

XI.S4 10 CFR PART 50, APPENDIX J

Program Description

As described in 10 CFR Part 50, Appendix J, containment leak rate tests are required to “assure that (a) leakage through these containments or systems and components penetrating these containments does not exceed allowable leakage rates specified in the technical specifications and (b) integrity of the containment structure is maintained during its service life.”

Appendix J provides two options, Option A and Option B, either of which can be chosen to meet the requirements of a containment leak rate test (LRT) program. Option A is prescriptive with all testing performed on specified, uniform periodic intervals. Option B is a performance-based approach. Some of the differences between these options are discussed below. More detailed information for Option B is provided in the Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.163²³ and NEI 94-01 as approved by the NRC Final Safety Evaluation for the Nuclear Energy Institute (NEI) Topical Report (TR) 94-01, Revision 2. Three types of tests are performed under either Option A or Option B. Type A tests are performed to determine the overall primary containment integrated leakage rate at the loss of coolant accident peak containment pressure. Type B tests are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. Type C tests are intended to detect local leaks and to measure leakage across containment isolation valves installed in containment penetrations or lines penetrating containment. If Type C tests are not performed under this program, they could be included under an ASME Code, Section XI, Inservice Test Program leakage testing for systems containing the isolation valves.

Appendix J requires a general inspection of the accessible interior and exterior surfaces of the containment structure and components be performed prior to any Type A test. General Visual examinations performed in accordance with the ASME Section XI, Subsection IWE (AMP XI.S1) or ASME Section XI, Subsection IWL (AMP XI.S2) program are an acceptable substitute. The purpose of the inspection is to uncover any evidence of structural deterioration that may affect the containment structural integrity or leak-tightness. If there is evidence of structural deterioration, the Type A test is not performed until corrective action is taken in accordance with the repair/replacement procedures.

Evaluation and Technical Basis

1. **Scope of Program:** The scope of the containment LRT program includes all containment boundary pressure-retaining components.
2. **Preventive Action:** The containment LRT program is a performance monitoring program that includes no preventive actions.
3. **Parameters Monitored or Inspected:** The parameters to be monitored are leakage rates through containment shells, containment liners, and associated welds, penetrations, fittings, and other access openings.
4. **Detection of Aging Effects:** A containment LRT program is effective in detecting leakage rate of the containment pressure boundary components, including seals and gaskets. While the calculation of leakage rates and satisfactory performance of containment leakage rate

²³ RG 1.163 Rev. 0 or the latest Revision.

testing demonstrates the leak-tightness and structural integrity of the containment, it does not by itself provide information that would indicate that aging degradation has initiated or that the capacity of the containment may have been reduced for other types of loads, such as seismic loading. This would be achieved with the additional implementation of an acceptable containment inservice inspection program as described in ASME Section XI, Subsection IWE (AMP XI.S1) and ASME Section XI, Subsection IWL (AMP XI.S2).

5. **Monitoring and Trending:** Because the LRT program is repeated throughout the operating license period, the entire pressure boundary is monitored over time. The frequency of these tests depends on which option (A or B) is selected. With Option A, testing is performed on a regular fixed time interval as defined in 10 CFR Part 50, Appendix J. In the case of Option B, the interval for testing may be adjusted on the basis of acceptable performance in meeting leakage limits in prior tests. Additional details for implementing Option B are provided in NRC RG 1.163 and NEI 94-01.
6. **Acceptance Criteria:** Acceptance criteria for leakage rates are defined in plant technical specifications. These acceptance criteria meet the requirements in 10 CFR Part 50, Appendix J, and are part of each plant's current licensing basis.
7. **Corrective Actions:** Corrective actions are taken in accordance with 10 CFR Part 50, Appendix J, and NEI 94-01. When leakage rates do not meet the acceptance criteria, an evaluation is performed to identify the cause of the unacceptable performance and appropriate corrective actions are taken. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions.
8. **Confirmation Process:** As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process.
9. **Administrative Controls:** Results of the LRT program are documented as described in 10 CFR Part 50, Appendix J, to demonstrate that the acceptance criteria for leakage have been satisfied. The test results that exceed the performance criteria are assessed under 10 CFR 50.72 and 10 CFR 50.73. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the administrative controls.
10. **Operating Experience:** To date, the 10 CFR Part 50, Appendix J, LRT program, in conjunction with the containment inservice inspection program, has been effective in preventing unacceptable leakage through the containment pressure boundary. Implementation of Option B for testing frequency must be consistent with plant-specific operating experience.

References

- 10 CFR Part 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants*, Office of the Federal Register, National Archives and Records Administration, 2009.
- 10 CFR Part 50, Appendix J, *Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors*, Office of the Federal Register, National Archives and Records Administration, 2009.

10 CFR 50.72, *Immediate Notification Requirements for Operating Nuclear Power Reactors*, Office of the Federal Register, National Archives and Records Administration, 2009.

10 CFR 50.73, *Licensee Event Report System*, Office of the Federal Register, National Archives and Records Administration, 2009.

Final Safety Evaluation for 'Nuclear Energy Institute (NEI) Topical Report (TR) 94-01, Revision 2, *Industry Guideline for Implementing Performance-Based Option of 10 CFR, Part 50, Appendix J*,' and 'Electric Power Research Institute (EPRI) Report No. 1009325, Revision 2, *Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals*, August 2007,' June 25, 2008.

NEI 94-01, Rev. 2-A, *Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J*, Nuclear Energy Institute, August 2007.

NRC Regulatory Guide 1.163, Rev. 0, *Performance-Based Containment Leak-Test Program*, U.S. Nuclear Regulatory Commission, September 1995.