



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION II
 101 MARIETTA ST., N.W., SUITE 3100
 ATLANTA, GEORGIA 30303

Report No. 50-370/82-27

Licensee: Duke Power Company
 422 South Church Street
 Charlotte, NC 28242

Facility Name: McGuire

Docket No. 50-370

License No. CPPR-84

Inspection at McGuire site near Charlotte, North Carolina

Inspector: H. L. Whitener 10-22-82
 H. L. Whitener Date Signed

Accompanying Personnel: D. C. Kirkpatrick, IE, Division of Engineering QA,
 September 23-27, 1982.

Approved by: Frank Jape 10/24/82
 F. Jape, Section Chief Date Signed
 Engineering Inspection Branch
 Division of Engineering and Technical Programs

SUMMARY

Inspection on September 22-28, 1982

Areas Inspected

This routine, announced inspection involved one hundred inspector-hours on site in the areas of witnessing the primary containment integrated leak rate testing and included inspection of the test procedure, test preparations, test performance and test results.

Results

Of the four areas inspected, no violations or deviations were identified in three areas; one apparent deviation was found in one area; (Failure to reduce containment pressure to less than 85% of ILRT pressure for at least 24 hours prior to performing the leak rate test, DEV 370/82-27-01 (See paragraph 5a).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *R. Wilkinson, Acting Plant Manager
- J. Snyder, Performance Engineer, General Office
- *M. Sample, Licensing Engineer
- *D. Mendezoff, Licensing Engineer
- *J. Boyles, Unit 2 Performance Assistant Engineer
- *A. Sipe, Performance Assistant Engineer
- W. Petisa, Performance Assistant Engineer
- *M. Semmler, Performance Junior Engineer
- B. Gragg, Performance Specialist

Other licensee employees contacted included leak rate test personnel.

NRC Resident Inspector

- *P. Hopkins, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on September 28, 1982, with those persons indicated in paragraph 1 above. Matters discussed at the interview are as follows:

a. DEV 370/82-27-01

The inspector identified the failure to reduce containment pressure to less than 85% of ILRT pressure for at least 24 hours as a deviation from industry standard ANSI/ANS 56.8, 1981 (See paragraph 5.a).

b. IFI 370 82-27-02

The inspector discussed his concern relating to the inlet pressure measurement for the imposed leak rate flowmeter. The licensee committed to evaluate the technique used to measure the inlet pressure (See paragraph 5.b.4).

3. Licensee Action on Previous Enforcement Matters

Not inspected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Containment Integrated Leak Rate Test (70307, 70313)

The inspectors reviewed and witnessed test activities to determine that the primary containment integrated leak rate test was performed in accordance with the requirements of Appendix J to 10CFR50, ANSI 45.4, Section 6 of the FSAR, the test procedure TP/2/A/1200/29, "Containment Initial Integrated Leak Rate Test and Structural Integrity Test," and with the recommendations specified in industry standard ANSI/ANS 56.8, 1981.

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 to the regulatory requirements listed above; (2) observation of test performance to determine that test prerequisites were completed, special equipment was installed and calibrated and appropriate data were recorded and analyzed; 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/or reviewed portions of the test preparation, containment pressurization, temperature stabilization, and data processing in the period of September 22-28, 1982. The following items were inspected:

- (1) The test was conducted in accordance with an approved procedure maintained at the test control center. Test discrepancies and changes to the procedure were documented in the procedure.
- (2) Selected test prerequisites were reviewed and found to be completed.
- (3) Selected 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 15 minute intervals.
- (6) Problems encountered during the test were described in the test event log.
- (7) Pressurized gas sources were reviewed for proper isolation and venting to preclude in-leakage or interference of out-leakage through containment isolation valves.

- (8) Selected procedure valve alignments were reviewed against system drawings to verify correct boundary alignment and venting and draining of specific systems.
- (9) A sampling of valve positions was observed to verify conformance to procedure valve alignment.
- (10) Temperature, pressure, dew point, and flow data were recorded at 15 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.

No violations were identified in the above areas and with the exception of item 1, the inspector had no further questions in these areas. Regarding item 1, review of the containment pressurization sequence specified in the test procedure raised a concern that outgassing may mask the true leak rate. The procedure requires pressurization of the containment to 16.875 PSIG for at least 10 minutes for the structural integrity test. Containment pressure is then reduced to 15 PSIG to begin the 4 hour stabilization period and the 24 hour leak rate measurement. Under these conditions, air trapped at the higher pressure in insulation, concrete, volumes between insulation valves where the inside valve is leaking, or in vessels vented to containment atmosphere will bleed back into the netfree volume of the containment. Air feeding into the containment free volume at the same time the measurement of air lost from the containment volume is being made will affect the measured leak rate in a non-conservative manner. This condition was reviewed by IE Headquarters during the McGuire 1 ILRT. IE estimated that outgassing could mask as much as 8% of the allowable leakage (Memorandum To Martin Region II from Jordan, IE dated 12/7/78). An industry standard ANSI/ANS 56.8 has been published which recommends that if a containment has been pressurized above test pressure prior to the ILRT, the containment pressure be reduced to less than 85% of test pressure for at least 24 hours prior to repressurizing to test pressure. The inspector identified failure to follow the above recommendation as a deviation to industry standard practice ANSI/ANS 56.8, 1981, paragraph 5.2.1 as follows: (DEV 370/82-27-01): Failure to reduce containment pressure to less than 85% of ILRT pressure for at least 24 hours to allow for outgassing prior to performing the leak rate test.

b. Integrated Leak Rate Test (ILRT) Performance

(1) Method

The containment leak rate was determined by the mass point analysis and linear regression techniques on a minimum of 24 hours of mass data recorded at 15 minute intervals. Containment pressure was full accident pressure (15 PSIG). A statistical 95% upper confidence limit (UCL) was calculated.

(2) Test Description and Sequence

Initial pressurization of the containment was secured at 7:00 a.m. 9/25/82 at the structural integrity test pressure of 16.97 psig. The containment pressure was reduced to the ILRT pressure of 15.07 psig at 10:00 a.m. 9/25/82. Problems with the humidity detectors and the computer program delayed the start of the test until 2:45 a.m., 9/26/82. Test data were recorded at 15 minute intervals from 2:45 a.m., 9/26/82 to 2:30 p.m. 9/27/82. An imposed leak was established and data for the supplemental test taken at 15 minute intervals from 3:30 p.m., 9/27/82 to 2:30 a.m., 9/28/82. The test was terminated at this time.

(3) Test Results

The integrated leak rate measurement (Lam) spanned a period of approximately 36 hours. At 30.5 hours into the test the licensee calculated the leak rate (Lam) as 0.0784 wt.% per day and the upper confidence limit (UCL) as 0.092 wt.% per day. These values are in reasonable agreement with Lam of 0.082 wt.% per day and UCL of 0.107 wt.% per day calculated by the inspectors. The final Lam calculated by the licensee was 0.077 wt.% per day. At this time the identified add-on leakage was not quantified but is expected to be minimal. The preliminary calculated leak rate of 0.077 wt.% per day is well within the allowable leak rate of 0.15 wt.% per day. The final leak rate will be reviewed when the licensee submits the leak rate test report.

(4) 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 ILRT instrumentation to measure a change in leak rate. A known leak rate (Lo) is imposed on the containment and the measured composite leak rate (Lc) must equal, within $\pm 0.25 L_a$, the sum of the measured leak rate (Lam) plus the known leak rate (Lo).

The acceptance criteria is expressed as:

$$L_o + L_{am} - 0.25 L_a \leq L_c \leq L_o + L_{am} + 0.25 L_a$$

Results of the supplemental test show that the composite leak rate Lc was within limits as follows:

Lc (measured)	0.34 wt.% per day
Lo (imposed)	0.276 wt.% per day
Lam (measured)	0.077 wt.% per day
.25 La (± 0.2%)	0.05 wt.% per day

Using these values in the criteria yields the following results:

$$0.303\% \leq 0.34\% \leq 0.403\%$$

Based on the above calculations, the inspector concluded that the integrated leak rate test results were within the acceptance criteria specified in Appendix J to 10 CFR 50 and the Technical Specifications. However, one problem was identified concerning the supplemental test results. The licensee initially assumed that the inlet pressure of the flow meter measuring the imposed leak rate would be containment pressure (29.355 psia). Under these conditions the supplemental test did not meet acceptable limits. The licensee subsequently rigged a pressure gage at the inlet of the flow meter and obtained a reading of 4.92 psig or 19.27 psia. The above calculations are based on this pressure. The method used to obtain the pressure at the inlet of the flow meter consisted of attaching a pressure gage to a tube taped to a hypodermic needle. The hypodermic needle was inserted into a section of rubber hose in the flow path near the inlet to the flow meter. In that a 10 psi pressure drop appeared large relative to the run of pipe between the containment and the flowmeter, the inspector expressed a concern as to possible effects on the measurement from inserting a tube into the flow path or the angle of the tube relative to the direction of flow. At the exit interview the licensee agreed to evaluate the measurement technique and confirm the pressure measurement. This matter was identified for follow-up inspection as: (IFI 370/82-27-02): Review licensee's evaluation of the imposed leak rate flowmeter inlet pressure and potential effect on the validity of the Supplemental Test results.