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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 39 Related to ESBWR Design Certification Application – Engineered Safety Features – RAI Numbers 6.2-75 through 6.2-94**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

If you have any questions about the information provided here, please let me know.

Sincerely,

Kathy Sedney for

David H. Hinds
Manager, ESBWR

D068

Reference:

1. MFN 06-202, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 39 Related to ESBWR Design Certification Application,* June 22, 2006

Enclosure:

1. MFN 06-231 – Response to Portion of NRC Request for Additional Information Letter No. 39 Related to ESBWR Design Certification Application – Engineered Safety Features – RAI Numbers 6.2-75 through 6.2-94

cc:

WD Beckner	USNRC (w/o enclosures)
AE Cubbage	USNRC (with enclosures)
LA Dudes	USNRC (w/o enclosures)
GB Stramback	GE/San Jose (with enclosures)
eDRF	0000-0055-6556

ENCLOSURE 1

MFN 06-231

Response to Portion of NRC Request for

Additional Information Letter No. 39

Related to ESBWR Design Certification Application

Engineered Safety Features

RAI Numbers 6.2-75 through 6.2-94

NRC RAI 6.2-75

DCD Tier 2, Section 6.2.6.1.1 mentions, without explanation or justification, that, for containment integrated leakage rate tests (ILRTs or Type A tests), main steam isolation valve (MSIV) leakage rates will be excluded from L_a, the maximum allowable containment leakage rate. Further, in DCD Tier 2 Chapter 16, Technical Specifications, there are several mentions of special treatment of MSIV leakage rates (SR 3.6.1.3.8, SR 3.6.1.3.10). However, 10 CFR Part 50, Appendix J, Option A or Option B, requires MSIV leakage rates to be included in L_a. An exemption from Appendix J would be required to exclude MSIV leakage rates from L_a.

In addition to this exemption, many operating BWRs have obtained exemptions from including MSIV rates in the sum of local leakage rates (Type B and Type C tests). Many operating BWRs have also obtained exemptions from the requirement to perform Type C tests of MSIVs with a test pressure of P_a, the calculated peak containment internal pressure related to the design basis loss-of-coolant accident (LOCA). Standard Review Plan (SRP) 6.2.6, Rev. 2, July 1981,states that, for MSIV Type C tests, a test pressure of less than P_a and the test acceptance criteria should be justified and included in the plant TS.

In the DCD Tier 2, provide and justify the proposed test pressure and acceptance criteria for the MSIVs, and discuss the proposed treatment of the measured leakage rates, in relation to their inclusion in the Type A measured leakage rate and the sum of the Type B and Type C leakage rates. Further, provide and justify any needed exemption requests from Appendix J requirements.

GE Response

It is correct that the definition of L_a as given in 10 CFR 50 Appendix J includes all leakages paths from the containment. However the containment design leakage rate of 0.5% weight of containment volume in a 24-hour period does not include MSIV leakage (see DCD Tier 2, Table 6.2-1 for containment design leakage). Therefore as an exemption from Appendix J, L_a is redefined as containment leakage given in DCD Table 6.2-1. DCD Tier 2, Section 6.2.6.1.1 first bullet under the heading "Acceptance Criteria" will be revised as per Attachment A. This exemption from the leakage acceptance criteria of 10 CFR 50, Appendix J, is needed because the MSIV leakage rate is accounted for separately in the site radiological dose analysis.

For Type C tests MSIVs will be tested at a differential pressure less than P_a. The exemption from the pressure requirements of 10 CFR Part 50, Appendix J, is needed because the design of the MSIVs is such that the test pressure is applied between two MSIVs in the same line and testing in the reverse direction for one of the MSIVs tends to unseat the valve disc and would result in a meaningless test. Also, at a lower differential pressure the leakage testing of MSIV is more severe and conservative than at higher differential pressure. The MSIV seat and disc are made of steel for which the lower differential pressure will not have enough force to deform the seat and disc interface

to seal off the micro-opening between the two parts. A lower test pressure will drive the air across the opening whereas a higher differential pressure may actually seal the leak paths.

The measured leakage rate of MSIV in a Type C test will not be included in the sum of leakages from Type B and C tests which is an exemption from 10 CFR 50 Appendix J requirement. The justification for this exemption is the redefinition of L_a which does not include MSIV leakage as stated above.

The above exemptions from 10 CFR 50 Appendix J requirements along with justifications are added in the DCD Tier 2, Sections 6.2.6.1.1 and in 6.2.6.3 after the three new paragraphs added in response to RAI 6.2-91.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-76

DCD Tier 2, Section 6.2.6 contains numerous references to Appendix J reporting requirements. However, all requirements to make reports to the NRC were eliminated from Appendix J (in what is now known as Option A) in 1995, and Option B, promulgated in 1995, also contains no reporting requirements, other than referring to the requirements contained in 10 CFR 50.72 and 10 CFR 50.73.

Correct these statements in Section 6.2.6 of the DCD.

GE Response

Comment is accepted. The following changes will be made in DCD Tier 2, Revision 2:

Section 6.2.6.1.1, under heading "Acceptance Criteria", first bullet will be revised by deleting the following:

"The calculated leakage rate and upper 95% confidence limit are reported to the NRC."

Section 6.2.6.1.1, under heading "Acceptance Criteria", third bullet will be revised by deleting the following in the last sentence:

"and included in the report to be submitted to the NRC."

Section 6.2.6.1.1, under heading "Prerequisites", first bullet will be revised by deleting the following:

"The structural deterioration and corrective action are reported to the NRC in accordance with Appendix J of 10 CFR 50."

Section 6.2.6.1.2, third paragraph will be revised by deleting the following:

"If any ILRT fails to meet the acceptance criteria prior to corrective action, the test schedule applicable to subsequent ILRTs shall be subject to review and approval by the NRC.

Section 6.2.6.2, third paragraph will be revised by deleting the following:

"If repairs are required to meet this limit, the results are reported in a separate summary to the NRC."

Section 6.2.6.3, last paragraph will be revised by deleting the following:

"If repairs are required to meet this limit, the results are reported in a separate summary to the NRC, including description of the structural conditions of the components that contributed to the failure."

Section 6.2.6.4, second paragraph will be revised by deleting the following:

"Type A, B, and C test results are submitted to the NRC in the summary report approximately three months after each test."

The DCD changes are shown in Attachment A.

NRC RAI # 6.2-77

DCD Tier 2, Section 6.2.6 uses the term Pac instead of Pa for the calculated peak containment internal pressure related to the design basis loss-of-coolant accident. Although there is a historical basis for the use of Pac, Pa is used today in most documents, including Options A and B of Appendix J, in standard technical specifications, and in the proposed technical specifications in DCD Tier 2 Chapter 16.

In the interests of clarity and consistency, replace P_{ac} with P_a in the DCD.

GE Response

Comment is accepted. The following changes will be made in DCD Tier 2, Revision 2:

Section 6.2.6.2, second paragraph will be revised by changing P_{ac} to P_a at two places

Section 6.2.6.3, second, third and fourth paragraph will be revised by changing P_{ac} to P_a at three places

The DCD changes are shown in Attachment A.

NRC RAI 6.2-78

In DCD Tier 2, Section 6.2.6, second paragraph, second bullet (General Design Criterion 53), the word "below" should be "bellows." Correct this error in the DCD.

GE Response

Comment is accepted. In DCD Tier 2, Revision 2, Section 6.2.6, second bullet will be revised by changing the word "below" to "bellows" in the last sentence.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-79

In DCD Tier 2, Section 6.2.6.1.1, second paragraph, second bullet, [ILRT] pressure Stabilization Phase," the discussion is appropriate for Option A of Appendix J. However, the requirements associated with Option B of Appendix J, through ESBWR's commitment to conform to Regulatory Guide (RG) 1.163 through proposed Technical Specification 5.5.9, are more elaborate.

Expand the discussion in the DCD to address the Option B requirements.

GE Response

Comment is accepted. DCD Tier 2, Section 6.2.6.1.1, second paragraph, second bullet will be revised to include the ILRT containment pressure stabilization criteria for 10 CFR 50 Appendix J Option B as given in Section 5.6 of ANS 56.8-1994.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-80

In DCD Tier 2 Section 6.2.6.1.1, second paragraph, third bullet, "[Pre-operational] Integrated Leakage Rate Test Phase," states that a test duration of less than 24 hours may be acceptable if it can be demonstrated that the leakage rate can be accurately determined during the shorter test period. For a pre-operational ILRT, this is generally prohibited. Under Option B of Appendix J, a 24-hour minimum duration is required by ESBWR's commitment to conform to RG 1.163 through Technical Specification 5.5.9. RG 1.163 endorses ANSI/ANS-56.8-1994, which states, in section 5.8.1(3), "The Type A duration shall be at least 24 hours for a preoperational test...." In a similar way, Appendix J, Option A, section III.A.3.(a) states that, for the Mass Point Method, the test duration of any Type A test must be at least 24 hours. For the rarely-used Total Time and Point-to-Point methods, one is required to conform to N45.4-1972, which states, in section 7.6, "If it can be demonstrated to the satisfaction of those responsible for the acceptance of the containment structure that the leakage rate can be accurately determined during a shorter test period, the agreed-upon shorter period may be used."

The only short-duration methodology which the NRC has accepted is Bechtel Topical Report BN-TOP-1, Revision 1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants," dated November 1, 1972. However, this methodology is rarely used today.

The staff suggests that GE delete the last sentence in the third bullet. Alternately, add to the DCD a full explanation of the restrictions on the use of test durations of less than 24 hours.

GE Response

Comment is accepted. In DCD Tier 2, Revision 2, Section 6.2.6.1.1, second paragraph, third bullet will be revised by deleting the following:

"A shorter test period may be acceptable if it can be demonstrated that the leakage rate can be accurately determined during the shorter test period."

The DCD changes are shown in Attachment A.

NRC RAI 6.2-81

In DCD Tier 2, Section 6.2.6.1.1, under the heading "Acceptance criteria," second bullet, there is the following statement concerning the ILRT verification test: "The measurements are acceptable if the correlation between the verification test data and ILRT data demonstrates an agreement within ± 25%." The correct figure is ±0.25 L_a, in accordance with section III.A.3.(b) of Option A of Appendix J and section 5.9.3 of ANSI/ANS-56.8-1994 for Option B of Appendix J.

Correct this error in the DCD.

GE Response

Comment is accepted. In DCD Tier 2, Revision 2, Section 6.2.6.1.1,under the heading "Acceptance Criteria" second bullet, second last sentence will be revised by changing "± 25%" to "±0.25 L_a".

The DCD changes are shown in Attachment A.

NRC RAI 6.2-82

In DCD Tier 2, Section 6.2.6.1.1, under the heading "Acceptance Criteria," the third bullet discusses actions to take during an ILRT if excessive leakage occurs through locally testable penetrations or isolation valves to the extent that it would interfere with satisfactory completion of the test. The third sentence states: "The sum of the local leakage rates and the UCL shall be less than 75% of the maximum allowable leakage, L_a." This is consistent with Option A requirements, but more conservative than Option B requirements. Option B guidelines define a "performance leakage rate" for determining the success of an ILRT for the purpose of determining the future ILRT schedule (see NEI 94-01, Revision 0, section 8.0). The performance leakage rate is generally less than the Option A as-found leakage rate, meaning that a test which would have failed under Option A usually passes under Option B, and Option B test frequencies usually are not increased as they would be under Option A.
If the ESBWR intent is to use the Option B approach described above, provide an appropriate revision to this section of the DCD.

GE Response

Comment is accepted. DCD Section 6.2.6.1.1, third bullet under the heading "Acceptance Criteria" will be revised by incorporating the 10 CFR 50 Appendix J, Option B guidelines as explained in NEI 94-01, Revision 0, Section 8.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-83

The response to NRC RAI 6.2-3 provides a revision to the first two paragraphs of DCD Tier 2, Section 6.2.6.1.2, to be made as part of DCD Revision 02. The second sentence of the second paragraph states, "In case Option A is selected, the ILRTs will be performed approximately at equal intervals during each 10-year service period." One can see that this statement does not define the test frequency; it does not say how many tests are performed during each 10-year service period. Option A requires 3 tests in each 10-year service period (Appendix J, Option A, section III.D.1.(a)).

Correct this sentence in the DCD.

GE Response

Comment is accepted. In DCD Section 6.2.6.1.2, the second sentence of second paragraph will be revised to read as follows:

"In case Option A is selected, the ILRTs will be performed at least three (3) times during each 10-year service period."

This change supersedes the change provided in the same sentence in response to RAI # 6.2-3.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-84

DCD Tier 2, Section 6.2.6.1.2, third paragraph, discusses required actions if any ILRTs fail to meet their acceptance criteria. These actions apply to Option A, but are more conservative than Option B (see NEI 94-01, Revision 0, section 9.2.6).

Label the existing discussion as applicable to Option A in the DCD and the staff suggests that GE add a discussion for Option B to the DCD.

GE Response

Comment is accepted. DCD Tier 2, Section 6.2.6.1.2, third paragraph is revised and labeled for Option A and following this a paragraph is inserted that discusses Option B.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-85

DCD Tier 2, Section 6.2.6.1.2, under the heading "Additional Criteria for Integrated Leakage Rate Tests," discusses venting and draining of systems for the test. However, the criteria are not completely consistent with either Option A or Option B of Appendix J, or the associated guidance documents. Specifically:

(a) In the second sub-bullet of the first bullet, the DCD says that portions of closed systems inside containment that penetrate containment and that are not relied upon for containment isolation purposes following a LOCA are kept open or vented to the containment atmosphere during the ILRT. By contrast, Option A, section III.A.1.(d) replaces the highlighted portion above with "rupture as a result of a loss of coolant accident." For Option B, NEI 94-01, Revision 0, is applicable. It states, in section 8.0:

"All Appendix J pathways must be properly drained and vented during the performance of the ILRT, with the following exceptions:

- *Pathways in systems which are required for proper conduct of the Type A test or to maintain the plant in a safe shutdown condition during the Type A test;*
- *Pathways in systems that are normally filled with fluid and operable under post-accident conditions;*
- *Portions of the pathways outside primary containment that are designed to Seismic Category I and at least Safety Class 2; or,*
- *For planning and scheduling purpose, or ALARA considerations, pathways which are Type B or C tested within the previous 24 calendar months need not be vented or drained during the Type A test."*

The second bullet is applicable.

(b) The third bullet in the DCD states:

"Those portions of fluid systems penetrating containment that are external to the containment and that are not designed to provide a containment isolation barrier are vented to the outside atmosphere, as applicable, to ensure that full post-accident differential pressure is maintained across the containment isolation barrier." [emphasis added]

For Option B, the third bullet of the quotation from NEI 94-01, Revision 0, section 8.0, above, differs from the highlighted phrase from the DCD. For Option A, there is no specifically-applicable guidance.

These differences between the DCD and the requirements are significant. Revise the DCD to provide justifications for these variances from the requirements, or revise the DCD to be consistent with the requirements for both Option A and Option B.

GE Response

Comment in (a) for Options A and B is accepted. DCD Tier 2, Section 6.2.6.1.2 is revised by incorporating the requirement of Appendix J, Option A, section III.A.1.(d) and adding the requirements for Option B as per NEI 94-01 Revision 0, Section 8.0
Comment (b) is accepted. DCD Tier 2, Section 6.2.6.1.2 under the heading "Additional Criteria for Integrated Leakage Rate Tests" is revised by incorporating Option B requirements.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-86

DCD Tier 2 Section 6.2.6.2, "Containment Penetration Leakage Rate Test (Type B)," states that, for the flowmeter method, water may be used as a test medium for Type B tests, "if applicable."

Option A, section III.B.1, requires the Type B test medium to be air, nitrogen, or pneumatic fluid specified in the technical specifications or associated bases. As water is not a pneumatic fluid, it is prohibited.

Option B, section III.B., begins: "Type B pneumatic tests...." Applicable guidance is in ANSI/ANS-56.8-1994, section 3.3.5, "Test Medium," which states, in part, "Type B and Type C tests shall be conducted with air or nitrogen."

Delete the option for water as a Type B test medium from the DCD.

GE Response

Comment is accepted. In DCD Tier 2, Section 6.2.6.2, second paragraph, water option as a testing medium for Type B test is deleted.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-87

In DCD Tier 2, Section 6.2.6.2, the last sentence states, "Because the restraining force on the door is not critical for the performance of the overall [air] lock pressure test on a lock with inflatable seals, no mechanism for monitoring the force is provided." However, this contradicts the last sentence of the previous paragraph, which states, "These air-locks contain no inflatable seals."

Correct this discrepancy in the DCD.

GE Response

Comment is accepted. The discrepancy will be removed with the following changes:

In DCD Tier 2, Section 6.2.6.2 -

Last sentence of second last paragraph: "These air-locks contain no inflatable seals" will be deleted.

Last sentence of last paragraph: "because the restraining force on the door is not critical for the performance of the overall lock pressure test on a lock with inflatable seals, no mechanism for monitoring the force is provided." will be deleted.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-88

DCD Tier 2, Section 6.2.6.2, second paragraph, allows Type B tests to be performed using either the pressure-decay method or the flowmeter method. The fifth paragraph seems to require the pressure decay method only to be used for air lock tests. Because the pressure-decay method can be problematic for air lock door seals, verify that this is the intent, or modify the DCD to allow the flowmeter method for air lock tests.

GE Response

Comment is accepted. In DCD Tier 2, Section 6.2.6.2, fifth paragraph will be revised to include the flowmeter option for Type B testing of personnel air-locks.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-89

DCD Tier 2, Section 6.2.6.3, second paragraph, fourth sentence, states: "The rate of decay of pressure of the know test volume is monitored to calculate the leakage rate." Correct the word "know" to "known."

GE Response

Comment is accepted. In DCD Tier 2, Section 6.2.6.3, second paragraph, fourth sentence, the word "know" will be changed to "known".

The DCD changes are shown in Attachment A.

NRC RAI 6.2-90

DCD Tier 2, Section 6.2.6.3, "Containment Isolation Valve Leakage Rate Test (Type C)," states that, for the flowmeter method, water may be used as a test medium for Type C tests, "if applicable."

Option A, section III.C.2.(a), "Test Pressure," states: "Valves, unless pressurized with fluid (e.g., water, nitrogen) from a seal system, shall be pressurized with air or nitrogen at a pressure of Pa."

Option B, section III.B., begins: "Type B pneumatic tests... and Type C pneumatic tests...." Applicable guidance is in ANSI/ANS-56.8-1994, section 3.3.5, "Test Medium," which states, in part, "Type B and Type C tests shall be conducted with air or nitrogen."

The leakage rate tests for containment isolation valves (CIVs) served by seal systems are not Type C tests per se and are addressed in RAI 6.2-91.

Delete the option for water as a Type C test medium from the DCD.

GE Response

As per 10 CFR 50 Appendix J, III.C.2.(b), testing of CIVs served by seal system are Type C tests. Testing some CIVs with water as a test medium is appropriate for a CIV that may be justified equivalent to a valve served by a seal system. Always applying Section III.C.2.(a) to all systems penetrating the containment could result in putting the plant in a less safe condition, and would not always ensure that post-accident leakage would be minimized. For example, the Reactor Water Cleanup/Shutdown Cooling (RWCU/SDC) system has two independent trains for (a) maintaining reactor water purification during plant operations and (b) providing nonsafety-related reactor shutdown cooling. Unlike testing with water, testing its CIVs with nitrogen requires that a shutdown cooling train to be taken out-of-service, and thus, it would not be available if a malfunction occurred in the other shutdown cooling train. Therefore, applying Section III.C.2.(a) would reduce shutdown cooling function redundancy, and thus, would put the plant in a less safe condition. Plus, the RWCU/SDC system is kept filled with water, and is designed and maintained for operation at the full reactor power pressure condition has a closed loop outside containment, and thus, its design pressure is about 20 times the post-accident containment pressure. Therefore, any post-accident CIV leakage would still be contained within RWCU/SDC system.

The DCD Tier 2, Section 6.2.6.3 second paragraph, second to last sentence is revised as shown in Attachment A.

NRC RAI 6.2-91

DCD Tier 2, Section 6.2.6.3, fourth paragraph, first sentence, states: "Valves that are in lines designed to be, or remain, filled with a liquid for at least 30 days subsequent to a LOCA are leakage rate tested with that liquid at a pressure not less than 1.1 P_{ac}." This is not consistent with, and is less conservative than, the requirements of Option A or the requirements associated with Option B of Appendix J, through ESBWR's commitment to conform to Regulatory Guide 1.163 through proposed Technical Specification 5.5.9.

Option A, section III.C.2.(b), "Test Pressure," states: "Valves, which are sealed with fluid from a seal system shall be pressurized with that fluid to a pressure not less than 1.10 Pa." Section III.C.3., "Acceptance Criterion," states:

"The combined leakage rate for all penetrations and valves subject to Type B and C tests shall be less than 0.60 L_a. Leakage from containment isolation valves that are sealed with fluid from a seal system may be excluded when determining the combined leakage rate: Provided, That;

(a) Such valves have been demonstrated to have fluid leakage rates that do not exceed those specified in the technical specifications or associated bases, and

(b) The installed isolation valve seal-water system fluid inventory is sufficient to assure the sealing function for at least 30 days at a pressure of 1.10 Pa."

For Option B, NEI 94-01, Revision 0, section 6.0, states, in part:

"Primary containment barriers sealed with a qualified seal system shall be periodically tested to demonstrate their functionality in accordance with the plant Technical Specifications. Specific details of the testing methodology and requirements are contained in ANSI/ANS 56.8-1994 and should be adopted by licensees with applicable systems.... Leakage from containment isolation valves that are sealed with a qualified seal system may be excluded when determining the combined leakage rate provided that:

- *Such valves have been demonstrated to have fluid leakage rates that do not exceed those specified in the technical specifications or associated bases, and*
- *The installed isolation valve seal-water system fluid inventory is sufficient to assume the sealing function for at least 30 days at a pressure of 1.10 P_a."*

ANSI/ANS-56.8-1994 contains the following definition and criteria:

*"**qualified seal system.** A system that is capable of sealing the leakage with a liquid at a pressure no less than 1.1 P_{ac} for at least 30 days following the DBA [design basis accident]."*

*"**3.4 Qualified seal system testing requirements.** Primary containment barriers sealed with a qualified seal system are not required to be local leakage rate tested. If a seal system is used as a primary containment barrier, it shall be periodically tested to prove its functionality. This functional test shall demonstrate that the seal system is capable of*

sealing the primary containment barrier(s) with the sealing liquid at a differential pressure of not less than 1.1 P_{ac} for at least 30 days following a DBA. Qualified seal system testing is as specified in the plant's licensing basis."

Revise the DCD to conform to these requirements.

GE Response

Comment is accepted. DCD Tier 2, Section 6.2.6.3, fourth paragraph will be deleted and replaced with three new paragraphs.

The DCD change is shown in Attachment A.

NRC RAI 6.2-92

DCD Tier 2, Section 6.2.6.3, fifth paragraph, describes conditions under which test connections, vent lines, and drain lines do not require Type C testing. These conditions are consistent with the requirements, except that the valves must be 1 inch or less in size (see NEI 94-01, Revision 0, section 6.0, or section 3.3.1(3) of ANSI/ANS-56.8-1994).

Add this additional condition to the DCD or justify the deviation.

GE Response

Comment is accepted. DCD Tier 2, Section 6.2.6.2, fifth paragraph will be modified by adding the condition that 25-mm (1-inch) or smaller valves may not be tested for Type C tests.

The DCD change is shown in Attachment A.

NRC RAI 6.2-93

DCD Tier 2, Tables 6.2-16 through 6.2-38 provide various information about the ESBWR's CIVs. One line item in each table is "Type C Leakage Test." As stated in Regulatory Guide 1.70, Revision 3, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)," each entry is to be "yes" or "no." However, in every case in these tables the entry is "See Table 3.9-8." Unfortunately, Table 3.9-8, "In-Service Testing," is not useful for this purpose. It lists non-CIVs as well as CIVs, it has information about various inservice tests (like valve exercising tests) in addition to Type C tests, it references the ASME code instead of Appendix J, and it uses non-Appendix J terminology like "Category A tests." The staff has attempted to glean the required information from the table, but finds that it is difficult, if not impossible, to positively determine which CIVs are or are not Type C tested.

Provide a simple "yes" or "no" for each line item entry in Tables 6.2-16 through 6.2-38. Further, for each "no," provide a justification for not Type C testing the CIV.

GE Response

Comment is accepted. Tables 6.2-26 through 6.2-38 will be updated by entering "Yes" or "No" for the Type C Leakage Test.

The DCD changes are shown in Attachment A.

NRC RAI 6.2-94

Many operating plants that uses Option A of Appendix J for Type B testing has obtained an exemption from section III.D.2.(b)(ii) of the regulation. The DCD does not discuss this issue.

Section III.D.2.(b)(ii) states, "Air locks opened during periods when containment integrity is not required by the plant's Technical Specifications shall be tested at the end of such periods at not less than P_a." This seemingly reasonable requirement has an unintended effect: if a plant goes to cold shutdown for even a few hours, it must test its air locks at pressure P_a before restart. Most air lock door seals can't take Pa test pressure without unseating, so this requires a full air lock test, which takes hours to perform. Operating plants have obtained exemptions which instead allow door seal leakage rate tests, at reduced pressure, which take a few minutes to perform. Option B of Appendix J does not have this problem.

Provide ESBWR's position on this issue. If the intent is to have future applicants request exemptions, discuss it in the DCD, especially in DCD Tier 2, Section 6.2.8.3, which currently requires COL Holders to perform Type B tests in conformance with Appendix J.

GE Response

Comment is accepted. DCD Tier 2, Section 6.2.6.2, fourth paragraph will be revised to state an exemption from 10 CFR Appendix J Option A, Section III.D.2.(b)(ii) for testing of air-locks at pressure less than P_a.

The DCD change is shown in Attachment A.

ATTACHMENT A

DCD SECTION 6.2.6 MARKUP CHANGES IN RESPONSE TO NRC RAIs 6.2-75 THROUGH 6.2-94

6.2.6 Containment Leakage Testing

This subsection describes the testing program for determining the containment integrated leakage rate (Type A tests), containment penetration leakage rates (Type B tests), and containment isolation valve leakage rates (Type C tests) that complies with 10 CFR 50 Appendix J, Option A or Option B as per Regulatory Guide 1.163, and GDC 52, 53 and 54. The leakage rate testing capability is consistent with the testing requirements of ANS-56.8. Type A, B, and C tests are performed prior to operations and periodically thereafter to assure that leakage rates through the containment and through systems or components that penetrate containment do not exceed their maximum allowable rates. Maintenance of the containment, including repairs on systems and components penetrating the containment, is performed as necessary to maintain leakage rates at or below acceptable values.

The ESBWR conformance with Appendix J satisfies the requirements of the following GDC.

- GDC 52 as it relates to the reactor containment and exposed equipment being designed to accommodate the test conditions for the containment integrated leak rate test (up to the containment design pressure).
- GDC 53 as it relates to the reactor containment being designed to permit appropriate inspection of important areas (such as penetrations), an appropriate surveillance program, and leak testing at the containment design pressure of penetrations having resilient seals and expansion ~~below~~bellows.
- GDC 54 as it relates to piping systems penetrating primary reactor containment being designed with a capability to determine if valve leakage is within acceptable limits.

6.2.6.1 Containment Integrated Leakage Rate Test (Type A)

6.2.6.1.1 Initial Integrated Leak Rate Test

After construction of the reactor containment, including installation of all portions of mechanical, electrical, and instrumentation systems penetrating the containment pressure boundary, and upon satisfactory completion of all structural integrity tests described in Subsections 3.8.1 and 3.8.3, the initial (preoperational) Type A integrated leakage rate test (ILRT) is performed to verify that the actual containment leakage rate does not exceed the design limit.

The ILRT is performed by pressurizing the containment with air. The air shall be dry, clean, and free of contaminants. Pressurization shall be conducted preferably when there is relatively low humidity in the outside atmosphere to avoid moisture condensation within the containment structure. To provide low humidity and improve pumping efficiency, cool night air is also preferred. The containment ILRT consists of three phases, namely:

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- Pressurization Phase: Portable air compressors shall be used to pressurize the containment at a calculated accidental peak containment internal pressure, ~~P_{ae}~~P_a. Pressurization takes approximately 8 hours.

- Pressure Stabilization Phase: ~~After the required test pressure has been achieved, the containment pressure shall be allowed to stabilize for at least 4 hours before leakage measurements may be performed. Pressure stability shall be considered achieved when a condition of essential temperature equilibrium has been attained.~~

  - 10 CFR 50 Appendix J, Option A- After the required test pressure has been achieved, the containment pressure shall be allowed to stabilize for at least 4 hours before leakage measurements may be performed. Pressure stability shall be considered achieved when a condition of essential temperature equilibrium has been attained.

  - 10 CFR 50 Appendix J, Option B- The containment atmosphere stabilization criteria given in Section 5.6 of ANS 56.8 shall be implemented.

- Integrated Leakage Rate Test Phase: After the containment atmosphere has stabilized, the ILRT test begins. The test duration shall extend to 24 hours of retained internal pressure. ~~A shorter test period may be acceptable if it can be demonstrated that the leakage rate can be accurately determined during the shorter test period.~~

The absolute method, as described in ANSI N45.4, shall be used to determine the mass of air in the containment. This method calculates air mass at a stated time by means of direct pressure, temperature, and humidity measurements. The contained mass is calculated using the ideal gas law. The calculated mass shall be plotted against time during the test period, and the mass point method, as described in ANSI/ANS 56.8, shall be used to determine the leakage rate. Instrumentation and monitors used in the ILRT shall be designed, calibrated, and tested so that containment parameters can be precisely measured. A computer shall be used for data acquisition and computation of the leakage rate.

Acceptance Criteria

- A standard statistical analysis of the data is conducted by a linear regression analysis using the method of least squares to determine the leakage rate and associated 95% Upper Confidence Limit (UCL). ILRT results are satisfactory if the UCL is less than 75% of the maximum allowable leakage rate, L_a. As an exemption from the definition of L_a in 10 CFR 50 Appendix J, the maximum allowable leakage rate (L_a) is redefined as Containment Leakage Rate given in Table 6.2-1 which excludes the MSIV leakage rate. The treatment of MSIV leakage pathway separately in radiological dose analysis in Section 15.4.4.5.2 justifies this exemption. ~~The maximum allowable leakage rate (L_a) is 0.5% by weight of the contained atmosphere in a 24-hour period (excluding MSIV leakage). The calculated leakage rate and upper 95% confidence limit are reported to the NRC.~~

- After completing the initial ILRT, a verification test is conducted to confirm the ability of the ILRT method and equipment to satisfactorily determine the

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containment leakage rate (L_{am}). The accuracy of the leakage rate tests is verified by superimposing a calibrated leak on the normal containment leakage rate or by other methods of demonstrated equivalency. The difference between the total leakage and the superimposed known leakage is the actual leakage rate. This method confirms the test accuracy. The measurements are acceptable if the correlation between the verification test data and ILRT data demonstrates an agreement within ~~±25%~~0.25L_a. Appendix C of ANSI/ANS 56.8 includes more descriptive information on verification methods.

- During the ILRT (including the verification test), if excessive leakage occurs through locally testable penetrations or isolation valves to the extent that it would interfere with satisfactory completion of the test, these leakage paths may be isolated and the Type A test continued until completion. A local test shall be performed before and after the repair of each isolated path. The test results shall be reported with both pre- and post-repair local leakage rates as if two Type A tests had been conducted. Record of corrective actions shall be documented.
  - For 10 CFR 50 Appendix J Option A, the sum of the local leakage rates and the UCL shall be less than 0.75 L_a. Local leakage rates shall not be subtracted from the Type A test results to determine acceptability of the test.~~and included in the report to be submitted to the NRC.~~
  - For 10 CFR 50 Appendix J, Option B, the acceptance criteria shall be based on a calculated performance leakage rate which is defined as the sum of Type A UCL and As-left Minimum Pathway Leakage Rate (MNPLR) for all Type B and Type C pathways that were in service, isolated or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, any leakage pathways that were isolated during performance of the test shall be factored into the performance determination. If the leakage can be determined by a local leak rate test, the As-left MNPLR for that leakage path must also be added to the Type A UCL. If the leakage cannot be determined by local leak rate testing, the performance criteria for the Type A test is not met.

Prerequisites

The following prerequisites are completed before starting an ILRT:

- A visual examination of critical areas and general inspection of the accessible interior and exterior surfaces of the containment structure and components are performed to uncover any evidence of structural deterioration that may affect either the structural integrity or leak-tightness of the containment. If there is evidence of significant structural deterioration, corrective action is taken in accordance with approved repair procedures before the ILRT is performed.~~The structural deterioration and corrective action are reported to the NRC in accordance with Appendix J of 10 CFR 50.~~ Except for the inspections and actions described above, during the period between the initiation of the inspection

and the initiation of the ILRT, no preliminary leak detection surveys and repairs are performed before conducting the Type A test.

- Closure of containment isolation valves is accomplished by the normal mode of actuation and without preliminary exercises or adjustments (e.g., no tightening of the valves by manual hand-wheel after closure by valve motor). All malfunctions and subsequent corrective actions are reported in conjunction with the ILRT results.
- The Type B and Type C leakage rate tests (Subsections 6.2.6.2 and 6.2.6.3) are completed before the Type A test is performed.

6.2.6.1.2 Periodic Integrated Leakage Rate Tests

Following the initial preoperational tests, ILRTs (Type A tests) are conducted periodically according to 10 CFR 50 Appendix J to ensure that the containment integrity is maintained and to determine if the leakage rate has increased since the previous ILRT. The tests are performed at ~~regular~~ intervals ~~(~~as described below~~)~~, after major repairs, and upon indication of excessive leakage. The periodic ILRTs follow the same method as the initial ILRT, and the same test prerequisites and acceptance criteria also apply to the periodic ILRTs. Verification tests are also performed after each ILRT.

After the initial ILRT, periodic ILRTs ~~shall~~ will be performed at intervals depending on whether Option A or Option B of 10 CFR 50 Appendix J is selected by the COL Holder. In case Option A is selected, the ILRTs will be performed at least three (3) ~~approximately equal intervals~~times during each 10-year service period. In case Option B is selected, the test interval will be as per Regulatory Guide 1.163. In addition, any major modification or replacement of components of the reactor containment performed after the initial ILRT are followed by either a Type A or a Type B test of the area affected by the modification, with the affected area meeting the applicable acceptance criteria. This frequency of testing is established on the basis of 10 CFR 50 Appendix J.

~~If any ILRT fails to meet the acceptance criteria prior to corrective action, the test schedule applicable to subsequent ILRTs shall be subject to review and approval by the NRC.~~If 10 CFR 50 Appendix J Option A is followed and if~~If~~ two consecutive periodic ILRTs fail to meet the acceptance criteria prior to corrective action, an ILRT is performed at each plant shutdown for major refueling or approximately every 24 months (whichever occurs first), until two consecutive ILRTs meet the acceptance criteria, after which time the previously established periodic retest schedule may be resumed.

If 10 CFR 50 Appendix J Option B is followed and if the ILRT results are not acceptable, then a determination should be performed to identify the cause of unacceptable performance and determine appropriate corrective actions. Once the cause determination and corrective actions have been completed, acceptable performance should be reestablished by performing an ILRT within 48 months following the unsuccessful ILRT test. Following a successful ILRT, the surveillance frequency may be returned to one per 10 years.

The following a~~A~~dditional Criteria will be met for Integrated Leakage Rate Tests if 10 CFR 50 Appendix J Option A is implemented:

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- The following portions of systems are kept open or vented to the containment atmosphere during the ILRT:
  - portions of fluid systems that are part of the reactor coolant pressure boundary that are open directly to the reactor containment atmosphere under post-accident conditions and that become an extension of the boundary of the reactor containment; and
  - portions of closed systems inside containment that penetrate containment and that are not relied upon for containment isolation purposes following a LOCA.
  - portions of closed systems inside containment that penetrate containment and rupture as a result of LOCA. However ESBWR does not have any system that penetrates the containment and ruptures as a result of LOCA.
- All systems not designed to remain filled with fluid (e.g., vented) after a LOCA are drained of water to the extent necessary to ensure exposure of the system containment isolation valves to the containment air test pressure.
- Those portions of fluid systems penetrating containment that are external to the containment and that are not designed to provide a containment isolation barrier are vented to the outside atmosphere, as applicable, to ensure that full post-accident differential pressure is maintained across the containment isolation barrier.
- Systems that are required to maintain the plant in a safe condition during the ILRT are operable in their normal mode and are not vented. Also, systems that are normally filled with water and operating under post-LOCA conditions are not vented. Results of local leakage rate tests of penetrations associated with these systems are added to the ILRT results.

The following additional Criteria will be met for Integrated Leakage Rate Tests if 10 CFR 50 Appendix J Option B is implemented:

All Appendix J pathways must be properly drained and vented during the performance of ILRT, with the following exceptions:

- Pathways in systems which are required for proper conduct of the ILRT or to maintain the plant in a safe shutdown condition during the ILRT.
- Pathways in systems that are normally filled with fluid and operable under post-accident condition.
- Portion of pathways outside primary containment that are designed to Seismic Category I and at least Safety Class 2.
- For planning and scheduling purpose, or ALARA considerations, pathways which are Type B or C tested within the previous 24 calendar months need not be vented or drained during the ILRT.

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6.2.6.2 Containment Penetration Leakage Rate Test (Type B)

Containment penetrations whose designs incorporate resilient seals, bellows, gaskets, or sealant compounds; air-locks and air-lock door seals; equipment and access hatch seals; and electrical penetration canisters receive preoperational and periodic Type B leakage rate tests in accordance with 10 CFR 50 Appendix J. Containment penetrations subject to Type B tests are listed in Table 6.2-47. The local leak detection tests of Type B and Type C (Subsection 6.2.6.3) are completed prior to the preoperational or periodic Type A tests.

Type B tests are performed at containment peak accident pressure, ~~P_{ae}~~P_a, by local pressurization using either the pressure-decay or flowmeter method. For the pressure-decay method, a test volume is pressurized with air or nitrogen to at least P_a~~P_{ae}~~. The rate of decay of pressure of the known test volume is monitored to calculate the leakage rate. For the flowmeter method, the required test pressure is maintained in the test volume by making up air, or nitrogen, ~~or water (if applicable)~~ through a calibrated flowmeter. The flowmeter fluid flow rate is the leakage rate from the test volume.

The acceptance criteria for Type B tests are given in the plant-specific Technical Specifications. The combined leakage rate of all components subject to Type B and Type C tests do not exceed 60% of L_a. ~~If repairs are required to meet this limit, the results are reported in a separate summary to the NRC.~~ The summary includes a description of the structural conditions of the components that contributed to failure.

In accordance with 10 CFR 50 Appendix J, Type B tests ~~(except for air-locks)~~ are performed at intervals depending on whether Option A or Option B of 10 CFR 50 Appendix J is selected by the COL Holder. In case Option A is selected, Type B tests (except for air-locks) will be performed during each reactor shutdown for major fuel reloading, or other convenient intervals, but in no case at intervals greater than two years. Under this option ~~A~~air-locks opened when containment integrity is required are tested in manual mode within 3 days of being opened. If the air-lock is to be opened more frequently than once every 3 days, the air-lock is tested at least once every 3 days during the period of frequent openings. The acceptance criteria for air-lock will be a leakage rate of less than or equal to 0.05 L_a, when tested at pressure greater than or equal to P_a. As an exemption from 10 CFR 50 Appendix J, Section III.D.2.(b)(ii), in the event that the testing for this 3-day interval cannot be performed at P_a, a lower test pressure specified in the technical specification will be applied between the door seals with an acceptable maximum measured leakage rate of 0.01 L_a. Air-locks are tested at initial fuel loading, and at least once every 6 months thereafter. In case Option B is selected, the test interval will be as per Regulatory Guide 1.163. Air-locks that are allowed to be opened during power operation may be tested at ~~full~~ power operation so as to avoid shutting down. ~~These air-locks contain no inflatable seals.~~

Personnel air-locks through the containment include provisions for testing the door seals and the overall air lock leakage rates. Each door includes test connections that allow the annulus between the seals to be pressurized and the pressure decay (if pressure-decay method is used) or flow (if flowmeter method is used) is monitored to determine the leak-tight integrity of the seals. Test connections are also provided on the outer face of each bulkhead so that the entire lock interior can be pressurized and the pressure decay or flow

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monitored to determine the overall lock leakage. Clamps or tiedowns are installed to keep the doors sealed during the overall lock test, because normal locking mechanisms are not designed for the full differential pressure across the door in the reverse direction. ~~Because the restraining force on the door is not critical for the performance of the overall lock pressure test on a lock with inflatable seals, no mechanism for monitoring the force is provided. (See Subsection 6.2.8.3 for COL items.)~~

6.2.6.3 Containment Isolation Valve Leakage Rate Test (Type C)

Type C tests are performed on all containment isolation valves required to be tested per 10 CFR 50 Appendix J Option A or Option B. Containment isolation valves subject to Type C tests are listed within Tables 6.2-16 through 6.2-42.

Type C tests (like Type B tests) are performed by local pressurization using either the pressure-decay or flowmeter method. The test pressure is applied in the same direction as when the valve is required to perform its safety function, unless it can be shown that results from tests with pressure applied in a different direction are equivalent or conservative. For the pressure-decay method, test volume is pressurized with air or nitrogen to at least P_a~~P~~$_{ae}$. The rate of decay of pressure of the known test volume is monitored to calculate the leakage rate. For the flowmeter method, the required test pressure is maintained in the test volume by making up air, nitrogen, or water (~~if applicable~~for valves served by seal system or valves equivalent to a valve served by a seal system) through a calibrated flowmeter. The flowmeter fluid flow rate is the isolation valve leakage rate.

All isolation valve seats that are exposed to containment atmosphere subsequent to a LOCA are tested with air or nitrogen at containment peak accident pressure P_a~~P~~$_{ae}$.

Valves which are sealed with a fluid from a sealed system or valves not provided with a seal system and may be justified to be equivalent to valves with seal system shall be tested in accordance with 10 CFR 50 Appendix J Option A or Option B as given below. A valid justification for equivalency of such valves is that they are in lines designed to be, or remain, filled with water for at least 30 days subsequent to a LOCA.

Option A of Appendix J - Valves sealed with a seal system shall be pressurized with the seal system fluid to a pressure not less than 1.10 P_a. Valves not provided with a seal system, which may be justified to be equivalent to valves with seal system, will be leakage rate tested with water (exemption from 10 CFR 50 Appendix J) to a pressure not less than 1.10 P_a. In both cases the measured leakage may not be converted to equivalent air leakage and may be excluded when determining the combined leakage rate of components subject to Type B and Type C tests provided that:

- Such valves have been demonstrated to have fluid leakage rates that do not exceed those specified in the Technical Specifications or associated bases, and
- For sealed valves, the installed isolation valve seal-water system fluid inventory is sufficient to assume the sealing function for at least 30 days at a pressure of 1.10 P_a.

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Option B of Appendix J – As per ANS 56.8 Section 3.4, valves sealed with a fluid from a qualified seal system are not required to be leak tested and the testing of seal system shall be as per Section 3.4 of ANS 56.8. However valves not provided with a seal system which may be justified to be equivalent to valves with seal system will be leakage rate tested with water to a pressure not less than 1.10 P_a. The measured leakage may not be converted to equivalent air leakage and may be excluded when determining the combined leakage rate of components subject to Type B and Type C tests provided that:

- Such valves have been demonstrated to have fluid leakage rates that do not exceed those specified in the Technical Specifications or associated bases, and
- For sealed valves the installed isolation valve seal-water system fluid inventory is sufficient to assume the sealing function for at least 30 days at a pressure of 1.10 P_a.

The following exemptions from 10 CFR 50 Appendix J Option A or Option B will be taken for Type C test for MSIVs:

- MSIVs will be tested at a pressure less than P_a as specified in Technical Specifications. This is justified because the design of the MSIVs is such that the test pressure is applied between two MSIVs in the same line and testing in the reverse direction for one of the MSIVs tends to unseat the valve disc and would result in a meaningless test. Also, at a lower differential pressure the leakage testing of MSIV is more severe and conservative than at higher differential pressure. The MSIV seat and disc are made of steel for which the lower differential pressure will not have enough force to deform the seat and disc interface to seal off the micro-openings between the two parts. A lower test pressure will drive the air across the opening whereas a higher differential pressure may actually seal the leakage paths.
- The measured leakage rate of MSIV in a Type C test will be excluded when determining the combined leakage rate of components subject to Type B and Type C tests. The justification for this exemption from 10 CFR 50 Appendix- J requirement is because it is excluded from L_a which is redefined in Subsection 6.2.6.1.1.

All test connections, vent lines, or drain lines consisting of double or multiple barriers (e.g., two valves in series, one valve and a cap, or one valve and a flange) that are connected between isolation valves and form a part of the containment boundary and are 25-mm (1-inch) or less in size may not be Type-C tested due to their infrequent use, because the multiple barrier configurations are maintained using an administrative control program.

Type C testing shall be performed in the correct direction of the leakage path unless it can be demonstrated that testing in the reverse direction is equivalent or more conservative. The correct direction of the leakage path is from inside the containment to outside containment.

Instrument lines that penetrate containment conform to Regulatory Guide 1.11 and may not be Type-C tested. The lines that connect to the reactor coolant pressure boundary

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include a restricting orifice inside containment, are Seismic Category I, and terminate in Seismic Category I instruments. The instrument lines also include manual isolation valves and excess flow check valves or equivalent. These valves are normally open and are considered extensions of the containment, whose integrity is continuously demonstrated during normal operation. In addition, these lines are subject to the periodic Type A test, because they are open (up to the pressure boundary instruments) during the ILRT. Leak-tight integrity is also verified during functional and surveillance activities as well as visual observations during operator tours.

The combined leakage rate of all components subject to Type B (Subsection 6.2.6.2) and Type C tests shall not exceed 60% of L_a. ~~If repairs are required to meet this limit, the results are reported in a separate summary to the NRC, including description of the structural conditions of the components that contributed to the failure.~~

6.2.6.4 Scheduling and Reporting of Periodic Tests

The periodic leakage rate test schedule requirements for Types A, B, and C tests are specified in the plant-specific Technical Specifications.

Type B and C tests ~~are~~ will be conducted at any time during normal plant operations or during shutdown periods, ~~as long as the time interval between tests for any individual Type B or C tests does not exceed 30 months.~~ with test intervals as per Option A or Option B of 10 CFR 50 Appendix J. Each time a Type B or C test is completed, the overall total leakage rate for all required Type B and C tests is updated to reflect the most recent test results. In addition to the periodic tests, any major modification or replacement of a component that is part of the primary reactor containment boundary performed after the preoperational leakage rate test will be followed by either a Type A, B, or C test (as applicable) for the area affected by the modification. ~~Type A, B, and C test results are submitted to the NRC in the summary report approximately three months after each test.~~

The leakage test summary report will include descriptions of the containment inspection method, any repairs necessary to meet the acceptance criteria, and the test results.

Table 6.2-16

Containment Isolation Valve Information for the Nuclear Boiler System

Main Steam Line A

Type C Leakage Test	~~See Table 3.9-8~~Yes	~~See Table 3.9-8~~Yes	~~See Table 3.9-8~~Yes

Table 6.2-17

Containment Isolation Valve Information for the Nuclear Boiler System

Main Steam Line B

Type C Leakage Test	~~See Table 3.9-8~~Yes	~~See Table 3.9-8~~Yes	~~See Table 3.9-8~~Yes

Table 6.2-18

Containment Isolation Valve Information for the Nuclear Boiler System

Main Steam Line C

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-19

Containment Isolation Valve Information for the Nuclear Boiler System

Main Steam Line D

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-20

Containment Isolation Valve Information

for the Nuclear Boiler System Main Steam Line Drains

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-21

Containment Isolation Valve Information for the Nuclear Boiler System

Feedwater Line A

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-22

Containment Isolation Valve Information for the Nuclear Boiler System

Feedwater Line B

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-23

Containment Isolation Valve Information for the Isolation Condenser System Loop A

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-24

Containment Isolation Valve Information for the Isolation Condenser System Loop A

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-25

Containment Isolation Valve Information for the Isolation Condenser System Loop B

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

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Table 6.2-26

Containment Isolation Valve Information for the Isolation Condenser System Loop B

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-27

Containment Isolation Valve Information for the Isolation Condenser System Loop C

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-28

Containment Isolation Valve Information for the Isolation Condenser System Loop C

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-29

Containment Isolation Valve Information for the Isolation Condenser System Loop D

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

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Table 6.2-30

Containment Isolation Valve Information for the Isolation Condenser System Loop D

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-31

Containment Isolation Valve Information for the Reactor Water Cleanup/Shutdown Cooling System

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-31a

Containment Isolation Valve Information for the Reactor Water Cleanup/Shutdown Cooling System

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

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Table 6.2-32

Containment Isolation Valve Information for the Standby Liquid Control System

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-33

Containment Isolation Valve Information for the Fuel and Auxiliary Pools Cooling System,

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-34

Containment Isolation Valve Information for the Fuel and Auxiliary Pools Cooling System

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-35

Containment Isolation Valve Information for the Fuel and Auxiliary Pools Cooling System

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-36

Containment Isolation Valve Information for the Containment Inerting ystem

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-37

Containment Isolation Valve Information for the Containment Inerting System

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~

Table 6.2-38

Containment Isolation Valve Information for the Containment Inerting System

Type C Leakage Test	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~	Yes~~See Table 3.9-8~~