



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

APPENDIX J REVIEW

LICENSE NO. DPR-22

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NO. 50-263

1.0 Introduction

Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," of 10 CFR Part 50 was published on February 14, 1973. Because many nuclear plants were already operating and a number more in advanced stages of design or construction, the NRC decided to have these plants reevaluated against the requirements of the new regulation. Therefore, beginning in August 1975, licensees were requested to review compliance with the requirements of Appendix J. Following the initial responses to these requests, the NRC staff developed positions which assured that the objectives of the testing requirements in the regulations were satisfied. The positions have since been applied in our review of the submittals filed by the licensee for Monticello.

2.0 Discussion

On August 5, 1975 (Reference 1) the NRC requested Northern States Power Company (the licensee) to review the containment leakage testing program at the Monticello Nuclear Generating Plant (Monticello) and the associated Technical Specifications for compliance with the requirements of Appendix J to 10 CFR Part 50.

By letter dated September 19, 1975 (Reference 2), the licensee provided a detailed comparison between the containment leakage testing program at Monticello and the requirements of Appendix J. By application dated January 30, 1976 (Reference 3) and subsequently revised on May 4, 1976 (Reference 4), the licensee proposed changes to the Technical Specifications. The licensee supplemented the license amendment request with a request for 1) certain exemptions from the requirements of Appendix J in a letter dated May 5, 1976 (Reference 5) and 2) proposed modification to various piping systems in another letter, also dated May 5, 1976 (Reference 6). On October 28, 1976, a meeting was held with the licensee to discuss certain aspects of the proposals. At this time, the licensee provided additional information

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to support various positions. The minutes of this meeting along with the submitted information and interchanged agreements were documented in a summary dated November 12, 1976 (Reference 7). Finally, by letter dated September 2, 1977, as supplemented on March 20, 1978 (References 8 and 9), the licensee requested additional changes to the Technical Specifications that decreased the duration of the Type A test. Reference 8 was later revised by letter dated December 6, 1979 (Reference 10) and was approved by the staff on February 29, 1980 (Reference 11). Therefore, the licensee provided an overall plan for achieving full compliance with Appendix J, that includes design modifications, proposed changes to the Technical Specifications and requests for exemptions.

3.0 Evaluation

Our consultant, the Franklin Research Center (FRC), has reviewed the licensee's submittals (References 2 to 9) and prepared Technical Evaluation Report (TER-C5257-30), "Containment Leakage Rate Testing," for Monticello. We have reviewed FRC's evaluation and concur in its bases and findings, but with one exception. This exception is associated with the proposed change to Item 4.7.A.2.b.3.c of the Technical Specifications and concerns the percentage of leakage rate measured during the supplemental test during the Type A test. Further discussion of our position is stated in Section 3.3.2 of this Safety Evaluation.

The licensee's program consists of an exemption request, design modifications and changes to the Technical Specifications. Our evaluation discusses the exemption requests only. The request for an amendment to the Technical Specifications and your proposed modifications will be reviewed in a separate action.

The licensee, in Reference 5, requested certain exemptions to the requirements of Appendix J and provided additional information in a meeting, documented in Reference 7.

3.1.1 Type B Testing of Instrument Lines

The licensee requested an exemption from Type B testing of thirteen instrument lines associated with the following penetrations:

X-29E	Drywell Pressure Sensing Line
X-29F	Drywell Pressure Sensing Line
X-32C	Drywell Flood Level Switch Tap
X-50E	Drywell Pressure Sensing Line
X-50F	Drywell Pressure Sensing Line
X-206A	Torus Instrumentation
X-206B	Torus Instrumentation
X-206C	Torus Instrumentation
X-206D	Torus Instrumentation
X-209A	Torus Instrumentation

X-209B Torus Instrumentation
X-209C Torus Instrumentation
X-209D Torus Instrumentation

Since these instrument lines are connected to sealed transducers and are designed to withstand the stresses of a loss-of-coolant accident, they are considered a part of the containment barrier. The integrity of this type of barrier is ensured by exposing the lines to periodic Type A test pressure.

Therefore, these instrument lines do not require Type B testing, provided they are exposed to Type A test pressure. No exemption from the requirements of Appendix J is necessary because the objectives of Appendix J are satisfied.

3.1.2 Type B Testing of the Drywell Air Locks

The licensee has requested an exemption from both pressure and frequency of Type B testing of the air lock. Specifically, the following exemptions were requested:

- a) A 10 psig test in lieu of the required 41 psig (Pa, peak calculated accident pressure) test;
- b) A three day test of the air lock when it is in use rather than after each use; and
- c) An acceptance criteria of 0.025 La (maximum allowable leakage rate) at 10 psig would be imposed when the air lock is tested at times other than when all Type B and C penetrations are tested.

After the licensee submitted the exemption request, Section III.D.2 of Appendix J had been revised, effective October 22, 1980. The revised rule requires testing of the air locks as follows:

1. Every six months at a pressure of not less than accident pressure (Pa) and after periods when the air lock is opened and containment integrity is not required;
2. Within three days of opening (or every three days during periods of frequent opening) when containment integrity is required, at a pressure of Pa or at a reduced pressure as stated in the Technical Specifications.

Therefore, the licensee's request for exemption from testing the air lock after each opening, and testing the drywell air lock at 10 psig every three days when the air lock is in use is acceptable.

However, the licensee's request for exemption from the required air lock test pressure (Pa) during the six-month test is denied. Periodic testing (every six-month test) of the air lock at a test pressure of Pa is required to demonstrate air lock integrity at accident pressures. But in subsequent discussions with the licensee regarding test methodology and additional evaluation by the staff of air lock degradation, casual factors and operating history have resulted in reevaluation of our position. Test performance requires shutting down the reactor and opening the equipment hatch to install a strongback on the inner air lock door to prevent unseating the air lock door and subsequent door and hatch openings to remove it. This would result in an outage of several days for the licensee, the cost of replacement power to the public, and could subject operating personnel to additional radiation exposure. Furthermore, the additional openings of the equipment hatch and air lock provide additional opportunities for inadvertent seal degradation. Based on these considerations, we have developed the following modified position which we believe meets the objectives of Appendix J requirements for Type B tests of containment air locks. We still require containment air locks to be tested every six months at a pressure of not less than Pa in accordance with Appendix J, except that the test interval may be extended up to the next refueling outage (up to a maximum interval between Pa tests of 24 months) provided that there have been no air lock openings since the last successful test at Pa and a Pa test is performed following the next air lock opening. The intent of the Appendix J requirement is to assure that the air lock door seal integrity is maintained and no degradation has occurred as a result of opening the air lock doors between testing intervals at Pa. Since an inadequate basis exists to conclude that no air lock seal degradation occurs if the air lock doors have not been opened between extended testing intervals at Pa, we believe that a reduced pressure test or testing between seals every six months should be performed to assure that the air lock door seal integrity is maintained between the extended testing intervals at Pa. We believe this position satisfies the objectives of the requirements. The licensee will be requested to propose appropriate changes to the Technical Specifications.

We have denied the licensee's request to use an acceptance criteria of 0.025 La at 10 psig when air locks are tested at times other than testing all Type B and C penetrations because the licensee's method, to extrapolate the acceptance criteria of the Standard Technical Specifications to lower pressures, does not lead to a conservative correlation. The licensee shall be required to use a more conservative leakage rate when the air lock is tested at reduced pressure rather than accident pressure. The acceptance criterion at 10 psig should be 0.007 La rather than 0.025 La when extrapolating air lock test results measured at 10 psig as compared to Pa (41 psig).

3.1.3 Type C Testing of Torus and Drywell Motor-Operated Spray or Recirculation Valves

The licensee requested an exemption from Type C testing requirements for motor-operated isolation valves installed in the torus spray lines, torus recirculation lines, and drywell spray lines.

a. Torus Spray Lines (Valves MO-2006, 2007, 2010, 2011)

The licensee's request for exemption from Type C testing requirements for torus spray line valves MO-2006 and 2007 is acceptable because they are sealed by water from the RHR pumps under post-accident conditions.

The licensee's request for exemption from Type C testing requirements for torus spray line valves, (MO-2010 and 2011) is denied. Valve MO-2011 is a globe valve and without a detailed drawing, it cannot be determined on which side of the valve the packing is located. Nevertheless, the basic principles involved in the discussion below, associated with the drywell spray line apply to the torus spray line. The situation for MO-2010 is similar. These valves should be Type C tested in the direction of accident pressure or pneumatically tested so the valve packing and body-to-bonnet seals are exposed to the test pressure.

b. Torus Recirculation Lines (Valves MO-2008, 2009)

The licensee's request for exemption from Type C testing requirements for torus recirculation line valves MO-2008 and 2009 is acceptable because they are sealed by water from the suppression pool; provided the packing of these valves is not exposed to leakage coming from the torus spray line (MO-2010 and 2011).

c. Drywell Spray Lines (Valves MO-2020, 2021, 2022, 2023)

The licensee's request for exemption from Type C testing requirements for drywell spray line valves MO-2020 and 2021 is acceptable because the valves are sealed by water from the RHR pumps under post-accident conditions.

The licensee's request for exemption from Type C testing requirements for valves MO-2022 and 2023 is denied. In the case of valve MO-2023, the valve packing area of the body-to-bonnet seal area may be exposed to containment air pressure since the water seal is not present against this valve. In this case, containment air can escape to

the outside atmosphere through either the valve packing or the body-to-bonnet seal. The situation is similar for valve MO-2022. Since these valves can become a source of leakage of containment air to the outside atmosphere, they should be Type C tested in the direction of accident pressure or pneumatically tested so the valve packing and body-to-bonnet seals are exposed to test pressure.

3.1.4 Direction of Test Pressure

The licensee has requested an exemption from Appendix J to permit testing in a direction opposite to that in which the isolation valves will perform their safety function for the following penetrations:

X-14	Reactor Water Cleanup
X-18	Floor Drain Sump
X-19	Equipment Drain Sump
X-25	Drywell Ventilation
X-26	Drywell Ventilation
X-27D	Oxygen Analyzer
X-27E	Oxygen Analyzer
X-27F	Oxygen Analyzer
X-39A	Drywell Spray
X-39B	Drywell Spray
X-41	Coolant Sample
X-48	Nitrogen Pumpback
X-205	Torus Ventilation
X-214	Oxygen Analyzer
X-220	Oxygen Analyzer

No exemption from Appendix J is necessary for the reverse direction testing of isolation valves on penetrations X-25, 26, 27D, 27F, 41, 48, 205, 214 and 220 because Appendix J permits this type of testing. However, the licensee should retain on the site, the documentation that shows reverse direction testing to be equivalent to or more conservative than testing in the accident pressure direction.

However, exemption from the requirements of Appendix J to permit reverse-direction testing of the inboard isolation valves of the reactor water cleanup system (X-14), the floor sump discharge (X-18), and the equipment sump discharge (X-19) is denied. A lack of provision for leak testing in the required direction is not sufficient justification for exemption. These valves should be tested in the direction of accident pressure.

The licensee's request for exemption for testing of penetrations X-39A and X-39B is discussed in Section 3.1.3(c) of this Safety Evaluation.

3.1.5 Type C Testing of Core Spray Testable Check Valves

The licensee has requested an exemption from Type C testing requirements of the testable check valves (AO-14-13A and AO-14-13B) in the core spray lines.

Since the core spray testable check valves are not relied upon to perform a containment isolation function, exemption from the requirements of Appendix J is not required, provided the licensee meets the following two conditions:

- a. The motor-operated isolation valves (MO-1751, 1752, 1753, 1754) outside containment are designated as containment isolation valves and are Type C tested as required by Appendix J;
- b. The licensee has post-accident emergency procedures which require the operator to isolate an idle core spray loop by shutting the appropriate motor-operated isolation valves as soon as it is determined that there is no core spray flow and the flow cannot be established.

3.1.6 Type C Testing of Low Pressure Coolant Injection (LPCI) Testable Check Valves

The licensee has requested an exemption from Type C testing requirements of the testable check valves (AO-10-46A, AO-10-46B) in the low pressure coolant injection (LPCI) supply lines.

Since the LPCI testable check valves are not relied upon to perform a containment isolation function, whether the LPCI cooling loop is in operation or not, we find that an exemption is not required, because the licensee must perform Type C tests on the motor-operated isolation valves (MO-2012, 2013, 2014, 2015) outside containment.

3.1.7 Type C Test Pressure for Main Steam Isolation Valves

The licensee has requested, as an exemption from Appendix J, to continue testing the main steam isolation valves (MSIVs) at 25 psig in accordance with current Technical Specifications rather than 41 psig (Pa) as required by Appendix J. The penetrations and valves involved are as follows:

X-7A	AO-2-80A	AO-2-86A
X-7B	AO-2-80B	AO-2-86B
X-7C	AO-2-80C	AO-2-86C
X-7D	AO-2-80D	AO-2-86D

The MSIVs are leak tested by pressurizing between the valves. The MSIVs are angled in the main steam lines in the direction of flow to afford better sealing upon closure. On this basis, we conclude that testing at a reduced pressure of 25 psig is acceptable. A test pressure of Pa acting under the inboard disc is sufficient to lift the disc off its seat, and result in excessive leakage into the reactor vessel. This would result in a meaningless test. The proposed test calls for a test pressure of 25

psig to avoid lifting the disc at the inboard valve. The total observed leakage through both valves (inboard and outboard) is then conservatively assigned to the penetration.

Because of the unique design of these valves and for the reasons described above, we find acceptable the licensee's request for exemption from Type C pressure testing.

3.1.8 Lines Terminating Below the Surface of the Suppression Pool

The licensee requested an exemption from the Type C testing requirement of isolation valves in penetrations where the line terminates below the surface of the suppression pool.

Since the suppression pool provides an effective water seal, these valves are not relied upon to perform a containment isolation function. Therefore, request for exemption from Type C testing of those valves where the lines terminate below the surface of the suppression pool is not necessary.

3.1.9 Proposed Increase in the Value of Maximum Allowable Leakage Rate (La)

The licensee requested that the value of L_a be increased from the present 1.2% per day to 1.5% per day. The licensee's proposal to increase the maximum allowable leakage rate is not evaluated in this Safety Evaluation because this value is not derived in accordance with Appendix J and it is not within the purview of the Appendix J to prescribe how this value should be established. This matter is presently under staff review and any increase in the value of L_a must be justified through a dose consequence analysis for the site.

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4.0 References

1. Letter, K. R. Goller (USNRC) to L. O. Mayer (NSP), August 5, 1975
2. Letter, L. O. Mayer (NSP) to K. R. Goller (USNRC), September 19, 1975.
3. Letter, L. J. Wachter (NSP) to V. Stello (USNRC), January 30, 1976.
4. Letter, L. O. Mayer (NSP) to V. Stello (USNRC), May 4, 1976.
5. Letter, L. O. Mayer (NSP) to V. Stello, Subject: Requests for Exemption, May 5, 1976.
6. Letter, L. O. Mayer (NSP) to V. Stello, Subject: Planned Modifications, May 5, 1976.
7. Summary of Meeting to Discuss Monticello 10 CFR 50, Appendix J, Exemption Requests, November 12, 1976.
8. Letter, L. O. Mayer (NSP) to Director, Office of Nuclear Reactor Regulation, (USNRC) September 2, 1977.
9. Letter, L. O. Mayer (NSP) to Director, Office of Nuclear Reactor Regulation, (USNRC), March 20, 1978.
10. Letter, L. O. Mayer (NSP) to Director, Office of Nuclear Reactor Regulation, (USNRC), December 6, 1979.
11. Letter, T. A. Ippolito (USNRC) to L. O. Mayer (NSP), February 29, 1980.