

SAN ONOFRE
NUCLEAR GENERATING
STATION
UNIT 2

DOCKET NUMBER 50-361

Revised Pages 5, Q-1 and R-4 to
Reactor Containment Building
Integrated Leak Rate Test Report

February 1981

Revision 1

October, 1981

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A PDR

PENETRATION	SYSTEM /VALVE	LOCAL LEAKAGE RATE SCCM
45	Normal A/C Chill Water/2HV-9990 & 2HV-9920	1267.5
46	Normal A/C Chill Water/2HV-9971 & 2HV-9921	0+2.0
10B	ILRT Pressure Sensor/S21500MU038	0+2.0
10B	ILRT Pressure Sensor/S21500 MU039	0+2.0
34	ILRT Test Connection	0+0.2
68	Manual Aux Spray Bypass/S21208MU 129 & 130	637
Total		1910.7
% / Day		0.000864

E. Integrated Leakage Rate Measurement System

1. Absolute Pressure (1 + 1 backup)

Make: Mensor
 Model: 10100-001
 Range: 0-100 psia
 Accuracy: +.015% of reading
 Repeatability: +.0005% of full scale

Gage S/N 1487, Capsule S/N 2317
 Calibration Due Date: May 14, 1981

Gage S/N 1489, Capsule S/N 2349
 Calibration Due Date: May 14, 1981
 Calibration Standard:
 Texas Instruments S/N 2741, Capsule 834
 Calibration Due Date: May 10, 1981

2. Drybulb Temperature (18 plus 2 spares)

Make: Res-mount 100 ohm platinum
 Model: 78-65-17
 Range: 0-150° F
 Accuracy: + 0.1°F (60-120°F)
 + 0.15°F (0-150°F)
 Repeatability: +.1°F

S/N	S/N	S/N	S/N	S/N
120063	116020	120071	120070	120064
117228	116025	120058	117227	117238
120060	117233	117244	117240	120061
120073	120062	117241	117229	117230

Calibration Due Date: April 23, 1981
 Calibration Standard:
 Burns RTD S/N 84939 and
 VMC 202 Keithley 191 DMM

APPENDIX Q

INSTRUMENT SYSTEM ERROR ANALYSIS

The instrument system error analysis is based on the Figure of Merit, also known as Instrument Selection Guid (ISG), formula in BN-TOP-1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants." The formula is:

$$ISG = \pm \frac{2400}{t} \left[2 \left(\frac{ep}{P} \right)^2 + 2 \left(\frac{epv}{P} \right)^2 + 2 \left(\frac{et}{T} \right)^2 \right]^{1/2} \% / \text{Day}$$

where,

ep = absolute pressure measurement repeatability error divided by the square root of the number of sensors.

$$= (.0005\%) (100 \text{ psia}) / (1)^{1/2}$$

$$= .0005 \text{ psia}$$

epv = vapor pressure measurement accuracy error divided by the square root of the number of sensors. (NOTE: Accuracy is conservatively used rather than repeatability.)

$$= (.54^\circ\text{F}) (0.0124 \text{ psia}/^\circ\text{F}) * (4)^{1/2}$$

$$= .00335 \text{ psia}$$

* From steam tables at dewpoint temperature range 69-71°F

et = drybulb temperature measurement repeatability error divided by the square root of the number of sensors.

$$= (0.1^\circ\text{F}) / (18)^{1/2} = .0236^\circ\text{F}$$

P = Test pressure

$$= 71.9 \text{ psia}$$

T = Test temperature

$$= 540^\circ \text{ R}$$

b. Calculated leakage rate from regression analysis:

$$\bar{L} = a + bk_N \quad (5)$$

where:

\bar{L} = Calculated leakage rate, %/day, as determined from the regression line.

$$a = \frac{(\sum L_i) (\sum k_i^2) - (\sum k_i) (\sum L_i k_i)}{N (\sum k_i^2) - (\sum k_i)^2} \quad (6)$$

$$b = \frac{N(\sum L_i k_i) - (\sum L_i) (\sum k_i)}{N(\sum k_i^2) - (\sum k_i)^2} \quad (7)$$

k_i = Elapsed time at time of i^{th} data point

N = Number of data points

$$\sum = \sum_{i=1}^N$$

c. Calculated leakage rate at the 95% confidence level including error associated with the test).

Total-Time Method per BN-TOP-1.

$$\bar{L}_{95} = a + bk + S_{\bar{L}} \quad (8)$$

where:

\bar{L}_{95} = Calculated leakage rate at the 95% confidence level, %/day, at elapsed time k .

For $k_N < 24$

$$S_{\bar{L}} = t_{0.025; N-2} \sqrt{\frac{\sum (L_i - \bar{L}_i)^2}{N-2} \left[1 + \frac{1}{N} + \frac{(k_N - \bar{k})^2}{\sum (k_i - \bar{k})^2} \right]} \quad (9a)$$

$$\text{where, } t_{0.025; N-2} = 1.96 + \frac{2.37}{N-2} + \frac{2.82}{(N-2)^2};$$