PGE Portland General Electric Company

James E. Cross
Vice President and Chief Nuclear Officer

October 20, 1992

Trojan Nuclear Plant
Docket 50-344
License NPF-1

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington DC 20555

Dear Sirs:

Reactor Containment Building Integrated Leak Rate Test (Revised)

Attached is the revised technical report of the Containment Integrated Leak Rate Test (ILRT) performed during the 1990 Refueling Outage. It is submitted pursuant to Title 10 of the Code of Federal Regulations, Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors".

The test report was revised as a result of incomplete data analysis in the 1990 ILRT. The incomplete data analysis was identified during a review of the 1990 ILRT as part of the preparation for the next ILRT. A reanalysis of the test data determined that the test results met acceptance criteria. Revision bars are used to indicate changes in the attached report.

The incomplete analysis and its affect on the 1990 ILRT results (acceptance criteria met, but actual numerical leak rate value changed) was discussed with representatives of the Office of Nuclear Reactor Regulation and Region V, of the Nuclear Regulatory Commission on July 24, 1992.

Sincerely,

Robinson
for J.E. Cross

Attachment

c: Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission

Mr. David Stewart-Smith
State of Oregon
Department of Energy

Mr. R. C. Barr
NRC Resident Inspector
Trojan Nuclear Plant

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REACTOR CONTAINMENT BUILDING INTEGRATED LEAK RATE TEST

The 1990 Integrated Leak Rate Test (ILRT) was successfully conducted from May 29 to June 2, 1990. This test is the first of three to be conducted during the second 10-year inservice inspection interval as required by Trojan Technical Specification (TTS) 4.6.1.2.a, "Containment Leakage". It was conducted using the test methodology and provisions identified in American National Standards Institute (ANSI) N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors"; ANSI/American Nuclear Society (ANS) 56.8-1987, "Containment System Leakage Testing Requirements; and Bechtel Topical Report BN-TOP-1, Revision 1, November 1972, "Testing Criteria for Integrated Leak Rate Testing of Primary Containment Structures for Nuclear Power Plants." The results were evaluated using the acceptance criteria specified in the TTS and Title 10 of the Code of Federal Regulations, Part 50 (10 CFR 50), Appendix J, "Primary Reactor Containment Leakage Testing [illegible] Water-Cooled Power Reactors".

Containment Inspections

Examinations of the Containment Building linear plate were conducted per TTS 4.6.1.6.3, "Containment Structural Integrity, Liner Plate", before and after pressurization. Examinations of the Containment Building and anchorages and adjacent concrete surfaces were conducted per TTS 4.6.1.6.2, "Containment Structural Integrity, End Anchorages and Adjacent Concrete Surfaces", while at maximum test pressure. Significant structural deterioration or structural damage was not observed, thus the overall structural integrity was evaluated as acceptable.

Conduct of Leakage Test

Subsequent technical evaluation of the 1990 test results by BCP Technical Services, Inc., in July 1992, indicated that the Containment leaktight integrity was demonstrated by the data recorded during the 1990 Integrated Leakage Rate Test (ILRT). However, due to a malfunction of the temperature measurement system, segments of the originally recorded data could not be used in the leakage rate calculation. Also, it appears reasonably certain that when the verification test imposed leak was restarted following a temporary interruption, the flow rate was not the same as had been previously used. As a result, it was necessary to use specific data segments to demonstrate that Containment leaktightness had met acceptance criteria.

Pressurization of the Containment Building was halted at 60.2 psig, and stabilization of the air mass, including verification of the stable condition, was allowed for 13.6 hours. Containment Building pressure at the end of the stabilization period was 60.6 psig.

Following stabilization, the ILRT was run for 11.8 hours to obtain satisfactory data. The Containment Building leak rate was evaluated at 10-minute increments. The verification test which followed failed to validate the first data set of the ILRT. Test instrumentation was reviewed to determine why the data acquisition system did not adequately indicate the induced leak. One dew cell's input into the leak rate equation was removed from the data scan because it exhibited unusually low readings (data recording of this point was continued).

The ILRT was reentered and run for 20.5 hours to obtain satisfactory data. The verification test which followed validated the ILRT. The imposed leak was temporarily interrupted then restarted during the verification test. Following the successful verification, the Containment Building was depressurized.

The Containment was at test pressure for over 55 hours, during which time two Type A and two verification tests were conducted. Within that period, there are two noncontiguous segments of temperature data, each extending for more than 12 hours, which appear to follow the expected trend. The first segment of temperature data was associated with the first Type A test. The second segment of temperature data was associated with, and continued through the end of, the second Type A test. The leakage rate was calculated using data for the final eight hours (up to the initiation of the verification test imposed leak) of this segment. Results meet the established acceptance criteria.

Plant personnel were able to verify that the induced leak indication was correct after the restart (the second segment of the second verification test) but could not state with certainty that this was the case previously. Therefore, only the second segment of the verification test was considered valid for use in leakage rate calculation. The rate calculated for this segment was within the acceptance band determined for the 8-hour test described above, although recorded temperature deviated due to the temperature measurement system malfunction previously mentioned from the expected trend during the verification test period.

Temperature data recorded during the periods when the trend appeared to be normal were used to reconstruct an exponential temperature profile for the time period Containment was pressurized. This profile closely matches the temperatures used to determine the parameters of the exponential function. Reconstructed temperatures were used in a recalculation of the verification test leakage rate. The new calculated rate was in the acceptance band. Reconstructed temperatures were also used to calculate the mass point leakage rate over the entire second Type A test period (21.5 hours). The leakage rate trend was extrapolated to a 24-hour test duration [with effectively no change in either rate or Upper Confidence Level (UCL)]. The mass point UCL met acceptance criteria and the verification test rate was well within the acceptance band but was also close to the expected value.

ILRT Type A Results

The calculated leak rate for the ILRT Type A test, Lam-TT, using the "Total Time" method was 0.0141 weight percent of the Containment Building atmosphere per day (percent/day). The total local leak rate test (LLRT) leakage not included in the ILRT was determined to be 0.000017 percent/day. Therefore, the overall leak rate for the ILRT Type A test was determined to be 0.014117 weight percent per day.

Bechtel's Topical Report BN-TOP-1 (FSAR Section 6.2.1.6.1, Reference 14) provides the acceptance criteria for Type A tests with durations of less than 24 hours. With a duration of 8 hours the 1990 ILRT Type A test met the acceptance criteria as follows:

95 percent ULC on total time leakage rate:	0.0693 percent/day
Acceptance Limit:	0.0750 percent/day
Extrapolated total time leakage rate:	0.0505 percent/day
Acceptance Limit:	0.0750 percent/day
Mean of the measured rates:	<0.0489 percent/day
Acceptance Limit:	0.1000 percent/day

The previous ILRT was completed on May 29, 1986. The summary report, which was provided by a letter dated October 31, 1986, reported an overall integrated leak rate for the ILRT of 0.01703 weight percent per day, following certain corrective action.

Verification Test Results

The induced leak rate for the verification test (Lo) was 0.0856 weight percent per day. The calculated leak rate for the test (Lc) was 0.0750 percent/day.

The acceptance criterion is stated mathematically as:

$$(L_o + L_{am-TT} + 0.25L_a) > L_c > (L_o + L_{am-TT} - 0.25L_a)$$

The acceptance criterion was met because:

$$(0.0856 + 0.0141 + 0.025) > 0.0750 > (0.0856 + 0.0141 - 0.025)$$

$$0.1247 > 0.0750 > 0.0747$$

Summary of Type B and C Leak Tests

A review of LLRTs performed since the 1986 ILRT did not reveal a test failure for any penetration. Since 1986 the results of Type B and C leak rate tests, expressed in standard cubic centimeters per minute (sccm), are as follows:

Year	Type B (sccm)	Type C (sccm)	Total (sccm)
1990	25,762 ± 228	24,873 ± 207	50,635 ± 308
1989	5,342 ± 165	17,989 ± 212	23,331 ± 269
1988	7,282 ± 126	26,236 ± 209	33,518 ± 244
1987	2,498 ± 62	12,104 ± 243	[illegible],602 ± 251

The acceptance criterion is that the combined leak rate for all penetrations and valves subject to Type B and C leak rate tests shall be less than or equal to 0.60 of L_a, which is 119,874 sccm.

The acceptance criterion was met because the "Total" values indicated in the summary above are less than or equal to 119,874 sccm.

Summary of Modifications Made to the Containment Boundary

Modification made to the Containment boundary since the 1986 ILRT and prior to this ILRT are listed below. The LLRT leakage measured after the work was completed is shown when applicable.

1. Steam Generator Blowdown System Penetrations:

P-39-1	Valves MO-6716 and MO-2810
P-36-1	Valves MO-6717 and MO-2813
P-37-1	Valves MO-6718 and MO-2812
P-38-1	Valves MO-6719 and MO-2808

The valves and associated piping outside the Containment Building were replaced by Request for Design Change 83-052 in May 1988. These penetrations are not subject to local leak rate testing.

2. Electrical Penetrations:

E-121	Assembly NZ13	0 sccm
E-141	Assembly AZ07	0 sccm
E-171	Assembly CZ07	11 sccm

The assemblies were replaced by RDC 89-011 in May 1990.

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