



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W.  
ATLANTA, GEORGIA 30323

Report No.: 50-261/92-08

Licensee: Carolina Power and Light Company  
P. O. Box 1551  
Raleigh, NC 27602

Docket No.: 50-261

License No.: DPR-23

Facility Name: H. B. Robinson

Inspection Conducted: April 6-10, 1992

Inspector: H. L. Whitener 5-5-92  
H. L. Whitener Date Signed

Approved by: Carole Julian for 5/5/92  
F. Jape, Chief Date Signed  
Test Programs Section  
Engineering Branch  
Division of Reactor Safety

### SUMMARY

#### Scope:

This routine, unannounced inspection was conducted in the areas of containment integrated leak rate testing including review of associated documents, observation of test activities, and verification of test results.

#### Results:

In the areas inspected, violations or deviations were not identified.

The licensee performed an "as found" integrated leak rate test (ILRT) in conjunction with a containment building structural integrity test (SIT). Preliminary analysis show that test results for both the ILRT and SIT were within the specified acceptance limits. Personnel involved in these tests were knowledgeable of the test requirements. Detailed test procedures were followed and the tests were well controlled.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- J. Barry, SRO, Operations
- \*D. Baur, Regulatory Compliance
- J. Bournes, Engineer, Technical Support
- R. Chambers, Plant General Manager
- G. Comer, Engineer, Technical Support
- \*C. Dietz, Vice President, Robinson Nuclear Project Department
- D. Dyksterhouse, Engineer, NED
- \*W. Farmer, Manager, Engineering Programs
- \*W. Gainey, Manager, Plant Supports
- \*M. Page, Manager, Technical Support
- \*D. Stadler, Licensing Engineer, Nuclear Licensing
- \*W. Worthington, Engineer, NED

Other licensee employees contacted during this inspection included engineers, operators, technicians, and administrative personnel.

#### Other Organizations

##### General Physics Corporation

##### Containment Leak Rate Consultants:

- R. Carey
- \*R. Shirk

##### NRC Resident Inspector(s)

- \*L. Garner, Senior Resident Inspector
- \*C. Ogle, Resident Inspector

\*Attended exit interview

### 2. Containment Integrated Leak Rate Test - Unit 2 (70307, 70313)

The inspector reviewed and witnessed test activities to determine that the primary containment integrated leak rate test was performed in accordance with the requirements of 10 CFR 50 Appendix J, Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors; ANSI-N45.4-1972, American National Standard Leakage - Rate Testing of

Containment Structures for Nuclear Reactors; BN-TOP-1, Revision 1 - 1972, Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants; and, test procedure EST-085, Containment Integrated Leak Rate Test.

Selected sampling of the licensee's activities which were inspected included: (1) review of the test procedures to verify that the procedures were properly approved and conformed with the regulatory requirements; (2) observation of test performance to determine that test prerequisites were completed, special equipment was installed, instrumentation was calibrated and appropriate data were recorded; and (3) preliminary evaluation of leakage rate test results to verify that leak rate limits were met.

Pertinent aspects are discussed in the following paragraphs.

a. General Observations

The inspector witnessed and reviewed portions of the test preparation, temperature stabilization and data processing during the period April 6-10, 1992. The inspector's observations included the following:

- (1) The test was conducted in accordance with an approved procedure. Procedure changes and test discrepancies were properly documented in the procedure.
- (2) Test prerequisites selected for review were found to be completed.
- (3) Selected plant systems required to maintain test control were found to be operational.
- (4) Special test instrumentation was reviewed and found to be completed.
- (5) Controls for preventing pressurized air sources inside containment or externally pressurized penetrations were established in the test procedure.
- (6) Instructions and documentation for venting, draining, and isolation of systems were established in the test procedure.
- (7) Problems encountered during the test were described in the test event log.

- (8) A containment temperature survey was previously performed to determine representative locations of instruments.
- (9) An in-situ check of CILRT instruments was performed prior to the test.
- (10) Temperature, pressure, humidity, and flow data were recorded at 15-minute intervals. Data were assembled and retained for final evaluation and analysis by the licensee. A final leak rate test report will be submitted to the Office of Nuclear Reactor Regulation pursuant to Paragraph V of Appendix J to 10 CFR 50.

b. Procedure Review (70307) Unit 2

Portions of EST-085, Containment Integrated Leak Rate Test, Revision 3, dated March 27, 1992, were reviewed to verify that test conditions, test controls, valve alignments, and acceptance criteria are specified. The inspector concluded that test conditions and controls were specified in detail in the text; valve alignments and valve restoration were specified in detail in attachments 9.2 and 9.8; system venting and draining were specified in detail in attachment 9.11; and, provisions were made for recording leakage of penetrations not in the required alignment and leakage correction due to repair or adjustment of leakage barriers in attachment 9.7. The procedure specifies the determination of the "as found" leak rate. However, in this case, the test was performed in the "as found" condition and correction of the measured leakage was not required. Detailed instrumentation information is provided in an associated procedure EST-095.

Several temporary changes to the test procedure were reviewed to confirm that minor procedure changes to accommodate system conditions did not affect test leakage boundaries.

Penetration valve alignment for a limited selection of systems were reviewed against plant drawings to verify that correct alignments were specified. The penetrations reviewed included:

<u>Penetration No.</u>	<u>Description</u>
2	Pressurizer RLF Tank H <sub>2</sub> Supply
3	Pressurizer RLF Tank Makeup-Primary Water

(cont'd)

<u>Penetration No.</u>	<u>Description</u>
4	Primary SYS Vent HDR
5	Reactor Coolant Drain Tank Gas Analyzer
6	Drain HDR - Reactor Coolant Tank
29	Reactor Coolant SYS Sample Line (Pressurizer STM Sample)
30	Reactor Coolant SYS Sample Line (Pressurizer Liquid Sample)
31	Reactor Coolant SYS Sample Line (Loops 2 and 3)
33	Instr Air HDR
60	Accumulator Sample Line
65	Hydrogen Supply

No problems were identified in the review of the above penetration valve alignments.

The inspector concluded that the integrated leak rate test procedure contains the required information and level of detail to adequately address regulatory requirements.

c. Containment Integrated Leak Rate Test (CILRT) Performance - Unit 2 (70313)

(1) Method

The integrated leak rate test was performed at the calculated accident pressure (Pa) by the absolute test method. Acceptance criteria were included in the test procedure for Mass Point, Total Time and Short Duration testing in accordance with the specifications of ANSI/ANS-56.8-1981, "Containment System Leakage Testing Requirements"; ANSI-N45.4-1972, "Leakage-Rate testing of Containment Structures for Nuclear Reactor"; and, BN-TOP-1, Revision 1-1972, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants", respectively.

The computer program for analysis of test data was provided by General Physics Corporation. The program included capability for analysis of test data according to the Mass Point, Total Time or Short Duration test methodologies. The test analysis was performed using the 24 hour Mass Point method.

(2) Description

The licensee performed a 24 hour test at 42 psig with hold points at 14, 21, 35 and 42 psig for collection of structural Integrity Test (SIT) data.

Values bounding the test conditions were as follows:

Containment Volume	1950000 cubic feet
Accident Pressure (Pa)	42 psig
Maximum Allowable Leakage (La)	0.1 wt. percent per day

System conditions for performance of the integrated leak rate test were as follows:

Reactor Vessel	-	Vented to containment atmosphere: water filled
RHR System	-	One loop operating in the shutdown cooling mode
Containment Ventilation System	-	Fans tripped: No forced air flow. Cooling water flow at 860 gpm.
Containment Isolation System	-	Vented, drained, and aligned per procedure EST-085.

The following Table gives a brief description of test sequence and events extracted from the test logbook.

<u>Date</u>	<u>Time</u>	<u>Event</u>
04/06/92	5:00 pm	Final walkdown of containment followed by containment closeout and initial pressurization.
04/07/92	9:00 am	Start stabilization for SIT data collection at 14 psig plateau.
	11:00 am	Inboard purge exhaust valve leaking: pressure between isolation valves is the same as containment: outboard purge valve not leaking.
	10:46 pm	Secured pressurization at 21.5 psig plateau for collection of SIT data: two minor leaks identified at WD1896 and FP 314: no repair made.
4/8/92	6:45 am	Secured pressurization at 35 psig for SIT data collection.
	11:30 am	Start pressurization to 42 psig plateau (test pressure).
	4:15 pm	Pressurization secured: start minimum 4 hour stabilization at 42 psig plateau.
	11:30 pm	First data point for ILRT
4/9/92	2:58 pm	Data collection for 24 hour Mass Point ILRT in progress: dew cell #5 found to be erratic and eliminated: Leak rates recalculated: additional minor leakages identified at WD 1787A, PAS-9, AND IA 3766: no repairs made.
	11:30 pm	Mass Point 24 hour ILRT terminated: Lam = 0.059 wt. percent per day.
	11:45 pm	Supplemental test started

(cont'd)

<u>Date</u>	<u>Time</u>	<u>Event</u>
4/10/92	3:45 am	Supplemental test terminated: $L_c = 0.156$ wt. percent per day.

d. Test Analysis and Results

(1) Type A Test

The Technical Specification for H.B. Robinson Unit 2 specifies the allowable containment leakage rate ( $L_a$ ) as 0.1 wt. percent per day of the containment volume of 1,950,000 cu.ft. calculated for the accident pressure ( $P_a$ ) of 42 psig. Therefore, the acceptance limit for the integrated leak rate (Type A) test of  $0.75L_a$  is 0.075 wt. percent per day.

Analysis of 24 hours of data using the Mass Point methodology shows that the calculated leak rate using a linear regression technique was 0.0593 wt. percent per day with a 95 percent Upper Confidence Limit (UCL) of 0.0602 wt. percent per day. No add-on leakage corrections were required. The resulting "as left" leakage rate of 0.0602 wt. percent per day for the 95 percent UCL meets the Appendix J Limit of 0.075 wt. percent per day. Total Time calculations for the calculated leak rate of 0.0564 wt. percent per day and a 95 percent UCL of 0.0644 wt. percent per day were in reasonable agreement with Mass Point Calculations. Also, the inspectors calculational checks were reasonably consistent with the licensees test results.

(2) Supplemental Test

Appendix J requires that a supplemental test be performed to verify the accuracy of the Type A test and the ability of the CILRT instrumentation to measure a change in leak rate. An acceptable supplemental test method is described in Appendix C of ANSI-N45.4-1972, as follows:

A known leak rate ( $L_o$ ) is imposed on the containment and the measured composite leak rate ( $L_c$ ) must equal, within  $\pm 0.25 L_a$ , the sum of the measured Type A leak rate ( $L_{am}$ ) plus the known leak rate ( $L_o$ ).



The acceptance criteria is expressed as:

$$L_o + L_{am} - 0.25 L_a < L_c < L_o + L_{am} + 0.25 L_a$$

A four hour supplemental test was performed by the imposed leak rate method described in Appendix C to ANSI-N45.4-1972. The following values in units of wt. percent per day were obtained using Mass Point analysis.

Mass Point (wt. percent per day)

L <sub>am</sub>	0.0593
L <sub>o</sub>	0.0996
0.25 L <sub>a</sub>	0.025
L <sub>c</sub>	0.1563

Using these values in the acceptance criteria yields the following:

$$0.133 < 0.1563 < 0.1839$$

L<sub>c</sub> = 0.1563 satisfies the above inequality and therefore, the supplement test is acceptable.

3. Status of Containment Leak Rate Testing

This integrated leak rate test (ILRT) was performed as an "as found" ILRT and is also the "as left" ILRT. No repairs or adjustments were made to containment leakage barriers prior to the Type A test. The measured leak rate UCL of 0.0602 wt. percent per day satisfied both the "as found" leak rate limit of 0.1 wt. percent per day and the "as left" leak rate limit of 0.075 wt. percent per day. The inspector concluded that the licensee has demonstrated an acceptable containment leakage.

4. Structural Integrity Test

The licensee performed a containment building structural integrity test in conjunction with the integrated leak rate test. SIT data was collected at pressure plateaus of 14, 21, 35 and 42 psig. The data collected and instrumentation used in this test was essentially the same as that used in the 1970 and 1974 tests to permit direct comparison to the earlier test results. Preliminary analysis of test results was as follows:

## a. Deflection of Cylinder

Acceptance criteria	1.62 inches
Measured	0.8 inches
Measured 1974	0.8 inches

## b. Vertical Elongation

Acceptance criteria	0.175 inches
Measured	0.13 inches maximum
Measured 1974 (Taunt wire device)	0.138 inches maximum

## c. Vertical Rise at Top of Dome

Measured	0.25 inches
Measured 1974	0.231 inches

## d. Crack Patterns (Same Areas as 1974)

Maximum observed	0.20 inches
Maximum 1974	0.231 inches

The licensee indicated that there appeared to be more cracks and cracks opened earlier but maximum gap was about the same as 1974.

Data collected from the IST will be analyzed in detail at the corporate office.

## 5. Exit Interview

The inspection scope and results were summarized on April 10, 1992, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.