



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W.  
ATLANTA, GEORGIA 30303

Report No.: 50-338/84-29

Licensee: Virginia Electric and Power Company  
Richmond, VA 23261

Docket No.: 50-338

License No.: NPF-4

Facility Name: North Anna

Inspection Conducted: July 31 - August 7, 1984

Inspectors: *H. L. Whitener*  
H. L. Whitener

*10 Oct 84*  
Date Signed

*E. S. Mellen*  
E. S. Mellen

*10/4/84*  
Date Signed

Accompanying Personnel: D. C. Kirkpatrick

Approved by: *F. Jape*  
F. Jape, Section Chief  
Engineering Branch  
Division of Reactor Safety

*10/18/84*  
Date Signed

SUMMARY

Scope: This routine, announced inspection involved 70 inspector-hours on site in the areas of witnessing the containment integrated leak rate test for Unit 1, review of leak rate test associated documentation, and review of the local leak rate test procedure.

Results: No violations or deviations were identified.

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## REPORT DETAILS

### 1. Licensee Employees Contacted

- \*G. E. Kane, Assistant Station Manger
- \*L. A. Johnson, Superintendent, Technical Services
- \*J. P. Smith, Engineering Supervisor, Performance and Testing
- G. Amedeo, Senior Engineer, Performance and Testing
- L. Hartz, Engineer, Performance and Testing
- R. Sharp, Associate Engineer, Performance and Testing
- K. Summers, Associate Engineering Technician
- D. Snodgrass, Instrument Supervisor

#### Other Organization

#### Stone and Webster

- R. Perry, Engineering Consultant
- J. Busa, Engineering Consultant

\*Attended exit interview

### 2. Exit Interview

The inspection scope and findings were summarized on August 7, 1984, with those persons indicated in paragraph 1 above. The licensee acknowledged the failed ILRT and agreed to provide a complete analysis of identified problems, corrective actions and the as found containment leakage condition in the final test report.

### 3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

### 4. Unresolved Items

Unresolved items were not identified during this inspection.

### 5. Containment Integrated Leak Rate Test - Unit 1 (61719)

The inspectors reviewed and witnessed test activities to determine that the Unit 1 primary containment integrated leak rate test was performed in accordance with the requirements of Appendix J to 10 CFR 50, ANSI 45.4 and the test procedure, 1-PT 61.1, "Reactor Containment Building Integrated Leak Rate Test."

Selected sampling of the licensee's activities which were inspected included: (1) review of the test procedure to verify that the procedure was 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 of the test are discussed in the following paragraphs.

a. General Observations

The inspectors witnessed and reviewed portions of the test preparation, containment pressurization, temperature stabilization and data processing during the period of July 31 - August 7, 1984. The following items were verified:

- (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 reviewed were found to be completed.
- (3) Plant systems required to maintain test control were reviewed and found to be operational
- (4) Special test instrumentation was reviewed and found to be installed and calibrated.
- (5) Data required for the performance of the containment leak rate calculations were recorded at 10 minute intervals.
- (6) Problems encountered during the test were described in the test event log.
- (7) Pressurized gas sources were properly isolated and vented to preclude in-leakage or interference of out-leakage through containment isolation valves.
- (8) Procedure valve alignment was reviewed against system drawings to verify correct boundary alignment, and venting and draining of specific systems.
- (9) Temperature, pressure, dew point, and flow data were recorded at 10 minute intervals. Data were assembled and retained for final evaluation and analysis by the licensee. A final ILRT report will be submitted to the Office of Nuclear Reactor Regulation.

b. Integrated Leak Rate Test Procedure Review

The inspectors reviewed test procedure 1-PT-61.1 to verify that adequate test controls, acceptance criteria and valve alignments were specified. Attachment 6.8 to the procedure lists those penetrations which were not aligned in accordance with Appendix J to 10 CFR 50 and specifies that Type C testing will be performed on these penetrations and the results added to the Type A leakage result. No significant

problems, deviations or violations were identified in the procedure review except for the acceptance criteria stated for the supplemental test. This issue is discussed in item c below.

c. Integrated Leak Rate Performance

(1) Method

The containment leak rate was monitored by the mass point analysis using linear regression techniques on a minimum of 24 hours mass data recorded at 10 minute intervals with the containment at 40.6 psig. The 95% upper confidence limit was also calculated. A supplemental test using the pump back method of injecting air into containment was specified in the test procedure. The acceptance criterion in section 5.2 of the test procedure states that the mass change measured by the containment leak rate instrumentation must agree with the metered mass change within 25%. At the exit interview, the inspectors stated that paragraph III.A.3.b of Appendix J references ANSI-45.4, 1972, as an acceptable method for the supplemental test. The use of an alternate method is not excluded. However, Appendix J clearly requires that for any supplemental test method selected, the test shall be conducted for sufficient duration to accurately establish the change in leakage rate between the Type A and the supplemental test. This regulation appears to prohibit a verification test based only on the measurement of a step change in the mass of the containment. A conference call was held on August 24 between North Anna, Stone and Webster, NRR and Region II, in which the licensee was informed that acceptance of a supplemental test must be based on confirmation that the change in leak rate between the Type A test and the supplemental test leak rate, including a known imposed leakage, must meet the criteria as stated in Appendix J, III.A.3.b.

(2) Test Description and Sequence

The containment integrated leak rate test was initiated with the containment inspection at 9:40 a.m. on August 4 and was aborted at 9:00 p.m. on August 8. Problems identified during the test included excessive leakage through penetration 38, Containment Sump Pump Discharge, and penetration 93, Containment Atmosphere Cleanup; a cyclic characteristic in the measured leakage rate from an unknown origin; and loss of two out of three containment fan coolers. The test was aborted prior to the verification test when significant temperature changes occurred upon loss of the second containment fan cooler. The licensee informed Region II by telephone that repairs will be made to penetrations 38 and 93 and the cyclic behavior of the leakage rate investigated prior to rerunning the Type A test.

The test log shows the following sequence:

<u>Date</u>	<u>Time</u>	<u>Event</u>
8/4	0940	Containment access control was established and containment inspection initiated.
	1130	Containment inspection was completed. No significant problems were identified.
	1430	Containment pressurization was initiated at about 4 psi/hr.
	2219	One of three containment fan coolers tripped.
	2357	Secured compressors and began stabilization period. Walkdown of systems to identify leakage was in progress.
8/5	0330	RTD, TE-LM 100-4 was deleted from instrument system.
	0600	Temperature stabilization criterion was met at 0.3 °F/hr change. Data accumulation for the Type A test was initiated.
	0900	Early estimation of leak rate indicates about two times the allowable leakage. Inspection for source of leakage still in progress.
	1830	Large leakage paths identified at penetration 38 and 93 isolated.
	2322	Pressure build up was observed in personnel airlock indicating leakage through

the inner door. No leakage has been observed through the outer door.

8/6	1535	Pressurized personnel airlock to 42 psig (slightly less than containment pressure) to obtain equalization with containment pressure and reduce any apparent leakage as a result of in-leakage to this compartment.
	1600	Systematic leakage inspection still in progress.
8/7		Continued identification and evaluation of system leakage. Decision was made at 2100 on 8/8 to abort the test and depressurize the containment to effect repairs. Inspections have identified a number of small leaks and one significant packing leak.

### (3) Test Results

Allowable leakage ( $L_a$ ) for North Anna Unit 1 is 0.1 wt.% per day. Therefore the integrated leak rate test leakage limit of 0.75  $L_a$  is 0.075% of the containment air by weight per day. In the twelve hours following temperature stabilization in the containment at 6:00 a.m. on August 5, the leak rate varied from about 0.2 wt% to .1wt% per day and yielded a statistically averaged leak rate of 0.15%. At 6:00 p.m. on August 5 the licensee elected to isolate identified leakage at penetrations 38 and 93 and continue the search for additional leak paths. The leakage rate for twelve hours starting at 6:00 p.m. on August 5 and ending at 6:00 a.m. August 6 decreased to about 0.11 wt% per day but was still above the acceptable limit. The licensee continued to manipulate and test systems in the search for additional leakage paths until August 8 when the containment was depressurized for repairs.

At the exit interview the inspector identified the test as the first failed integrated leak rate test on North Anna Unit 1. The licensee stated that the ILRT report to NRR will include a description and analysis of identified leakage, leakage repair and adjustment, the as found containment conditions and a proposed integrated leak rate test schedule.

The licensee subsequently informed Region II that after system repairs were made, a successful integrated leak rate test was performed on September 9 with a leak rate of about one half of the 0.75 wt% limit.

A successful supplemental test was performed following the Type A test by the imposed leak rate technique described in ANSI 45.4, 1972. The NRC will review the test description and analysis when the licensee's final report is received.