

ARKANSAS POWER AND LIGHT COMPANY

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NUMBER 50-368

REACTOR CONTAINMENT BUILDING

INTEGRATED LEAK RATE TEST

MAY 1, 1985

Revision 1

May 20, 1988

Submitted to

The United States Nuclear Regulatory Commission

Pursuant To

Facility Operating Licensing Number NPF-6

SU-082

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I. INTRODUCTION

The reactor containment building Integrated Leakage Rate Test (Type A) is performed to demonstrate that leakage through the primary reactor containment and systems and components penetrating primary containment does not exceed allowable leakage rate values as specified in the Plant Technical Specifications.

A successful Type A test was performed at Arkansas Nuclear One, Unit 2 between 1230 on 4/30/85 and 1230 on 5/1/85. The results were substantiated by the data from the Verification Test acquired between 1630 and 2030 on 5/1/85. These tests were performed according to the requirements of the Arkansas Nuclear One Technical Specifications and 10CFR50, Appendix J. The Type A test was conducted applying the absolute method defined in ANSI/ANS 56.8-1981 (previously ANSI N274), "Containment System Leakage Testing Requirements." The leakage rate was calculated by formulas specified in ANSI 45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors" and ANSI/ANS 56.8-1981. A total-time analysis is also included as described in ANSI 45.4-1972 and Bechtel Topical Report BN-TOP-1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants," as referenced in the ANO-2 Technical Specifications.

III. TEST DATA SUMMARY

A. Plant Information

Owner	Arkansas Power & Light
Plant	Arkansas Nuclear One, Unit 2
Location	6 Miles NW of Russellville, Arkansas
Containment type	Prestressed, post-tensioned concrete
NGSS Supplier, Type	CE, PWR
Docket No.	50-368
License No.	NPF-6

B. Technical Data

1. Containment Net Free Air Volume	1,780,000 cu. ft.
2. Design Pressure	54 psig
3. Design Temperature	288°F
4. Calculated Peak Accident Pressure, Pa	54 psig
5. Peak Accident Temperature	411°F

C. Test Results - Type A Test

1. Test Method	Absolute
2. Data Analysis Techniques	Mass Point (per ANSI/ANS 56.8-1981) Total Time (per ANSI 45.4-1972 and BN-TOP-1)
3. Test Pressure	54.3 psig
4. Maximum Allowable Leakage Rate, La	0.1%/day
5. 75% of La	0.075%/day

6. Integrated Leakage Rate Test Results	Leakage Rate, %/day	
	From Regression Line (Lam)	At Upper 95% Confidence Limit

a. Mass Point Analysis	0.022	0.023
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b. Total Time Analysis		%/day
Mean of the measured leakage rates	=	.042
Maximum allowable leakage rate	=	.100
75% of maximum allowable leakage rate	=	.075
The upper 95% confidence limit	=	.020
The calculated leakage rate	=	.011

7.	Verification Test Imposed Leakage Rate	5.85 SCFM (0.1%/day)
8.	Verification Test Results	Leakage Rate <u>%/day</u>
	a. Mass Point Analysis	0.120
9.	Verification Test Limits	Test Limits <u>%/day</u>
	a. Mass Point Analysis	
	1) Upper Limit (Lo+Lam+0.25La)	0.147
	2) Lower Limit (Lo+Lam-0.25La)	0.097

10. Report Printouts

The Report Printouts of the Type A and Verification Test summary data and calculations are provided for the Mass Point Analysis and Total Time Analysis (appendices C through H). Stabilization data are also provided (Appendices B and F).

D. Test Results - Type B & C Tests

Refer to Appendix I for a summary of Local Leakage Rate Test results since the last ILRT was performed.

E. Integrated Leakage Rate Measurement System

1. Absolute Pressure (2 channels)

Range:	0-100,000 counts
Measurement system error:	0.001 psia
Sensor error:	0.005 psig
Range:	0-100 psia
Repeatability:	0.0005 psia

Texas Instruments Model 145-02 Precision Pressure Instrument, Serial Number No. 2861
Bourdon Capsule Serial No. 6806
Calibration Date: 4/3/85

Texas Instrument Model 145-02 Precision Pressure Instrument, Serial Number No. 2860
Bourdon Capsule Serial No. 6807
Calibration Date: 4/3/85

2. Drybulb Temperature (18 plus 3 spares)

Range:	(-190) - (+200)°F
Measurement system error:	0.1°F
Sensor error:	0.2°F
Repeatability:	0.05°F

Resistance Temperature Detectors - Leeds & Northrup
Thermohm - 4-lead, 100 ohm copper
Calibration Date: 11/19/84

IV. ANALYSIS AND INTERPRETATION

A. Type A Test Adjustment and Other Penalties

The following penetrations were used for the ILRT:

<u>Penetration No.</u>	<u>Equipment</u>	<u>Leakage Rate</u>
2P-61A	2IA-88	0 accm
2P-61B	2IA-89	2.80 accm
2P-62	ILRT Pressurization Line	<u>40.40 accm</u>
		43.20 accm

- B. Valve 2PS-189 at penetration number 2P-66 was hand tightened during the test. However, this does not constitute an adjustment as this penetration is not required to be vented. Therefore, closing this valve was not necessary for successful completion of the test.

C. Type B and C Test Results

The total of tested type B and C local leakage rates are: as found 5058.707 accm; as left, 1388.887 accm. The acceptance criterion is that the above total be less than 20,990 accm (.06% per day, 60% of La). The total for type B and C tests for the "as found" condition is within the acceptance criteria.

D. Conclusions

The ILRT results for the upper 95% confidence limits at 54 psig (-0 psi, + .3 psi) were:

Mass Point Analysis .023% per day.
Total Time Analysis .020% per day.

These values must be increased by leakage rates in section IV.A above. The total, 43.20 accm (equivalent to 0.00012% per day), added to the 95% confidence limit results in a value of .023% per day for Mass Point Analysis, and .020% per day for the Total Time Analysis.

The acceptance criterion is that this value be less than .075%/day (75% of La). The calculated value is within the acceptance criteria.

The ISG was calculated as 0.011%/day which is within the acceptance criterion of \leq .025 (25% of La).

LLRT DATA FOR PENETRATIONS USED DURING MAY 1985 ILRT

<u>PENETRATION NUMBER</u>	<u>VALVE NUMBER</u>	<u>ACTUAL FOUND LEAKAGE (ACCM)</u>	<u>ACTUAL LEFT LEAKAGE (ACCM)</u>	<u>DATE</u>
2P61	2IA88	0		5/6/85
2P61	2IA89	2.80		5/7/85
2P62	Blank Flanges		40.4	5/7/85

NOTE: 2PS-189 was closed during ILRT to keep the following valves from leaking water. However, these valves are not subject to type C testing and are not required to be vented during ILRT. This leakage is reported for information only.

LLRT DATA FOR VALVES 2SV5633-1 & 2SV5633-2

<u>PENETRATION NUMBER</u>	<u>VALVE NUMBER</u>	<u>ACTUAL FOUND LEAKAGE (ACCM)</u>	<u>ACTUAL LEFT LEAKAGE (ACCM)</u>	<u>DATE</u>
2P66	2SV-5633-1	Not Applicable	29.43	5/10/85
2P66	2SV-5633-2	Not Applicable	11.10	5/10/85

NOTE: These valves were within the boundary for ILRT, and were closed during ILRT. These valves are not subject to type C testing and are not required to be vented during ILRT. This leakage is reported for information only.

LLRT DATA FOR VALVES 2SV-5634-1 and 2

<u>PENETRATION NUMBER</u>	<u>VALVE NUMBER</u>	<u>ACTUAL FOUND LEAKAGE (ACCM)</u>	<u>ACTUAL LEFT LEAKAGE (ACCM)</u>	<u>DATE</u>
2P67	2SV-5634-1	Not Applicable	5.51	5/8/85
2P67	2SV-5634-2	Not Applicable	5.54	5/8/85

TYPE C TESTS

<u>PENETRATION NUMBER</u>	<u>VALVE SYSTEM</u>	<u>"AS-FOUND" LEAKAGE (ACCM)</u>	<u>"AS-LEFT" LEAKAGE (ACCM)</u>
2P-6	Containment HVAC	29.24	29.24
2P-8	Sampling System	57.43	57.43
2P-9	Hydrogen and Nitrogen Addition	13.98	13.98
2P-14	Chemical and Volume Control	784.12	76.47
2P-18	Chemical and Volume Control	0.00	0.00
2P-31	Gaseous Radioactive Waste	137.25	38.19
2P-37	Sampling System	8.56	8.56
2P-39	Reactor Coolant System	0.00	0.00
2P-40	Fire Water System	1827.86	0.00
2P-41	Hydrogen and Nitrogen Addition	124.01	28.62
2P-51	Chilled Water	0.0	0.0
2P-52	Component Cooling Water	82.78	82.78
2P-58	Containment HVAC	21.94	21.94
2P-59	Chilled Water	862.84	341.88
2P-60	Component Cooling Water	0.0	0.0
2P-61	Instrument Air	7.01	7.01
2P-62	Instrument Air	4.12	4.12
2P-68	Liquid Radioactive Waste	69.24	69.24
2P-69	Boron Management System	421.21	2.31
2V-1	Containment HVAC	568.80	568.80
2V-1	Containment HVAC	0.0	0.0
	Total	<u>5020.39</u>	<u>1350.57</u>

TYPE B TESTS

<u>PENETRATION NUMBER</u>	<u>SYSTEM</u>	<u>LEAK RATE (ACCM)</u>	
		<u>"AS-FOUND"</u>	<u>"AS LEFT"</u>
2C-1	Equipment Hatch	35.86	35.86
2C-2	Escape Lock	0.0	0.0
2C-3	Fuel Transfer Tube	0.0	0.0
2C-4	Personnel Lock	0.0	0.0
2E-1	Electrical Penetration	2.46	2.46
All Other	Electrical Penetrations	0.0	0.0
	Total	<u>38.32</u>	<u>38.32</u>
		<u>"AS-FOUND"</u>	<u>"AS LEFT"</u>
TOTAL OF TYPE B AND C PENETRATIONS TESTED		5058.707	1388.887

LLRT DATA TAKEN JUST PRIOR TO MAY 1985 ILRT

<u>PENET. NUMBER</u>	<u>VALVE NUMBER</u>	<u>LEAKAGE (ACCM)</u>		<u>COMMENTS</u>
		<u>"AS-FOUND"</u>	<u>"AS-LEFT"</u>	
2C1	Equip. Hatch	35.86	35.86	Performed under 2304.22 control Copy #151
2C2	Barrel	0.00	0.00	Performed under 2304.22 control copy #151
2C2	Inner Seal	0.00	0.00	
2C2	Outer Seal	0.00	0.00	
2C3	Fuel Transfer	0.00	0.00	
2C4	Inner Seal	0.00	0.00	Performed under 2304.22 control copy #153
2C4	Outer Seal	0.00	0.00	
2P6	2SV-8273-1	24.21	24.21	
2P6	2SV-8271-2	23.84	23.84	
2P6	2CV-8233-1	0.00	0.00	
2P6	2SV-8231-2	5.03	5.03	
2P8	2SV-5833-1	57.43	57.43	
2P8	2SV-5843-2	20.87	20.87	
2P9	2CV-6207-2	13.98	13.98	
2P14	2CV-4821-1	76.47	76.47	
2P14	2CV-4823-2	784.12	60.375	Volume correction
2P18	2CV-4846-1	0.00	0.00	
2P18	2CV-4847-2	0.00	0.00	
2P31	2CV-2401-1	121.49	26.25	
2P31	2CV-2400-2	137.25	38.19	
2P37	2SV-5878-1	3.38	3.38	
2P37	2SV-5876-2	3.75	3.75	
2P37	2SV-5871-2	4.81	4.81	
2P39	2CV-4690-2	0.00	0.00	
2P40	2CV-3200-2	1827.86	0.00	
2P41	2CV-6213-2	124.01	28.62	
2P51	2CV-3852-1	0.00	0.00	
2P52	2CV-5236-1	82.78	82.78	
2P58	2SV-8261-2	2.74	2.74	
2P58	2SV-8263-2	17.41	17.41	
2P58	2CV-8259-1	4.53	4.53	
2P58	2SV-8265-1	15.70	15.70	
2P59	2CV-3850-2	0.00	0.00	
2P59	2CV-3851-1	862.84	341.88	
2P60	2CV-5255-1	0.00	0.00	
2P61	2IA-88	5.607	5.607	
2P61	2IA-89	1.40	1.40	
2P62	Blank Flanges	4.12	4.12	
2P68	2CV-2061-2	69.24	69.24	
2P68	2CV-2060-1	42.45	42.45	
2P69	2CV-2201-1	2.31	2.31	
2P69	2CV-2201-2	421.21	0.00	
2V1	2CV-8284-2			
	2CV-8289-1	568.80	568.80	
2V2	2CV-8286-2			
	2CV-8291-1	0.00	0.00	

ARKANSAS NUCLEAR ONE - UNIT 2
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 1230 430 1985
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
1230	535.067	68.5868	
1245	535.089	68.5876	.284
1300	535.077	68.5864	.112
1315	535.088	68.5871	.114
1330	535.100	68.5886	.081
1345	535.105	68.5880	.102
1400	535.113	68.5887	.093
1415	535.118	68.5892	.081
1430	535.123	68.5898	.073
1445	535.128	68.5919	.043
1500	535.120	68.5925	.016
1515	535.130	68.5908	.052
1530	535.140	68.5913	.056
1545	535.171	68.5922	.085
1600	535.148	68.5921	.050
1615	535.155	68.5917	.060
1630	535.156	68.5947	.030
1645	535.175	68.5929	.064
1700	535.171	68.5961	.032
1715	535.169	68.5948	.038
1730	535.187	68.5945	.054
1745	535.189	68.5935	.059
1800	535.191	68.5915	.071
1815	535.195	68.5960	.043
1830	535.206	68.5973	.043
1845	535.208	68.5950	.055
1900	535.210	68.5958	.050
1915	535.207	68.5970	.040
1930	535.210	68.5976	.038
1945	535.227	68.5965	.052
2000	535.226	68.5991	.037
2015	535.219	68.5979	.038
2030	535.239	68.6029	.026
2045	535.237	68.5980	.045
2100	535.236	68.5986	.041
2115	535.243	68.5999	.038
2130	535.248	68.6000	.039
2145	535.258	68.6001	.042
2200	535.256	68.5998	.041
2215	535.253	68.6002	.037
2230	535.252	68.6015	.031
2245	535.257	68.6036	.026
2300	535.271	68.6030	.033
2315	535.276	68.6030	.034
2330	535.271	68.6029	.032
2345	535.290	68.6040	.035

0	535.278	68.6037	.031
15	535.296	68.6047	.034
30	535.288	68.6040	.033
45	535.289	68.6040	.032
100	535.299	68.6065	.028
115	535.294	68.6047	.030
130	535.310	68.6037	.038
145	535.304	68.6044	.034
200	535.323	68.6069	.033
215	535.326	68.6052	.037
230	535.332	68.6055	.038
245	535.324	68.6061	.033
300	535.325	68.6088	.027
315	535.335	68.6061	.036
330	535.326	68.6079	.028
345	535.337	68.6089	.029
400	535.329	68.6072	.030
415	535.335	68.6088	.027
430	535.336	68.6084	.028
445	535.342	68.6082	.030
500	535.356	68.6094	.030
515	535.356	68.6111	.027
530	535.341	68.6092	.026
545	535.366	68.6102	.030
600	535.350	68.6092	.028
615	535.353	68.6105	.026
630	535.358	68.6111	.025
645	535.357	68.6116	.024
700	535.352	68.6109	.024
715	535.346	68.6118	.020
730	535.382	68.6121	.028
745	535.382	68.6110	.029
800	535.374	68.6113	.027
815	535.368	68.6097	.028
830	535.385	68.6109	.029
845	535.371	68.6098	.028
900	535.376	68.6105	.027
915	535.371	68.6109	.025
930	535.366	68.6112	.023
945	535.379	68.6076	.031
1000	535.358	68.6101	.023
1015	535.375	68.6091	.028
1030	535.386	68.6084	.031
1045	535.385	68.6094	.029
1100	535.386	68.6068	.033
1115	535.380	68.6091	.028
1130	535.382	68.6099	.026
1145	535.396	68.6105	.028
1200	535.395	68.6111	.026
1215	535.394	68.6158	.019
1230	535.394	68.6089	.029

MEAN OF THE MEASURED LEAKAGE RATES	=	.042
MAXIMUM ALLOWABLE LEAKAGE RATE	=	.100
75% OF MAXIMUM ALLOWABLE LEAKAGE RATE	=	.075
THE UPPER 95% CONFIDENCE LIMIT	=	.020
THE CALCULATED LEAKAGE RATE	=	.011