FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT #3

NUCLEAR GENERATING PLANT

LOCAL LEAK RATE TEST REPORT

Contract No. 37380

Prepared By A.J. DeGrasse Date 9/20/79

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I. Introduction

Type B and C test were conducted in accordance with FPC Surveillance Procedure SP179 at Pa, 49.6 $^{+.5}_{-0}$ psig in conformance with the criteria specified in Appendix J of 10CFR50 using the methods and provisions of ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors."

Florida Power Corporation was responsible for conducting the tests. Catalytic, Inc. the contractor, prepared the surveillance test procedure and provided technical support during the performance of the tests.

II. General Data

Owner: Florida Power Corporation

Docket No: 50-302

Location: Crystal River Nuclear Power Plant

Containment Description: Reinforced Concrete Cylinder with Steel Liner.

Containment Net Free Volume: 2×10^6 cu. ft.

Design Pressure: 49.6 psig

Maximum Allowable Leak Rate: .6LA (248,656 scc/min.)

Recorded Total Leakage: .0678LA (28,098 scc/min.)

Test Start Date: April 13, 1979

Test Completion Date: June 19, 1979

III. Discussion

The methods used to determine the leakage rates of containment isolation valves are as follows:

1. Out-Leakage
2. In-Leakage
3. Pressure Decay

The "Out-Leakage" method of testing consisted of applying test pressure to the upstream side of an isolation valve and measuring leakage with a rotometer or Leak Rate Monitor installed on the downstream side of the isolation valve.

The "In-Leakage" method of leak testing consisted of pressurizing a portion of system piping, bounded on at least one side by the isolation valves (and/or blind flanges) to be tested, and measuring the flow of compressed gas required to maintain the test pressure in the test volume using a rotometer or Leak Rate Monitor installed integrally with the pressurization rig.

The "Pressure Decay" method of leak rate testing consisted of pressurizing the test volume to $49.6^{+.5}_{-0}$ psig and measuring the pressure decay rate with a 1% accuracy pressure gauge.

The test method consisted of pressurizing the test section slowly, through a 'fast charge' line to approximately 45 psig, as indicated on the test rig pressure gauge. After the test section was charged to 45 psig the fast charge line was disconnected and the "Leak Rate Monitor" was cut in service. Pressure was increased with the Leak Rate Monitor to $49.6^{+.5}_{-0}$ psig. After a stabilization period of approximately 15-20 min., the leakage rate was directly read from the "Leak Rate Monitor".
(See Figure 1)

During pressure decay measurements leakage rates were estimated using the 'decay mode' of the leak rate monitor or pressure gauge. All instrumentation used during the test was calibrated prior to commencement of the test in addition to certified calibration from the instrument supplier.

Appendix A was developed to show which penetrations are subject to Type B & C testing.

Appendix B shows valves/components tested between scheduled Local Leak Rate tests due to maintenance and increased surveillance.

CATALYTIC, INC.
Centre Square West, 1500 Market Street, Philadelphia, Pennsylvania 19102

LOCAL LEAK RATE TEST REPORT

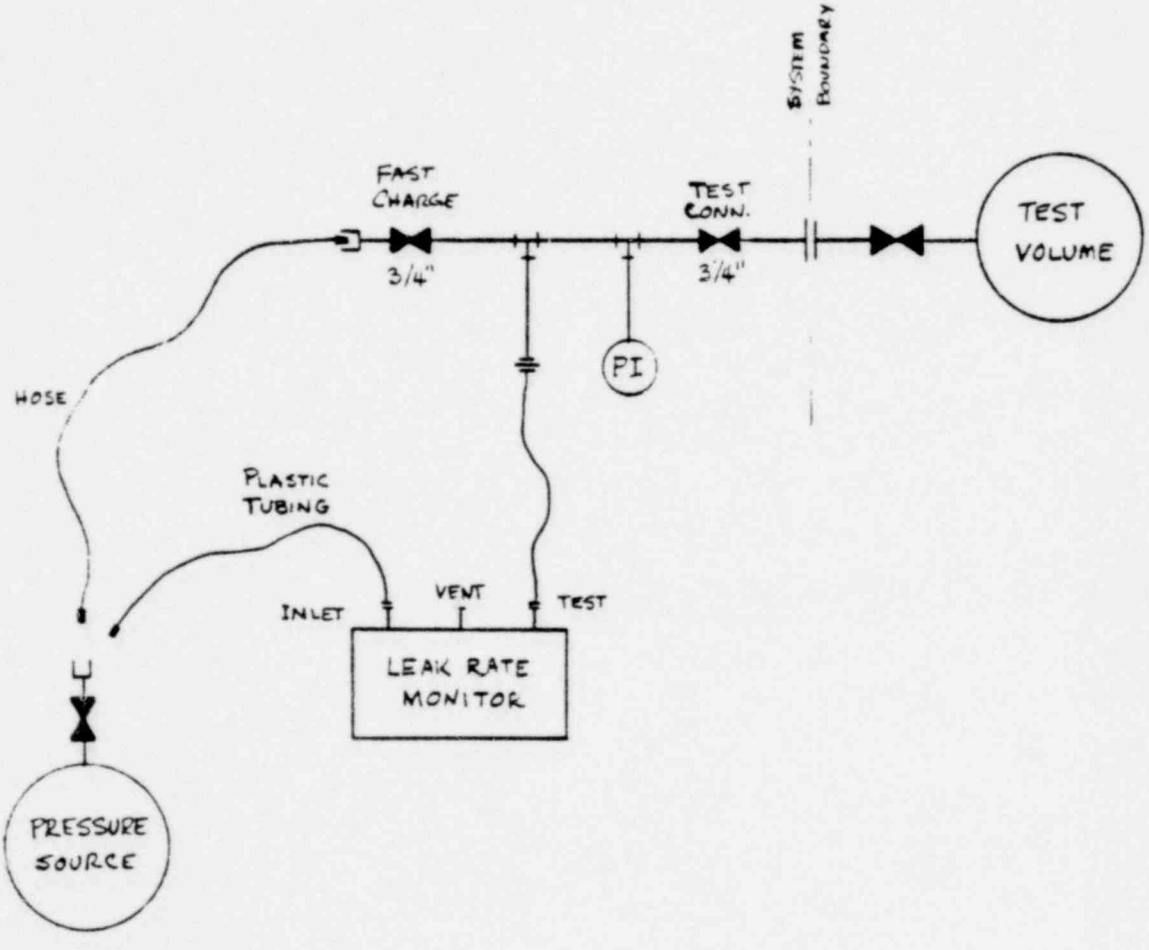

Figure 1

IV. Local Leak Rate Test Results

1. Type B

Description	As Found	Re-Test	As-Left	Acceptance Criteria
Equipment Hatch Resilient Seals	2 cc/min	N/A	2 cc/min	< 500 cc/min
Fuel Transfer Tube Gasket-3B	2 cc/min	N/A	2 cc/min	< 100 cc/min
Fuel Transfer Tube Gasket-3A	2 cc/min	N/A	2 cc/min	< 100 cc/min
LRV-45 and Blind Flange	2 cc/min	N/A	2 cc/min	< 100 cc/min
LRV-44 and Blind Flange	20.3 cc/min	N/A	20.3 cc/min	< 100 cc/min
Chemical Cleaning Penetration Gaskets 119	57.0 cc/min	N/A	57.0 cc/min	< 100 cc/min
Chemical Cleaning Penetration Gaskets 120	11.0 cc/min	N/A	11.0 cc/min	< 100 cc/min

Total Measured Type B Leakage 96.3 cc/min

2. Type C

Description	As Found	Re-Test	As-Left	Acceptance Criteria
Decay Heat Sys.				
DHV-93	5.5 cc/min	N/A	5.5 cc/min	< 2740 cc/min
DHV-91	3.8 cc/min	N/A	3.8 cc/min	< 2740 cc/min
Liquid Sampling Sys.				
CAV-126	40 cc/min	N/A	40 cc/min	< 1370 cc/min
CAV-1	30.0 cc/min	N/A	30.0 cc/min	< 1370 cc/min
CAV-3	10.0 cc/min	N/A	10.0 cc/min	< 1370 cc/min
CAV-2	1680 cc/min	N/A	1680 cc/min	< 1370 cc/min
Industrial Cooling Water				
CIV-41	11.0 cc/min	N/A	11.0 cc/min	< 3425 cc/min
CIV-40	> 20,000 cc/min	27.1 cc/min	27.1 cc/min	< 3425 cc/min
CIV-34	20.9 cc/min	N/A	20.9 cc/min	< 3425 cc/min
CIV-35	4.8 cc/min	N/A	4.8 cc/min	< 3425 cc/min
Demineralized Water				
DWV-162	17,640 cc/min	36.7 cc/min	36.7 cc/min	< 4110 cc/min
DWV-160	10,230 cc/min	41.0 cc in	41.0 cc/min	< 4110 cc/min
Make & Purification System				
MUV-40	219 cc/min	N/A	219 cc/min	< 3425 cc/min
MUV-41	30.2 cc/min	N/A	30.2 cc/min	< 3425 cc/min
MUV-49	100.0 cc/min	N/A	100.0 cc/min	< 3425 cc/min
MUV-260	230 cc/min	N/A	230 cc/min	< 1370 cc/min
MUV-261	10 cc/min	N/A	10 cc/min	< 1370 cc/min

2. Type C (Continued)

Description	As Found	Re-Test	As-Left	Acceptance Criteria
Make & Purification System				
MUV-259	60 cc/min	N/A	60 cc/min	< 1370 cc/min
MUV-258	450 cc/min	N/A	450 cc/min	< 1370 cc/min
MUV-253	1890 cc/min	N/A	1890 cc/min	< 1370 cc/min
Core Flood System				
CFV-20	795 cc/min	N/A	795 cc/min	< 1370 cc/min
CFV-19	65 cc/min	N/A	65 cc/min	< 1370 cc/min
CFV-25	134 cc/min	N/A	134 cc/min	< 1370 cc/min
CFV-28	590 cc/min	N/A	590 cc/min	< 1370 cc/min
CFV-17	121 cc/min	N/A	121 cc/min	< 1370 cc/min
CFV-18	79.5 cc/min	N/A	79.5 cc/min	< 1370 cc/min
CFV-26	180 cc/min	N/A	180 cc/min	< 180 cc/min
CFV-27	45 cc/min	N/A	45 cc/min	< 1370 cc/min
CFV-15	3.9 cc/min	N/A	3.9 cc/min	< 1370 cc/min
CFV-16	2 cc/min	N/A	2.0 cc/min	< 1370 cc/min
CFV-29	2 cc/min	N/A	2.0 cc/min	< 2055 cc/min
CFV-11	3.0 cc/min	N/A	3.0 cc/min	< 1370 cc/min
CFV-12	2 cc/min	N/A	2 cc/min	< 1370 cc/min
CFV-42	16 cc/min	N/A	16 cc/min	< 1370 cc/min
Nitrogen System				
NGV-62	2 cc/min	N/A	2 cc/min	< 2055 cc/min
NGV-82	2 cc/min	N/A	2 cc/min	< 1370 cc/min

2. Type C (Continued)

Description	As Found	Re-Test	As-Left	Acceptance Criteria
Station & Instrument Air System				
SAV-24	49 cc/min	N/A	49 cc/min	< 4110 cc/min
IAV-28	19.6 cc/min	N/A	19.6 cc/min	< 2740 cc/min
IAV-29	381 cc/min	N/A	381 cc/min	< 2740 cc/min
Spent Fuel Cooling System				
SFV-18 and SFV-19	13,250 cc/min	N/A	13,250 cc/min	< 13,700 cc/min
Waste Disposal System				
WDV-3 & WDV-4	195.0 cc/min	N/A	195.0 cc/min	< 5480 cc/min
WDV-60 & WDV-61	2 cc/min	N/A	2.0 cc/min	< 2740 cc/min
WDV-406	117 cc/min	N/A	117 cc/min	< 2055 cc/min
WDV-405	156 cc/min	N/A	156 cc/min	< 2055 cc/min
WDV-94	4.8 cc/min	N/A	4.8 cc/min	< 4110 cc/min
WDV-62	18.4 cc/min	N/A	18.4 cc/min	< 2740 cc/min
Containment Monitoring System				
WSV-3	2.3 cc/min	N/A	2.3 cc/min	< 1370 cc/min
WSV-4	2 cc/min	N/A	2.0 cc/min	< 1370 cc/min
WSV-5	2 cc/min	N/A	2.0 cc/min	< 1370 cc/min
WSV-6	2 cc/min	N/A	2.0 cc/min	< 1370 cc/min
WSV-1	75 cc/min	N/A	75 cc/min	< 1370 cc/min
WSV-2	69 cc/min	N/A	69 cc/min	< 1370 cc/min

2. Type C (Continued)

Description	As Found	Re-Test	As-Left	Acceptance Criteria
R.B. Purge System				
AHV-1C and AHV-1D	409 cc/min	N/A	409 cc/min	< 2500 cc/min
AHV-1A and AHV-1B	2.25×10^6 cc/min		3.2 cc/min	< 2500 cc/min
	Retest 1	2.8×10^5 cc/min		
	Retest 2	4.50×10^5 cc/min		
	Retest 3	3.2 cc/min		
Containment Leak Rate System				
LRV-50	20 cc/min	N/A	20 cc/min	< 10,960 cc/min
LRV-36	2780 cc/min	N/A	2780 cc/min	< 10,960 cc/min
LRV-51	1585 cc/min	N/A	1585 cc/min	< 10,960 cc/min
LRV-35 & LRV-47	1920 cc/min	N/A	1920 cc/min	< 10,960 cc/min
LRV-49	2 cc/min	N/A	2 cc/min	< 10,960 cc/min
LRV-38 & LRV-52	2 cc/min	N/A	2 cc/min	< 10,960 cc/min

LOCAL LEAK RATE TEST REPORT

Total number of Valves tested - 67

Total number of Valves re-tested - 4

Total number of Valves repaired - 4

Total as found leakage - 2.33×10^6 cc/min
(Type B&C) (5.62LA)

Total as left leakage (Type C) - 2.80×10^4 cc/min
(.0675LA)

Combined Type B and C leakage - 28,105 cc/min
(.0678LA)

Error adjusted total as left leakage - 2.86×10^4 cc/min
(Type C) (.0690LA)

Error adjusted combined Type B and C Leakage - 28,667 cc/min
(.0692LA)

Note: Error adjusted leakages are based on a maximum instrument calibration accuracy of 2% applied in the conservative direction.

Note: A minimum sensitivity of 2.0 cc/min has been used for each test.

V. Analysis and Interpretation

La = 0.25% by weight per 24 hrs. of the mass of containment air at 64.3 psia.

Mass of Containment Air = $\frac{PV}{RT}$, where:

P = Containment Pressure = 64.3 psia

V = Containment Free Volume = 2×10^6 cu ft

R = Gas Constant = $53.35 \frac{\text{ft} - \text{lb}}{\text{lbm} - {}^{\circ}\text{R}}$.

T = Containment Temperature, assumed 549.69°R (90°F)

$$\text{Mass of Containment Air} = \frac{(64.3 \text{ psia})\ (2 \times 10^6 \text{ft}^3)(144 \text{ in}^2/\text{ft}^2)}{\left(53.35 \frac{\text{ft} - \text{lbf}}{\text{lbm} - {}^{\circ}\text{R}}\right)(549.69^{\circ}\text{R})}$$

Mass of Containment Air = 631,467.8 lbm

$$\text{La} = \frac{(0.0025/\text{day})\ (631{,}467.8 \text{ lbm})}{24 \text{ hrs/day}} = 65.78 \text{ lbm/hr}$$

$$= \frac{(65.78 \text{ lbm/hr})\ 471.9 \frac{\text{scc/min}}{\text{SCFH}}}{0.0749 \text{ lbm/cu ft}} = 414{,}427 \text{ scc/min}$$

0.6 La = 248,656 scc/min

Excluding the type "B" penetrations and the 48" reactor building purge valves, the total number of "nominal inches of valve diameter" for all other valves to be leak tested is:

Total D = 169.5 Nominal Inches

and

$$\frac{0.6 \text{ La}}{\text{Total D}} = \frac{248{,}656 \text{ scc/min}}{169.5 \text{ nominal inches}} = 1450 \text{ scc/min/nominal inch.}$$

The action value was based on 95% of the 1450 scc/min/nominal inch.

(0.95 x 1450 = 1370 scc/min/nominal inch)

The alert value was based on 70% of the 1450 scc/min/nominal inch.

(0.70 x 1450 = 1000 scc/min/nominal inch)

Value Size	Alert Value	Action Value
1"	1000	1370
1½"	1500	2055
2"	2000	2740
2½"	2500	3425
3"	3000	4110
4"	4000	5480
6"	6000	8220
8"	8000	10,960
10"	10,000	13,700

(All leakage rates expressed in scc/min)

The remaining 5% was used to develop the Type "B" and Reactor building purge value acceptance criteria. The distribution was based on plant experience and input to LA. Type "B" penetrations and the 48" Reactor building purge valves action and alert values are as follows:

	Alert Value	Action Value
Equipment Hatch Resilient Seals	Zero Leakage	500 scc/min
Fuel Transfer Tubes Gaskets	Zero Leakage	100 scc/min
ILRT Gaskets	Zero Leakage	100 scc/min

	Alert	Action
Steam Generator Chemical Cleaning Gaskets	Zero Leakage	100 cc/min
Reactor Building Purge Valve	500 scc/min	2500 scc/min

DERIVATION OF PRESSURE DECAY EQUATION

The mass contained air at the beginning and end of the test is:

$$W_1 = P_1 V/RT_1 \quad \text{and} \quad W_2 = P_2 V/RT_2$$

where the test volume V is constant.

The mass loss is then given by:

$$\text{Mass loss} = W_1 - W_2 = \left(\frac{P_1}{T_1} - \frac{P_2}{T_2}\right) \frac{V}{R}$$

The mass loss can be converted to a volume loss rate at standard conditions since:

$$W = \frac{P_s V_s}{R T_s} \quad \text{or} \quad V_s = \frac{WRT_s}{P_s}$$

and thus the leakage rate in standard volume units becomes

$$L_L = \frac{V_{s_1} - V_{s_2}}{t} = \frac{1}{t}\left(\frac{W_1 RT_s}{P_s} - \frac{W_2 RT_s}{P_s}\right) = \frac{RT_s}{P_s t}(W_1 - W_2)$$

$$L_L = \frac{VT_s}{P_s t}\left(\frac{P_1}{T_1} - \frac{P_2}{T_2}\right)$$

Pressure Decay

The test volume was pressurized with air to at least PA (49.6 psig). The pressure change within the test volume was recorded as a function of time. The leakage rate was calculated from the pressure decay rate and the free air volume of the test volume. Temperature changes were considered.

L_L = Leakage rate, standard cubic centimeter per min, scc/min.

V = total test free air volume, cubic feet

t = test duration, hours

T_1, T_2 = test volume absolute temperature at start and end of test, respectively, Absolute Units

P_1, P_2 = test volume absolute pressure at start and end of test respectively, absolute units

T_s = standard temperature

P_s = standard pressure

The formula for computing leakage rate is:

$$L_L = \left(\frac{P_1}{T_1} - \frac{P_2}{T_2}\right)\left(\frac{V \quad T_s}{t \quad P_s}\right)\left(471.9 \ \frac{\text{scc/min}}{\text{SCFH}}\right)$$

VI. Summary

Local Leak Rate testing was performed on the containment isolation valves and penetrations listed in Technical Specification Table 3.6-1.

A total of 67 valves were tested with only 4 valves requiring maintenance and repair. The following valves had higher than acceptable as found leakage and were repaired and retested:

CIV-40
DWV-162
DWV-160
AHV-1A & 1B

Three retests were conducted on valves AHV-1A & 1B with only one retest on DWV-160, 162 and CIV-40. FPC will retest valves AHV-1A and 1B every six months.

The following valves were found to have leakage exceeding the alert and action value:

MUV-253
CAV-2

Maintenance was not performed on these valves due to lack of repair parts and of the overall low total leakage. A review and evaluation was conducted by FPC to determine overall total leakage and further disposition of subject valves for repair.

Eight penetrations were tested using rotometers (Penetrations: 116, 202, 119, 356, 113, 110, 111 and 112) under revision 6 of surveillance procedure SP-179. The remaining penetration tests were performed under revision 7 of surveillance procedure SP-179.

Most containment isolation valves were tested in the same direction that leakage would occur subsequent to a design basis loss of coolant accident. Valves tested in the reverse direction were determined to be more conservative (see Appendix A for valves tested in reverse direction).

The total as-found leakage was 5.62 La. As-left leakage was .0678 La. See Section IV for individual valve penetrations leakages.

APPENDIX A

LOCAL LEAK RATE TEST SUMMARY INDEX

NOTES

1. Valves are required to be open during post-accident conditions.

2. Locked open.

3. Not a containment boundary; does not "provide a direct connection".

4. Connected to the secondary side of steam generator.

5. Low Pressure Injection System.

6. 10CFR50 Appendix J, II H-4, Main steam and Feedwater exclusion for PWR's.

7. High Pressure Injection System.

8. 10CFR50 Appendix J, III C-3, Seal water system pressure greater than 1.10 Pa.

9. General Design Criteria #57.

10. Tested in reverse direction, ASME Section XI, IWV-3420(c) "Exceptions".

11. Not testable in direction of post-accident flow.

12. These valves isolate to main steam piping only.

13. Cannot be tested with fuel in core.

Symbol designates valves exempted from type "C" test per tech spec (table 3.6-1), and is followed by the applicable notes as the official reason for exemption.

* Valve categoried per ASME, Section XI Article IWV-2100.

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FLOW DIAGRAM FD-302-672

SYSTEM Liquid Sampling

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
439	CAV-1	1"	Globe	N-2	108'-2"	322°	1000/1370	A	9	Notes: 10
439	CAV-2	1"	Globe	N-2	108'-2"	322°	1000/1370	A	9	
439	CAV-3	1"	Globe	N-2	108'-2"	322°	1000/1370	A	9	Notes: 10
439	CAV-126	1"	Globe	N-1	108'-2"	322°	1000/1370	A	9	Notes: 10
440	CAV-4	1"	Globe	B31.1	104'-11"	322°	—	B	—	Notes: 3,4 #12
440	CAV-6	1"	Globe	B31.1	104'-11"	322°	—	B	—	Notes: 3,4 #12
441	CAV-5	1"	Globe	B31.1	104'-11"	317°	—	B	—	Notes: 3,4 #12
441	CAV-7	1"	Globe	B31.1	104'-11"	317°	—	B	—	Notes: 3,4 #12

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FLOW DIAGRAM FD-302-641

SYSTEM Decay Heat Removal

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO	VALVE NO	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
329	DHV-91	2"	Globe	N-1	133'-0	217°	2000/2740	A	8	
329	DHV-93	2"	Check	N-1	133'-0	217°	2000/2740	A,C	8	
342	DHV-2	10"	Check	N-1	106'-0	205°	—	C	—	Notes: 1,5
342	DHV-6	10"	Gate	N-1	106'-0	205°	—	B	—	Notes: 1,5 #1
343	DHV-1	10"	Check	N-1	106'-0	220°	—	C	—	Notes: 1,5
343	DHV-5	10"	Gate	N-1	106'-0	220°	—	B	—	Notes: 1,5 #1
344	DHV-4	12"	Gate	N-1	106'-0	215°	—	B	—	Notes: 9 #3,13
344	DHV-41	12"	Gate	N-1	106'-0	215°	—	B	—	Notes: 9 #3,13
345	DHV-43	14"	Gate	N-2	86'-3"	—	—	B	—	Notes: 1 #1,3
346	DHV-42	14"	Gate	N-2	86'-3"	—	—	B	—	Notes: 1 #1,3

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FLOW DIAGRAM FD-302-762

SYSTEM Industrial Cooling Water

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
206	CIV-41	2½"	Gate	B31,1ES	104'-0	165°	2500/3425	A	10	
207	CIV-40	2½"	Gate	B31,1ES	104'-0	167°	2500/3425	A	10	
366	CIV-34	2½"	Gate	B31,1ES	106'-0	192°	2500/3425	A	10	
367	CIV-35	2½"	Gate	B31,1ES	109'-0	195°	2500/3425	A	10	

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FLOW DIAGRAM FD-302-182

SYSTEM Demineralized Water

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
117	DWV-160	3"	Gate	B31.1	112'-0	40°	3000/4110	A	11	
117	DWV-162	3"	Check	B31.1	112'-0	40°	3000/4110	A,C	11	

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FLOW DIAGRAM FD-302-661

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FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

SYSTEM Makeup & Purification

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY*	SP-179 Enclosure	REMARKS
333	MUV-40	2½"	Gate	N-1	108'-0	267°	2500/3425	A	12	Notes: 10
333	MUV-41	2½"	Gate	N-1	108'-0	267°	2500/3425	A	12	Notes: 10
333	MUV-49	2½"	Gate	N-1	108'-0	267°	2500/3425	A	12	
336	MUV-25	2½"	Globe	N-1	108'-0	265°	—	B	—	Notes: 1,7 #1,7
336	MUV-163	2½"	Check	N-1	108'-0	265°	—	C	—	Notes: 1,7 #1,7
337	MUV-26	2½"	Globe	N-1	108'-0	262°	—	B	—	Notes: 1,7 #1,7
337	MUV-164	2½"	Check	N-1	108'-0	262°	—	C	—	Notes: 1,7 #1,7
338	MUV-18	4"	Gate	N-1	130'-0	217°	—	B	—	Notes: 1,7
338	MUV-162	4"	Check	N-1	130'-0	217°	—	C	—	Notes: 1,7
434	MUV-23	2½"	Globe	N-1	108'-0	275°	—	B	—	Notes: 1,7 #1,7
434	MUV-160	2½"	Check	N-1	108'-0	275°	—	C	—	Notes: 1,7 #1,7
435	MUV-24	2½"	Gate	N-1	108'-0	272°	—	B	—	Notes: 1,7 #1,7
435	MUV-161	2½"	Check	N-1	108'-0	272°	—	C	—	Notes: 1,7 #1,7
435	MUV-27	2½"	Gate	N-1	108'-0	272°	—	B	—	Notes: 1,7 #1,7

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FLOW DIAGRAM FD-302-661

SYSTEM Makeup & Purification

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO	VALVE NO	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY*	SP-179 Enclosure	REMARKS
377	MUV-253	1"	Globe	N-1	136'-0	220°	1000/1370	A	12	
377	MUV-258	1"	Globe	N-1	136'-0	220°	1000/1370	A	12	Notes: 10
377	MUV-259	1"	Globe	N-1	136'-0	220°	1000/1370	A	12	Notes: 10
377	MUV-260	1"	Globe	N-1	136'-0	220°	1000/1370	A	12	Notes: 10
377	MUV-261	1"	Globe	N-1	136'-0	220°	1000/1370	A	12	Notes: 10

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FLOW DIAGRAM FD-302-702

SYSTEM Core Flooding

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
123	CFV-2[illegible]	1"	Check	N-2	112'-0	30°	1000/1370	A	17	
123	CFV-28	1"	Globe	N-2	112'-0	30°	1000/1370	A	17	Notes: 10
124	CFV-17	1"	Check	N-2	112'-0	32°	1000/1370	A	17	
124	CFV-27	1"	Globe	N-2	112'-0	32°	1000/1370	A	17	Notes: 10
350	CFV-18	1"	Check	N-2	127'-0	225°	1000/1370	A	17	
350	CFV-26	1"	Globe	N-2	127'-0	225°	1000/1370	A	17	Notes:10
373	CFV-19	1"	Check	N-2	127'-0	210°	1000/1370	A	17	
373	CFV-25	1"	Globe	N-2	127'-0	210°	1000/1370	A	17	Notes: 10
351	CFV-15	1"	Globe	N-2	127'-0	215°	1000/1370	A	17	Notes: 10
351	CFV-16	1"	Globe	N-2	127'-0	215°	1000/1370	A	17	Notes: 10
351	CFV-29	1½"	Globe	N-2	127'-0	215°	1500/7055	A	17	
352	CFV-11	1"	Globe	N-2	127'-0	217°	1000/1370	A	17	Notes: 10
352	CFV-12	1"	Globe	N-2	127'-0	217°	1000/1370	A	17	Notes: 10
352	CFV-42	1"	Globe	N-2	127'-0	217°	1000/1370	A	17	

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FLOW DIAGRAM FD-302-673

SYSTEM Nitrogen to Rx. Bldg.

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
317	NGV-81	1½"	Gate	B31.1	130'-0	215°	—	B	—	Notes:3,4 #12
355	NGV-62	1½"	Gate	B31.1	127'-0	212°	1500/2055	A	18	
372	NGV-82	1"	Gate	B31.1	133'-0	225°	1000/1370	A	18	

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FLOW DIAGRAM FD-302-271

SYSTEM Service & Instrument Air

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO	VALVE NO	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CHITERIA	VALVE CATEGORY*	SP-179 Enclosure	REMARKS
110	SAV-23	3"	Gate	B31.1	139'-0	20°	—	E	—	Notes: 10 #10
110	SAV-24	3"	Gate	B31.1	139'-0	20°	3000/4110	A,E	19	
111	IAV-61	2"	Gate	B31.1	136'-0	30°	—	E	—	Notes: 10 #10
111	IAV-28	2"	Gate	B31.1	136'-0	30°	2000/2740	A,E	19	
112	IAV-62	2"	Gate	B31.1	136'-0	32°	—	E	—	Notes: 10 #8
112	IAV-29	2"	Gate	B31.1	136'-0	32°	2000/2740	A,E	19	

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FLOW DIAGRAM FD-302-621

SYSTEM Spent Fuel Pool Cooling

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY*	SP-179 Enclosure	REMARKS
347	SFV-18	10"	Gate	N-3	130'-0	225°	10000/13700	A,E	20	Notes: 10,11
347	SFV-19	10"	Gate	N-3	130'-0	225°	10000/13700	A,E	20	
348	Flange	34"	—	N-3	125'-7"	—	0/100	—	5	
436	Flange	34"	—	N-3	125'-7"	—	0/100	—	5	

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FLOW DIAGRAM FD-302-681

SYSTEM Liquid Waste Disposal

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
339	WDV-3	4"	Diaph	N-3	112'-0	225°	4000/5480	A	13	Notes: 10
339	WDV-4	4"	Diaph	N-3	112'-0	225°	4000/5480	A	13	
349	WDV-60	2"	Gate	N-3	112'-0	227°	2000/2740	A	13	Notes: 10,11
349	WDV-61	2"	Diaph	N-3	112'-0	227°	2000/2740	A	13	
374	WDV-62	2"	Diaph	N-3	106'-0	227°	2000/2740	A	13	
374	WDV-94	3"	Globe	N-3	106'-0	227°	3000/4110	A	13	Notes: 10
354	WDV-405	14"	Globe	N-3	133'-0	215°	1500/2055	A	13	
354	WDV-406	14"	Globe	N-3	133'-0	215°	1500/2055	A	13	Notes: 10

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FLOW DIAGRAM FD-302-693

SYSTEM Containment Monitoring

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
315	WSV-3	1"	Ball	N-3	136'-0	215°	1000/1370	A	14	Notes: 10
315	WSV-4	1"	Ball	N-3	136'-0	215°	1000/1370	A	14	Notes: 10
332	WSV-5	1"	Ball	N-3	127'-0	220°	1000/1370	A	14	Notes: 10,11
332	WSV-6	1"	Ball	N-3	127'-0	220°	1000/1370	A	14	Notes: 10,11
356	WSV-1	1"	Diaph	N-3	127'-0	205°	1000/1370	A,E	14	Notes: 10,11
356	WSV-2	1"	Diaph	N-3	127'-0	205°	1000/1370	A,E	14	Notes: 10,11

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FLOW DIAGRAM FD-302-751

SYSTEM Reactor Bldg. Purge

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY*	SP-17° Enclosure	REMARKS
113	AHV-1C	48"	BF	N-3	139'-0	75°	0/2000	A	15	Notes: 10,11
113	AHV-1D	48"	BF	N-3	139'-0	75°	0/2000	A	15	
357	AHV-1A	48"	BF	N-3	153'-6"	207°	0/2000	A	15	
357	AHV-1B	48"	BF	N-3	153'-6"	207°	0/2000	A	15	Notes: 10,11

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FLOW DIAGRAM FD-302-711

SYSTEM Reactor Bldg. Spray

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
340	BSV-3	8"	Globe	N-2	106'-0	225°	—	B	—	Notes: 1 #1
340	BSV-27	8"	Check	N-2	106'-0	225°	—	C	—	Notes: 1 #1
341	BSV-4	8"	Globe	N-2	106'-0	210°	—	B	—	Notes: 1 #1
341	BSV-26	8"	Check	N-2	106'-0	210°	—	C	—	Notes: 1 #1

11511 313

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FLOW DIAGRAM FD-302-712

SYSTEM Rx Bldg. Pressure Sensing

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY*	SP-179 Enclosure	REMARKS
319	BSV-132	1"	Gate	N-3	112'-0	195°	—	E	—	Notes: 1,2,3
426	BSV-147	1"	Gate	N-3	104'-11"	342°	—	E	—	Notes: 1,2,3
429	BSV-130	2"	Gate	N-3	108'-2"	317°	—	E	—	Notes: 1,2,3
442	BSV-131	2"	Gate	N-3	108'-2"	345°	—	E	—	Notes: 1,2,3

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FLOW DIAGRAM FD-302-722

SYSTEM Leak Rate Testing

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO	VALVE NO	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY*	SP-179 Enclosure	REMARKS
116	LRV-45	2"	Globe	N-3	130'-0	17°	2000/2740	A,E	16	
116	Flange	2"	—	N-3	130'-0	17°	0/100	—	6	
202	LRV-44	2"	Globe	N-3	135'-0	100°	2000/2740	A,E	16	
202	Flange	2"	—	N-3	135'-0	100°	0/100	—	6	
121	LRV-36	8"	Gate	N-3	133'-0	30°	8000/10960	—	16	
121	LRV-50	8"	Gate	N-3	133'-0	30°	8000/10960	A,E	16	
122	LRV-35	8"	Gate	N-3	133'-0	32°	8000/10960	A,E	16	
122	LRV-47	3"	Gate	N-3	133'-0	32°	3000/4110	A,E	16	
122	LRV-51	8"	Gate	N-3	133'-0	32°	8000/10960	A,E	16	
125	LRV-49	8"	Gate	N-3	123'-0	75°	8000/10960	A,E	16	
125	LRV-30	8"	Gate	N-3	123'-0	75°	8000/10960	A,E	16	
125	LRV-52	3"	Gate	N-3	123'-0	75°	3000/4110	A,E	16	

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FLOW DIAGRAM FD-302-011

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

SYSTEM Main & Reheat Steam

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
105	MSV-411	24"	MSIV	B31.1	123' 0	38°	—	B	—	Notes: 4,6 #6
106	MSV-412	24"	MSIV	B31.1	123'-0	46°	—	B	—	Notes: 4,6 #6
107	MSV-414	24"	MSIV	B31.1	123'-0	89°	—	B	—	Notes: 4,6 #6
201	MSV-413	24"	MSIV	B31.1	123'-0	97°	—	B	—	Notes: 4,6 #6
314	MSV-146	4"	Globe	B31.1	106'-0	217°	—	E	—	Notes: 4,6
316	MSV-114	1½"	Globe	B31.1	136'-0	225°	—	E	—	Notes: 4,6
318	MSV-128	4"	Globe	B31.1	106'-0	212°	—	E	—	Notes: 4,6
320	MSV-132	1½"	Globe	B31.1	136'-0	227°	—	E	—	Notes: 4,6
427	MSV-130	3"	Globe	B31.1	108'-2"	340°	—	B	—	Notes: 4,6 #6
428	MSV-148	3"	Globe	B31.1	131'-0	337°	—	B	—	Notes: 4,6 #6

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FLOW DIAGRAM FD-302-192

SYSTEM Steam Gen. Chem. Cleaning

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
119	Flange	20"	—	B31.1	106'-0	42°	0/100	—	7	
119	Flange	20"	—	B31.1	106'-0	42°	0/100	—	7	
120	Flange	20"	—	B31.1	106'-0	30°	0/100	—	7	
120	Flange	20"	—	B31.1	106'-0	30°	0/100	—	7	

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FLOW DIAGRAM FD-302-081

SYSTEM Feedwater

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO.	VALVE NO.	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
108	FWV-46	18"	Check	B31.1	123'-0	80°	—	C	—	Notes: 4,6 #6
109	FWV-43	6"	Check	B31.1ES	106'-0	40°	—	C	—	Notes: 4,6 #6
423	FWV-45	18"	Check	B31.1	131'-0	342°	—	C	—	Notes: 4,6 #6
424	FWV-132	1"	Globe	B31.1ES	108'-2"	342°	—	C	—	Notes: 4,6 #6

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FLOW DIAGRAM FD-302-601

SYSTEM Nuclear Services Cooling

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO	VALVE NO	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY*	SP-179 Enclosure	REMARKS
321	SWV-48	8"	BF	B31.1	106'-0	207°	—	B	—	Notes: 8 #3
322	SWV-49	8"	BF	B31.1	106'-0	202°	—	B	—	Notes: 8 #3
323	SWV-80	6"	BF	B31.1ES	133'-0	212°	—	B	—	Notes: 8 #3
324	SWV-84	6"	BF	B31.1ES	130'-0	212°	—	B	—	Notes: 8 #3
325	SWV-82	6"	BF	B31.1ES	133'-0	210°	—	B	—	Notes: 8 #3
326	SWV-86	6"	BF	B31.1ES	130'-0	210°	—	B	—	Notes: 8 #3
330	SWV-109	3"	Gate	B31.1ES	136'-0	210°	—	B	—	Notes: 8 #3
331	SWV-110	3"	Gate	B31.1ES	136'-0	212°	—	B	—	Notes: 8 #3
358	SWV-39	8"	BF	B31.1ES	106'-0	195°	—	B	—	Notes: 8 #1,3
359	SWV-45	8"	BF	B31.1ES	106'-0	200°	—	B	—	Notes: 8 #1,3
360	SWV-47	8"	BF	B31.1	112'-0	212°	—	B	—	Notes: 8 #3
361	SWV-50	8"	BF	B31.1	112'-0	210°	—	B	—	Notes: 8 #3
362	SWV-81	6"	BF	B31.1ES	133'-0	207°	—	B	—	Notes: 8 #3
363	SWV-85	6"	BF	B31.1ES	130'-0	207°	—	B	—	Notes: 8 #3
364	SWV-79	6"	BF	B31.1ES	133'-0	205°	—	B	—	Notes: 8 #3
365	SWV-83	6"	BF	B31.1ES	130'-0	205°	—	B	—	Notes: 8 #3

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PHILADELPHIA, PA.

FLOW DIAGRAM FD-302-601

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT-3

SYSTEM Nuclear Services Cooling

LOCAL LEAK RATE TEST SUMMARY INDEX

PENE NO	VALVE NO	SIZE	VALVE TYPE	PIPING CLASS	ELEVATION	AZIMUTH	LEAKAGE CRITERIA	VALVE CATEGORY *	SP-179 Enclosure	REMARKS
368	SWV-35	8"	BF	B31.1ES	109'-0	197°	—	B	—	Notes: 8 #1,3
369	SWV-41	8"	BF	B31.1ES	112'-0	197°	—	B	—	Notes: 8 #1,3
370	SWV-37	8"	BF	B31.1ES	106'-0	197°	—	B	—	Notes: 8 #1,3
371	SWV-43	8"	BF	B31.1ES	112'-0	200°	—	B	—	Notes: 8 #1,3

APPENDIX B

LLRT'S PERFORMED BETWEEN REFUELING OUTAGES

LLRT'S PERFORMED BETWEEN REFUELING OUTAGES

Description	As Found	Re-Test	As-Left	Date Tested
CAV-1	0	N/A	0	9/2/78
CAV-2	534.6	N/A	534.6	9/2/78
CAV-3	0	N/A	0	9/2/78
CAV-126	534	N/A	534	9/2/78
Fuel Transfer Tube 3A	0	N/A	0	9/2/78
Fuel Transfer Tube 3B	0	N/A	0	9/2/78
Equipment Hatch	57.1	N/A	57.1	9/7/78