOCA Hydrogen to GA	C	0	0	0	
50	Post LOCA Hydrogen Control Air Supply	C	0	250	250	
50	Post LOCA Hydrogen to GA	C	0	275	275	

ANNULUS PENETRATIONS

41A	Containment Vacuum Breaker	C	-	-	0	(Note 1)
41B	Containment Vacuum Breaker	C	-	-	14	(Note 1)
42A	Post LOCA Hydrogen Air Vent	C	0	0	0	

ANNULUS PENETRATIONS

Measured Leakage-SCCM

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max
50	Post LOCA Hydrogen Air Vent	C	0	0	0
6A	#21 Steam Line Bellows	B	-	-	0
6B	#22 Steam Line Bellows	B	-	-	0
7C	#21 Feedwater Line Bellows	B	-	-	0
7D	#22 Feedwater Line Bellows	B	-	-	0
8C	#21 Steam Generator Blowdown Bellows	B	-	-	0
8D	#22 Steam Generator Blowdown Bellows	B	-	-	0
9	Residual Heat Out Bellows	B	-	-	0
10	Residual Heat In Bellows	B	-	-	0
11	Letdown Line Bellows	B	-	-	0
18	Fuel Transfer Tube Bellows	B	-	-	0
	Equipment Hatch	B	-	-	0

NOTES:
1) Maximum leakage is the total leakage when air is applied to inner space between valves.
2) Penetration 35 is tested in conjunction with penetrations 28A and 28B.
3) Numbers contained in brackets [ ] are leakages measured after repair.
4) Reference Appendix D for repair summary.

APPENDIX B

Type B and C test Results - 1980 Refueling Outage

Each penetration is tested according to Surveillance Procedure 2072 and Technical Specification Table 4.4-1. Type H tests are normally performed using air, thus no water/air conversion factor is used. In cases where water is used for the type H test, a water/air conversion ratio of 1.0/68.55 is used.

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max
1	Pressure Relief Tank Sample to GA	C	-	2	2
4	Primary Vent Header	C	-	0	0
5	Reactor Coolant Drain Tank Pump Discharge	C	-	237	237
11	Letdown Line	C	0	0	0
12	Charging Line	H	[600] 900	950	950
13A	No. 21 RCP Seal Water Supply	H	0	0	0
13B	No. 22 RCP Seal Water Supply	H	350	0	350
14	RCP Seal Water Return	H	[0] 1450	9	9
15	Pressurizer Stm Sample	C	[0.4] 288	303	0.4
16	Pressurizer Liquid Smpl	C	[1900] 2800	3	1900
17	Loop B Hot Leg Sample	C	[13] 5500	0	13
18	Fuel Transfer Tube	B	C	14	14
19	Service Air	B	0	0	0
21	Reactor Coolant Drain Tank Gas to GA	C	0	9.2	9.2
22	Cntmt Air Sample In	C	0	0	0
23	Cntmt Air Sample Out	C	0	7.5	7.5

ABSVZ PENETRATIONS

Measured Leakage-SCCM

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max	
25A	Cntmt Purge Exhaust	C	-	-	204	(Note 1)
25B	Cntmt Purge Supply	C	-	-	3650	(Note 1)
26	Cntmt Sump "A" Dischg	C	-	0	0	
27 C-1	ILRT Pressure Instrument	B	0	0	0	
27 C-2	ILRT Pressure Instrument	B	0	0	0	
28A	Cold Leg Safety Injection	H	-	274	274	
28B	Hot Leg Safety Injection	H	-	822	822	
29A	Internal Containment Spray	H	-	480	480	
29B	Internal Containment Spray	H	-	343	343	
30A	Containment Sump B Suction Line	H	-	1600	1600	
30B	Containment Sump B Suction Line	H	-	0	0	
35	Safety Injection & Accumulator Test Line	H	-	-	-	(Note 2)
42E	Containment Heating Condensate	B	0	0	0	
42E	Containment Heating Vent	B	0	0	0	
44	ILRT Pressurization	B	0	0	0	
45	Reactor Makeup Water to Pressurizer Relief Tank	C	0	0	0	
48	Low Head Safety Injection	H	0	0	0	

ABSVZ PENETRATIONS			Measured Leakage-SCCM			
Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max	
51	Fire Protection Water	B	1.9	0	1.9	
52	In-Service Purge Exhaust	C	-	-	0	(Note 1)
53	In-Service Purge Supply	C	-	670	670	(Note 1)
54	Containment Heating Steam	B	2.2	0	2.2	
55	Demin Water	B	0	0	0	
EXTERIOR PENETRATIONS						
7	Pressurizer Relief Tank N_2 Supply	C	(615) 720	0	615	
20	Instrument Air	C	2140	560	2140	
31	N_2 to Accumulator	C	-	7	7	
42A	Post LOCA Hydrogen Control Air Supply	C	0	75	75	
42A	Post LOCA Hydrogen to GA	C	0	75	75	
50	Post LOCA Hydrogen Control Air Supply	C	0	47	47	
50	Post LOCA Hydrogen to GA	C	0	125	125	
ANNULUS PENETRATIONS						
41A	Containment Vacuum Breaker	C	-	-	192	(Note 1)
41B	Containment Vacuum Breaker	C	-	-	282	(Note 1)
42A	Post LOCA Hydrogen Air Vent	C	3.6	40	40	

ANNULUS PENETRATIONS — Measured Leakage-SCCM

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max
50	Post LOCA Hydrogen Air Vent	C	0	0	0
6A	#21 Steam Line Bellows	B	-	0	0
6B	#22 Steam Line Bellows	B	-	0	0
7C	#21 Feedwater Line Bellows	B	-	0	0
7D	#22 Feedwater Line Bellows	B	-	0	0
8C	#21 Steam Generator Blowdown Bellows	B	-	0	0
8D	#22 Steam Generator Blowdown Bellows	B	-	3.5	3.5
9	Residual Heat Out Bellows	B	-	0	0
10	Residual Heat In Bellows	B	-	0	0
11	Letdown Line Bellows	B	-	0	0
18	Fuel Transfer Tube Bellows	B	-	1	1
	Equipment Hatch	B	8	-	8

NOTES: 1) Maximum leakage is the total leakage when air is applied to inner space between valves.

2) Penetration 35 is tested in conjunction with penetrations 28A and 28B.

3) Numbers contained in brackets [ ] are leakages measured after repair.

APPENDIX C

Type B and C test Results - 1981 Refueling Outage

Each penetration is tested according to Surveillance Procedure 2072 and Technical Specification Table 4.4-1. Type H tests are normally performed using air, thus no water/air conversion factor is used. In cases where water is used for the type H test, a water/air conversion ratio of 1.0/68.55 is used.

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max
1	Pressure Relief Tank Sample to GA	C	-	0.1	0.1
4	Primary Vent Header	C	-	6	6
5	Reactor Coolant Drain Tank Pump Discharge	C	-	2	2
11	Letdown Line	C	0	0	0
12	Charging Line	H	45	220	220
13A	No. 21 RCP Seal Water Supply	H	0	0	0
13B	No. 22 RCP Seal Water Supply	H	0	0	0
14	RCP Seal Water Return	H	0	0	0
15	Pressurizer Stm Sample	C	30	8.1	30
16	Pressurizer Liquid Smpl	C	180	15	180
17	Loop B Hot Leg Sample	C	[0.2] 6000	0	0.2
18	Fuel Transfer Tube	B	1.0	3.0	3.0
19	Service Air	B	[6] 8.9	1.6	6
21	Reactor Coolant Drain Tank Gas to GA	C	3	4	4
22	Cntmt Air Sample In	C	[0.5] 0	[4.3] 40	4.3
23	Cntmt Air Sample Out	C	[2.8] 20	0	2.8

ABSVZ PENETRATIONS

Measured Leakage-SCCM

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max	
25A	Cntmt Purge Exhaust	C	-	-	(0) 530	(Note 1)
25B	Cntmt Purge Supply	C	-	-	[0] 255	(Note 1)
26	Cntmt Sump "A" Dischg	C	-	0.6	0.6	
27 C-1	ILRT Pressure Instrument	B	0	[0] 1.3	0	
27 C-2	ILRT Pressure Instrument	B	0	[0] 0	0	
28A	Cold Leg Safety Injection	H	-	[0] 30	0	
28B	Hot Leg Safety Injection	H	-	[2100] 185	2100	
29A	Internal Containment Spray	H	-	[0] 11550	0	
29B	Internal Containment Spray	H	-	[10] 40	10	
30A	Containment Sump B Suction Line	H	-	24	24	
30B	Containment Sump B Suction Line	H	-	160	160	
35	Safety Injection & Accumulator Test Line	H	-	-	-	(Note 2)
42E	Containment Heating Condensate	B	20	0	20	
42E	Containment Heating Vent	B	15	15	15	
44	ILRT Pressurization	B	[140] 0	[160] 0	160	
45	Reactor Makeup Water to Pressurizer Relief Tank	C	0	70	70	
48	Low Head Safety Injection	H	0	0	0	

ABSVZ PENETRATIONS — Measured Leakage-SCCM

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max	
51	Fire Protection Water	B	1.6	0	1.6	
52	In-Service Purge Exhaust	C	-	-	100	(Note 1)
53	In-Service Purge Supply	C	-	-	[4400] 205	(Note 1)
54	Containment Heating Steam	B	10.3	35	35	
55	Demin Water	B	[2] 6.5	0	2	

EXTERIOR PENETRATIONS

2	Pressurizer Relief Tank N_2 Supply	C	340	20	340	
20	Instrument Air	C	3.1	2900	2900	
31	N_2 to Accumulator	C	-	100	100	
42A	Post LOCA Hydrogen Control Air Supply	C	[55.2] 30	[0.6] 4830	55.2	
42A	Post LOCA Hydrogen to GA	C	0	0	0	
50	Post LOCA Hydrogen Control Air Supply	C	[55] 15	[190] 35	190	
50	Post LOCA Hydrogen to GA	C	0	0	0	

ANNULUS PENETRATIONS

41A	Containment Vacuum Breaker	C	1.0	78	78	(Note 1)
41B	Containment Vacuum Breaker	C	36	220	220	
42A	Post LOCA Hydrogen Air Vent	C	[55] 0	[.56] 30	55	

ANNULUS PENETRATIONS

Measured Leakage-SCCM

Pen. No.	Penetration	Test Type	Inside	Outside	As Left Max
50	Post LOCA Hydrogen Air Vent	C	[55] 15	[190] 0	190
6A	#21 Steam Line Bellows	B	-	2.8	2.8
6B	#22 Steam Line Bellows	B	-	10	10
7C	#21 Feedwater Line Bellows	B	-	2.1	2.1
7D	#22 Feedwater Line Bellows	B	-	20	20
8C	#21 Steam Generator Blowdown Bellows	B	-	10	10
8D	#22 Steam Generator Blowdown Bellows	B	-	17	17
9	Residual Heat Out Bellows	B	-	15	15
10	Residual Heat In Bellows	B	-	12	12
11	Letdown Line Bellows	B	-	11	11
18	Fuel Transfer Tube Bellows	B	-	0	0
	Equipment Hatch	B	0	-	0

NOTES: 1) Maximum leakage is the total leakage when air is applied to inner space between valves.

2) Penetration 35 is tested in conjunction with penetrations 28A and 28B.

3) Numbers contained in brackets [ ] are leakages measured after repair.

APPENDIX D

SUMMARY TECHNICAL REPORT ON TYPE B AND C TESTS FAILING TO MEET ACCEPTANCE CRITERIA SINCE LAST TYPE A TEST

1978 Refueling Outage

Penetrations 28A & 28B

The containment purge and exhaust valves were tested and found to leak excessively. A pressure decay calculation indicated that the purge supply and exhaust valves leaked at a rate of 14.9×10^6 SCCM and 20.6×10^6 SCCM respectively.

The seats were cleaned and adjusted. A subsequent leak test resulted in a leakage rate of 435 SCCM and 570 SCCM for the purge and supply valves respectively.