

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8012020079 DOC. DATE: 80/11/26 NOTARIZED: NO DOCKET #
 FACIL: 50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
 50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
 AUTH. NAME: AUTHOR AFFILIATION
 UHRIG, R.E. Florida Power & Light Co.
 RECIP. NAME: RECIPIENT AFFILIATION
 VARGA, S.A. Operating Reactors Branch 1

SUBJECT: Forwards info re air lock leakage testing per 790312 request.

DISTRIBUTION CODE: A001S COPIES RECEIVED: LTR 3 ENCL 3 SIZE: 8
 TITLE: General Distribution for after Issuance of Operating License

NOTES:

	RECIPIENT ID CODE/NAME		COPIES		RECIPIENT ID CODE/NAME		COPIES	
			LTR	ENCL			LTR	ENCL
ACTION:	VARGA, S.	04	13	13				
INTERNAL:	D/DIR, HUM FAC08		1	1	I&E	06	2	2
	NRC PDR	02	1	1	OFED	11	1	0
	OR ASSESS BR	10	1	0	REG. FILE	01	1	1
EXTERNAL:	ACRS	09	16	16	LPDR	03	1	1
	NSIC	05	1	1				

DEC 5 1980

TOTAL NUMBER OF COPIES REQUIRED: LTR 38 ENCL 36

THE
FEDERAL BUREAU OF INVESTIGATION
UNITED STATES DEPARTMENT OF JUSTICE
WASHINGTON, D. C. 20535
MEMORANDUM FOR THE DIRECTOR
SUBJECT: [Illegible]

RE: [Illegible]

1. [Illegible]

2. [Illegible]

3. [Illegible]

4. [Illegible]

5. [Illegible]

6. [Illegible]

7. [Illegible]

8. [Illegible]

9. [Illegible]

10. [Illegible]

RECEIVED DISTRIBUTION
SERVICES UNIT
NOV 26 1980

DEC 11 1980

U.S. NRC
DISTRIBUTION SERVICES
BRANCH



November 26, 1980
L-80-389

Office of Nuclear Reactor Regulation
Attention: Mr. S.A. Varga, Chief
Operating Reactors Branch #1
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Varga:

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250 & 50-251
Air Lock Leakage Testing

The information requested in a NRC letter dated March 12, 1979 concerning the above subject is attached.

Very truly yours,

J. A. De Mastri
for

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/PLP/md

Attachment

cc: J.P. O'Reilly, Region II
Harold F. Reis, Esquire

A001
5
3/3

8012020

079

P

PEOPLE ... SERVING PEOPLE

APR 1 1964

RECEIVED

ATTACHMENT 1Item 1

The actual vacuum value to be used in the testing of personnel air locks.

Response 1

The test will begin at a absolute pressure of 12.92" Hg (17" Hg vacuum) and alarm if pressure increases to 14.42" Hg (15.5" Hg vacuum).

Item 2

The method to be used for the extrapolation of testing results to a leakage rate at the accident pressure.

Response 2

To determine the leak rate at 50 psig (64.7 psia), the design basis accident pressure, the following derivation was used:

Flow for a compressible fluid may be calculated as follows:

$$F = K Y \sqrt{\Delta P} \quad (1)$$

where F = Flow or leakage
 K = Coefficient of resistance
 Y = Expansion factor
 ΔP = Pressure drop across seal

The maximum value for Y is 1.0 and calculates the leakage for a non-compressible fluid. The coefficient of resistance is constant for each seal tested. Therefore:

$$F = K \sqrt{\Delta P} \quad \text{or} \quad L = K \sqrt{\Delta P}$$

A ratio between the leak rate at L_{50} and L_{test} becomes:

$$\frac{L_{50}}{L_{\text{test}}} = \frac{K \sqrt{P_{64.7} - P_{14.7}}}{K \sqrt{P_{14.7} - P_{\text{test}}}}$$

$$L_{50} = L_{\text{test}} \left(\frac{\sqrt{P_{64.7} - P_{14.7}}}{\sqrt{P_{14.7} - P_{\text{test}}}} \right)$$

where $P_{64.7} = 131.73$ " Hg

$P_{14.7} = 29.92$ " Hg

$$L_{50} = L_{\text{test}} \left(\frac{\sqrt{131.73 - 29.92}}{\sqrt{29.92 - P_{\text{test}}}} \right)$$

¹Chemical Engineer's Handbook, McGraw-Hill, Inc., 1963
 Section 5 (Fluid Mechanics, Flow Measurement) Pages 5-8 & 5-9

Response 2 cont.

$$L_{50} = \sqrt{102.52} \left(\frac{L_{\text{test}}}{\sqrt{29.92 - P_{\text{test}}}} \right)$$

$$\therefore L_{50} = 10.13 \left(\frac{L_{\text{test}}}{\sqrt{29.92 - P_{\text{test}}}} \right)$$

with pressures in inches of Hg

Item 3

A discussion of the bases on which the leakage limits for a vacuum pressure test were established.

Response 3

The set points for the vacuum test system are as follows:

$$P_{\text{test}} = 12.92'' \text{ Hg} \pm 1\%$$

$$P_{\text{fail}} = 14.42'' \text{ Hg} \pm 1\%$$

$$T = 1 \text{ minute} \pm 1\%$$

These values are set by the vacuum pump and timers to be used. To calculate the actual leak rates involved, the following derivation was used:

P_1 = Pressure @ the beginning of the test @ t_1 ("Hg)

P_2 = Pressure @ the end of the test @ t_2 ("Hg)

t = Time interval during test = $t_2 - t_1$ (minute)

T_1 = Temperature @ t_1 , P_1 ($^{\circ}\text{R}$)

T_2 = Temperature @ t_2 , P_2 ($^{\circ}\text{R}$)

M_1 = Mass of contained air @ t_1 , P_1 (lb m)

M_2 = Mass of contained air @ t_2 , P_2 (lb m)

V = Volume of annulus between O-ring (cc)

ℓ = % leakage per interval of time (%/min)

L = Change in volume per interval of time (cc/min)

R = Gas constant = 53.35 ft lb_f/lb_m $^{\circ}\text{R}$

$$\text{from } \ell = \left(\frac{M_1 - M_2}{M_1 t} \right) \times 100$$

$$P_1 V = M_1 R T_1$$

$$P_2 V = M_2 R T_2$$

$$\text{substitute } \ell = \frac{\left(\frac{P_1 V}{R T_1} - \frac{P_2 V}{R T_2} \right)}{\left(\frac{P_1 V}{R T_1} \right) t} \times 100$$

ATTACHMENT 1, PAGE 3Response 3 cont.

equation #1
$$\ell = \frac{100}{t} \left(1 - \frac{T_1 P_2}{T_2 P_1} \right)$$

let $L = \frac{\ell \times V}{100}$

equation #2
$$L = \frac{V}{t} \left[1 - \frac{T_1 P_2}{T_2 P_1} \right]$$

For a test time (t) of 1 minute, $T_1 = T_2$

equation #3
$$L = \frac{V}{t} \left[1 - \frac{P_2}{P_1} \right]$$

personnel airlock
$$L = \left[\frac{260 \text{ cc}}{1 \text{ min}} \right] \left[1 - \frac{12.92'' \text{ Hg}}{14.42'' \text{ Hg}} \right]$$

$L = 27.0 \text{ cc/min. at a leak rate test pressure of } 12.92'' \text{ Hg.}$

$$L_{50} = 10.13 \left(\frac{L \text{ TEST}}{\sqrt{29.92 - P \text{ TEST}}} \right)$$

$$= 10.13 \left(\frac{27.0}{\sqrt{29.92 - 14.42}} \right)$$

$= 69.47 \text{ cc/min at a leak rate test pressure of } 64.7 \text{ psia.}$

emergency airlock
$$L = L = \left(\frac{65 \text{ cc}}{1 \text{ min}} \right) \left(1 - \frac{12.92'' \text{ Hg}}{14.42'' \text{ Hg}} \right)$$

$L = 6.8 \text{ cc/min at a leak rate test pressure of } 12.92'' \text{ Hg.}$

$$L_{50} = 10.13 \left(\frac{L \text{ TEST}}{\sqrt{29.92 - P \text{ TEST}}} \right)$$

$$= 10.13 \left(\frac{6.8}{\sqrt{29.92 - 14.42}} \right)$$

$= 17.50 \text{ cc/min at a leak rate test pressure of } 64.7 \text{ psia.}$

Safety Factor due to 1% instrument error. Assumption is that instruments have a 1% error showing a smaller than actual leak rate.

personnel airlock
$$L = \left[\frac{260 \text{ cc}}{.99 \text{ min}} \right] \left[1 - \frac{12.79}{14.56} \right]$$

$L = 31.93 \text{ cc/min at } 12.79'' \text{ Hg}$

$$L_{50} = 10.13 \left(\frac{31.93}{\sqrt{29.92 - 12.79}} \right)$$

$= 78.15 \text{ cc/min at } 64.7 \text{ psia}$

ATTACHMENT 1, PAGE 4

Therefore total % error would be

$$\begin{aligned} \text{error} &= \left(\frac{69.47 - 78.15}{69.47} \right) \times 100 \\ &= -12.5\% \end{aligned}$$

$$\text{Emergency airlock } L = \left(\frac{65 \text{ cc}}{.99 \text{ min}} \right) \left(1 - \frac{12.79}{14.56} \right)$$

$$= 7.98 \text{ cc/min at } 14.56'' \text{ Hg.}$$

$$L_{50} = 10.13 \left(\frac{7.98}{29.92 - 14.56} \right)$$

$$= 20.63 \text{ cc/min at } 64.7 \text{ psia.}$$

Therefore Total % error would be

$$\begin{aligned} \text{Error} &= \left(\frac{17.50 - 20.63}{17.50} \right) \times 100 \\ &= 17.89\% \end{aligned}$$

Therefore, the leak rates with maximum error per instrument are 78.15 cc/min for the personnel airlock and 20.63 cc/min for the emergency airlock. These limits are well below the acceptable allowable local leak rate of 0.250% wt/day or 45,000 cc/min.

ATTACHMENT 2

Additional Information

Mr. Earl Brooks, USNRC Inspector, requested several low pressure tests to be conducted on Turkey Point Plant's personnel airlocks.

On January 22, 1980, 0.2 psig was applied between the outer door "O"-ring seals. A pressure decay test was used to determine if leakage occurred at low pressure. Thirteen (13) minutes were allowed and no leakage was observed. The Heise gauge used indicates in hundredths of a psi. Reference Data Sheet 1.

On February 11, 1980, during the personnel airlock strong back test, four low pressure decay tests were performed using the same LLRT pressure equipment (with the calibration data given on the data sheet for the 0.2 psig decay test). No leakage was observed from the airlock through either of the "O"-ring door seals. Reference Data Sheet 2.

The automatic vacuum leak detector was used to verify the results of both tests. The vacuum leak detector certified that both sets of "O"-ring seals were leak free.

DATA SHEET 1
Florida Power & Light Company
Turkey Point Plant
LOCAL LEAK RATE TEST
DATA SHEET

UNIT NO. <u>4</u>	PENETRATION NO. <u>41</u>	SYSTEM <u>PERSONNEL HATCH</u>
COMPONENT(S) TESTED: <u>OUTER DOOR ANULUS</u>	RIG NO. <u>1</u>	PROCEDURE NO. <u>N/A</u>

Flow Conversion Factor: Low = N/A cc/min per % High = N/A cc/min per %

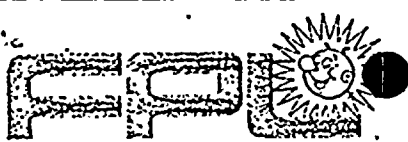
TIME (Hr & Min)	PRESSURE (PSIA)	TEMP (°F)		FLOW INDICATOR READING		FLOW cc/min
		AAT*	TAT*	cc/min or %		
				LOW	HIGH	
0-00 <u>1700</u>	<u>14.90</u>	<u>72</u>	<u>72</u>	<u>0</u>	<u>-</u>	<u>0</u>
0-15 <u>1713</u>	<u>14.90</u>	<u>72</u>	<u>72</u>	<u>0</u>	<u>-</u>	<u>0</u>
0-30						
0-45						
0-60						

INSTRUMENT DATA	PRESSURE INDICATOR	FLOW INDICATOR
Manufacturer	Heise	Brooks Rotameter
Model No.	0 - 100 PSIA	1110-05F1B1Z 1110-01F1B1Z17
Serial No.	CMM 22699	7711H43609-1 7905H77376-2
I & C No.	PTP 10002	PTP 10008 PTP 10006 PTP 10004
Calibration Date	12-11-79	2-09-78 9-12-79

Tested by W. H. Haley Date Jan. 22, 1980

Approved by Willie Boudry Date Jan 22, 1980

Notes: *AAT - Ambient Air Temperature
 TAT - Test Air Temperature



FLORIDA POWER & LIGHT COMPANY

INTER-OFFICE CORRESPONDENCE

TO Russ Gouldy

LOCATION

FPL - Turkey Point

DATE

February 12, 1980

FROM Bill Haley

COPIES TO

SUBJECT: PERSONNEL AIR LOCK LOW
PRESSURE TESTING

On February 11, 1980 the Unit 4 Personnel Air Lock was pressurized to four (4) different pressures up to 2psi in approximately 1/2 lb increments.

Each step was monitored for ten (10) minutes. No pressure decay was noticed at any pressure. The following is a list of times, pressures (PSIA) and temperatures monitored:

<u>Time</u>	<u>Pressure (PSIA)</u>	<u>Test Air Temperature</u>
1400 - 1410	15.22	65° F
1420 - 1430	15.72	66°
1435 - 1445	16.21	66°
1455 - 1505	16.72	66°

Bill Haley

PTP - Technical Department

I PERSONALLY WITNESSED THIS TEST.

PE II.