

3.6 CONTAINMENT SYSTEMS

3.6.1.1 Primary Containment

LCO 3.6.1.1 Primary containment shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Primary containment inoperable.	A.1 Restore primary containment to OPERABLE status.	1 hour
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u> B.2 Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.1.1 Perform required visual examinations and leakage rate testing except for primary containment air lock testing, in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions.</p> <p>The maximum allowable leakage rate, L_a, is $[0.5]\%$ of primary containment air weight per day at the calculated peak containment pressure, P_a.</p> <p><i>remove brackets</i></p>	<p>-----NOTE----- SR 3.0.2 is not applicable -----</p> <p>In accordance with 10 CFR 50, Appendix J, as modified by approved exemptions</p>
<p>SR 3.6.1.1.2 Verify primary containment structural integrity in accordance with the Primary Containment Tendon Surveillance Program.</p> <p><i>N/A for ABWR re-inforced concrete containment; also program deleted from sec. 5.0</i></p>	<p>In accordance with the Primary Containment Tendon Surveillance Program</p>
<p>SR 3.6.1.1.3² Verify drywell to suppression chamber differential pressure does not decrease at a rate > 6 mm (0.25 inch) water gauge per minute tested over a $[10]$ minute period at an initial differential pressure of $.07$ kg/cm²d (1psid).</p> <p><i>12, 5, 4.5, 15, 0.31, remove brackets</i></p>	<p>18 months</p> <p>AND</p> <p>-----NOTE----- Only required after two consecutive tests fail and continues until two consecutive tests pass -----</p> <p>9 months</p>

3.6 CONTAINMENT SYSTEMS

3.6.1.2 Primary Containment Air Locks

LCO 3.6.1.2 Two primary containment air locks shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

NOTES

1. Entry and exit is permissible to perform repairs of the affected air lock components.
2. Separate Condition entry is allowed for each air lock.
3. Enter applicable Conditions and Required Actions of LCO 3.6.1.1, "Primary Containment," when air lock leakage results in exceeding overall containment leakage rate acceptance criteria.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more primary containment air locks with one primary containment air lock door inoperable.	<p>NOTES</p> <ol style="list-style-type: none"> 1. Required Actions A.1, A.2, and A.3 are not applicable if both doors in the same air lock are inoperable and Condition C is entered. 2. Entry and exit is permissible for 7 days under administrative controls if both air locks are inoperable. 	(continued)

Primary Containment Air Locks
3.6.1.2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.1 Verify the OPERABLE door is closed in the affected air lock. (S)	1 hour
	AND	
	A.2 Lock the OPERABLE door closed in the affected air lock. (S)	24 hours
	AND	
	A.3 -----NOTE----- Air lock doors in high radiation areas or areas with limited access due to inerting may be verified locked closed by administrative means. ----- Verify the OPERABLE door is locked closed in the affected air lock. (S)	Once per 31 days
B. One or more primary containment air locks with primary containment air lock interlock mechanism inoperable.	-----NOTES----- 1. Required Actions B.1, B.2, and B.3 are not applicable if both doors in the same air lock are inoperable and Condition C is entered. 2. Entry into and exit from containment is permissible under the control of a dedicated individual. -----	(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.1 Verify an OPERABLE door is closed in the affected air lock. (S)	1 hour
	AND	
	B.2 Lock an OPERABLE door closed in the affected air lock. (S)	24 hours
	AND	
	B.3 -----NOTE----- Air lock doors in high radiation areas or areas with limited access due to inerting may be verified locked closed by administrative means. ----- Verify an OPERABLE door is locked closed in the affected air lock. (S)	Once per 31 days

Primary Containment Air Locks
3.6.1.2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or more primary containment air locks inoperable for reasons other than Condition A or B.	C.1 Initiate action to evaluate primary containment overall leakage rate per LCO 3.6.1.1, using current air lock test results.	Immediately
	AND	
	C.2 Verify a door is closed in the affected air lock. (3)	1 hour
	AND	
		(continued)
C. (continued)	C.3 Restore air lock to OPERABLE status. (3)	24 hours
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3.	12 hours
	AND	
	D.2 Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.2.1</p> <p>-----NOTES-----</p> <ol style="list-style-type: none"> 1. An inoperable air lock door does not invalidate the previous successful performance of the overall air lock leakage test. 2. Results shall be evaluated against acceptance criteria of SR 3.6.1.1.1 in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions. <p>-----</p> <p>Perform required primary containment air lock leakage rate testing in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions.</p> <p>The acceptance criteria for air lock testing are:</p> <ol style="list-style-type: none"> a. Overall air lock leakage rate is $\leq 0.05 L_g$ when tested at $\geq P_g$. b. For each door, leakage rate is $\leq 0.01 L_g$ when the gap between the door seals is pressurized to $\geq 7 \text{ kg/cm}^2 \text{ (10 psig)}$ for at least 15 minutes. <p>[] kg/cm^2 [] psig</p> <p><i>(inflatable seals not used)</i></p>	<p>-----NOTE-----</p> <p>SR 3.0.2 is not applicable</p> <p>-----</p> <p>In accordance with 10 CFR 50, Appendix J, as modified by approved exemptions</p>
<p>SR 3.6.1.2.2</p> <p>Verify primary containment air lock seal air flask pressure is ≥ 90 psig.</p>	<p>7 days</p>
<p>SR 3.6.1.2.2</p> <p>-----NOTE-----</p> <p>Only required to be performed upon entry into primary containment when the primary containment is de-inerted.</p> <p>-----</p> <p>Verify only one door in the primary containment air lock can be opened at a time.</p>	<p>184 days</p>

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3.6.1.3 Primary Containment Isolation Valves (PCIVs)

LCO 3.6.1.3 Each PCIV shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
When associated instrumentation is required to be OPERABLE
per LCO 3.3.1.1, "Primary Containment Isolation
Instrumentation."

SSLC SENSOR
and LCO 3.3.1.4, "ESF Actuation Instrumentation."

ACTIONS

NOTES

1. Penetration flow paths [except for purge valve penetration flow paths] may be unisolated intermittently under administrative controls.
2. Separate Condition entry is allowed for each penetration flow path.
3. Enter applicable Conditions and Required Actions for systems made inoperable by PCIVs.
4. Enter applicable Conditions and Required Actions of LCO 3.6.1.1, "Primary Containment," when PCIV leakage results in exceeding overall containment leakage rate acceptance criteria.

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. -----NOTE----- Only applicable to penetration flow paths with two PCIVs.</p> <p>One or more penetration flow paths with one PCIV inoperable [except for purge valve or secondary containment bypass leakage not within limit].</p>	<p>A.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.</p> <p>AND</p>	<p>4 hours except for main steam line</p> <p>AND</p> <p>8 hours for main steam line</p> <p>(continued)</p>

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	<p>A.2</p> <p>-----NOTE----- Valves and blind flanges in high radiation areas may be verified by use of administrative means. -----</p> <p>Verify the affected penetration flow path is isolated.</p>	<p>Once per 31 days for isolation devices outside primary containment, drywell, and steam tunnel</p> <p><u>AND</u></p> <p>Prior to entering MODE 2 or 3 from MODE 4, if primary containment was de-inerted while in MODE 4, if not performed within the previous 92 days, for isolation devices inside primary containment</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>B. -----NOTE----- Only applicable to penetration flow paths with two PCIVs. -----</p> <p>One or more penetration flow paths with two PCIVs inoperable [except for purge valve leakage not within limit].</p>	<p>B.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.</p>	<p>1 hour</p>
<p>C. -----NOTE----- Only applicable to penetration flow paths with only one PCIV. -----</p> <p>One or more penetration flow paths with one PCIV inoperable.</p>	<p>C.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.</p> <p><u>AND</u></p> <p>C.2 -----NOTE----- Valves and blind flanges in high radiation areas may be verified by use of administrative means. -----</p> <p>Verify the affected penetration flow path is isolated.</p>	<p>4 hours except for excess flow check valves (EFCVs)</p> <p><u>AND</u></p> <p>12 hours for EFCVs</p> <p>Once per 31 days</p>
<p>D. Secondary containment bypass leakage rate not within limit.</p>	<p>D.1 Restore leakage rate to within limit.</p>	<p>4 hours</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<u>D</u> E. One or more penetration flow paths with one or more containment purge valves not within purge valve leakage limits.	<u>D</u> E.1 Isolate the affected penetration flow path by use of at least one [closed and de-activated automatic valve, closed manual valve, or blind flange].	24 hours
	AND <u>D</u> E.2 -----NOTE----- Valves and blind flanges in high radiation areas may be verified by use of administrative means. ----- Verify the affected penetration flow path is isolated.	Once per 31 days for isolation devices outside containment AND
	AND <u>D</u> E.3 Perform SR 3.6.1.3.7 for the resilient seal purge valves closed to comply with Required Action E.1.	Prior to entering MODE 4 ^A if not performed within the previous 92 days for isolation devices inside containment Once per [92] days
	D	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>E ^D F. Required Action and associated Completion Time of Condition A, B, C, D or E not met in MODE 1, 2, or 3.</p>	<p>E ^D F.1 Be in MODE 3.</p> <p>AND</p> <p>E ^D F.2 Be in MODE 4.</p>	<p>12 hours</p> <p>36 hours</p>
<p>F ^D G. Required Action and associated Completion Time of Condition A, B, C, D or E not met for PCIV(s) required to be OPERABLE during movement of irradiated fuel assemblies in the primary or secondary containment.</p>	<p>F ^D G.1 -----NOTE----- LCO 3.0.3 is not applicable. -----</p> <p>Suspend movement of irradiated fuel assemblies in primary and secondary containment.</p>	<p>Immediately</p>
<p>G ^D H. Required Action and associated Completion Time of Condition A, B, C, D or E not met for PCIV(s) required to be OPERABLE during CORE ALTERATIONS.</p>	<p>G ^D H.1 Suspend CORE ALTERATIONS.</p>	<p>Immediately</p>
<p>H ^D I. Required Action and associated Completion Time of Condition A, B, C, D or E not met for PCIV(s) required to be OPERABLE during MODE 4 or 5 or during operations with a potential for draining the reactor vessel (OPDRVs).</p>	<p>H ^D I.1 Initiate action to suspend OPDRVs.</p> <p>OR</p> <p>H ^D I.2 Initiate action to restore valve(s) to OPERABLE status.</p>	<p>Immediately</p> <p>Immediately</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.3.1</p> <p>-----NOTE----- Only required to be met in MODES 1, 2, and 3.</p> <p>Verify each 550 mm (22 inch) primary containment purge valve is sealed closed except for one purge valve in a penetration flow path while in Condition 1 of this LCO. <i>D</i></p>	<p>31 days</p>
<p>SR 3.6.1.3.2</p> <p>-----NOTES-----</p> <ol style="list-style-type: none"> Only required to be met in MODES 1, 2, and 3. Not required to be met when the 550 mm (22 inch) primary containment purge valves are open for pressure control, ALARA or air quality considerations for personnel entry, or Surveillances that require the valves to be open. <p>Verify each 550 mm (22 inch) primary containment purge valve is closed.</p>	<p><i>inerting, de-inerting,</i></p> <p>31 days</p>

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.3.3 -----NOTES-----</p> <ol style="list-style-type: none"> 1. Valves and blind flanges in high radiation areas may be verified by use of administrative means. 2. Not required to be met for PCIVs that are open under administrative controls. <p>-----</p> <p>Verify each primary containment isolation manual valve and blind flange that is located outside primary containment and is required to be closed during accident conditions is closed.</p>	<p>31 days</p>
<p>SR 3.6.1.3.4 -----NOTES-----</p> <ol style="list-style-type: none"> 1. Valves and blind flanges in high radiation areas may be verified by use of administrative means. 2. Not required to be met for PCIVs that are open under administrative controls. <p>-----</p> <p>Verify each primary containment isolation manual valve and blind flange that is located inside primary containment and is required to be closed during accident conditions is closed.</p>	<p>Prior to entering MODE 2 or 3 from MODE 4, if primary containment was de-inerted while in MODE 4, if not performed within the previous 92 days</p>

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.1.3.5 Verify continuity of the traversing incore prob (TIP) shear isolation valve explosive charge. <i>A</i>	31 days
SR 3.6.1.3.6 Verify the isolation time of each power operated and each automatic PCIV, except MSIVs, is within limits.	In accordance with the Inservice Testing Program or 92 days <i>stet</i>
<div style="border: 1px solid black; padding: 10px;"> <p>SR 3.6.1.3.7 -----NOTES-----</p> <ol style="list-style-type: none"> Only required to be met in MODES 1, 2, and 3. Results shall be evaluated against acceptance criteria of SR 3.6.1.1.1 in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions. <p>Perform leakage rate testing for each primary containment purge valve with resilient seals.</p> </div>	<div style="border: 1px solid black; padding: 10px;"> <p>184 days</p> <p><u>AND</u></p> <p>Once within 92 days after opening the valve</p> </div>

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.3.8 Verify the isolation time of each MSIV is ≥ 3 seconds and ≤ 4.5 seconds.</p> <p><i>stc (in buses)</i></p> <p><i>(i.e., total closure time exclusive of electrical delay)</i></p>	<p>In accordance with the Inservice Testing Program or 18 months</p> <p>3 months</p>
<p>SR 3.6.1.3.9 Verify each automatic PCIV actuates to the isolation position on an actual or simulated isolation signal.</p>	<p>18 months</p>
<p>SR 3.6.1.3.10 Verify each reactor instrumentation line EFCV actuates on a simulated instrument line break to restrict flow to ≤ 3.8 L/h (lph).</p>	<p>18 months</p>

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.1.3.11 Remove and test the explosive squib from each shear isolation valve of the TIP System. <div style="text-align: center; margin-top: 10px;"> \sqrt{A} </div>	18 months on a STAGGERED TEST BASIS
<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;"> SR 3.6.1.3.12 </div> <div style="border: 1px solid black; padding: 10px; width: 600px;"> <p style="text-align: center; margin: 0;">-----NOTE-----</p> <ol style="list-style-type: none"> 1. Only required to be met in MODES 1, 2, and 3. 2. Results shall be evaluated against acceptance criteria of SR 3.6.1.1.1 in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions. <p style="text-align: center; margin-top: 10px;">-----</p> </div> </div> <div style="margin-top: 20px;"> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 10px;">align test</div> <div style="border-left: 1px solid black; padding-left: 10px; width: 600px;"> <p>Verify the combined leakage rate of [3.8 l/m (1 gpm) times the total number of PCIVs] through hydrostatically tested lines that penetrate the primary containment is not exceeded when these isolation valves are tested at \geq \sqrt{A} kg/cm²-g (\sqrt{A} psig).</p> </div> </div> <div style="margin-top: 10px; margin-left: 100px;"> <div style="display: flex; justify-content: space-around; width: 200px;"> 3.0 42.9 </div> </div> </div>	18 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.3.13 -----NOTE-----</p> <p>Results shall be evaluated against acceptance criteria of SR 3.6.1.1.1 in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions.</p> <p>-----</p> <p>Verify leakage rate through each MSIV is $\leq 1 \text{ m}^3/\text{h}$ (35 scfh) when tested at $\geq 1.76 \text{ kg/cm}^2\text{g}$ (25 psig).</p>	<p>-----NOTE-----</p> <p>SR 3.0.2 is not applicable</p> <p>-----</p> <p>In accordance with 10 CFR 50, Appendix J, as modified by approved exemptions</p>

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.3.14 -----NOTES-----</p> <p>1. Only required to be met in MODES 1, 2, and 3.</p> <p>Verify each [550 mm (22 inch)] primary containment purge valve is blocked to restrict the valve from opening > [50]%. </p>	<p>18 months</p>
<p>SR 3.6.1.3.15 -----NOTE-----</p> <p>Results shall be evaluated against acceptance criteria of SR 3.6.1.1.1 in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions.</p> <p>Verify the combined leakage rate for all secondary containment bypass leakage paths is $\leq [\quad L_e]$ when pressurized to $\geq [\quad]$ kg/cm²g ($[\quad]$ psig).</p>	<p>18 months</p>

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3.6.1.4 Drywell Pressure

LCO 3.6.1.4 Drywell pressure shall be $\leq .05^3 \text{ kg/cm}^2\text{g}$ (0.75 psig).

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Drywell pressure not within limit.	A.1 Restore drywell pressure to within limit.	1 hour
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u> B.2 Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.1.4.1 Verify drywell pressure is within limit.	12 hours

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3.6.1.5 Drywell Air Temperature

LC0 3.6.1.5 Drywell average air temperature shall be $\leq 57^{\circ}\text{C}$ (135°F).

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Drywell average air temperature not within limit.	A.1 Restore drywell average air temperature to within limit.	8 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u> B.2 Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.1.5.1 Verify drywell average air temperature is within limit.	24 hours

3.6 CONTAINMENT SYSTEMS

3.6.1.6 ~~Suppression Chamber~~-to-Drywell Vacuum Breakers

LCO 3.6.1.6 ~~Eight suppression chamber~~-to-drywell vacuum breakers shall be OPERABLE.

AND

~~Eight suppression chamber~~-to-drywell vacuum breakers shall be closed.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One Wetwell suppression chamber -to-drywell vacuum breaker inoperable for opening.	A.1 Restore one vacuum breaker to OPERABLE status.	72 hours
B. One Wetwell suppression chamber -to-drywell vacuum breaker not closed.	B.1 Close the open vacuum breaker.	2 hours
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3.	12 hours
	<u>AND</u> C.2 Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.6.1</p> <p style="text-align: center;">-----NOTE-----</p> <p>Not required to be met for vacuum breakers that are open during Surveillances or when performing their intended function.</p> <p>Verify each vacuum breaker is closed.</p> <p style="margin-left: 300px;"><i>.007 Kg/cm²d (0.1 psid)</i></p>	<p>14 days</p> <p><u>AND</u></p> <p>Within 2 hours after any discharge of steam to the suppression chamber from the safety/relief valves (S/RVs) or any operation that causes the drywell- <i>Wetwell</i> suppression chamber differential pressure to be reduced by ≥ .035 Kg/cm²d (0.5 psid).*</p>
<p>SR 3.6.1.6.2 Perform a functional test of each required vacuum breaker.</p>	<p>18 months</p>

(continued)

*If position indicating instruments indicate that one or more vacuum breakers are not closed, verify by alternate means that each vacuum breaker is closed within the following 10 hours.

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.1.6.3 Verify the opening setpoint of each required vacuum breaker is ≤ 0.007 kg/cm ² d (0.5 psid).	18 months

opens at \geq

3.6 CONTAINMENT SYSTEMS

3.6.2.1 Suppression Pool Average Temperature

LCO 3.6.2.1 Suppression pool average temperature shall be:

- a. $\leq 43^{\circ}\text{C}$ (110°F) when THERMAL POWER is $> 1\%$ RTP and no testing that adds heat to the suppression pool is being performed;
- b. $\leq 46^{\circ}\text{C}$ (115°F) when THERMAL POWER is $> 1\%$ RTP and testing that adds heat to the suppression pool is being performed; and
- c. $\leq 49^{\circ}\text{C}$ (120°F) when THERMAL POWER is $\leq 1\%$ RTP.



APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Suppression pool average temperature $> 43^{\circ}\text{C}$ (110°F) but $\leq 49^{\circ}\text{C}$ (120°F).	A.1 Verify suppression pool average temperature is $\leq 49^{\circ}\text{C}$ (120°F).	Once per hour
<u>AND</u>	<u>AND</u>	
THERMAL POWER is $> 1\%$ RTP.	A.2 Restore suppression pool average temperature to $\leq 43^{\circ}\text{C}$ (110°F).	24 hours
<u>AND</u>		
Not performing testing that adds heat to the suppression pool.		

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met.	B.1 Reduce THERMAL POWER to < 1% RTP.	12 hours
C. Suppression pool average temperature > 46°C (115°F). <u>AND</u> THERMAL POWER > 1% RTP. <u>AND</u> Performing testing that adds heat to the suppression pool.	C.1 Suspend all testing that adds heat to the suppression pool.	Immediately
D. Suppression pool average temperature > 49°C (120°F) but ≤ 54°C (130°F).	D.1 Verify suppression pool average temperature is ≤ 54°C (130°F).	Once per 30 minutes
(continued) 		
E. Suppression pool average temperature > 54°C (130°F).	E.1 Depressurize the reactor vessel to < 14.1 kg/cm ² g (200 psig).	12 hours
	<u>AND</u> E.2 Be in MODE 4.	36 hours 

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.2.1.1 Verify suppression pool average temperature is within the applicable limits.	24 hours <u>AND</u> 5 minutes when performing testing that adds heat to the suppression pool

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3.6.2.2 Suppression Pool Water Level

LCO 3.6.2.2 Suppression pool water level shall be ≥ 7 meters and ≤ 7.1 meters.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Suppression pool water level not within limits.	A.1 Restore suppression pool water level to within limits.	2 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u> B.2 Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.2.2.1 Verify suppression pool water level is within limits.	24 hours

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3.6.2.3 Residual Heat Removal (RHR) Suppression Pool Cooling

LC0 3.6.2.3 Three RHR suppression pool cooling subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RHR suppression pool cooling subsystem inoperable.	A.1 Restore RHR suppression pool cooling subsystem to OPERABLE status.	30 X days
B. Two RHR suppression pool cooling subsystems inoperable.	B.1 Restore one RHR suppression pool cooling subsystem to <u>operable</u> status.	72 hours ALL CAP
C. Required Action and associated Completion Time of Condition A [↑] not met. OR Three RHR suppression pool cooling subsystems inoperable.	C.1 Be in MODE 3. <u>AND</u> C.2 Be in MODE 4.	12 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.2.3.1 Verify each RHR suppression pool cooling subsystem manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position or can be aligned to the correct position.	31 days
SR 3.6.2.3.2 Verify each RHR pump develops a flow rate > 265 l/s (4200 gpm) through the associated heat exchanger while operating in the suppression pool cooling mode.	In accordance with the Inservice Testing Program or 92 days

~~SR 3.6.2.3.3 Verify each RHR suppression pool cooling subsystem actuates on an actual or simulated automatic initiation signal.~~ 18 months

3.6 CONTAINMENT SYSTEMS

3.6.3.1 Primary Containment Hydrogen Recombiners

LCO 3.6.3.1 Two primary containment hydrogen recombiners shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One primary containment hydrogen recombiner inoperable.	<p>A.1</p> <p>-----NOTE----- LCO 3.0.4 is not applicable. -----</p> <p>Restore primary containment hydrogen recombiner to OPERABLE status.</p>	30 days
B. Two primary containment hydrogen recombiners inoperable.	<p>B.1</p> <p>Verify by administrative means that the hydrogen control function is maintained.</p> <p><u>AND</u></p> <p>B.2</p> <p>Restore one primary containment hydrogen recombiner to OPERABLE status.</p>	<p>1 hour</p> <p><u>AND</u></p> <p>Every 12 hours thereafter</p> <p>7 days</p>
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.3.1.1 ² Perform a system functional test for each primary containment hydrogen recombiner.	18 months
SR 3.6.3.1.1 ³ Visually examine each primary containment hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions.	18 months
SR 3.6.3.1.1 ⁴ Perform a resistance to ground test for each heater phase.	18 months

SR 3.6.3.1.1 Perform a system functional test for each primary containment hydrogen recombiner. 6 months

Primary Containment Oxygen Concentration
3.6.3.2

3.6 CONTAINMENT SYSTEMS

3.6.3.2 Primary Containment Oxygen Concentration

LCO 3.6.3.2 The primary containment oxygen concentration shall be < 3.5 volume percent.

APPLICABILITY: MODE 1 during the time period:

- a. From 24 hours after THERMAL POWER is > 15% RTP following startup, to
- b. 24 hours prior to reducing THERMAL POWER to < 15% RTP prior to the next scheduled reactor shutdown.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Primary containment oxygen concentration not within limit.	A.1 Restore oxygen concentration to within limit.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Reduce THERMAL POWER to < 15% RTP.	8 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.3.2.1 Verify primary containment oxygen concentration is within limits.	7 days

3.6 CONTAINMENT SYSTEMS

3.6.4.1 Secondary Containment

LCO 3.6.4.1 The secondary containment shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of irradiated fuel assemblies in the
secondary containment,
During CORE ALTERATIONS,
During operations with a potential for draining the reactor
vessel (OPDRVs).

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Secondary containment inoperable in MODE 1, 2, or 3.	A.1 Restore secondary containment to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u> B.2 Be in MODE 4.	36 hours
C. Secondary containment inoperable during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	C.1 -----NOTE----- LCO 3.0.3 is not applicable. ----- Suspend movement of irradiated fuel assemblies in the secondary containment. <u>AND</u>	Immediately (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	C.2 Suspend CORE ALTERATIONS.	Immediately
	AND C.3 Initiate action to suspend OPDRVs.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.4.1.1 Verify secondary containment vacuum is $\geq 6.3426E-04 \text{ Kg/cm}^2$ (0.25 inch of vacuum water gauge). <i>6.34 Kg/m²g</i>	24 hours
SR 3.6.4.1.2 Verify all secondary containment equipment hatches are closed and sealed.	31 days
SR 3.6.4.1.3 Verify each secondary containment access door is closed, except when the access opening is being used for entry and exit, then at least one door shall be closed.	31 days
SR 3.6.4.1.4 Verify each standby gas treatment (SGT) subsystem will draw down the secondary containment to $\geq 6.3426E-04 \text{ Kg/cm}^2$ (0.25 inch of vacuum water gauge) in ≤ 120 seconds. <i>6.34 Kg/m²g</i>	18 months on a STAGGERED TEST BASIS

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.4.1.5 Verify each SGT subsystem can maintain $\geq 6.3426\text{E-}04 \text{ Kg/cm}^2\text{g}$ (0.25 inch of vacuum water gauge) in the secondary containment for 1 hour at a flow rate \leq (4000 cfm).	18 months on a STAGGERED TEST BASIS

6800 m³/h

3.6 CONTAINMENT SYSTEMS

3.6.4.2 Secondary Containment Isolation Valves (SCIVs)

LCO 3.6.4.2 Each SCIV shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of irradiated fuel assemblies in the
secondary containment,
During CORE ALTERATIONS,
During operations with a potential for draining the reactor
vessel (OPDRVs).

ACTIONS

NOTES

1. Penetration flow paths may be unisolated intermittently under administrative controls.
2. Separate Condition entry is allowed for each penetration flow path.
3. Enter applicable Conditions and Required Actions for systems made inoperable by SCIVs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more penetration flow paths with one SCIV inoperable.	A.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.	8 hours
	<u>AND</u>	
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	<p>A.2 -----NOTE----- Valves and blind flanges in high radiation areas may be verified by use of administrative means. -----</p> <p>Verify the affected penetration flow path is isolated.</p>	Once per 31 days
<p>B. -----NOTE----- Only applicable to penetration flow paths with two isolation valves. -----</p> <p>One or more penetration flow paths with two SCIVs inoperable.</p>	<p>B.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.</p>	4 hours
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, or 3.	<p>C.1 Be in MODE 3.</p> <p><u>AND</u></p> <p>C.2 Be in MODE 4.</p>	<p>12 hours</p> <p>36 hours</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A or B not met during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	D.1 -----NOTE----- LCO 3.0.3 is not applicable. -----	
	Suspend movement of irradiated fuel assemblies in the secondary containment.	Immediately
	<u>AND</u>	
	D.2 Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>	
	D.3 Initiate action to suspend OPDRVs.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.4.2.1 -----NOTES-----</p> <ol style="list-style-type: none"> 1. Valves and blind flanges in high radiation areas may be verified by use of administrative means. 2. Not required to be met for SCIVs that are open under administrative controls. <p>-----</p> <p>Verify each secondary containment isolation manual valve and blind flange that is required to be closed during accident conditions is closed.</p>	<p>31 days</p>
<p>SR 3.6.4.2.2 Verify the isolation time of each power operated and each automatic SCIV is within limits.</p>	<p>In accordance with the Inservice Testing Program or 92 days</p>
<p>SR 3.6.4.2.3 Verify each automatic SCIV actuates to the isolation position on an actual or simulated actuation signal.</p>	<p>18 months</p>

3.6 CONTAINMENT SYSTEMS

3.6.4.3 Standby Gas Treatment (SGT) System

LCO 3.6.4.3 Two SGT trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of irradiated fuel assemblies in the
secondary containment,
During CORE ALTERATIONS,
During operations with a potential for draining the reactor
vessel (OPDRVs).

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SGT train inoperable.	A.1 Restore SGT train to OPERABLE status.	7 days
^C B. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, or 3. <i>or B</i>	^C B.1 Be in MODE 3. <u>AND</u> ^C B.2 Be in MODE 4.	12 hours 36 hours
^D B. Required Action and associated Completion Time of Condition A not met during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	-----NOTE----- LCO 3.0.3 is not applicable. ^D B.1 Place OPERABLE SGT train in operation. <u>OR</u>	Immediately (continued)

B. Two SGT trains inoperable in MODES 1, 2 or 3.

B.1 Restore one SGT train to OPERABLE status.

4 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<u>D</u> <u>1.</u> (continued)	<u>D</u> <u>1.2.1</u> Suspend movement of irradiated fuel assemblies in secondary containment.	Immediately
	<u>D</u> <u>AND</u> <u>1.2.2</u> Suspend CORE ALTERATIONS.	Immediately
	<u>D</u> <u>AND</u> <u>1.2.3</u> Initiate action to suspend OPDRVs.	Immediately
<u>E</u> <u>1.</u> Two SGT subsystems inoperable during movement of irradiated fuel assemblies in the secondary containment, during CORE ALTERATIONS, or during OPDRVs.	<u>E</u> <u>1.1</u> -----NOTE----- LCO 3.0.3 is not applicable. ----- Suspend movement of irradiated fuel assemblies in secondary containment.	Immediately
	<u>AND</u> <u>E</u> <u>1.2</u> Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u> <u>E</u> <u>1.3</u> Initiate action to suspend OPDRVs.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.3.1	Operate each SGT train for $\geq [10]$ continuous hours with heaters operating.	31 days
SR 3.6.4.3.2	Perform required SGT filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.6.4.3.3	Verify each SGT train actuates on an actual or simulated initiation signal.	18 months
SR 3.6.4.3.4	Verify each SGT filter cooler bypass damper can be opened and the fan started.	18 months

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1.1 Primary Containment

BASES

BACKGROUND

The function of the primary containment is to isolate and contain fission products released from the Reactor Primary System following a Design Basis Accident (DBA) and to confine the postulated release of radioactive material. The primary containment consists of a steel lined, reinforced concrete vessel, which surrounds the Reactor Primary System and provides an essentially leak tight barrier against an uncontrolled release of radioactive material to the environment.

The isolation devices for the penetrations in the primary containment boundary are a part of the containment leak tight barrier. To maintain this leak tight barrier:

- a. All penetrations required to be closed during accident conditions are either:
 1. capable of being closed by an OPERABLE automatic Containment Isolation System, or
 2. closed by manual valves, blind flanges, or de-activated automatic valves secured in their closed positions, except as provided in LCO 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)";
- b. The primary containment air lock is OPERABLE, except as provided in LCO 3.6.1.2, "Primary Containment Air Lock";
- c. The sealing mechanism associated with a penetration (e.g., welds, bellows, or o-rings) is OPERABLE.

This Specification ensures that the performance of the primary containment, in the event of a DBA, meets the assumptions used in the safety analyses of References 1 and 2. SR 3.6.1.1.1 leakage rate requirements are in

(continued)

BASES

BACKGROUND
(continued)

conformance with 10 CFR 50, Appendix J (Ref. 3), as modified by approved exemptions. ~~B3.6.1.1-3~~ stet

APPLICABLE
SAFETY ANALYSES

The safety design basis for the primary containment is that it must withstand the pressures and temperatures of the limiting DBA without exceeding the design leakage rate.

The DBA that postulates the maximum release of radioactive material within primary containment is a LOCA. In the analysis of this accident, it is assumed that primary containment is OPERABLE such that release of fission products to the environment is controlled by the rate of primary containment leakage. ~~B3.6.1.1-1~~ stet

Analytical methods and assumptions involving the primary containment are presented in References 1 and 2. The safety analyses assume a nonmechanistic fission product release following a DBA, which forms the basis for determination of offsite doses. The fission product release is, in turn, based on an assumed leakage rate from the primary containment. OPERABILITY of the primary containment ensures that the leakage rate assumed in the safety analyses is not exceeded. ~~B3.6.1.1-2~~

4 The maximum allowable leakage rate for the primary containment (L_a) is [0.5]% by weight of the containment air per 24 hours at the maximum peak containment pressure (P_a) of 2.73 Kg/cm²g (39 psig) or []% by weight of the containment air per 24 hours at the reduced pressure of P_t of [] Kg/cm²g ([] psig) (Ref. 3). ~~B3.6.1.1-1~~ stet

Primary containment satisfies Criterion 3 of the NRC Policy Statement.

LCO

~~B3.6.1.1-3~~ stet
Primary containment OPERABILITY is maintained by limiting leakage to within the acceptance criteria of 10 CFR 50, Appendix J (Ref. 3). Compliance with this LCO will ensure a primary containment configuration, including equipment hatches, that is structurally sound and that will limit leakage to those leakage rates assumed in the safety analyses. Individual leakage rates specified for the primary containment air lock are addressed in LCO 3.6.1.2.

(continued)

BASES (continued)

APPLICABILITY In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, primary containment is not required to be OPERABLE in MODES 4 and 5 to prevent leakage of radioactive material from primary containment.

ACTIONS

A.1

In the event primary containment is inoperable, primary containment must be restored to OPERABLE status within 1 hour. The 1 hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining primary containment OPERABILITY during MODES 1, 2, and 3. This time period also ensures that the probability of an accident (requiring primary containment OPERABILITY) occurring during periods where primary containment is inoperable is minimal.

B.1 and B.2

If primary containment cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.1.1

step ~~B3.6.1.1.3~~

Maintaining the primary containment OPERABLE requires compliance with the visual examinations and leakage rate test requirements of 10 CFR 50, Appendix J (Ref. 3), as modified by approved exemptions. Failure to meet air lock leakage testing (SR 3.6.1.2.1), [resilient seal primary containment purge valve leakage testing (SR 3.6.1.3.7),]

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.1.1 (continued)

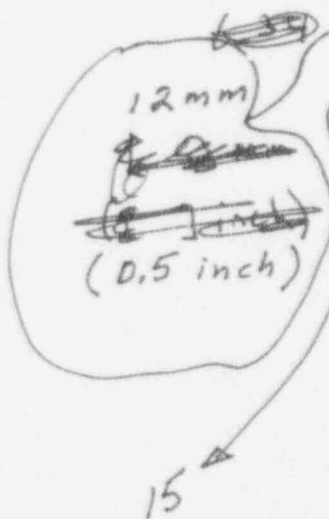
main steam isolation valve leakage (SR 3.6.1.3.12), or 12 hydrostatically tested valve leakage (SR 3.6.1.3.12) does not necessarily result in a failure of this SR. The impact of the failure to meet these SRs must be evaluated against the Type A, B, and C acceptance criteria of 10 CFR 50, Appendix J. The Frequency is required by 10 CFR 50, Appendix J (Ref. 3), as modified by approved exemptions. Thus, SR 3.0.2 (which allows Frequency extensions) does not apply.

~~3.6.1.1.3~~
stet

SR 3.6.1.1.2

Maintaining the pressure suppression function of primary containment requires limiting the leakage from the drywell to the suppression chamber. Thus, if an event were to occur that pressurized the drywell, the steam would be directed through the horizontal vents into the suppression pool. This SR measures drywell to suppression chamber differential pressure during a 10 minute period to ensure that the leakage paths that would bypass the suppression pool are within allowable limits.

Satisfactory performance of this SR can be achieved by establishing a known differential pressure between the drywell and the suppression chamber and verifying that the pressure in either the suppression chamber or the drywell does not change by more than 6 mm (0.25 inch) of water per minute over a 10 minute period. The leakage test is performed every 18 months. The 18 month Frequency was developed considering it is prudent that this Surveillance be performed during a unit outage and also in view of the fact that component failures that might have affected this test are identified by other primary containment SRs. Two consecutive test failures, however, would indicate unexpected primary containment degradation; in this event, as the Note indicates, increasing the Frequency to once every 9 months is required until the situation is remedied as evidenced by passing two consecutive tests.



(continued)

BASES

- REFERENCES *B3.6.1.1*
- stat* { *✓* 1. ABWR SSAR, Section 6.2.
 ✓ -2. ABWR SSAR, Section 15.1.
 -3. 10 CFR 50, Appendix J.
-
-

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1.2 Primary Containment Air Locks

BASES

BACKGROUND

TWO *S* *are* *S* *have*
~~One~~ double door primary containment air lock ^{*S*} has been built into the primary containment to provide personnel access to the drywell and to provide primary containment isolation during the process of personnel entering and exiting the drywell. The air lock ^{*S*} is designed to withstand the same loads, temperatures, and peak design internal and external pressures as the primary containment (Ref. ~~1~~). As part of ^{*S*} the primary containment, the air lock limits the release of radioactive material to the environment during normal unit operation and through a range of transients and accidents up to and including postulated Design Basis Accidents (DBAs). *3.6.1.2 set*

Each air lock door has been designed and tested to certify its ability to withstand a pressure in excess of the maximum expected pressure following a DBA in primary containment. Each of the doors contains double gasketed seals and local leakage rate testing capability to ensure pressure integrity. To effect a leak tight seal, the air lock design uses pressure seated doors (i.e., an increase in primary containment internal pressure results in increased sealing force on each door.)

*in each
air lock*

S *are*
Each air lock is nominally a right circular cylinder, ~~10 ft in diameter~~, with doors at each end that are interlocked to prevent simultaneous opening. The air lock ^{*S*} is provided with limit switches on both doors that provide control room indication of door position. [Additionally, control room indication is provided to alert the operator whenever an air lock interlock mechanism is defeated.] During periods when primary containment is not required to be OPERABLE, the air lock interlock mechanism may be disabled, allowing both doors of an air lock to remain open for extended periods when frequent primary containment entry is necessary. Under some conditions, as allowed by this LCO, the primary containment may be accessed through the air lock when the door interlock mechanism has failed, by manually performing the interlock function.

(continued)

BASES

BACKGROUND
(continued)

The primary containment air lock^s forms part of the primary containment pressure boundary. As such, air lock integrity and leak tightness are essential for maintaining primary containment leakage rate to within limits in the event of a DBA. Not maintaining air lock integrity or leak tightness may result in a leakage rate in excess of that assumed in the unit safety analysis. SR 3.6.1.1.1 leakage rate requirements conform with 10 CFR 50, Appendix J (Ref. 1), as modified by approved exemptions.

~~B 3.6.1.2-2~~
stat

APPLICABLE
SAFETY ANALYSES

The DBA that postulates the maximum release of radioactive material within primary containment is a LOCA. In the analysis of this accident, it is assumed that primary containment is OPERABLE, such that release of fission products to the environment is controlled by the rate of primary containment leakage. The primary containment is designed with a maximum allowable leakage rate (L_a) of 0.5% by weight of the containment air per 24 hours at the calculated maximum peak containment pressure (P_a) of 2.74 Kg/cm²g (39 psig) Ref. 1). This allowable leakage rate forms the basis for the acceptance criteria imposed on the SRs associated with the air lock.

~~B 3.6.1.2-3~~
stat

Primary containment air lock OPERABILITY is also required to minimize the amount of fission product gases that may escape primary containment through the air lock and contaminate and pressurize the secondary containment.

The primary containment air lock satisfies Criterion 3 of the NRC Policy Statement.

LCO

As part of the primary containment, the air lock's safety function is related to control of containment leakage rates following a DBA. Thus, the air lock's structural integrity and leak tightness are essential to the successful mitigation of such an event.

The primary containment air locks are required to be OPERABLE. For each air lock to be considered OPERABLE, the air lock interlock mechanism must be OPERABLE, the air lock must be in compliance with the Type B air lock leakage test, and both air lock doors must be OPERABLE. The interlock

(continued)

BASES

LCO
(continued)

allows only one air lock door to be opened at a time. This provision ensures that a gross breach of primary containment does not exist when primary containment is required to be OPERABLE. Closure of a single door in each air lock is sufficient to provide a leak tight barrier following postulated events. Nevertheless, both doors are kept closed when the air lock is not being used for normal entry into and exit from primary containment.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, the primary containment air lock is not required to be OPERABLE in MODES 4 and 5 to prevent leakage of radioactive material from primary containment.

ACTIONS

The ACTIONS are modified by Note 1, which allows entry and exit to perform repairs of the affected air lock component. If the outer door is inoperable, then it may be easily accessed to repair. If the inner door is the one that is inoperable, however, then it is preferred that the air lock be accessed from inside primary containment by entering through the other OPERABLE air lock. If this is not practical, however, then it is permissible to enter the air lock through the OPERABLE outer door, which means there is a short time during which the primary containment boundary is not intact (during access through the outer door). The ability to open the OPERABLE door, even if it means the primary containment boundary is temporarily not intact, is acceptable due to the low probability of an event that could pressurize the primary containment during the short time in which the OPERABLE door is expected to be open. The OPERABLE door must be immediately closed after each entry and exit.

Note 2 has been included to provide clarification that, for this LCO, separate Condition entry is allowed for each air lock.

The ACTIONS are modified by a third Note, which ensures appropriate remedial measures are taken when necessary.

(continued)

BASES

ACTIONS
(continued)

Pursuant to LCO 3.0.6, actions are not required, even if primary containment is exceeding its leakage limit. Therefore, the Note is added to require ACTIONS for LCO 3.6.1.1, "Primary Containment," to be taken in this event.

A.1, A.2, and A.3

With one primary containment air lock door inoperable in one or more primary containment air locks, the OPERABLE door must be verified closed (Required Action A.1) in each affected air lock. This ensures that a leak tight primary containment barrier is maintained by the use of an OPERABLE air lock door. This action must be completed within 1 hour. The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1.1, which requires that primary containment be restored to OPERABLE status within 1 hour.

In addition, the affected air lock penetration must be isolated by locking closed the OPERABLE air lock door within the 24 hour Completion Time. The 24 hour Completion Time is considered reasonable for locking the OPERABLE air lock door, considering that the OPERABLE door of the affected air lock is being maintained closed.

(s)

(s)

Required Action A.3 ensures that the affected air lock with an inoperable door has been isolated by the use of a locked closed OPERABLE air lock door. This ensures that an acceptable primary containment leakage boundary is maintained. The Completion Time of once per 31 days is based on engineering judgment and is considered adequate in view of the low likelihood of a locked door being mispositioned and other administrative controls.

Required Action A.3 is modified by a Note that applies to air lock doors located in high radiation areas or areas with limited access due to inerting and allows these doors to be verified locked closed by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of the door, once it has been verified to be in the proper position, is small.

(continued)

BASES

ACTIONS

A.1, A.2, and A.3 (continued)

The Required Actions have been modified by two Notes. Note 1 ensures that only the Required Actions and associated Completion Times of Condition C are required if both doors in the air lock are inoperable. With both doors in the air lock inoperable, an OPERABLE door is not available to be closed. Required Actions C.1 and C.2 are the appropriate remedial actions. Note 2 allows use of the air lock for entry and exit for 7 days under administrative controls.

Primary containment entry may be required to perform Technical Specifications (TS) Surveillances and Required Actions, as well as other activities on equipment inside primary containment that are required by TS or activities on equipment that support TS-required equipment. This Note is not intended to preclude performing other activities (i.e., non-TS-related activities) if the primary containment was entered, using the inoperable air lock, to perform an allowed activity listed above. This allowance is acceptable due to the low probability of an event that could pressurize the primary containment during the short time that the OPERABLE door is expected to be open.

B.1, B.2, and B.3

With an air lock interlock mechanism inoperable in one or both primary containment air locks, the Required Actions and associated Completion Times are consistent with those specified in Condition A.

The Required Actions have been modified by two Notes. Note 1 ensures that only the Required Actions and associated Completion Times of Condition C are required if both doors in one air lock are inoperable. With both doors in the air lock inoperable, an OPERABLE door is not available to be closed. Required Actions C.1 and C.2 are the appropriate remedial actions. Note 2 allows entry into and exit from the primary containment under the control of a dedicated individual stationed at the air lock to ensure that only one door is opened at a time (i.e., the individual performs the function of the interlock).

Required Action B.3 is modified by a Note that applies to air lock doors located in high radiation areas or areas with

(continued)

BASES

ACTIONS

B.1, B.2, and B.3 (continued)

limited access due to inerting and that allows these doors to be verified locked closed by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of the door, once it has been verified to be in the proper position, is small.

C.1, C.2, and C.3

With one or more air locks inoperable for reasons other than those described in Condition A or B, Required Action C.1 requires action to be immediately initiated to evaluate containment overall leakage rates using current air lock leakage test results. An evaluation is acceptable since it is overly conservative to immediately declare the primary containment inoperable if both doors in an air lock have failed a seal test or if the overall air lock leakage is not within limits. In many instances (e.g., only one seal per door has failed) primary containment remains OPERABLE, yet only 1 hour (according to LCO 3.6.1.1) would be provided to restore the air lock door to OPERABLE status prior to requiring a plant shutdown. In addition, even with both doors failing the seal test, the overall containment leakage rate can still be within limits.

Required Action C.2 requires that one door in the affected primary containment air locks must be verified closed. This action must be completed within the 1 hour Completion Time. This specified time period is consistent with the ACTIONS of LCO 3.6.1.1, which require that primary containment be restored to OPERABLE status within 1 hour.

Additionally, the air lock must be restored to OPERABLE status within 24 hours. The 24 hour Completion Time is reasonable for restoring an inoperable air lock to OPERABLE status considering that at least one door is maintained closed in each affected air lock.

(continued)

BASES

ACTIONS
(continued)

D.1 and D.2

If the inoperable primary containment air lock cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.2.1

~~B3.6.1.2.2~~ *stet*

Maintaining primary containment air locks OPERABLE requires compliance with the leakage rate test requirements of 10 CFR 50, Appendix J (Ref. 1), as modified by approved exemptions. This SR reflects the leakage rate testing requirements with respect to air lock leakage (Type B leakage tests). The acceptance criteria were established [during initial air lock and primary containment OPERABILITY testing]. The periodic testing requirements verify that the air lock leakage does not exceed the allowed fraction of the overall primary containment leakage rate. The Frequency is required by 10 CFR 50, Appendix J (Ref. 1), as modified by approved exemptions. Thus, SR 3.0.2 (which allows Frequency extensions) does not apply.

~~B3.6.1.2.2~~ *stet*

The SR has been modified by two Notes. Note 1 states that an inoperable air lock door does not invalidate the previous successful performance of the overall air lock leakage test. This is considered reasonable since either air lock door is capable of providing a fission product barrier in the event of a DBA. Note 2 has been added to this SR, requiring the results to be evaluated against the acceptance criteria of SR 3.6.1.1.1. This ensures that air lock leakage is properly accounted for in determining the overall primary containment leakage rate.

(continued)

BASES (continued)

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.6.1.2.2

The air lock interlock mechanism is designed to prevent simultaneous opening of both doors in the air lock. Since both the inner and outer doors of an air lock are designed to withstand the maximum expected post accident primary containment pressure, closure of either door will support primary containment OPERABILITY. Thus, the interlock feature supports primary containment OPERABILITY while the air lock is being used for personnel transit in and out of the containment. Periodic testing of this interlock demonstrates that the interlock will function as designed and that simultaneous inner and outer door opening will not inadvertently occur. Due to the purely mechanical nature of this interlock, and given that the interlock mechanism is only challenged when primary containment is entered, this test is only required to be performed upon entering primary containment, but is not required more frequently than 184 days when primary containment is de-inerted. The 184 day Frequency is based on engineering judgment and is considered adequate in view of other administrative controls [such as indications of interlock mechanism status, available to operations personnel].

REFERENCES ~~03.6.1.2~~-1. ABWR SSAR, Section 3.8.2.

skel ✓ -2. 10 CFR 50, Appendix J.

✓ -3. ABWR SSAR, Section 6.2.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1.3 Primary Containment Isolation Valves (PCIVs)

BASES

BACKGROUND

The function of the PCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated Design Basis Accidents (DBAs) to within limits. Primary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for a DBA.

The OPERABILITY requirements for PCIVs help ensure that adequate primary containment leak tightness is maintained during and after an accident by minimizing potential leakage paths to the environment. Therefore, the OPERABILITY requirements provide assurance that primary containment leakage rates assumed in the safety analyses will not be exceeded. These isolation devices are either passive or active (automatic). Manual valves, de-activated automatic valves secured in their closed position (including check valves with flow through the valve secured), blind flanges, and closed systems are considered passive devices. Check valves, or other automatic valves designed to close without operator action following an accident, are considered active devices. Two barriers in series are provided for each penetration so that no single credible failure or malfunction of an active component can result in a loss of isolation or leakage that exceeds limits assumed in the safety analyses. One of these barriers may be a closed system.

The primary containment purge lines are 550 mm (22 inches) in diameter; vent lines are 550 mm (22 inches) in diameter. The 550 mm (22 inch) primary containment purge valves are normally maintained closed in MODES 1, 2, and 3 to ensure leak tightness. The isolation valves on the 550 mm (22 inch) vent lines have 50 mm (2 inch) bypass lines around them for use during normal reactor operation. Two additional redundant excess flow isolating dampers are provided on the vent line upstream of the Standby Gas Treatment (SGT) System filter trains. These isolation

(continued)

BASES

BACKGROUND
(continued)

dampers, together with the PCIVs, will prevent high pressure from reaching the SGT System filter trains in the unlikely event of a loss of coolant accident (LOCA) during venting. Closure of the excess flow isolation dampers will not prevent the SGT System from performing its design function (that is, to maintain a negative pressure in the secondary containment). To ensure that a vent path is available, a 50 mm (2 inch) bypass line is provide around the dampers.

APPLICABLE
SAFETY ANALYSES

The PCIVs LCO was derived from the requirements related to the control of leakage from the primary containment during major accidents. This LCO is intended to ensure that primary containment leakage rates do not exceed the values assumed in the safety analyses. As part of the primary containment boundary, PCIV OPERABILITY supports leak tightness of primary containment. Therefore, the safety analysis of any event requiring isolation of primary containment is applicable to this LCO.

The DBAs that result in a release of radioactive material within primary containment are a LOCA and a main steam line break (MSLB). In the analysis for each of these accidents, it is assumed that PCIVs are either closed or close within the required isolation times following event initiation. This ensures that potential leakage paths to the environment through PCIVs (and primary containment purge valves) are minimized. Of the events analyzed in Reference ~~the~~ ^{are} the MSLB is the most limiting event due to radiological consequences. The closure time of the main steam isolation valves (MSIVs) is the most significant variable from a radiological standpoint. The MSIVs are required to close within 3 to 4.5 seconds; therefore, the 4.5 second closure time is assumed in the analysis. The safety analyses assume that the purge valves were closed at event initiation. Likewise, it is assumed that the primary containment is isolated such that release of fission products to the environment is controlled by the rate of primary containment leakage.

The DBA analysis assumes that within 60 seconds of the accident, isolation of the primary containment is complete and leakage is terminated, except for the maximum allowable leakage rate, L_p . The primary containment isolation total

(continued)

BASES (continued)

APPLICABLE
SAFETY ANALYSES
(continued)

response time of 60 seconds includes signal delay, diesel generator startup (for loss of offsite power), and PCIV stroke times.

The single failure criterion required to be imposed in the conduct of unit safety analyses was considered in the original design of the primary containment purge valves. Two valves in series on each purge line provide assurance that both the supply and exhaust lines could be isolated even if a single failure occurred.

[The primary containment purge valves may be unable to close in the environment following a LOCA. Therefore, each of the purge valves is required to remain sealed closed during MODES 1, 2, and 3.] In this case, the single failure criterion remains applicable to the primary containment purge valve due to failure in the control circuit associated with each valve. Again, the primary containment purge valve design precludes a single failure from compromising primary containment OPERABILITY as long as the system is operated in accordance with this LCO.

PCIVs satisfy Criterion 3 of the NRC Policy Statement.

LCO

PCIVs form a part of the primary containment boundary. The PCIV safety function is related to control of primary containment leakage rates during a DBA.

The power operated, automatic isolation valves are required to have isolation times within limits and actuate on an automatic isolation signal. The 550 mm (22 inch) purge valves must be maintained sealed closed [or blocked to prevent full opening]. The valves covered by this LCO are listed with their associated stroke times in Reference 2. ~~B3.6.1.3-2~~ *stet*

The normally closed isolation valves are considered OPERABLE when manual valves are closed, automatic valves are de-activated and secured in their closed position, blind flanges are in place, and closed systems are intact. These passive isolation valves and devices are those listed in Reference 2. Purge valves with resilient seals, secondary bypass valves, MSIVs, and hydrostatically tested valves must

~~B3.6.1.3-2~~
stet

(continued)

BASES

LCO
(continued)

meet additional leakage rate requirements. Other PCIV leakage rates are addressed by LCO 3.6.1.1, "Primary Containment," as Type C testing.

This LCO provides assurance that the PCIVs will perform their designed safety functions to control leakage from the primary containment during accidents.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, most PCIVs are not required to be OPERABLE [and the primary containment purge valves are not required to be sealed closed] in MODES 4 and 5. Certain valves, however, are required to be OPERABLE to prevent inadvertent reactor vessel draindown. These valves are those whose associated instrumentation is required to be OPERABLE per LCO 3.3.1.1, "Primary Containment Isolation Instrumentation." (This does not include the valves that isolate the associated instrumentation.)

and LCO 3.3.1.4, "ESF Actuation Instrumentation."

SSLC
SENSOR

ACTIONS

The ACTIONS are modified by a Note allowing penetration flow path(s) [except for purge valve flow path(s)] to be unisolated intermittently under administrative controls. These controls consist of stationing a dedicated operator at the controls of the valve, who is in continuous communication with the control room. In this way, the penetration can be rapidly isolated when a need for primary containment isolation is indicated. Due to the size of the primary containment purge line penetration and the fact that those penetrations exhaust directly from the containment atmosphere to the environment, the penetration flow path containing these valves is not allowed to be opened under administrative controls. A single purge valve in a penetration flow path may be opened to effect repairs to an inoperable valve, as allowed by SR 3.6.1.3.1.

A second Note has been added to provide clarification that, for the purpose of this LCO, separate Condition entry is allowed for each penetration flow path.

(continued)

BASES (continued)

ACTIONS
(continued)

The ACTIONS are modified by a third Note, which ensures that appropriate remedial actions are taken, if necessary, if the affected system(s) are rendered inoperable by an inoperable PCIV (e.g., an Emergency Core Cooling Systems subsystem is inoperable due to a failed open test return valve).

Note 4 ensures appropriate remedial actions are taken when the primary containment leakage limits are exceeded. Pursuant to LCO 3.0.6, these actions are not required even when the associated LCO is not met. Therefore, Notes 3 and 4 are added to require that the proper actions are taken.

A.1 and A.2

With one or more penetration flow paths with one PCIV inoperable [except for purge valve leakage not within limit], the affected penetration flow paths must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, a blind flange, and a check valve with flow through the valve secured. For penetration isolated in accordance with Required Action A.1, the valve used to isolate the penetration should be the closest available valve to the primary containment. The Required Action must be completed within the 4 hour Completion Time (8 hours for main steam lines). The Completion Time of 4 hours is reasonable considering the time required to isolate the penetration and the relative importance of supporting primary containment OPERABILITY during MODES 1, 2, and 3. For main steam lines, an 8 hour Completion Time is allowed. The Completion Time of 8 hours for the main steam lines allows a period of time to restore the MSIVs to OPERABLE status given the fact that MSIV closure will result in isolation of the main steam line(s) and a potential for plant shutdown.

For affected penetrations that have been isolated in accordance with Required Action A.1, the affected penetration flow path(s) must be verified to be isolated on a periodic basis. This is necessary to ensure that primary containment penetrations required to be isolated following

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

an accident, and no longer capable of being automatically isolated, will be in the isolation position should an event occur. This Required Action does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown, that those valves outside containment and capable of potentially being mispositioned are in the correct position. The Completion Time of "once 31 days for isolation devices outside primary containment," is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low. For valves inside primary containment, the time period "prior to entering MODE 2 or 3 from MODE 4, if primary containment was de-inerted while in MODE 4, if not performed within the previous 92 days," is based on engineering judgment and is considered reasonable in view of the inaccessibility of the valves and other administrative controls ensuring that valve misalignment is an unlikely possibility.

per →

specified →

Condition A is modified by a Note indicating that this Condition is only applicable to those penetration flow paths with two PCIVs. For penetration flow paths with one PCIV, Condition C provides the appropriate Required Actions.

Required Action A.2 is modified by a Note that applies to valves and blind flanges located in high radiation areas, and allows them to be verified by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is low.

B.1

With one or more penetration flow paths with two PCIVs inoperable, either the inoperable PCIVs must be restored to OPERABLE status or the affected penetration flow path must be isolated within 1 hour. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and

(continued)

BASES

ACTIONS

B.1 (continued)

de-activated automatic valve, a closed manual valve, and a blind flange. The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1.1.

Condition B is modified by a Note indicating this Condition is only applicable to penetration flow paths with two PCIVs.

For penetration flow paths with one PCIV, Condition C provides the appropriate Required Actions.

C.1 and C.2

With one or more penetration flow paths with one PCIV inoperable, the inoperable valve must be restored to OPERABLE status or the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration. Required Action C.1 must be completed within the 4 hour Completion Time. The Completion Time of 4 hours is reasonable considering the relative stability of the closed system (hence, reliability) to act as a penetration isolation boundary and the relative importance of supporting primary containment OPERABILITY during MODES 1, 2, and 3. The Completion Time of 12 hours is reasonable considering the instrument and the small pipe diameter of penetration (hence, reliability) to act as a penetration isolation boundary and the small pipe diameter of the affected penetrations. In the event the affected penetration flow path is isolated in accordance with Required Action C.1, the affected penetration must be verified to be isolated on a periodic basis. This is necessary to ensure that primary containment penetrations required to be isolated following an accident are isolated. The Completion Time of once per 31 days for verifying each affected penetration is isolated is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low.

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

Condition C is modified by a Note indicating that this Condition is only applicable to penetration flow paths with only one PCIV. For penetration flow paths with two PCIVs, Conditions A and B provide the appropriate Required Actions.

Required Action C.2 is modified by a Note that applies to valves and blind flanges located in high radiation areas and allows them to be verified by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is low.

D.1, D.2, and D.3

In the event one or more containment purge valves are not within the purge valve leakage limits, purge valve leakage must be restored to within limits or the affected penetration must be isolated. The method of isolation must be by the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a [closed and de-activated automatic valve, closed manual valve, and blind flange]. A purge valve with resilient seals utilized to satisfy Required Action D.1 must have been demonstrated to meet the leakage requirements of SR 3.6.1.3.7. The specified Completion Time is reasonable, considering that one containment purge valve remains closed (refer to the SR 3.6.1.3.1), so that a gross breach of containment does not exist.

In accordance with Required Action D.2, this penetration flow path must be verified to be isolated on a periodic basis. The periodic verification is necessary to ensure that containment penetrations required to be isolated following an accident, which are no longer capable of being automatically isolated, will be in the isolation position should an event occur. This Required Action does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown, that those isolation devices outside containment and potentially capable of being mispositioned are in the correct position.

(continued)

BASES

ACTIONS

D.1, D.2, and D.3 (continued)

For the isolation devices inside containment, the time period specified as "prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days" is based on engineering judgment and is considered reasonable in view of the inaccessibility of the isolation devices and other administrative controls that will ensure that isolation device misalignment is an unlikely possibility.

For the containment purge valve with resilient seal that is isolated in accordance with Required Action D.1, SR 3.6.1.3.7 must be performed at least once every [92] days. This provides assurance that degradation of the resilient seal is detected and confirms that the leakage rate of the containment purge valve does not increase during the time the penetration is isolated. The normal Frequency for SR 3.6.1.3.7, 184 days, is based on an NRC initiative, Generic Issue B-20 (Ref. 3). Since more reliance is placed on a single valve while in this Condition, it is prudent to perform the SR more often. Therefore, a Frequency of once per [92] days was chosen and has been shown to be acceptable based on operating experience.

Step ~~B3.6.1.3-3~~

E.1 and E.2

If any Required Action and associated Completion Time cannot be met in MODE 1, 2, or 3, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1, G.1, H.1, and H.2

If any Required Action and associated Completion Time cannot be met, the unit must be placed in a condition in which the LCO does not apply. If applicable, CORE ALTERATIONS and movement of irradiated fuel assemblies must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe

(continued)

BASES

ACTIONS

F.1, G.1, H.1, and H.2 (continued)

condition. Also, if applicable, action must be immediately initiated to suspend operations with a potential for draining the reactor vessel (OPDRVs) to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended and valve(s) are restored to OPERABLE status. If suspending an OPDRVs would result in closing the residual heat removal (RHR) shutdown cooling isolation valves, an alternative Required Action is provided to immediately initiate action to restore the valve(s) to OPERABLE status. This allows RHR to remain in service while actions are being taken to restore the valve.

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.3.1

Each 550 mm (22 inch) primary containment purge valve is required to be verified sealed closed at 31 day intervals. This SR is designed to ensure that a gross breach of primary containment is not caused by an inadvertent or spurious opening of a primary containment purge valve. Detailed analysis of the purge valves failed to conclusively demonstrate their ability to close during a LOCA in time to limit offsite doses. Primary containment purge valves that are sealed closed must have motive power to the valve operator removed. This can be accomplished by de-energizing the source of electric power or removing the air supply to the valve operator. In this application, the term "sealed" has no connotation of leak tightness. The 31 day Frequency is a result of an NRC initiative, Generic Issue B-24 (Ref. 1), related to primary containment purge valve use during unit operations.

This SR allows a valve that is open under administrative controls to not meet the SR during the time the valve is open. Opening a purge valve under administrative controls is restricted to one valve in a penetration flow path at a given time (refer to discussion for Note 1 of the ACTIONS) in order to effect repairs to that valve. This allows one purge valve to be opened without resulting in a failure of the Surveillance and resultant entry into the ACTIONS for this purge valve, provided the stated restrictions are met. Condition 1 must be entered during this allowance, and the

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.3.1 (continued)

valve opened only as necessary for effecting repairs. Each purge valve in the penetration flow path may be alternately opened, provided one remains sealed closed, if necessary, to complete repairs on the penetration.

The SR is modified by a Note stating that primary containment purge valves are only required to be sealed closed in MODES 1, 2, and 3. If a LOCA inside primary containment occurs in these MODES, the purge valves may not be capable of closing before the pressure pulse affects systems downstream of the purge valves or the release of radioactive material will exceed limits prior to the closing of the purge valves. At other times when the purge valves are required to be capable of closing (e.g., during handling of irradiated fuel), pressurization concerns are not present and the purge valves are allowed to be open.

SR 3.6.1.3.2

This SR ensures that the primary containment purge valves are closed as required or, if open, open for an allowable reason.

[The SR is also modified by a Note (Note 1), stating that primary containment purge valves are only required to be closed in MODES 1, 2, and 3. If a LOCA inside primary containment occurs in these MODES, the purge valves may not be capable of closing before the pressure pulse affects systems downstream of the purge valves, or the release of radioactive material will exceed limits prior to the purge valves closing. At other times when the purge valves are required to be capable of closing (e.g., during handling of irradiated fuel), pressurization concerns are not present and the purge valves are allowed to be open.]

The SR is modified by a Note (Note 2) stating that the SR is not required to be met when the purge valves are open for the stated reasons. The Note states that these valves may be opened for inerting, de-inerting, pressure control, ALARA, or air quality considerations for personnel entry, or Surveillances that require the valves to be open. The 550 mm (22 inch) purge valves are capable of closing in the environment following a LOCA. Therefore, these valves are

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.3.2 (continued)

allowed to be open for limited periods of time. The 31 day Frequency is consistent with other PCIV requirements discussed in SR 3.6.1.3.3.

SR 3.6.1.3.3

This SR verifies that each primary containment isolation manual valve and blind flange that is located outside primary containment, and is required to be closed during accident conditions, is closed. The SR helps to ensure that post accident leakage of radioactive fluids or gases outside the primary containment boundary is within design limits. This SR does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown, that those valves outside primary containment, and capable of being mispositioned, are in the correct position. Since verification of valve position for valves outside primary containment is relatively easy, the 31 day Frequency was chosen to provide added assurance that the valves are in the correct positions.

Two Notes have been added to this SR. The first Note allows valves and blind flanges located in high radiation areas to be verified by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since the primary containment is intact and access to these areas is typically restricted during MODES 1, 2, and 3 for ALARA reasons. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is low. A second Note has been included to clarify that valves that are open under administrative controls are not required to meet the SR during the time that the valves are open.

SR 3.6.1.3.4

This SR verifies that each primary containment manual isolation valve and blind flange that is located inside primary containment, and is required to be closed during accident conditions, is closed. The SR helps to ensure that post accident leakage of radioactive fluids or gases outside the primary containment boundary is within design limits.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.3.4 (continued)

For valves inside primary containment, the Frequency defined as "prior to entering MODE 2 or 3 from MODE 4 if primary containment was de-inerted while in MODE 4, if not performed within the previous 92 days," is appropriate since these valves and flanges are operated under administrative controls and the probability of their misalignment is low.

Two Notes have been added to this SR. The first Note allows valves and blind flanges located in high radiation areas to be verified by use of administrative controls. Allowing verification by administrative controls is considered acceptable since the primary containment is inerted and access to these areas is typically restricted during MODES 1, 2, and 3 for ALARA reasons. Therefore, the probability of misalignment of these valves, once they have been verified to be in their proper position, is low. A second Note has been included to clarify that valves that are open under administrative controls are not required to meet the SR during the time that the valves are open.

SR 3.6.1.3.5

automatic

The traversing incore probe (TIP) shear isolation valves are actuated by explosive charges. Surveillance of explosive charge continuity provides assurance that TIP valves will actuate when required. Other administrative controls, such as those that limit the shelf life of the explosive charges, must be followed. The 31 day Frequency is based on operating experience that has demonstrated the reliability of the explosive charge continuity.

SR 3.6.1.3.6

Verifying the isolation time of each power operated and each automatic PCIV is within limits is required to demonstrate OPERABILITY. MSIVS may be excluded from this SR since MSIV full closure isolation time is demonstrated by SR 3.6.1.3.8. The isolation time test ensures that the valve will isolate in a time period less than or equal to that assumed in the safety analyses. The isolation time and Frequency of this SR are in accordance with the requirements of the Inservice Testing Program or 92 days.

*(Refs. B3.6.1.3 2 and
B3.6.1.3 7)*
(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.6.1.3.7

~~B3.6.1.3-5~~ set

Set ~~B3.6.1.3-3~~

For primary containment purge valves with resilient seals, additional leakage rate testing beyond the test requirements of 10 CFR 50, Appendix J (Ref. 5), is required to ensure OPERABILITY. Operating experience has demonstrated that this type of seal has the potential to degrade in a shorter time period than do other seal types. Based on this observation, and the importance of maintaining this penetration leak tight (due to the direct path between primary containment and the environment), a Frequency of 184 days was established as part of the NRC resolution of Generic Issue B-20 (Ref. 3). Additionally, this SR must be performed once within 92 days after opening the valve. The 92 day Frequency was chosen recognizing that cycling the valve could introduce additional seal degradation (beyond that which occurs to a valve that has not been opened). Thus, decreasing the interval (from 184 days) is a prudent measure after a valve has been opened.

The SR is modified by a Note stating that the primary containment purge valves are only required to meet leakage rate testing requirements in MODES 1, 2, and 3. If a LOCA inside primary containment occurs in these MODES, purge valve leakage must be minimized to ensure offsite radiological release is within limits. At other times when the purge valves are required to be capable of closing (e.g., during handling of irradiated fuel), pressurization concerns are not present and the purge valves are allowed to be open.

**** 1** A second Note has been added to this SR requiring that the results be evaluated against the acceptance criteria of SR 3.6.1.1.1. This ensure that primary containment purge valve leakage is properly accounted for in determining the overall primary containment leakage rate.

SR 3.6.1.3.8

total closure

exclusive of electrical delay

Verifying the isolation time of each MSIV is within the specified limits is required to demonstrate OPERABILITY. The isolation time test ensures that the MSIV will isolate in a time period that does not exceed the times assumed in the DBA analyses. This ensures that the calculated radiological consequences of these events remain within

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.3.8 (continued)

10 CFR 100 limits. The Frequency of this SR is ~~in accordance with the requirements of the Inservice Testing Program or 18 months.~~

3

SR 3.6.1.3.9

Automatic PCIVs close on a primary containment isolation signal to prevent leakage of radioactive material from primary containment following a DBA. This SR ensures that each automatic PCIV will actuate to its isolation position on a primary containment isolation signal. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.6.3.6 overlaps this SR to provide complete testing of the safety function. The 18 month Frequency was developed considering it is prudent that this Surveillance be performed only during a unit outage since isolation of penetrations would eliminate cooling water flow and disrupt the normal operation of many critical components. Operating experience has shown that these components usually pass this Surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

For some PCIVs, the Inservice Testing Program allows this surveillance to be performed during cold shutdown, as opposed to a unit outage, provided the Frequency is no greater than 18 months.

SR 3.6.1.3.10

This SR requires a demonstration that each reactor instrumentation line excess flow check valve (EFCV) is OPERABLE by verifying that the valve reduces flow to $\leq 3.8 \text{ E-3 m}^3/\text{hr}$ (1 gph) on a simulated instrument line break. This SR provides assurance that the instrumentation line EFCVs will perform so that predicted radiological consequences will not be exceeded during the postulated instrument line break event evaluated in Reference 6. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass this Surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

Start
B3.6.1.3.6

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.6.1.3.11 A

The TIP shear isolation valves are actuated by explosive charges. An in place functional test is not possible with this design. The explosive squib is removed and tested to provide assurance that the valves will actuate when required. The replacement charge for the explosive squib shall be from the same manufactured batch as the one fired or from another batch that has been certified by having one of the batch successfully fired. The Frequency of 18 months on a STAGGERED TEST BASIS is considered adequate given the administrative controls on replacement charges and the frequent checks of circuit continuity (SR 3.6.1.3.5).

SR 3.6.1.3.12

2 ****2** The analyses in References ~~3~~ and ~~6~~ are based on leakage that is less than the specified leakage rate. Leakage through each MSIV must be $\leq 1 \text{ m}^3/\text{hr}$ (35 scfh) when tested at $\geq \text{Pt of } 1.76 \text{ Kg/cm}^2\text{g}$ (25 psig). The MSIV leakage rate must be verified to be in accordance with the leakage test ~~SR 3.6.1.3.5~~ requirements of 10 CFR 50, Appendix J (Ref. ~~5~~), as modified by approved exemptions. A Note has been added to this SR requiring the results to be evaluated against the acceptance criteria of SR 3.6.1.1.1. This ensures that MSIV leakage is properly accounted for in determining the overall primary containment leakage rate. The Frequency is required by 10 CFR 50, Appendix J, as modified by approved exemptions; thus, SR 3.0.2 (which allows Frequency extensions) does not apply.

SR 3.6.1.3.13

Surveillance of hydrostatically tested lines provides assurance that the calculation assumptions of Reference ~~2~~ are met. Note also that dual function valves must pass all applicable SRs, including the Type C leakage rate test (SR 3.6.1.1.1), if appropriate. The combined leakage rates must be demonstrated in accordance with the leakage rate test requirements of 10 CFR 50, Appendix J (Ref. ~~9~~), as modified by approved exemptions.

This SR has been modified by two Notes. Note 1 states that these valves are only required to meet the combined leakage

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.3.13 (continued)

rate in MODES 1, 2, and 3, since this is when the Reactor Coolant System is pressurized and primary containment is required. In some instances, the valves are required to be capable of automatically closing during MODES other than MODES 1, 2, and 3. However, their leak tightness under accident conditions is not required in these other MODES or conditions. Note 2 has been added to this SR requiring the results to be evaluated against the acceptance criteria of SR 3.6.1.1.1. This ensures that these valves are properly accounted for in determining the overall primary containment leakage rate.

SR 3.6.1.3.14

Reviewer's Note: This SR is only required for those plants with purge valves with resilient seals allowed to be open during [MODE 1, 2, 3, or 4] and having blocking devices that are not permanently installed on the valves.

Verifying each 550 mm (22 inch) primary containment purge valve is blocked to restrict opening to \leq [50]% is required to ensure that the valves can close under DBA conditions within the times assumed in the analysis of References ~~1, 2, and 3~~ and ~~4~~. ~~3.6.1.3.14~~ ~~6~~ ~~2~~ ~~2~~

[The SR is modified by a Note stating that this SR is only required to be met in MODES 1, 2, and 3.] If a LOCA occurs, the purge valves must close to maintain containment leakage within the values assumed in the accident analysis. At other times when purge valves are required to be capable of closing (e.g., during movement of irradiated fuel assemblies), pressurization concerns are not present, thus the purge valves can be fully open. The ~~18~~ month Frequency is appropriate because the blocking devices are typically removed only during a refueling outage.

REFERENCES ~~3.6.1.3~~ 1. ABWR SSAR, Chapter 15.

~~2. ABWR SSAR, Section 6.2.~~

~~3. ABWR SSAR, Table 6.2-7.~~
2

(continued)

BASES (continued)

REFERENCES
(continued)

- ~~Gen 3~~ 4. Generic Issue B-20, "Containment Leakage Due to Seal Deterioration."
 - ~~Gen 4~~ 5. Generic Issue B-24.
 - ~~Gen 5~~ 6. 10 CFR 50, Appendix J.
 - ~~Gen 6~~ 7. ABWR SSAR, Section 6.2
-
- ~~Gen 7~~ 8. ABWR SSAR, Section 3.9.6

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1.4 Drywell Pressure

BASES

BACKGROUND

The drywell pressure is limited during normal operations to preserve the initial conditions assumed in the accident analysis for a Design Basis Accident (DBA) or loss of coolant accident (LOCA).

Primary containment performance is evaluated for the entire spectrum of break sizes for postulated LOCAs (Ref. 1). Among the inputs to the DBA is the initial primary containment internal pressure (Ref. 1). Analyses assume an initial drywell pressure of $0.05 \text{ Kg/cm}^2\text{g}$ (0.75 psig). This limitation ensures that the safety analysis remains valid by maintaining the expected initial conditions and ensures the drywell internal pressure does not exceed maximum allowable of $3.16 \text{ Kg/cm}^2\text{g}$ (45 psig). The maximum calculated drywell pressure occurs during the reactor blowdown phase of the DBA, which assumes a feedwater line break. The calculated peak drywell pressure for this limiting event is $2.74 \text{ Kg/cm}^2\text{g}$ (39 psig) (Ref. 1).

that the peak LOCA

new TP

APPLICABLE SAFETY ANALYSES

Drywell pressure satisfies Criterion 2 of the NRC Policy Statement.

LCO

In the event of a DBA, with an initial drywell pressure $\leq 0.05 \text{ Kg/cm}^2\text{g}$ (0.75 psig), the resultant peak drywell accident pressure will be maintained below the drywell design pressure.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, maintaining drywell pressure within limits is not required in MODE 4 or 5.

(continued)

BASES

ACTIONS

A.1

With drywell pressure not within the limit of the LCO, drywell pressure must be restored within 1 hour. The Required Action is necessary to return operation to within the bounds of the primary containment analysis. The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1.1, "Primary Containment," which requires that primary containment be restored to OPERABLE status within 1 hour.

B.1 and B.2

If drywell pressure cannot be restored to within limit within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.4.1

Verifying that drywell pressure is within limit ensures that unit operation remains within the limit assumed in the primary containment analysis. The 12 hour Frequency of this SR was developed, based on operating experience related to trending of drywell pressure variations and pressure instrument drift during the applicable MODES. Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal drywell pressure condition.

REFERENCES ~~ASME~~-1. ABWR SSAR, Section 6.2.

Stet

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1.5 Drywell Air Temperature

BASES

BACKGROUND

The drywell contains the reactor vessel and piping, which add heat to the airspace. Drywell coolers remove heat and maintain a suitable environment. The average airspace temperature affects the calculated response to postulated Design Basis Accidents (DBAs). The limitation on the drywell average air temperature was developed as reasonable, based on operating experience. The limitation on drywell air temperature is used in the Reference ~~X~~ safety analyses.

~~B3.6.1.5-1~~

APPLICABLE SAFETY ANALYSES

~~B3.6.1.5-1~~
~~B3.6.1.5-2~~
Primary containment performance is evaluated for a spectrum of break sizes for postulated loss of coolant accidents (LOCAs) (Ref. 1). Among the inputs to the design basis analysis is the initial drywell average air temperature (Ref. 1). Analyses assume an initial average drywell air temperature of 57°C (135°F). This limitation ensures that the safety analysis remains valid by maintaining the expected initial conditions and ensures that the peak LOCA drywell temperature does not exceed the maximum allowable temperature of 171°C (340°F) (Ref. 2). Exceeding this design temperature may result in the degradation of the primary containment structure under accident loads. Equipment inside primary containment, required to mitigate the effects of a DBA, is designed to operate and be capable of operating under environmental conditions expected for the accident.

The most severe drywell temperature condition occurs as a result of a small Reactor Coolant System rupture above the reactor water level, which results in the blowdown of reactor steam to the drywell. The drywell temperature analysis considers main steam line breaks occurring inside the drywell and having various break areas. The maximum calculated drywell average temperature for the worst case break area is provided in Reference 1. ~~B3.6.1.5-2~~

Drywell air temperature satisfies Criterion 2 of the NRC Policy Statement.

(continued)

BASES

LCO In the event of a DBA, with an initial drywell average air temperature less than or equal to the LCO temperature limit, the resultant peak accident temperature is maintained below the drywell design temperature. As a result, the ability of primary containment to perform its design function is ensured.

APPLICABILITY In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, maintaining drywell average air temperature within the limit is not required in MODE 4 or 5.

ACTIONS

A.1

With drywell average air temperature not within the limit of the LCO, drywell average temperature must be restored within 8 hours. The Required Action is necessary to return operation to within the bounds of the primary containment analysis. The 8 hour Completion Time is acceptable, considering the sensitivity of the analysis to variations in this parameter, and provides sufficient time to correct minor problems.

B.1 and B.2

If the drywell average air temperature cannot be restored to within limit within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.5.1

Verifying that the drywell average air temperature is within the LCO limit ensures that operation remains within the limits assumed for the primary containment analyses. Drywell air temperature is monitored in all quadrants and at various elevations (referenced to mean sea level). Due to the shape of the drywell, a volumetric average is used to determine an accurate representation of the actual average temperature.

The 24 hour Frequency of the SR was developed based on operating experience related to drywell average air temperature variations and temperature instrument drift during the applicable MODES and the low probability of a DBA occurring between surveillances. Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal drywell air temperature condition.

-
- REFERENCES ~~B3.6.1.5~~ 1. ABWR SSAR, Section 6.2.
2. ABWR SSAR, Section 6.2.1.
-

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1.6 ~~Suppression Chamber~~ Wetwell-to-Drywell Vacuum Breakers

BASES

BACKGROUND

The function of the ~~suppression chamber~~ Wetwell-to-drywell vacuum breakers is to relieve vacuum in the drywell. There are [8] internal vacuum breakers between the drywell and the ~~suppression chamber~~ Wetwell, which allow air and steam flow from the ~~suppression chamber~~ Wetwell to the drywell when the drywell is at a negative pressure with respect to the ~~suppression chamber~~ Wetwell. Therefore, ~~suppression chamber~~ Wetwell-to-drywell vacuum breakers prevent an excessive negative differential pressure across the wetwell drywell boundary. Each vacuum breaker is a self actuating valve, similar to a check valve, which can be manually operated for testing purposes.

A negative differential pressure across the drywell wall is caused by rapid depressurization of the drywell. Events that cause this rapid depressurization are cooling cycles, inadvertent drywell spray actuation and steam condensation from sprays or subcooled water reflood of a break in the event of a primary system rupture. Cooling cycles result in minor pressure transients in the drywell that occur slowly and are normally controlled by heating and ventilation equipment. Spray actuation or spill of subcooled water out of a break results in more significant pressure transients and becomes important in sizing the internal vacuum breakers.

In the event of a primary system rupture, steam condensation within the drywell results in the most severe pressure transient. Following a primary system rupture, air in the drywell is purged into the ~~suppression chamber~~ Wetwell free airspace, leaving the drywell full of steam. Subsequent condensation of the steam can be caused in two possible ways, namely, Emergency Core Cooling System flow from a ruptured pipe, or containment spray actuation following a loss of coolant accident (LOCA). These two cases determine the maximum depressurization rate of the drywell.

In addition, the waterleg in the vertical vents of the vent system is controlled by the drywell-to-~~suppression chamber~~ Wetwell differential pressure. If the drywell pressure is less than the ~~suppression chamber~~ Wetwell pressure, there will be an increase in the vent waterleg. This will result in an increase in

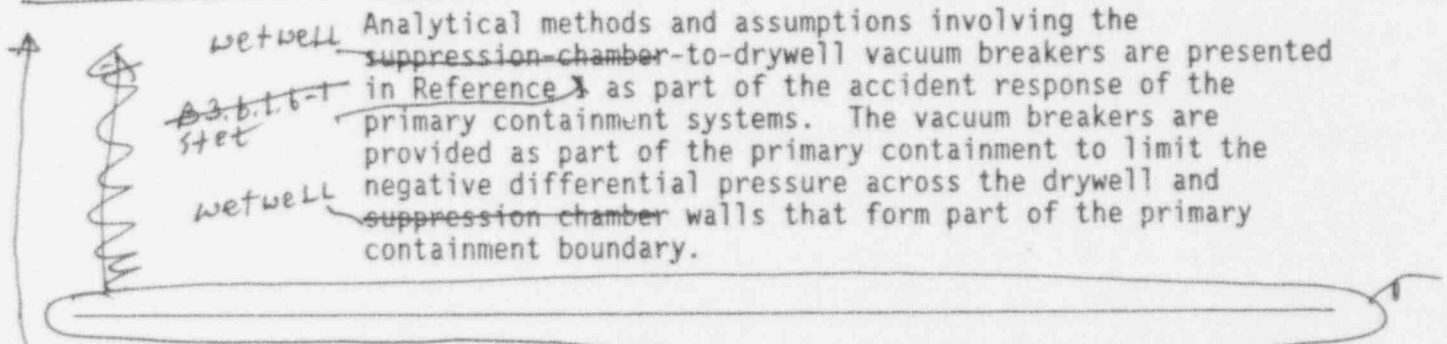
Wetwell

(continued)

BASES

BACKGROUND
(continued)

the water clearing inertia in the event of a postulated LOCA, resulting in an increase in the peak drywell pressure. This in turn will result in an increase in the pool swell dynamic loads. The internal vacuum breakers limit the height of the waterleg in the vent system during normal operation.



APPLICABLE
SAFETY ANALYSES

.007 Kg/cm²
(0.1 psid)

Analytical methods and assumptions involving the ~~suppression chamber-to-drywell~~ vacuum breakers are presented in Reference 1 as part of the accident response of the primary containment systems. The vacuum breakers are provided as part of the primary containment to limit the negative differential pressure across the drywell and ~~suppression chamber~~ walls that form part of the primary containment boundary.

The safety analyses assume that the internal vacuum breakers are closed initially and are fully open at a differential pressure of ~~.0354 Kg/cm² (0.5 psid)~~ (Ref. 1). ~~A3.6.1.6-1e~~ set. Additionally, 1 of the 8 internal vacuum breakers are assumed to fail in a closed position (Ref. 1). The results of the analyses show that the design pressure is not exceeded even under the worst case accident scenario. The vacuum breaker opening differential pressure ~~setpoint~~ and the requirement that all 8 vacuum breakers be OPERABLE are a result of the requirement placed on the vacuum breakers to limit the vent system waterleg height. Design Basis Accident (DBA) analyses require the vacuum breakers to be closed initially and to remain closed and leak tight, with the suppression pool at a positive pressure relative to the drywell.

The ~~suppression chamber~~ ^{wetwell}-to-drywell vacuum breakers satisfy Criterion 3 of the NRC Policy Statement.

LCO

All 8 of the ~~vacuum~~ ^{wetwell} breakers must be OPERABLE for opening. All ~~suppression chamber-to-drywell~~ vacuum breakers, however, are required to be closed (except during testing or when the vacuum breakers are performing the intended design function). The vacuum breaker OPERABILITY requirement provides assurance that the drywell-to-~~suppression chamber~~ negative differential pressure remains below the design

^{wetwell}
(continued)

BASES

LCO
(continued)

value. The requirement that the vacuum breakers be closed ensures that there is no excessive bypass leakage should a LOCA occur.

APPLICABILITY

In MODES 1, 2, and 3, the containment sprays of the residual heat removal system are required to be OPERABLE to mitigate the effects of a DBA. Excessive negative pressure inside the drywell could occur due to inadvertent actuation of the drywell spray. The vacuum breakers, therefore, are required to be OPERABLE in MODES 1, 2, and 3, when the containment sprays are required to be OPERABLE, to mitigate the effects of inadvertent actuation of the drywell spray. Also, in MODES 1, 2, and 3, a DBA could result in excessive negative differential pressure across the drywell wall, caused by the rapid depressurization of the drywell.

Also, inadvertent actuation of the drywell spray could result in rapid depressurization of the drywell. The vacuum breakers, therefore, are required to be OPERABLE in MODES 1, 2 and 3.

The event that results in the limiting rapid depressurization of the drywell is the primary system rupture that purges the drywell of air and fills the drywell free airspace with steam. Subsequent condensation of the steam would result in depressurization of the drywell. The limiting pressure and temperature of the primary system prior to a DBA occur in MODES 1, 2, and 3.

In MODES 4 and 5, the probability and consequences of these events are reduced by the pressure and temperature limitations in these MODES; therefore, maintaining suppression chamber-to-drywell vacuum breakers OPERABLE is not required in MODE 4 or 5.

Wetwell

ACTIONS

A.1

With one of the required vacuum breakers inoperable for opening (e.g., the vacuum breaker is not open and may be stuck closed or not within its opening setpoint limit, so that it would not function as designed during an event that depressurized the drywell), the remaining [seven] OPERABLE vacuum breakers are capable of providing the vacuum relief function. However, overall system reliability is reduced because a single failure in one of the remaining vacuum breakers could result in an excessive suppression chamber-to-drywell differential pressure during a DBA.

Wetwell

(continued)

BASES

ACTIONS

A.1 (continued)

Therefore, with one of the [eight] required vacuum breakers inoperable, 72 hours is allowed to restore at least one of the inoperable vacuum breakers to OPERABLE status so that plant conditions are consistent with those assumed for the design basis analysis. The 72 hour Completion Time is considered acceptable due to the low probability of an event in which the remaining vacuum breaker capability would not be adequate.

~~B.1 and B.2~~

wetwell

An open vacuum breaker allows communication between the drywell and ~~suppression chamber~~ airspace, and, as a result, there is the potential for ~~suppression chamber~~ wetwell overpressurization due to this bypass leakage if a LOCA were to occur. Therefore, the open vacuum breaker must be closed. A short time is allowed to close the vacuum breaker due to the low probability of an event that would pressurize primary containment. If vacuum breaker position indication is not reliable, an alternate method of verifying that the vacuum breakers are closed is to verify that a differential pressure of ~~0.35 Kg/cm² (0.5 psid)~~ between the ~~suppression chamber~~ and drywell is maintained for 1 hour without makeup. The required 2 hour Completion Time is considered adequate to perform this test.

.002 Kg/cm²
(0.1 psia)

C.1 — C1 and C.2

wetwell

If the inoperable ~~suppression chamber~~ wetwell vacuum breaker cannot be closed or restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.6.1

Each vacuum breaker is verified closed (except when being tested in accordance with SR 3.6.1.6.2 or when performing its intended function) to ensure that this potential large bypass leakage path is not present. This Surveillance is performed by observing the vacuum breaker position indication or by verifying that a differential pressure of ~~0.35 Kg/cm² (0.5 psid)~~ between the suppression chamber and drywell is maintained for 1 hour without makeup. The 14 day Frequency is based on engineering judgment, is considered adequate in view of other indications of vacuum breaker status available to operations personnel, and has been shown to be acceptable through operating experience. This verification is also required within 2 hours after any discharge of steam to the suppression chamber from the safety/relief valves or any operation that causes the drywell-to-suppression chamber differential pressure to be reduced by ~~> 0.35 Kg/cm² (0.5 psid)~~. A footnote is added to provide additional assurance of closure if position indication instruments indicate one or more vacuum breakers are not closed.

.007 Kg/cm²
(0.1 psid)

drywell

.007 Kg/cm²
(0.1 psid)

SR 3.6.1.6.2

Each required vacuum breaker must be cycled to ensure that it opens adequately to perform its design function and returns to the fully closed position. This ensures that the safety analysis assumptions are valid. The 18 month Frequency of this SR is based on the need to perform the surveillance during an outage. The vacuum breakers can only be manually actuated and are only accessible during an outage.

SR 3.6.1.6.3

Verification of the vacuum breaker opening ~~setpoint~~ is necessary to ensure that the safety analysis assumption regarding vacuum breaker full open differential pressure of ~~0.35 Kg/cm² (0.5 psid)~~ is valid. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance

.007 Kg/cm²
(0.1 psid)

pressure

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.1.6.3 (continued)

were performed with the reactor at power. For this facility, the 18 month Frequency has been shown to be acceptable, based on operating experience, and is further justified because of other surveillances performed at shorter Frequencies that convey the proper functioning status for each vacuum breaker.

REFERENCE *B3.6.1.6.1* 1. ABWR SSAR, Section 6.2.
Set

B 3.6 CONTAINMENT SYSTEMS

B 3.6.2.1 Suppression Pool Average Temperature

BASES

BACKGROUND

drywell
connecting

The ^{wetwell} ~~suppression chamber~~ is a steel lined reinforced concrete pressure vessel containing a volume of water called the suppression pool. The suppression pool is designed to absorb the decay heat and sensible energy released during a reactor blowdown from safety/relief valve discharges or from Design Basis Accidents (DBAs). The suppression pool must quench all the steam released through the vent lines during a loss of coolant accident (LOCA). This is the essential mitigative feature of a pressure suppression containment that ensures that the peak containment pressure is maintained below the maximum allowable pressure for DBAs of 3.16 Kg/cm²g (45 psig).

The suppression pool must also condense steam from steam exhaust lines in the turbine driven ~~systems (i.e., the~~ Reactor Core Isolation Cooling System. Suppression pool average temperature (along with LCO 3.6.2.2, "Suppression Pool Water Level") is a key indication of the capacity of the suppression pool to fulfill these requirements.

The technical concerns that lead to the development of suppression pool average temperature limits are as follows:

- Complete steam condensation—the original limit for the end of a LOCA blowdown was 76.67°C (170°F), based on the Bodega Bay and Humboldt Bay Tests;
- Primary containment peak pressure and temperature—the design pressure is 3.16 Kg/cm²g (45 psig) and design temperature is 171°C (340°F) (Ref. 1); and ~~B 3.6.2.1-1~~ ^{Set}
- Condensation oscillation loads maximum allowable initial temperature is 49°C (120°F).

(continued)

Suppression Pool Average Temperature
B 3.6.2.1

BASES (continued)

APPLICABLE
SAFETY ANALYSES

The postulated DBA against which the primary containment performance is evaluated is the entire spectrum of postulated pipe breaks within the primary containment. Inputs to the safety analyses include initial suppression pool water volume and suppression pool temperature (Reference 1 for LOCAs and Reference 2 for the pool temperature analyses required by Reference 3). An initial pool temperature of 43°C (110°F) is assumed for the Reference 1 and 2 analyses. Reactor shutdown at a pool temperature of 49°C (120°F) and vessel depressurization at a pool temperature of 54°C (130°F) are assumed for the Reference 2 analyses. The limit of 46°C (115°F), at which testing is terminated, is not used in the safety analyses because DBAs are assumed to not initiate during unit testing.

Suppression pool average temperature satisfies Criteria 2 and 3 of the NRC Policy Statement.

LCO

A limitation on the suppression pool average temperature is required to provide assurance that the containment conditions assumed for the safety analyses are met. This limitation subsequently ensures that peak primary containment pressures and temperatures do not exceed maximum allowable values during a postulated DBA or any transient resulting in heatup of the suppression pool. The LCO requirements are:

- a. Average temperature $\leq 43^{\circ}\text{C}$ (110°F) when THERMAL POWER is $\leq 1\%$ RTP and no testing that adds heat to the suppression pool is being performed. This requirement ensures that licensing bases initial conditions are met.
- b. Average temperature $\leq 46^{\circ}\text{C}$ (115°F) when THERMAL POWER is $\leq 1\%$ RTP and testing that adds heat to the suppression pool is being performed. This required value ensures that the unit has testing flexibility, and was selected to provide margin below the 49°C (120°F) limit at which reactor shutdown is required. When testing ends, temperature must be restored to $\leq 43^{\circ}\text{C}$ (110°F) within 24 hours according to Required

(continued)

BASES (continued)

LCO

b. (continued)

Action A.2. Therefore, the time period that the temperature is $> 43^{\circ}\text{C}$ (110°F) is short enough not to cause a significant increase in unit risk.

\leq c. Average temperature $\leq 49^{\circ}\text{C}$ (120°F) when THERMAL POWER is $\leq 1\%$ RTP. This requirement ensures that the unit will be shut down at $> 49^{\circ}\text{C}$ (120°F). The pool is designed to absorb decay heat and sensible heat but could be heated beyond design limits by the steam generated if the reactor is not shut down.

At the 1% RTP power level, heat input is approximately equal to normal system heat losses.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause significant heatup of the suppression pool. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining suppression pool average temperature within limits is not required in MODE 4 or 5.

ACTIONS

A.1 and A.2

1 and 3 to B.3.6.2.1
With the suppression pool average temperature above the specified limit when not performing testing that adds heat to the suppression pool and when above the specified power indication, the initial conditions exceed the conditions assumed for the Reference ~~1, 2, and 3~~ analyses. However, primary containment cooling capability still exists, and the primary containment pressure suppression function will occur at temperatures well above those assumed for safety analyses. Therefore, continued operation is allowed for a limited time. The 24 hour Completion Time is adequate to allow the suppression pool average temperature to be restored below the limit. Additionally, when suppression pool temperature is $> 43^{\circ}\text{C}$ (110°F), increased monitoring of the suppression pool temperature is required to ensure that it remains $\leq 49^{\circ}\text{C}$ (120°F). The once per hour Completion Time is adequate based on past experience, which has shown

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

that pool temperature increases relatively slowly except when testing that adds heat to the suppression pool is being performed. Furthermore, the once per hour Completion Time is considered adequate in view of other indications in the control room, including alarms, to alert the operator to an abnormal suppression pool average temperature condition.

B.1

If the suppression pool average temperature cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the power must be reduced to $\leq 1\%$ RTP within 12 hours. The 12 hour Completion Time is reasonable, based on operating experience, to reduce power from full power conditions in an orderly manner and without challenging plant systems.

C.1

Suppression pool average temperature is allowed to be $> 43^{\circ}\text{C}$ (110°F) when THERMAL POWER is $> 1\%$ RTP, and when testing that adds heat to the suppression pool is being performed. However, if temperature is $> 46^{\circ}\text{C}$ (115°F) all testing must be immediately suspended to preserve the heat absorption capability of the suppression pool. With the testing suspended, Condition A is entered and the Required Actions and associated Completion Times are applicable.

~~D.1 and D.2~~

When suppression pool average temperature is $> 49^{\circ}\text{C}$ (120°F), the suppression pool cooling function of the RHR system is automatically initiated. The pool temperature continues to increase due to the mismatch of cooling capacity and steam discharged into the pool. When the pool temperature reaches 54°C (130°F) a reactor scram is automatically initiated. Additionally, when suppression pool temperature is $> 49^{\circ}\text{C}$ (120°F), increased monitoring of pool temperature is required to ensure that it remains $\leq 54^{\circ}\text{C}$ (130°F). The once per 30 minute Completion Time is adequate, based on

(continued)

BASES

ACTIONS

D.1 and D.2 (continued)

operating experience. Given the high suppression pool average temperature in this Condition, the monitoring Frequency is increased to twice that of Condition A. Furthermore, the 30 minute Completion Time is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool average temperature condition.

E.1 and E.2

If suppression pool average temperature cannot be maintained at $\leq 54^{\circ}\text{C}$ (130°F), the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the reactor pressure must be reduced to $< 14.1 \text{ Kg/cm}^2\text{g}$ (200 psig) within 12 hours, and the plant must be brought to at least MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

Continued addition of heat to the suppression pool with suppression pool temperature $> 54^{\circ}\text{C}$ (130°F) could result in exceeding the design basis maximum allowable values for primary containment temperature or pressure. Furthermore, if a blowdown were to occur when the temperature was $> 54^{\circ}\text{C}$ (130°F), the maximum allowable bulk and local temperatures could be exceeded very quickly.

SURVEILLANCE
REQUIREMENTS

SR 3.6.2.1.1

The suppression pool average temperature is regularly monitored to ensure that the required limits are satisfied. The average temperature is determined by taking an arithmetic average of the OPERABLE suppression pool water temperature channels. The 24 hour Frequency has been shown, based on operating experience, to be acceptable. When heat is being added to the suppression pool by testing, however, it is necessary to monitor suppression pool temperature more frequently. The 5 minute Frequency during testing is justified by the rates at which tests will heat up the

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.2.1.1 (continued)

suppression pool, has been shown to be acceptable based on operating experience, and provides assurance that allowable pool temperatures are not exceeded. The Frequencies are further justified in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool average temperature condition.

REFERENCES

1. ABWR SSAR, Section 6.2.1.
 2. ABWR SSAR, Section 15.1.
 3. NUREG-0783, ~~"Plant Unique Load Definition Edwin I. Hatch Nuclear Power Plant Unit 1."~~
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↙
"Suppression Pool Temperature
Limits for BWR Containments".

B 3.6 CONTAINMENT SYSTEMS

B 3.6.2.2 Suppression Pool Water Level

BASES

BACKGROUND

The suppression pool is a steel lined reinforced concrete pressure vessel containing a volume of water called the suppression pool. The suppression pool is designed to absorb the energy associated with decay heat and sensible heat released during a reactor blowdown from safety/relief valve (S/RV) discharges or from a Design Basis Accident (DBA). The suppression pool must quench all the steam released through the vent lines during a loss of coolant accident (LOCA). This is the essential mitigative feature of a pressure suppression containment, which ensures that the peak containment pressure is maintained below the maximum allowable pressure for DBAs of $3.164 \text{ Kg/cm}^2\text{g}$ (45 psig).

22 ft. 11.5 inches

The suppression pool must also condense steam from the steam exhaust lines in the turbine driven system (i.e. Reactor Core Isolation Cooling (RCIC) System and provides the main emergency water supply source for the reactor vessel. The suppression pool level ranges between the low water level limit of 7 m (23 ft 0 inches) ~~at a volume of 3625 m³ (135,291 ft³)~~ and the high water level limit of 7.1 m (23 ft 3.5 inches). ~~a volume of 3625 m³ at~~

a volume
of 3580 m³
at

(126,426 ft³)

If the suppression pool water level is too low, an insufficient amount of water would be available to adequately condense the steam from the S/RV quenchers, main vents, or RCIC turbine exhaust lines. Low suppression pool water level could also result in an inadequate emergency makeup water source to the Emergency Core Cooling System. The lower volume would also absorb less steam energy before heating up excessively. Therefore, a minimum suppression pool water level is specified.

(128,016 ft³)

If the suppression pool water level is too high, it could result in excessive clearing loads from S/RV discharges and excessive pool swell loads during a DBA LOCA. Therefore, a maximum pool water level is specified. This LCO specifies an acceptable range to prevent the suppression pool water level from being either too high or too low.

(continued)

BASES

APPLICABLE
SAFETY ANALYSES

Initial suppression pool water level affects suppression pool temperature response calculations, calculated drywell pressure during vent clearing for a DBA, calculated pool swell loads for a DBA LOCA, and calculated loads due to S/RV discharges. Suppression pool water level must be maintained within the limits specified so that the safety analysis of Reference X remains valid.

Set ~~B3.6.2.2~~

Suppression pool water level satisfies Criteria 2 and 3 of the NRC Policy Statement.

LCO

A limit that suppression pool water level be ≥ 7 m (18 ft 4.5 inches) and ≤ 7.1 m (18 ft 9.75 inches) is required to ensure that the primary containment conditions assumed for the safety analyses are met. Either the high or low water level limits were used in the safety analyses, depending upon which is more conservative for a particular calculation.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause significant loads on the primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining suppression pool water level within limits is not required in MODE 4 or 5.

ACTIONS

A.1

With suppression pool water level outside the limits, the conditions assumed for the safety analyses are not met. If water level is below the minimum level, the pressure suppression function still exists as long as main vents are covered, RCIC turbine exhausts are covered, and S/RV quenchers are covered. If suppression pool water level is above the maximum level, protection against overpressurization still exists due to the margin in the peak containment pressure analysis or as long as the drywell and ~~containment~~ sprays are OPERABLE. Therefore, continued operation for a limited time is allowed. The 2 hour

Wetwell

(continued)

BASES

ACTIONS

A.1 (continued)

Completion Time is sufficient to restore suppression pool water level to within limits. Also, it takes into account the low probability of an event impacting the suppression pool water level occurring during this interval.

B.1 and B.2

If suppression pool water level cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.6.2.2.1

Verification of the suppression pool water level is to ensure that the required limits are satisfied. The 24 hour Frequency of this SR was developed considering operating experience related to trending variations in suppression pool water level and water level instrument drift during the applicable MODES and to assessing the proximity to the specified LCO level limits. Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool water level condition.

REFERENCE

~~B.1.1~~ 1. ABWR SSAR, Section 6.2.

6.2

B 3.6 CONTAINMENT SYSTEMS

B 3.6.2.3 Residual Heat Removal (RHR) Suppression Pool Cooling

BASES

BACKGROUND

Following a Design Basis Accident (DBA), the RHR Suppression Pool Cooling System removes heat from the suppression pool. The suppression pool is designed to absorb the sudden input of heat from the primary system. In the long term, the pool continues to absorb residual heat generated by fuel in the reactor core. Some means must be provided to remove heat from the suppression pool so that the temperature inside the primary containment remains within design limits. This function is provided by three redundant RHR suppression pool cooling subsystems. The purpose of this LCO is to ensure that the three subsystems are OPERABLE in applicable MODES.

both Each RHR subsystem *and automatically* contains one pump and one heat exchanger and is manually initiated and independently controlled. The three RHR subsystems perform the suppression pool cooling function by circulating water from the suppression pool through the RHR heat exchangers and returning it to the suppression pool. Reactor Building Cooling Water (RCW), S/RV leakage, and high pressure core injection, Reactor Core Isolation Cooling System testing increase suppression pool temperature more slowly. The RHR Suppression Pool Cooling System is also used to lower the suppression pool water bulk temperature following such events.

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and

APPLICABLE SAFETY ANALYSES

B3.6.2.3-1 stet
Reference *1* contains the results of analyses used to predict primary containment pressure and temperature following large and small break LOCAs. The intent of the analyses is to demonstrate that the heat removal capacity of the RHR Suppression Pool Cooling System is adequate to maintain the primary containment conditions within design limits. The suppression pool temperature is calculated to remain below the design limit.

B3.6.2.3-3 stet
Reference *3* contains discussion of additional analyses that was performed to support PRA success criteria for the long term heat removal function. The intent of these analyses was to predict primary containment pressure and temperature following low probability events beyond the DBA and to determine the minimum heat-removal capacity required to

(continued)

(A)

circulating through the shell side of the heat exchangers, exchanges heat with the suppression pool water and discharges this heat to the external heat sink via the reactor service water (RSW) system.

The combined heat removal capability of two RHR subsystems operating simultaneously is sufficient to meet the overall DBA pool cooling requirement for Loss of coolant accidents (LOCAs) and transient events such as a turbine trip or stuck open safety/relief (S/RV).

BASES

maintain the primary containment conditions within its ultimate capacity. The results are used to establish the minimum amount of RHR (Suppression Pool Cooling) system equipment required to prevent ultimate containment failure beyond DBA events.

The RHR Suppression Pool Cooling System satisfies Criterion 3 of the NRC Policy Statement.

LCO

During a DBA, a minimum of two RHR suppression pool cooling subsystems are required to maintain the primary containment peak pressure and temperature below the design limits (Ref. 1). To ensure that these requirements are met, three RHR suppression pool cooling subsystems must be OPERABLE with power from three safety related independent power supplies. Therefore, in the event of an accident, at least two subsystem are OPERABLE, assuming the worst case single active failure. An RHR suppression pool cooling subsystem is OPERABLE when the pump, the heat exchanger, and associated piping, valves, instrumentation, and controls are OPERABLE.

stet ~~B3.6.2.3-1~~

S

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment and cause a heatup and pressurization of primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, the RHR Suppression Pool Cooling System is not required to be OPERABLE in MODE 4 or 5.

ACTIONS

A.1

With one RHR suppression pool cooling subsystem inoperable, the inoperable subsystem must be restored within 30 days. In this Condition, the remaining RHR suppression pool cooling subsystems are adequate to perform the primary containment cooling function. However, the overall reliability is reduced because a single failure in one of the OPERABLE

(continued)

BASES

ACTIONS

A.1 (continued)

⁵ subsystem could result in reduced primary containment cooling capability. The ³⁰ X day Completion Time is acceptable in light of the redundant RHR suppression pool cooling capabilities afforded by the OPERABLE subsystems and the low probability of a DBA occurring during this period. Additionally, analyses of beyond design basis events demonstrates that one RHR suppression pool cooling subsystem is adequate to maintain containment conditions below the ultimate capacity. _{to}

B.1

With two RHR suppression pool cooling subsystems inoperable, at least one inoperable subsystem must be restored to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE RHR suppression pool cooling subsystem affords significant primary containment cooling capability and would be sufficient to maintain containment conditions well below its ultimate capacity. However, the overall reliability is reduced because a single failure in the one OPERABLE subsystem could result in a substantial loss of primary containment cooling capability. The 72 hour Completion Time was chosen in light of the redundant RHR suppression pool cooling capability afforded by the OPERABLE train and the low probability of a DBA occurring during this period.

C.1 and C.2

^{be} If the Required Action and associated Completion Time of Conditions A and B cannot be met within the required Completion Time or if three RHR suppression pool cooling subsystems are inoperable, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.2.3.1

Verifying the correct alignment for manual, power operated, and automatic valves, in the RHR suppression pool cooling mode flow path provides assurance that the proper flow path exists for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to locking, sealing, or securing. ~~A valve is also allowed to be in the nonaccident position, provided it can be aligned to the accident position within the time assumed in the accident analysis. This is acceptable, since the RHR suppression pool cooling mode is manually initiated.~~ This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Frequency of 31 days is justified because the valves are operated under procedural control, ^{and} improper valve position would affect only a single subsystem, the probability of an event requiring initiation of the system is low, ~~and the subsystem is a manually initiated system.~~ This Frequency has been shown to be acceptable, based on operating experience.

SR 3.6.2.3.2

Verifying that each RHR pump develops a flow rate $\geq 954 \text{ m}^3/\text{h}$ (4200 gpm), while operating in the suppression pool cooling mode with flow through the associated heat exchanger ensures that pump performance has not degraded during the cycle. Flow is a normal test of centrifugal pump performance required by ASME Code Section XI (Ref. 3). This test confirms one point on the pump design curve, and the results are indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is ~~in accordance with the Inservice Testing Program or 92 days~~. ^{2 SR 3.6.2.3-1}

INSEAT SR 3.6.2.3.3
from
next
page

No changes on page B 3.6-5.

(continued)

B 3.6 CONTAINMENT SYSTEMS

B 3.6.3.1 Primary Containment Hydrogen Recombiners

BASES

BACKGROUND

The primary containment hydrogen recombinder eliminates the potential breach of primary containment due to a hydrogen oxygen reaction and is part of combustible gas control required by 10 CFR 50.44, "Standards for Combustible Gas Control Systems in Light-Water-Cooled Reactors" (Ref. 1), and GDC 41, "Containment Atmosphere Cleanup" (Ref. 2). The primary containment hydrogen recombinder is required to reduce the hydrogen concentration in the primary containment following a loss of coolant accident (LOCA). The primary containment hydrogen recombinder accomplishes this by recombining hydrogen and oxygen to form water vapor. The vapor remains in the primary containment, thus eliminating any discharge to the environment. The primary containment hydrogen recombinder is manually initiated, since flammability limits would not be reached until several days after a Design Basis Accident (DBA).

is returned to

The primary containment hydrogen recombinder functions to maintain the hydrogen gas concentration within the containment at or below the flammability limit of 4.0 volume percent (v/o) following a postulated LOCA. It is fully redundant and consists of two 100% capacity subsystems. Each primary containment hydrogen recombinder consists of an enclosed blower assembly, heater section, reaction chamber, direct contact water spray gas cooler, water separator, and associated piping, valves, and instruments.

The primary containment hydrogen recombinder will be manually initiated from the main control room when the hydrogen gas concentration in the primary containment reaches [3.3] v/o. When the primary containment is inerted (oxygen concentration 3.5 v/o), the primary containment hydrogen recombinder will only function until the oxygen is used up (2.0 v/o hydrogen combines with 1.0 v/o oxygen). Two recombiners are provided to meet the requirement for redundancy and independence. Each recombinder is powered from a separate Engineered Safety Feature bus and is provided with separate power panel and control panel.

approximately
1

(continued)

BASES (continued)

APPLICABLE
SAFETY ANALYSES

The process gas circulating through the heater, the reaction chamber, and the cooler is automatically regulated to 255 m³/hr (150 scfm) by the use of an orifice plate installed in the cooler. The process gas is heated to 718°C (1325°F). The hydrogen and oxygen gases are recombined into water vapor, which is then condensed in the water spray gas cooler by the associated residual heat removal subsystem and discharged with some of the effluent process gas to the suppression chamber. The majority of the cooled, effluent process gas is mixed with the incoming process gas to dilute the incoming gas prior to the mixture entering the heater section.

The primary containment hydrogen recombiner provides the capability of controlling the bulk hydrogen concentration in primary containment to less than the lower flammable concentration of 4.0 v/o following a DBA. This control would prevent a primary containment wide hydrogen burn, thus ensuring that pressure and temperature conditions assumed in the analysis are not exceeded. The limiting DBA relative to hydrogen generation is a LOCA.

Hydrogen may accumulate in primary containment following a LOCA as a result of:

- a. A metal steam reaction between the zirconium fuel rod cladding and the reactor coolant; or
- b. Radiolytic decomposition of water in the Reactor Coolant System.

To evaluate the potential for hydrogen accumulation in primary containment following a LOCA, the hydrogen generation is calculated as a function of time following the initiation of the accident. Assumptions recommended by Reference 3 are used to maximize the amount of hydrogen calculated.

The calculation confirms that when the mitigating systems are actuated in accordance with emergency procedures, the peak hydrogen concentration in the primary containment is 4.0 v/o (Ref. 3).

The primary containment hydrogen recombiners satisfy Criterion 3 of the NRC Policy Statement.

(continued)

BASES (continued)

LCO Two primary containment hydrogen recombiners must be OPERABLE. This ensures operation of at least one primary containment hydrogen recombiner subsystem in the event of a worst case single active failure.

Operation with at least one primary containment hydrogen recombiner subsystem ensures that the post LOCA hydrogen concentration can be prevented from exceeding the flammability limit.

APPLICABILITY In MODES 1 and 2, the two primary containment hydrogen recombiners are required to control the hydrogen concentration within primary containment below its flammability limit of 4.0 v/o following a LOCA, assuming a worst case single failure.

In MODE 3, both the hydrogen production rate and the total hydrogen produced after a LOCA would be less than that calculated for the DBA LOCA. Also, because of the limited time in this MODE, the probability of an accident requiring the primary containment hydrogen recombiner is low. Therefore, the primary containment hydrogen recombiner is not required in MODE 3.

In MODES 4 and 5, the probability and consequences of a LOCA are low due to the pressure and temperature limitations in these MODES. Therefore, the primary containment hydrogen recombiner is not required in these MODES.

ACTIONS A.1

With one primary containment hydrogen recombiner inoperable, the inoperable recombiner must be restored to OPERABLE status within 30 days. In this Condition, the remaining OPERABLE recombiner is adequate to perform the hydrogen control function. However, the overall reliability is reduced because a single failure in the OPERABLE recombiner could result in reduced hydrogen control capability. The 30 day Completion Time is based on the low probability of the occurrence of a LOCA that would generate hydrogen in amounts capable of exceeding the flammability limit, the amount of time available after the event for operator action

(continued)

BASES

ACTIONS

A.1 (continued)

to prevent exceeding this limit, and the low probability of failure of the OPERABLE primary containment hydrogen recombiner.

Required Action A.1 has been modified by a Note indicating that the provisions of LCO 3.0.4 are not applicable. As a result, a MODE change is allowed when one recombiner is inoperable. This allowance is provided because of the low probability of the occurrence of a LOCA that would generate hydrogen in amounts capable of exceeding the flammability limit, the low probability of the failure of the OPERABLE subsystem, and the amount of time available after a postulated LOCA for operator action to prevent exceeding the flammability limit.

B.1 and B.2

With two primary containment hydrogen recombiners inoperable, the ability to perform the hydrogen control function via alternate capabilities must be verified by administrative means within 1 hour. The alternate hydrogen control capabilities are provided by the atmospheric control system (ACS). The 1 hour Completion Time allows a reasonable period of time to verify that a loss of hydrogen control function does not exist. Both the initial verification and all subsequent verifications may be performed as an administrative check by examining logs or other information to determine the availability of the alternate hydrogen control system. It does not mean to perform the Surveillances needed to demonstrate OPERABILITY of the alternate hydrogen control system. If the ability to perform the hydrogen control function is maintained, continued operation is permitted with two hydrogen recombiners inoperable for up to 7 days. Seven days is a reasonable time to allow two hydrogen recombiners to be inoperable because the hydrogen control function is maintained and because of the low probability of the occurrence of a LOCA that would generate hydrogen in the amounts capable of exceeding the flammability limit.

(continued)

BASES

ACTIONS
(continued)

C.1

If any Required Action and associated Completion Time cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.6.3.1.1 and SR 3.6.3.1.2

, every 6 months,

3.6.3.1.1

[316°C (600°F)]

[316°C (600°F)]

Performance of a system functional test for each primary containment hydrogen recombiner ensures that the recombiners are OPERABLE and can attain and sustain the temperature necessary for hydrogen recombination. In particular, ~~this~~ SR verifies that the minimum heater sheath temperature increases to $\geq 718^\circ\text{C}$ (1325°F) in ≤ 1.5 hours and that it is maintained $> 690^\circ\text{C}$ (1275°F) and $< 746^\circ\text{C}$ (1375°F) for ≥ 4 hours thereafter to check the ability of the recombiner to function properly (and to make sure that significant heater elements are not burned out).

Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

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SR 3.6.3.1.2.3

This SR ensures there are no physical problems that could affect recombiner operation. Since the recombiners are mechanically passive, except for the blower assemblies, they are subject to only minimal mechanical failure. The only credible failures involve loss of power or blower function, blockage of the internal flow path, missile impact, etc. A visual inspection is sufficient to determine abnormal conditions that could cause such failures.

Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month

Additionally, SR 3.6.3.1.2 verifies, every 18 months, that the reaction chamber temperature increases to $\geq 621^\circ\text{C}$ (1150°F) in [2] hours and that it is maintained $> 636^\circ\text{C}$ (1177°F) and $< 662^\circ\text{C}$ (1223°F) for $\geq [2]$ hours.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.3.1.2³ (continued)

Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.3.1.3⁴

This SR requires performance of a resistance to ground test of each heater phase to make sure that there are no detectable grounds in any heater phase. This is accomplished by verifying that the resistance to ground for any heater phase is $\geq [10,000]$ ohms.

Operating experience has shown that these components usually pass the Surveillance when performed at the ~~18~~ month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

~~3.6.3.1~~
REFERENCES

Stet

1. 10 CFR 50.44.
2. 10 CFR 50, Appendix A, GDC 41.
3. Regulatory Guide 1.7, Revision 1.
4. ABWR SSAR, Section 6.2.5.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.3.2 Primary Containment and Oxygen Concentration

BASES

BACKGROUND

All nuclear reactors must be designed to withstand events that generate hydrogen either due to the zirconium metal water reaction in the core or due to radiolysis.

APPLICABLE SAFETY ANALYSES

The primary method to control ~~hydrogen~~ is to inert the primary containment. With the primary containment inert, that is, oxygen concentration < 3.5 volume percent (v/o), a combustible mixture cannot be present in the primary containment for any hydrogen concentration. The capability to inert the primary containment and maintain oxygen < 3.5 v/o works together with the hydrogen recombiners (LCO 3.6.3.1, "Primary Containment Hydrogen Recombiners") to provide redundant and diverse methods to mitigate events that produce hydrogen. For example, an event that rapidly generates hydrogen from zirconium metal water reaction will result in excessive hydrogen in primary containment, but oxygen concentration will remain < 3.5 v/o and no combustion can occur. Long term generation of both hydrogen and oxygen from radiolytic decomposition of water may eventually result in a combustible mixture in primary containment, except that the hydrogen recombiners remove hydrogen and oxygen gases faster than they can be produced from radiolysis and again no combustion can occur. This LCO ensures that oxygen concentration does not exceed 3.5 v/o during operation in the applicable conditions. ~~see B 3.6.3.2.1~~

combustible
gases

The Reference ~~X~~ calculations assume that the primary containment is inerted when a Design Basis Accident loss of coolant accident occurs. Thus, the hydrogen assumed to be released to the primary containment as a result of metal water reaction in the reactor core will not produce combustible gas mixtures in the primary containment. Oxygen, which is subsequently generated by radiolytic decomposition of water, is recombined by the hydrogen recombiners (LCO 3.6.3.1) more rapidly than it is produced.

Primary containment oxygen concentration satisfies Criterion 2 of the NRC Policy Statement.

(continued)

BASES

LCO The primary containment oxygen concentration is maintained < 3.5 v/o to ensure that an event that produces any amount of hydrogen does not result in a combustible mixture inside primary containment.

APPLICABILITY The primary containment oxygen concentration must be within the specified limit when primary containment is inerted, except as allowed by the relaxations during startup and shutdown addressed below. The primary containment must be inert in MODE 1, since this is the condition with the highest probability of an event that could produce hydrogen.

Inerting the primary containment is an operational problem because it prevents containment access without an appropriate breathing apparatus. Therefore, the primary containment is inerted as late as possible in the plant startup and de-inerted as soon as possible in the plant shutdown. As long as reactor power is $< 15\%$ RTP, the potential for an event that generates significant hydrogen is low and the primary containment need not be inert. Furthermore, the probability of an event that generates hydrogen occurring within the first 24 hours of a startup, or within the last 24 hours before a shutdown, is low enough that these "windows," when the primary containment is not inerted, are also justified. The 24 hour time period is a reasonable amount of time to allow plant personnel to perform inerting or de-inerting.

ACTIONS

A.1

If oxygen concentration is ≥ 3.5 v/o at any time while operating in MODE 1, with the exception of the relaxations allowed during startup and shutdown, oxygen concentration must be restored to < 3.5 v/o within 24 hours. The 24 hour Completion Time is allowed when oxygen concentration is ≥ 3.5 v/o because of the availability of other hydrogen mitigating systems (e.g., hydrogen recombiners) and the low probability and long duration of an event that would generate significant amounts of hydrogen occurring during this period.

(continued)

BASES

ACTIONS
(continued)

B.1

If oxygen concentration cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, power must be reduced to $\leq 15\%$ RPT within 8 hours. The 8 hour Completion Time is reasonable, based on operating experience, to reduce reactor power from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.6.3.2.1

The primary containment must be determined to be inert by verifying that oxygen concentration is < 3.5 v/o. The 7 day Frequency is based on the slow rate at which oxygen concentration can change and on other indications of abnormal conditions (which would lead to more frequent checking by operators in accordance with plant procedures). Also, this Frequency has been shown to be acceptable through operating experience.

REFERENCES

~~B3.6.3.2~~
1. ABWR SSAR, Section 6.2.5.
Stat

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.1 Secondary Containment

BASES

BACKGROUND

The function of the [secondary containment] is to contain, dilute, and hold up fission products that may leak from primary containment following a Design Basis Accident (DBA). In conjunction with operation of the Standby Gas Treatment (SGT) System and closure of certain valves whose lines penetrate the [secondary containment], the [secondary containment] is designed to reduce the activity level of the fission products prior to release to the environment and to isolate and contain fission products that are released during certain operations that take place inside primary containment, when primary containment is not required to be OPERABLE, or that take place outside primary containment.

The [secondary containment] is a structure that completely encloses the primary containment and those components that may be postulated to contain primary system fluid. This structure forms a control volume that serves to hold up and dilute the fission products. It is possible for the pressure in the control volume to rise relative to the environmental pressure (e.g., due to pump and motor heat load additions). To prevent ground level exfiltration while allowing the [secondary containment] to be designed as a conventional structure, the [secondary containment] requires support systems to maintain the control volume pressure at less than the external pressure. Requirements for these systems are specified separately in LCO 3.6.4.2, "Secondary Containment Isolation Valves (SCIVs)," and LCO 3.6.4.3, "Standby Gas Treatment (SGT) System."

APPLICABLE SAFETY ANALYSES

There are two principal accidents for which credit is taken for [secondary containment] OPERABILITY. These are a loss of coolant accident (LOCA) (Ref. 1) and a fuel handling accident inside secondary containment (Ref. 2). The [secondary containment] performs no active function in response to each of these limiting events; however, its leak tightness is required to ensure that the release of radioactive materials from the primary containment is restricted to those leakage paths and associated leakage rates assumed in the accident analysis, and that fission

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

products entrapped within the [secondary containment] structure will be treated by the SGT System prior to discharge to the environment.

[Secondary containment] satisfies Criterion 3 of the NRC Policy Statement.

LCO

An OPERABLE [secondary containment] provides a control volume into which fission products that bypass or leak from primary containment, or are released from the reactor coolant pressure boundary components located in [secondary containment], can be diluted and processed prior to release to the environment. For the [secondary containment] to be considered OPERABLE, it must have adequate leak tightness to ensure that the required vacuum can be established and maintained.

APPLICABILITY

In MODES 1, 2, and 3, a LOCA could lead to a fission product release to primary containment that leaks to [secondary containment]. Therefore, [secondary containment] OPERABILITY is required during the same operating conditions that require primary containment OPERABILITY.

In MODES 4 and 5, the probability and consequences of the LOCA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining [secondary containment] OPERABLE is not required in MODE 4 or 5 to ensure a control volume, except for other situations for which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs), during CORE ALTERATIONS, or during movement of irradiated fuel assemblies in the [primary or secondary containment].

ACTIONS

A.1

If [secondary containment] is inoperable, it must be restored to OPERABLE status within 4 hours. The 4 hour Completion Time provides a period of time to correct the problem that is commensurate with the importance of

(continued)

BASES

ACTIONS

A.1 (continued)

maintaining [secondary containment] during MODES 1, 2, and 3. This time period also ensures that the probability of an accident (requiring [secondary containment] OPERABILITY) occurring during periods where [secondary containment] is inoperable is minimal.

B.1 and B.2

If [secondary containment] cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1, C.2, and C.3

Movement of irradiated fuel assemblies in the [secondary containment], CORE ALTERATIONS, and OPDRVs can be postulated to cause fission product release to the [secondary containment]. In such cases, the [secondary containment] is the only barrier to release of fission products to the environment. CORE ALTERATIONS and movement of irradiated fuel assemblies must be immediately suspended if the [secondary containment] is inoperable.

Suspension of these activities shall not preclude completing an action that involves moving a component to a safe position. Also, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

Required Action C.1 has been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend

(continued)

BASES

ACTIONS

C.1, C.2, and C.3 (continued)

movement of irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

SURVEILLANCE
REQUIREMENTS

SR 3.6.4.1.1

This SR ensures that the [secondary containment] boundary is sufficiently leak tight to preclude exfiltration under expected wind conditions. The 24 hour Frequency of this SR was developed based on operating experience related to [secondary containment] vacuum variations during the applicable MODES and the low probability of a DBA occurring between surveillances.

Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal [secondary containment] vacuum condition.

SR 3.6.4.1.2 and SR 3.6.4.1.3

Verifying that [secondary containment] equipment hatches and access doors are closed ensures that the infiltration of outside air of such a magnitude as to prevent maintaining the desired negative pressure does not occur. Verifying that all such openings are closed provides adequate assurance that exfiltration from the [secondary containment] will not occur. Maintaining [secondary containment] OPERABILITY requires verifying each door in the access opening is closed, except when the access opening is being used for normal transient entry and exit (then, at least one door must remain closed). The 31 day Frequency for these SRs has been shown to be adequate, based on operating experience, and is considered adequate in view of the other indications of door and hatch status that are available to the operator.

SR 3.6.4.1.4 and SR 3.6.4.1.5

The SGT System exhausts the secondary containment atmosphere to the environment through appropriate treatment equipment.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.4.1.4 and SR 3.6.4.1.5 (continued)

To ensure that all fission products are treated, SR 3.6.4.1.4 verifies that the SGT System will rapidly establish and maintain a pressure in the [secondary containment] that is less than the lowest postulated pressure external to the [secondary containment] boundary. This is confirmed by demonstrating that one SGT subsystem will draw down the [secondary containment] to $\geq 6.34 \text{ Kg/m}^3$ (0.25 inches) of vacuum water gauge in ≤ 120 seconds. This cannot be accomplished if the [secondary containment] boundary is not intact. SR 3.6.4.1.5 demonstrates that one SGT subsystem can maintain $\geq 6.34 \text{ Kg/m}^3$ (0.25 inches) of vacuum water gauge for 1 hour at a flow rate $\leq 6800 \text{ m}^3/\text{h}$ (4000 cfm). The 1 hour test period allows [secondary containment] to be in thermal equilibrium at steady state conditions. Therefore, these two tests are used to ensure [secondary containment] boundary integrity. Since these SRs are [secondary containment] tests, they need not be performed with each SGT subsystem. The SGT subsystems are tested on a STAGGERED TEST BASIS, however, to ensure that in addition to the requirements of LCO 3.6.4.3, either SGT subsystem will perform this test. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

- ~~B3.6.4.1~~
1. ABWR SSAR, Section 15.6.5.
2. ABWR SSAR, Section 15.7.4.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.2 Secondary Containment Isolation Valves (SCIVs)

BASES

BACKGROUND

The function of the SCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated Design Basis Accidents (DBAs) (Ref. 1). Secondary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that fission products that leak from primary containment following a DBA, or that are released during certain operations when primary containment is not required to be OPERABLE, or take place outside primary containment, are maintained within applicable limits.

The OPERABILITY requirements for SCIVs help ensure that adequate secondary containment leak tightness is maintained during and after an accident by minimizing potential paths to the environment. These isolation devices consist of either passive devices or active (automatic) devices. Manual valves, de-activated automatic valves secured in their closed position (including check valves with flow through the valve secured), and blind flanges are considered passive devices.

Automatic SCIVs close on a secondary containment isolation signal to prevent leakage of untreated radioactive material from secondary containment following a DBA or other accidents.

Other penetrations are isolated by the use of valves in the closed position or blind flanges.

APPLICABLE SAFETY ANALYSES

The SCIVs must be OPERABLE to ensure that secondary containment is a leak tight barrier to fission product releases. The principal accidents for which secondary containment leak tightness is required are a loss of coolant accident (Ref. 1), and a fuel handling accident inside secondary containment (Ref. 2). The secondary containment performs no active function in response to either of these limiting events, but its leak tightness is required to

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

ensure that leakage from the primary containment is processed by the Standby Gas Treatment (SGT) System before being released to the environment.

Maintaining SCIVs OPERABLE with isolation times within limits ensures that fission products will remain trapped inside secondary containment so that they can be treated by the SGT System prior to discharge to the environment.

SCIVs satisfy Criterion 3 of the NRC Policy Statement.

LCO

SCIVs form a part of the secondary containment boundary. The SCIV safety function is related to control of offsite radiation releases resulting from DBAs.

The automatic power operated isolation valves are considered OPERABLE when their isolation times are within limits and the valves actuate on an automatic isolation signal. The valves covered by this LCO, along with their associated stroke times, are listed in Reference 1. ~~B 3.6.4.2-3~~

The normally closed isolation valves or blind flanges are considered OPERABLE when manual valves are closed, automatic valves are de-activated and secured in their closed position, and blind flanges are in place. These passive isolation valves or devices are listed in Reference 1. *5/6/93*

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to the primary containment that leaks to the secondary containment. Therefore, the OPERABILITY of SCIVs is required.

In MODES 4 and 5, the probability and consequences of these events are reduced due to pressure and temperature limitations in these MODES. Therefore, maintaining SCIVs OPERABLE is not required in MODE 4 or 5, except for other situations under which significant radioactive releases can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs), during

(continued)

BASES

APPLICABILITY
(continued)

CORE ALTERATIONS, or during movement of irradiated fuel assemblies in the secondary containment. Moving irradiated fuel assemblies in the secondary containment may also occur in MODES 1, 2, and 3.

ACTIONS

The ACTIONS are modified by three Notes. The first Note allows penetration flow paths to be unisolated intermittently under administrative controls. These controls consist of stationing a dedicated operator, who is in continuous communication with the control room, at the controls of the valve. In this way, the penetration can be rapidly isolated when a need for secondary containment isolation is indicated.

The second Note provides clarification that for the purpose of this LCO separate Condition entry is allowed for each penetration flow path.

The third Note ensures appropriate remedial actions are taken, if necessary, if the affected system(s) are rendered inoperable by an inoperable SCIV.

A.1 and A.2

In the event that there are one or more penetration flow paths with one SCIV inoperable, the affected penetration flow path(s) must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic SCIV, a closed manual valve, and a blind flange. For penetrations isolated in accordance with Required Action A.1, the valve used to isolate the penetration should be the closest available valve to secondary containment. The Required Action must be completed within the 8 hour Completion Time. The specified time period is reasonable considering the time required to isolate the penetration, and the probability of a DBA, which requires the SCIVs to close, occurring during this short time, is very low.

For affected penetrations that have been isolated in accordance with Required Action A.1, the affected

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

penetration must be verified to be isolated on a periodic basis. This is necessary to ensure that secondary containment penetrations required to be isolated following an accident, but no longer capable of being automatically isolated, will be in the isolation position should an event occur. The Completion Time of once per 31 days is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low. This Required Action does not require any testing or valve manipulation. Rather, it involves verification that the affected penetration remains isolated.

Required Action A.2 is modified by a Note that applies to valves and blind flanges located in high radiation areas and allows them to be verified closed by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is low.

B.1

With two SCIVs in one or more penetration flow paths inoperable, the affected penetration flow path must be isolated within 4 hours. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. The 4 hour Completion Time is reasonable, considering the time required to isolate the penetration and the probability of a DBA, which requires the SCIVs to close, occurring during this short time, is very low.

The Condition has been modified by a Note stating that Condition B is only applicable to penetration flow paths with two isolation valves. This clarifies that only Condition A is entered if one SCIV is inoperable in each of two penetrations.

(continued)

BASES

ACTIONS
(continued)

C.1 and C.2

If any Required Action and associated Completion Time cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

D.1, D.2, and D.3

If any Required Action and associated Completion Time are not be met, the plant must be placed in a condition in which the LCO does not apply. If applicable, CORE ALTERATIONS and the movement of irradiated fuel assemblies in the secondary containment must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be immediately initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

Required Action D.1 has been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

SURVEILLANCE
REQUIREMENTS

SR 3.6.4.2.1

This SR verifies that each secondary containment manual isolation valve and blind flange that is required to be closed during accident conditions is closed. The SR helps to ensure that post accident leakage of radioactive fluids or gases outside of the secondary containment boundary is within design limits. This SR does not require any testing or valve manipulation. Rather, it involves verification

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.4.2.1 (continued)

that those valves in secondary containment that are capable of being mispositioned are in the correct position. Since these valves are readily accessible to personnel during normal unit operation and verification of their position is relatively easy, the 31 day Frequency was chosen to provide added assurance that the valves are in the correct positions.

Two Notes have been added to this SR. The first Note applies to valves and blind flanges located in high radiation areas and allows them to be verified by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted during MODES 1, 2, and 3 for ALARA reasons. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position, is low.

A second Note has been included to clarify that SCIVs that are open under administrative controls are not required to meet the SR during the time the valves are open.

SR 3.6.4.2.2

Verifying that the isolation time of each power operated and each automatic SCIV is within limits is required to demonstrate OPERABILITY. The isolation time test ensures that the valve will isolate in a time period less than or equal to that assumed in the safety analyses. The isolation time and Frequency of this SR are in accordance with the Inservice Testing Program or 92 days.

SR 3.6.4.2.3

Verifying that each automatic SCIV closes on a secondary containment isolation signal is required to prevent leakage of radioactive material from secondary containment following a DBA or other accidents. This SR ensures that each automatic SCIV will actuate to the isolation position on a secondary containment isolation signal. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.6.2.5 overlaps this SR to provide complete testing of the safety function. The

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.4.2.3 (continued)

2 [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

~~B 3.6.4.2~~
REFERENCES

1. ABWR SSAR, Section 15.6.5.
 2. ABWR SSAR, Section 15.7.4.
 3. ABWR SSAR, Section 6.2.
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B 3.6 CONTAINMENT SYSTEMS

B 3.6.4.3 Standby Gas Treatment (SGT) System

BASES

BACKGROUND

The SGT System is required by 10 CFR 50, Appendix A, GDC 41, "Containment Atmosphere Cleanup" (Ref. 1). The function of the SGT System is to ensure that radioactive materials that leak from the primary containment into the secondary containment following a Design Basis Accident (DBA) are filter 1 and adsorbed prior to exhausting to the environment.

The SGT System consists of the following components:

- a. Two 100 percent capacity charcoal filter trains, each consisting of (components listed in order of air flow direction):
 1. a moisture separator;
 2. an electric heater;
 3. a prefilter;
 4. a pre-high efficiency particulate air (HEPA) filter;
 5. a space heater;
 6. a charcoal adsorber;
 7. a spare heater; space
 8. a post-HEPA filter; and
- b. Two fully redundant subsystems, each with its own ductwork, flow element, dampers, and instrumentation controls, consisting of:
 1. a process fan and
 2. a cooling fan.

(continued)

BASES

BACKGROUND (continued)

The sizing of the SGT System equipment and components is based on the results of an infiltration analysis, as well as an exfiltration analysis of the secondary containment. The internal pressure of the SGT System boundary region is maintained at a negative pressure of 6.35 mm (0.25 inches) water gauge relative to the surrounding spaces when the system is in operation, which represents the internal pressure required to ensure zero exfiltration of air from the building when exposed to an 8.9 m/s (20 mph) wind blowing at an angle of 45° to the building. The continuous negative differential pressure is established within 10 → 20 minutes after SGT System initiation.

outdoor
atmosphere

all forms of
iodine (elemental,
organic, particulate,
and hydrogen
iodine),

The moisture separator is provided to remove entrained water in the air, while the electric heater reduces the relative humidity of the influent airstream to the adsorber section of the filter train to less than 70% whenever SGT System is in operation (Ref. 2). The prefilter removes large particulate matter, while the HEPA filter removes fine particulate matter and protects the charcoal from fouling. The charcoal adsorber removes ~~gaseous elemental iodine and organic iodides~~, and the final HEPA filter collects any carbon fines exhausted from the charcoal adsorber.

The SGT System automatically starts and operates in response to actuation signals, ~~indicative of conditions or an accident that could require operation of the system.~~ Following initiation, both SGT System train process fans start. Upon verification that both trains are operating, one of the redundant trains is normally shut down.

→ manually

APPLICABLE SAFETY ANALYSES

The design basis for the SGT System is to mitigate the consequences of a loss of coolant accident and fuel handling accidents (Ref. 2). For all events analyzed, the SGT System is shown to be automatically initiated to reduce, via filtration and adsorption, the radioactive material released to the environment.

(Ref. 3)

The SGT System satisfies Criterion 3 of the NRC Policy Statement.

(continued)

BASES

LCO

20

Following a DBA, a minimum of one SGT System train is required to maintain the secondary containment at the required negative pressure with respect to the surrounding spaces within 10 minutes of its initiation, and to process gaseous releases. Meeting the LCO requirements for two OPERABLE trains ensures operation of at least one SGT System train in the event of a single active failure.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, SGT System OPERABILITY is required during these MODES.

In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the SGT System in OPERABLE status is not required in MODE 4 or 5, except for other situations under which significant releases of radioactive material can be postulated, such as during operations with a potential for draining the reactor vessel (OPDRVs), during CORE ALTERATIONS, or during movement of irradiated fuel assemblies in the secondary containment.

ACTIONS

A.1

With one SGT train inoperable, the inoperable train must be restored to OPERABLE status in 7 days. In this Condition, the remaining OPERABLE SGT train is adequate to perform the required radioactivity release control function. However, the overall system reliability is reduced because a single active failure in the OPERABLE train could result in the radioactivity release control function not being adequately performed. The 7 day Completion Time is based on consideration of such factors as the availability of the OPERABLE redundant SGT System train and the low probability of a DBA occurring during this period.

B.1

If both SGT System trains are inoperable in MODE 1, 2 or 3, the SGT System may not be capable of supporting the required radioactivity release control function. Therefore, actions are required consistent with that required for an inoperable secondary containment.

C
B.1 and B.2

If the SGT System train^(s) cannot be restored to OPERABLE status within the required Completion Time, in MODE 1, 2,

(continued)

BASES

ACTIONS

^C~~B~~.1 and ^C~~B~~.2 (continued)

or 3, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

^D~~C~~.1, ^D~~C~~.2.1, ^D~~C~~.2.2, and ^D~~C~~.2.3

During movement of irradiated fuel assemblies, in the [secondary containment], during CORE ALTERATIONS, or during OPDRVs, when Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE SGT System train should immediately be placed in operation. This action ensures that the remaining train is OPERABLE, that no failures that could prevent automatic actuation have occurred, and that any other failure would be readily detected.

An alternative to Required Action ^D~~C~~.1 is to immediately suspend activities that represent a potential for releasing radioactive material to the secondary containment, thus placing the plant in a condition that minimizes risk. If applicable, CORE ALTERATIONS and movement of irradiated fuel assemblies must immediately be suspended. Suspension of these activities must not preclude completion of movement of a component to a safe position. Also, if applicable, actions must immediately be initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

The Required Actions of Condition ^D~~C~~ have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.1, 3.2.1, 3.2.2, and 3.2.3 (continued)

case, inability to suspend movement of irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

3.1, 3.2, and 3.3

When both SGT System trains are inoperable, if applicable, CORE ALTERATIONS and movement of irradiated fuel assemblies in [secondary containment] must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, actions must be immediately initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

Required Action 3.1 has been modified by a Note stating that LCO 3.0.3 is not applicable.

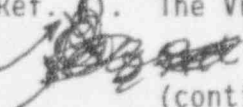
SURVEILLANCE
REQUIREMENTS

SR 3.6.4.3.1

Operating each SGT System for ^{trains} $\geq [10]$ continuous hours ensures that both ~~subsystems~~ are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. Operation [with the heaters on (automatic heater cycling to maintain temperature)] for $\geq [10]$ continuous hours every 31 days eliminates moisture on the adsorbers and HEPA filters. The 31 day Frequency was developed in consideration of the known reliability of fan motors and controls and the redundancy available in the system.

SR 3.6.4.3.2

This SR verifies that the required SGT System filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The SGT System filter tests are in accordance with Regulatory Guide 1.52 (Ref. 1). The VFTP

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3.6.4.3-3

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.4.3.2 (continued)

includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specified test frequencies and additional information are discussed in detail in the VFTP.

SR 3.6.4.3.3

This SR requires verification that each SGT ~~subsystem~~^{train} starts upon receipt of an actual or simulated initiation signal. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.6.2.5 overlaps this SR to provide complete testing of the safety function. While this Surveillance can be performed with the reactor at power, operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.4.3.4

This SR requires verification that the SGT System filter cooler bypass damper can be opened and the fan started. This ensures that the ventilation mode of SGT System operation is available. While this Surveillance can be performed with the reactor at power, operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

~~B3.6.4.3~~
REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. ABWR SSAR, Section 6.2.3.

Start

(continued)

BASES

REFERENCES
(continued)

3. ABWR SSAR, Section 15.6.5.

5-4. Regulatory Guide 1.52, Rev. [2].

4. ABWR SSAR, Section 15.7.4.