

February 21, 2013

TSTF-13-02  
PROJ0753

Attn: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Enclosed for NRC review is Revision 2 of TSTF-523, "Generic Letter 2008-01, Managing Gas Accumulation." TSTF-523 is applicable to all plant types.

Revision 1 of TSTF-523 was submitted to the NRC for review on March 29, 2012. In a public meeting between the TSTF and the NRC on January 17, 2013, the TSTF agreed to revise the proposed Bases to address an NRC concern.

The TSTF proposed to modify several Surveillance Requirements with a Note that would allow system vent flow paths to be opened under administrative control to permit venting of entrained gas. The proposed Bases of these Notes stated:

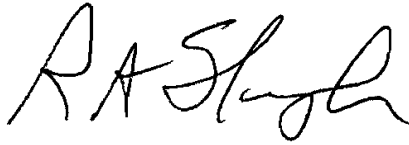
The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path *and restore the system to a condition equivalent to the design condition* if directed. (emphasis added)

The NRC was concerned that the design condition, with some exceptions, is water-solid and the system may not be restored to this condition at the time of valve closure. The TSTF agreed to revise the Bases insert and delete the highlighted phrase to address the NRC concern. This change does not alter the intent of the proposed Bases.

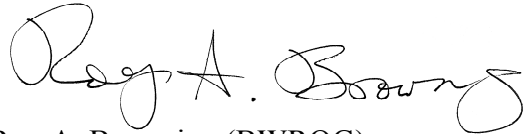
The change affects:

- NUREG-1430, TS 3.5.2, and 3.6.6
- NUREG-1431, TS 3.5.2, and 3.6.6 versions a through e
- NUREG-1432, TS 3.5.2, 3.6.6a, and 3.6.6b
- NUREG-1433, TS 3.5.1, 3.5.2, and 3.5.3
- NUREG-1434, TS 3.5.1, 3.5.2, 3.5.3, and 3.6.1.7.1

Should you have any questions, please do not hesitate to contact us.



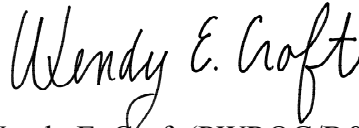
Robert Slough (PWROG/W)



Roy A. Browning (BWROG)



Otto W. Gustafson (PWROG/CE)



Wendy E. Croft (PWROG/B&W)

Enclosure

cc: Robert Elliott, Technical Specifications Branch, NRC  
Michelle Honcharik, Licensing Processes Branch, NRC

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## Technical Specifications Task Force Improved Standard Technical Specifications Change Traveler

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### Generic Letter 2008-01, Managing Gas Accumulation

NUREGs Affected:  1430  1431  1432  1433  1434

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Classification: 1) Technical Change

Recommended for CLIP?: Yes

Correction or Improvement: Improvement

NRC Fee Status: Exempt

Changes Marked on ISTS Rev 4.0

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See attached justification.

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### Revision History

#### OG Revision 0

**Revision Status: Closed**

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Revision Proposed by: NRC

Revision Description:  
Original Issue

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#### Owners Group Review Information

Date Originated by OG: 28-Mar-10

Owners Group Comments  
(No Comments)

Owners Group Resolution: Approved Date: 05-Apr-10

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#### TSTF Review Information

TSTF Received Date: 10-Jun-10 Date Distributed for Review 29-Jun-10

OG Review Completed:  BWOG  WOG  CEOG  BWROG

TSTF Comments:  
(No Comments)

TSTF Resolution: Approved Date: 29-Jun-10

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#### NRC Review Information

NRC Received Date: 29-Jun-10

NRC Comments:

Acceptance letter issued March 2, 2011.

Changes discussed at public meetings held on November 17, 2011.

Final Resolution: NRC Requests Changes: TSTF Will Revise

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#### TSTF Revision 1

**Revision Status: Closed**

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Revision Proposed by: TSTF

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21-Feb-13

**TSTF Revision 1****Revision Status: Closed**

Revision Description:

Revision 1 is a complete replacement of TSTF-523, Revision 0.

**Owners Group Review Information**

Date Originated by OG: 06-Feb-12

Owners Group Comments  
(No Comments)

Owners Group Resolution: Approved Date: 09-Mar-12

**TSTF Review Information**

TSTF Received Date: 09-Mar-12 Date Distributed for Review 09-Mar-12

OG Review Completed:  BWOG  WOG  CEOG  BWROGTSTF Comments:  
(No Comments)

TSTF Resolution: Approved Date: 29-Mar-12

**NRC Review Information**

NRC Received Date: 29-Mar-12

Final Resolution: NRC Requests Changes: TSTF Considering Final Resolution Date: 17-Jan-13

**TSTF Revision 2****Revision Status: Active**

Revision Proposed by: NRC

Revision Description:

At the January 17, 2013 TSTF/NRC meeting, the NRC requested a clarification to the Traveler.

Several SRs are modified by a Note that permits system vent flow paths to be opened under administrative control to permit venting and testing for entrained gas. The Bases of these Notes stated"

"The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path and restore the system to a condition equivalent to the design condition if directed."

The NRC was concerned that the design condition, with some exceptions, is water-solid and the system may not be restored to this condition at the time of valve closure.

The TSTF agreed to revise the Bases insert to delete the phrase "and restore the system to a condition equivalent to the design condition," in order to address the NRC concern. This change does not alter the intent of the proposed Bases.

21-Feb-13

**TSTF Revision 2****Revision Status: Active**

The following TS Bases are affected:

B&W 3.6.2 and 3.6.6

Westinghouse 3.5.2 and 3.6.6 (5 versions, a - e)

CE 3.5.2 and 3.6.6 (2 versions, a and b)

BWR/4 3.5.1, 3.5.2, and 3.5.3

BWR/6 3.5.1, 3.5.2, 3.5.3, and 3.6.1.7

**TSTF Review Information**

TSTF Received Date: 04-Feb-13

Date Distributed for Review 04-Feb-13

OG Review Completed:  BWOG  WOG  CEOG  BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved

Date: 20-Feb-13

**NRC Review Information**

NRC Received Date: 21-Feb-13

**Affected Technical Specifications**

SR 3.5.2.2	ECCS - Operating	NUREG(s)- 1430 1431 1432 Only
SR 3.5.2.2 Bases	ECCS - Operating	NUREG(s)- 1430 1431 1432 Only
LCO 3.4.6 Bases	RCS Loops - MODE 4	NUREG(s)- 1430 Only
SR 3.4.6.3	RCS Loops - MODE 4 Change Description: New SR	NUREG(s)- 1430 Only
SR 3.4.6.3 Bases	RCS Loops - MODE 4 Change Description: New SR	NUREG(s)- 1430 Only
LCO 3.4.7 Bases	RCS Loops - MODE 5, Loops Filled	NUREG(s)- 1430 Only
SR 3.4.7.4	RCS Loops - MODE 5, Loops Filled Change Description: New SR	NUREG(s)- 1430 Only
SR 3.4.7.4 Bases	RCS Loops - MODE 5, Loops Filled Change Description: New SR	NUREG(s)- 1430 Only
LCO 3.4.8 Bases	RCS Loops - MODE 5, Loops Not Filled	NUREG(s)- 1430 Only

21-Feb-13

SR 3.4.8.3	RCS Loops - MODE 5, Loops Not Filled Change Description: New SR	NUREG(s)- 1430 Only
SR 3.4.8.3 Bases	RCS Loops - MODE 5, Loops Not Filled Change Description: New SR	NUREG(s)- 1430 Only
LCO 3.5.2 Bases	ECCS - Operating	NUREG(s)- 1430 Only
SR 3.5.2.3	ECCS - Operating Change Description: New SR	NUREG(s)- 1430 Only
SR 3.5.2.3 Bases	ECCS - Operating Change Description: New SR	NUREG(s)- 1430 Only
LCO 3.5.3 Bases	ECCS - Shutdown	NUREG(s)- 1430 Only
LCO 3.6.6 Bases	Containment Spray and Cooling Systems	NUREG(s)- 1430 Only
SR 3.6.6.1	Containment Spray and Cooling System	NUREG(s)- 1430 Only
SR 3.6.6.1 Bases	Containment Spray and Cooling System	NUREG(s)- 1430 Only
SR 3.6.6.4	Containment Spray and Cooling Systems Change Description: New SR	NUREG(s)- 1430 Only
SR 3.6.6.4	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.5	NUREG(s)- 1430 Only
SR 3.6.6.4 Bases	Containment Spray and Cooling Systems Change Description: New SR	NUREG(s)- 1430 Only
SR 3.6.6.4 Bases	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.5	NUREG(s)- 1430 Only
SR 3.6.6.5	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.6	NUREG(s)- 1430 Only
SR 3.6.6.5 Bases	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.6	NUREG(s)- 1430 Only
SR 3.6.6.6	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.7	NUREG(s)- 1430 Only
SR 3.6.6.6 Bases	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.7	NUREG(s)- 1430 Only
SR 3.6.6.7	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.8	NUREG(s)- 1430 Only
SR 3.6.6.7 Bases	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.8	NUREG(s)- 1430 Only
SR 3.6.6.8	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.9	NUREG(s)- 1430 Only

21-Feb-13

SR 3.6.6.8 Bases	Containment Spray and Cooling Systems Change Description: Renamed 3.6.6.9	NUREG(s)- 1430 Only
LCO 3.9.4 Bases	DHR and Coolant Circulation - High Water Level	NUREG(s)- 1430 Only
SR 3.9.4.2	DHR and Coolant Circulation - High Water Level Change Description: New SR	NUREG(s)- 1430 Only
SR 3.9.4.2 Bases	DHR and Coolant Circulation - High Water Level Change Description: New SR	NUREG(s)- 1430 Only
LCO 3.9.5 Bases	DHR and Coolant Circulation - Low Water Level	NUREG(s)- 1430 Only
SR 3.9.5.3	DHR and Coolant Circulation - Low Water Level Change Description: New SR	NUREG(s)- 1430 Only
SR 3.9.5.3 Bases	DHR and Coolant Circulation - Low Water Level Change Description: New SR	NUREG(s)- 1430 Only
SR 3.6.6B.1	Containment Spray and Cooling System	NUREG(s)- 1431 1432 Only
SR 3.6.6A.1	Containment Spray and Cooling System	NUREG(s)- 1431 1432 Only
SR 3.6.6B.1 Bases	Containment Spray and Cooling System	NUREG(s)- 1431 1432 Only
SR 3.6.6A.1 Bases	Containment Spray and Cooling System	NUREG(s)- 1431 1432 Only
LCO 3.4.6 Bases	RCS Loops - MODE 4	NUREG(s)- 1431 Only
SR 3.4.6.4	RCS Loops - MODE 4 Change Description: New SR	NUREG(s)- 1431 Only
SR 3.4.6.4 Bases	RCS Loops - MODE 4 Change Description: New SR	NUREG(s)- 1431 Only
LCO 3.4.7	RCS Loops - MODE 5, Loops Filled	NUREG(s)- 1431 Only
SR 3.4.7.4	RCS Loops - MODE 5, Loops Filled Change Description: New SR	NUREG(s)- 1431 Only
SR 3.4.7.4 Bases	RCS Loops - MODE 5, Loops Filled Change Description: New SR	NUREG(s)- 1431 Only
LCO 3.4.8 Bases	RCS Loops - MODE 5, Loops Not Filled	NUREG(s)- 1431 Only
SR 3.4.8.3	RCS Loops - MODE 5, Loops Not Filled Change Description: New SR	NUREG(s)- 1431 Only
SR 3.4.8.3 Bases	RCS Loops - MODE 5, Loops Not Filled Change Description: New SR	NUREG(s)- 1431 Only
LCO 3.5.2 Bases	ECCS - Operating	NUREG(s)- 1431 Only

21-Feb-13

SR 3.5.2.3	ECCS - Operating	NUREG(s)- 1431 Only
SR 3.5.2.3 Bases	ECCS - Operating	NUREG(s)- 1431 Only
LCO 3.5.3 Bases	ECCS - Shutdown	NUREG(s)- 1431 Only
LCO 3.6.6B Bases	Containment Spray and Cooling Systems (Atmospheric and Dual)	NUREG(s)- 1431 Only
LCO 3.6.6A Bases	Containment Spray and Cooling Systems (Atmospheric and Dual)	NUREG(s)- 1431 Only
LCO 3.6.6C Bases	Containment Spray Systems (Ice Condenser)	NUREG(s)- 1431 Only
LCO 3.6.6D Bases	QS System (Subatmospheric)	NUREG(s)- 1431 Only
LCO 3.6.6E Bases	RS System (Subatmospheric)	NUREG(s)- 1431 Only
SR 3.6.6C.1	Containment Spray and Cooling System	NUREG(s)- 1431 Only
SR 3.6.6D.1	QS System	NUREG(s)- 1431 Only
SR 3.6.6C.1 Bases	Containment Spray and Cooling System	NUREG(s)- 1431 Only
SR 3.6.6D.1 Bases	QS System	NUREG(s)- 1431 Only
SR 3.6.6C.2	Containment Spray Systems (Ice Condenser) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6C.2	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.3	NUREG(s)- 1431 Only
SR 3.6.6D.2	QS System (Subatmospheric) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6D.2	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.3	NUREG(s)- 1431 Only
SR 3.6.6C.2 Bases	Containment Spray Systems (Ice Condenser) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6C.2 Bases	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.3	NUREG(s)- 1431 Only
SR 3.6.6D.2 Bases	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.3	NUREG(s)- 1431 Only
SR 3.6.6D.2 Bases	QS System (Subatmospheric) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6C.3	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.4	NUREG(s)- 1431 Only

21-Feb-13



SR 3.6.6D.3	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.4	NUREG(s)- 1431 Only
SR 3.6.6C.3 Bases	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.4	NUREG(s)- 1431 Only
SR 3.6.6D.3 Bases	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.4	NUREG(s)- 1431 Only
SR 3.6.6B.4	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.5	NUREG(s)- 1431 Only
SR 3.6.6B.4	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6A.4	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.5	NUREG(s)- 1431 Only
SR 3.6.6A.4	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6C.4	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.5	NUREG(s)- 1431 Only
SR 3.6.6D.4	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.5	NUREG(s)- 1431 Only
SR 3.6.6E.4	RS System	NUREG(s)- 1431 Only
SR 3.6.6A.4 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6A.4 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.5	NUREG(s)- 1431 Only
SR 3.6.6B.4 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6B.4 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.5	NUREG(s)- 1431 Only
SR 3.6.6C.4 Bases	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.5	NUREG(s)- 1431 Only
SR 3.6.6D.4 Bases	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.5	NUREG(s)- 1431 Only
SR 3.6.6E.4 Bases	RS System	NUREG(s)- 1431 Only

21-Feb-13

SR 3.6.6B.5	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.6	NUREG(s)- 1431 Only
SR 3.6.6A.5	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.6	NUREG(s)- 1431 Only
SR 3.6.6C.5	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.6	NUREG(s)- 1431 Only
SR 3.6.6D.5	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.6	NUREG(s)- 1431 Only
SR 3.6.6E.5	RS System (Subatmospheric) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6E.5	RS System (Subatmospheric) Change Description: Renamed 3.6.6E.6	NUREG(s)- 1431 Only
SR 3.6.6B.5 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.6	NUREG(s)- 1431 Only
SR 3.6.6A.5 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.6	NUREG(s)- 1431 Only
SR 3.6.6C.5 Bases	Containment Spray Systems (Ice Condenser) Change Description: Renamed 3.6.6C.6	NUREG(s)- 1431 Only
SR 3.6.6D.5 Bases	QS System (Subatmospheric) Change Description: Renamed 3.6.6D.6	NUREG(s)- 1431 Only
SR 3.6.6E.5 Bases	RS System (Subatmospheric) Change Description: New SR	NUREG(s)- 1431 Only
SR 3.6.6E.5 Bases	RS System (Subatmospheric) Change Description: Renamed 3.6.6E.6	NUREG(s)- 1431 Only
SR 3.6.6A.6	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.7	NUREG(s)- 1431 Only
SR 3.6.6B.6	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.7	NUREG(s)- 1431 Only
SR 3.6.6E.6	RS System (Subatmospheric) Change Description: Renamed 3.6.6E.7	NUREG(s)- 1431 Only
SR 3.6.6A.6 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.7	NUREG(s)- 1431 Only

SR 3.6.6B.6 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.7	NUREG(s)- 1431 Only
SR 3.6.6E.6 Bases	RS System (Subatmospheric) Change Description: Renamed 3.6.6E.7	NUREG(s)- 1431 Only
SR 3.6.6B.7	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.8	NUREG(s)- 1431 Only
SR 3.6.6A.7	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.8	NUREG(s)- 1431 Only
SR 3.6.6E.7	RS System (Subatmospheric) Change Description: Renamed 3.6.6E.8	NUREG(s)- 1431 Only
SR 3.6.6A.7 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.8	NUREG(s)- 1431 Only
SR 3.6.6B.7 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.8	NUREG(s)- 1431 Only
SR 3.6.6E.7 Bases	RS System (Subatmospheric) Change Description: Renamed 3.6.6E.8	NUREG(s)- 1431 Only
SR 3.6.6B.8	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.9	NUREG(s)- 1431 Only
SR 3.6.6A.8	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.9	NUREG(s)- 1431 Only
SR 3.6.6B.8 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.9	NUREG(s)- 1431 Only
SR 3.6.6A.8 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.9	NUREG(s)- 1431 Only
LCO 3.9.5 Bases	RHR and Coolant Circulation - High Water Level	NUREG(s)- 1431 Only
SR 3.9.5.2	RHR and Coolant Circulation - High Water Level Change Description: New SR	NUREG(s)- 1431 Only
SR 3.9.5.2 Bases	RHR and Coolant Circulation - High Water Level Change Description: New SR	NUREG(s)- 1431 Only
LCO 3.9.6 Bases	RHR and Coolant Circulation - Low Water Level	NUREG(s)- 1431 Only

21-Feb-13

SR 3.9.6.3	RHR and Coolant Circulation - Low Water Level Change Description: New SR	NUREG(s)- 1431 Only
SR 3.9.6.3 Bases	RHR and Coolant Circulation - Low Water Level Change Description: New SR	NUREG(s)- 1431 Only
LCO 3.4.6 Bases	RCS Loops - MODE 4	NUREG(s)- 1432 Only
SR 3.4.6.4	RCS Loops - MODE 4 Change Description: New SR	NUREG(s)- 1432 Only
SR 3.4.6.4 Bases	RCS Loops - MODE 4 Change Description: New SR	NUREG(s)- 1432 Only
LCO 3.4.7 Bases	RCS Loops - MODE 5, Loops Filled	NUREG(s)- 1432 Only
SR 3.4.7.4	RCS Loops - MODE 5, Loops Filled Change Description: New SR	NUREG(s)- 1432 Only
SR 3.4.7.4 Bases	RCS Loops - MODE 5, Loops Filled Change Description: New SR	NUREG(s)- 1432 Only
LCO 3.4.8 Bases	RCS Loops - MODE 5, Loops Not Filled	NUREG(s)- 1432 Only
SR 3.4.8.3	RCS Loops - MODE 5, Loops Not Filled Change Description: New SR	NUREG(s)- 1432 Only
SR 3.4.8.3 Bases	RCS Loops - MODE 5, Loops Not Filled Change Description: New SR	NUREG(s)- 1432 Only
LCO 3.5.2 Bases	ECCS - Operating	NUREG(s)- 1432 Only
SR 3.5.2.3	ECCS - Operating	NUREG(s)- 1432 Only
SR 3.5.2.3 Bases	ECCS - Operating	NUREG(s)- 1432 Only
LCO 3.5.3 Bases	ECCS - Shutdown	NUREG(s)- 1432 Only
LCO 3.6.6B Bases	Containment Spray and Cooling Systems (Atmospheric and Dual)	NUREG(s)- 1432 Only
LCO 3.6.6A Bases	Containment Spray and Cooling Systems (Atmospheric and Dual)	NUREG(s)- 1432 Only
SR 3.6.6A.5	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1432 Only
SR 3.6.6A.5	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.6	NUREG(s)- 1432 Only
SR 3.6.6B.5	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.6	NUREG(s)- 1432 Only

21-Feb-13

SR 3.6.6B.5	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1432 Only
SR 3.6.6B.5 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1432 Only
SR 3.6.6B.5 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.6	NUREG(s)- 1432 Only
SR 3.6.6A.5 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.6	NUREG(s)- 1432 Only
SR 3.6.6A.5 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: New SR	NUREG(s)- 1432 Only
SR 3.6.6B.6	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.7	NUREG(s)- 1432 Only
SR 3.6.6A.6	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.7	NUREG(s)- 1432 Only
SR 3.6.6A.6 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.7	NUREG(s)- 1432 Only
SR 3.6.6B.6 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.7	NUREG(s)- 1432 Only
SR 3.6.6A.7	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.8	NUREG(s)- 1432 Only
SR 3.6.6B.7	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.8	NUREG(s)- 1432 Only
SR 3.6.6A.7 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.8	NUREG(s)- 1432 Only
SR 3.6.6B.7 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.8	NUREG(s)- 1432 Only
SR 3.6.6A.8	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.9	NUREG(s)- 1432 Only

SR 3.6.6B.8	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.9	NUREG(s)- 1432 Only
SR 3.6.6B.8 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.9	NUREG(s)- 1432 Only
SR 3.6.6A.8 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.9	NUREG(s)- 1432 Only
SR 3.6.6A.9	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.10	NUREG(s)- 1432 Only
SR 3.6.6B.9	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.10	NUREG(s)- 1432 Only
SR 3.6.6B.9 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6B.10	NUREG(s)- 1432 Only
SR 3.6.6A.9 Bases	Containment Spray and Cooling Systems (Atmospheric and Dual) Change Description: Renamed 3.6.6A.10	NUREG(s)- 1432 Only
LCO 3.9.4	SDC and Coolant Circulation - High Water Level	NUREG(s)- 1432 Only
SR 3.9.4.2	SDC and Coolant Circulation - High Water Level Change Description: New SR	NUREG(s)- 1432 Only
SR 3.9.4.2 Bases	SDC and Coolant Circulation - High Water Level Change Description: New SR	NUREG(s)- 1432 Only
LCO 3.9.5	SDC and Coolant Circulation - Low Water Level	NUREG(s)- 1432 Only
SR 3.9.5.3	SDC and Coolant Circulation - Low Water Level Change Description: New SR	NUREG(s)- 1432 Only
SR 3.9.5.3 Bases	SDC and Coolant Circulation - Low Water Level Change Description: New SR	NUREG(s)- 1432 Only
SR 3.5.1.2	ECCS - Operating	NUREG(s)- 1433 1434 Only
SR 3.5.1.2 Bases	ECCS - Operating	NUREG(s)- 1433 1434 Only
SR 3.5.2.3	ECCS - Operating	NUREG(s)- 1433 1434 Only
SR 3.5.2.3 Bases	ECCS - Operating	NUREG(s)- 1433 1434 Only
SR 3.5.2.4	ECCS - Shutdown	NUREG(s)- 1433 1434 Only
SR 3.5.2.4 Bases	ECCS - Shutdown	NUREG(s)- 1433 1434 Only

21-Feb-13

SR 3.5.3.2	RCIC System	NUREG(s)- 1433 1434 Only
SR 3.5.3.2 Bases	RCIC System	NUREG(s)- 1433 1434 Only
LCO 3.4.8 Bases	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1433 Only
SR 3.4.8.2	RHR Shutdown Cooling System - Hot Shutdown Change Description: New SR	NUREG(s)- 1433 Only
SR 3.4.8.2 Bases	RHR Shutdown Cooling System - Hot Shutdown Change Description: New SR	NUREG(s)- 1433 Only
LCO 3.4.9 Bases	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1433 Only
SR 3.4.9.2	RHR Shutdown Cooling System - Cold Shutdown Change Description: New SR	NUREG(s)- 1433 Only
SR 3.4.9.2 Bases	RHR Shutdown Cooling System - Cold Shutdown Change Description: New SR	NUREG(s)- 1433 Only
LCO 3.5.1 Bases	ECCS - Operating	NUREG(s)- 1433 Only
SR 3.5.1.1	ECCS - Operating	NUREG(s)- 1433 Only
SR 3.5.1.1 Bases	ECCS - Operating	NUREG(s)- 1433 Only
LCO 3.5.2 Bases	ECCS - Shutdown	NUREG(s)- 1433 Only
LCO 3.5.3 Bases	RCIC System	NUREG(s)- 1433 Only
SR 3.5.3.1	RCIC System	NUREG(s)- 1433 Only
SR 3.5.3.1 Bases	RCIC System	NUREG(s)- 1433 Only
LCO 3.6.2.3 Bases	RHR Suppression Pool Cooling	NUREG(s)- 1433 Only
SR 3.6.2.3.2	RHR Suppression Pool Cooling Change Description: Renamed 3.6.2.3.3	NUREG(s)- 1433 Only
SR 3.6.2.3.2	RHR Suppression Pool Cooling Change Description: New SR	NUREG(s)- 1433 Only
SR 3.6.2.3.2 Bases	RHR Suppression Pool Cooling Change Description: New SR	NUREG(s)- 1433 Only
SR 3.6.2.3.2 Bases	RHR Suppression Pool Cooling Change Description: Renamed 3.6.2.3.3	NUREG(s)- 1433 Only
SR 3.6.2.3.3	RHR Suppression Pool Cooling Change Description: Renamed 3.6.2.3.4	NUREG(s)- 1433 Only
SR 3.6.2.3.3 Bases	RHR Suppression Pool Cooling Change Description: Renamed 3.6.2.3.4	NUREG(s)- 1433 Only

21-Feb-13

LCO 3.6.2.4 Bases	RHR Suppression Pool Spray	NUREG(s)- 1433 Only
SR 3.6.2.4.2	RHR Suppression Pool Spray Change Description: New SR	NUREG(s)- 1433 Only
SR 3.6.2.4.2	RHR Suppression Pool Spray Change Description: Renamed 3.6.2.4.3	NUREG(s)- 1433 Only
SR 3.6.2.4.2 Bases	RHR Suppression Pool Spray Change Description: Renamed 3.6.2.4.3	NUREG(s)- 1433 Only
SR 3.6.2.4.2 Bases	RHR Suppression Pool Spray Change Description: New SR	NUREG(s)- 1433 Only
LCO 3.9.8 Bases	RHR - High Water Level	NUREG(s)- 1433 Only
SR 3.9.8.2	RHR - High Water Level Change Description: New SR	NUREG(s)- 1433 Only
SR 3.9.8.2 Bases	RHR - High Water Level Change Description: New SR	NUREG(s)- 1433 Only
LCO 3.9.9 Bases	RHR - Low Water Level	NUREG(s)- 1433 Only
SR 3.9.9.2	RHR - Low Water Level Change Description: New SR	NUREG(s)- 1433 Only
SR 3.9.9.2 Bases	RHR - Low Water Level Change Description: New SR	NUREG(s)- 1433 Only
LCO 3.4.9 Bases	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1434 Only
SR 3.4.9.2	RHR Shutdown Cooling System - Hot Shutdown Change Description: New SR	NUREG(s)- 1434 Only
SR 3.4.9.2 Bases	RHR Shutdown Cooling System - Hot Shutdown Change Description: New SR	NUREG(s)- 1434 Only
LCO 3.4.10 Bases	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1434 Only
SR 3.4.10.2	RHR Shutdown Cooling System - Cold Shutdown Change Description: New SR	NUREG(s)- 1434 Only
SR 3.4.10.2 Bases	RHR Shutdown Cooling System - Cold Shutdown Change Description: New SR	NUREG(s)- 1434 Only
LCO 3.5.1 Bases	ECCS - Operating	NUREG(s)- 1434 Only
SR 3.5.1.1	ECCS - Operating	NUREG(s)- 1434 Only
SR 3.5.1.1 Bases	ECCS - Operating	NUREG(s)- 1434 Only
LCO 3.5.2 Bases	ECCS - Shutdown	NUREG(s)- 1434 Only

21-Feb-13



SR 3.5.2.3	ECCS - Shutdown	NUREG(s)- 1434 Only
SR 3.5.2.3 Bases	ECCS - Shutdown	NUREG(s)- 1434 Only
LCO 3.5.3 Bases	RCIC System	NUREG(s)- 1434 Only
SR 3.5.3.1	RCIC System	NUREG(s)- 1434 Only
SR 3.5.3.1 Bases	RCIC System	NUREG(s)- 1434 Only
LCO 3.6.1.7 Bases	RHR Containment Spray System	NUREG(s)- 1434 Only
SR 3.6.1.7.1	RHR Containment Spray System	NUREG(s)- 1434 Only
SR 3.6.1.7.1 Bases	RHR Containment Spray System	NUREG(s)- 1434 Only
SR 3.6.1.7.2	RHR Containment Spray System Change Description: New SR	NUREG(s)- 1434 Only
SR 3.6.1.7.2	RHR Containment Spray System Change Description: Renamed 3.6.1.7.3	NUREG(s)- 1434 Only
SR 3.6.1.7.2 Bases	RHR Containment Spray System Change Description: Renamed 3.6.1.7.3	NUREG(s)- 1434 Only
SR 3.6.1.7.2 Bases	RHR Containment Spray System Change Description: New SR	NUREG(s)- 1434 Only
SR 3.6.1.7.3	RHR Containment Spray System Change Description: Renamed 3.6.1.7.4	NUREG(s)- 1434 Only
SR 3.6.1.7.3 Bases	RHR Containment Spray System Change Description: Renamed 3.6.1.7.4	NUREG(s)- 1434 Only
SR 3.6.1.7.4	RHR Containment Spray System Change Description: Renamed 3.6.1.7.5	NUREG(s)- 1434 Only
SR 3.6.1.7.4 Bases	RHR Containment Spray System Change Description: Renamed 3.6.1.7.5	NUREG(s)- 1434 Only
LCO 3.6.2.3 Bases	RHR Suppression Pool Cooling	NUREG(s)- 1434 Only
SR 3.6.2.3.2	RHR Suppression Pool Cooling Change Description: Renamed 3.6.2.3.3	NUREG(s)- 1434 Only
SR 3.6.2.3.2	RHR Suppression Pool Cooling Change Description: New SR	NUREG(s)- 1434 Only
SR 3.6.2.3.2 Bases	RHR Suppression Pool Cooling Change Description: Renamed 3.6.2.3.3	NUREG(s)- 1434 Only
SR 3.6.2.3.2 Bases	RHR Suppression Pool Cooling Change Description: New SR	NUREG(s)- 1434 Only

21-Feb-13

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LCO 3.9.8	RHR - High Water Level	NUREG(s)- 1434 Only
SR 3.9.8.2	RHR - High Water Level Change Description: New SR	NUREG(s)- 1434 Only
SR 3.9.8.2 Bases	RHR - High Water Level Change Description: New SR	NUREG(s)- 1434 Only
LCO 3.9.9 Bases	RHR - Low Water Level Change Description: New SR	NUREG(s)- 1434 Only
SR 3.9.9.2	RHR - Low Water Level Change Description: New SR	NUREG(s)- 1434 Only
SR 3.9.9.2 Bases	RHR - Low Water Level Change Description: New SR	NUREG(s)- 1434 Only

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## 1. Summary Description

Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," (Ref. 1) addresses the issue of gas accumulation in the Emergency Core Cooling System (ECCS), Decay Heat Removal (DHR) (also called Residual Heat Removal (RHR) or Shutdown Cooling (SDC)) System, and Containment Spray (CS) System to ensure that gas accumulation is maintained less than the amount that challenges Operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified. The Nuclear Regulatory Commission (NRC) requested that licensees perform evaluations and submit information regarding gas management activities in response to the GL.

The GL states, "the NRC staff plans to use this information during activities that are being planned as a follow-up to this GL and for guidance in the Technical Specifications Task Force program to develop improved TSs." The TSTF (Technical Specifications Task Force) has developed a proposed change to the Improved Standard Technical Specifications (ISTS) (NUREG-1430 through -1434) (References 2 through 6) in response to this statement.

The proposed change modifies the existing Surveillance Requirements (SRs) related to gas accumulation for the ECCS and adds new SRs on entrained gas to the specifications governing the DHR, RHR, and SDC systems and to the CS systems. Similar changes are made to the existing SR on the RCIC System to maintain consistency within the ITS. Existing SRs are revised to facilitate the performance of the proposed gas accumulation SR. The Bases are revised to reflect the change to the SRs.

The Limiting Condition for Operation (LCO) Bases for the specifications governing the ECCS, and the Reactor Core Isolation Cooling (RCIC), DHR, RHR, SDC, and CS Systems are revised to add an acknowledgement that management of gas voids is important to system Operability.

The proposed change captures the on-going activities related to system Operability needed to address the concerns in the GL.

## 2. Detailed Description

### 2.1 Revise or Add Surveillance Requirements

The ECCS System and, for NUREG-1433 and NUREG-1434 ISTS, Reactor Core Isolation Cooling (RCIC) System, TSs currently contain Surveillance Requirements related to gas accumulation. In NUREG-1430, NUREG-1431, and NUREG-1432 (Pressurized Water Reactor [PWR] designs), these SRs state "Verify ECCS piping is full of water". In NUREG-1433 and NUREG-1434 (Boiling Water Reactor [BWR] designs), the ECCS SR states "Verify for each ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve." The RCIC SR states, "Verify the RCIC System piping is filled with water from the pump discharge valve to the injection valve."

These SRs are revised to state:

"Verify the [system name] locations susceptible to gas accumulation are sufficiently filled with water."

The existing Frequency of 31 days and the existing plant-specific option to control the Frequency in accordance with the NRC-approved Surveillance Frequency Control Program are retained.

In those TS for which there is currently no SR related to gas accumulation (RHR/DHR/SDC and CS), a new SR is proposed which states:

"Verify the [system name] locations susceptible to gas accumulation are sufficiently filled with water."

The ISTS Frequency is "[31 days OR In accordance with the Surveillance Frequency Control Program]". For licensees without a Surveillance Frequency Control Program, the Frequency will be "31 days." For licensees with a Surveillance Frequency Control Program, the Frequency will be "In accordance with the Surveillance Frequency Control Program."

A Note is added to the proposed gas accumulation SR for the RHR system LCOs that are initially applicable during a plant shutdown. These are LCO 3.4.6, 'RCS Loops – MODE 4' for PWR designs, LCO 3.4.8, "RHR Shutdown Cooling System - Hot Shutdown" for BWR/4 designs and LCO 3.4.9, "RHR Shutdown Cooling System - Hot Shutdown" for BWR/6 designs. The Note states that the SR does not have to be performed until 12 hours after entering the Applicability of the LCO (Mode 4 for PWRs and Mode 3 with reactor steam dome pressure < [the RHR cut in permissive pressure] for BWRs.)

A Note is added to some existing SRs that require verification that manual valves are in the correct position. For system vent flow paths, the correct position is closed. The Note allows the SR to not be met for system vent flow paths while performing the proposed gas accumulation SR, which may require opening system vent flow paths.

The Bases for the SRs are revised. The Bases of the proposed gas accumulation SRs discuss methods of identifying locations susceptible to gas accumulation, gas volume acceptance criteria, and methods for performing the SR. The Bases information is consistent with licensee actions and on-going programs related to GL 2008-01.

## 2.2 Revise the LCO Bases

The LCO Bases of the affected specifications are revised to add a statement similar to the following:

"Management of gas voids is important to [system name] OPERABILITY."

The LCO Bases describe what is required for Operability of the system. Including this statement reiterates the importance of gas management.

### 2.3 Affected Specifications

The proposed change affects the following specifications:

<b>NUREG-1430 (Babcock and Wilcox Plants)</b>	
3.4.6, RCS Loops - MODE 4	Revise LCO Bases. Add new SR 3.4.6.3 and associated Bases
3.4.7, RCS Loops - MODE 5, Loops Filled	Revise LCO Bases. Add new SR 3.4.7.4 and associated Bases
3.4.8, RCS Loops - MODE 5, Loops Not Filled	Revise LCO Bases. Add new SR 3.4.8.3 and associated Bases
3.5.2, ECCS - Operating	Revise LCO Bases. Revise 3.5.2.2 and SR 3.5.2.3 and associated Bases
3.5.3, ECCS - Shutdown	Revise LCO Bases. Note: SR 3.5.3.1 references the SRs and Bases in LCO 3.5.2.
3.6.6, Containment Spray and Cooling Systems	Revise LCO Bases. Revise SR 3.6.6.1 and associated Bases. Add new SR 3.6.6.4 and associated Bases. Renumber subsequent SRs.
3.9.4, DHR and Coolant Circulation - High Water Level	Revise LCO Bases. Add new SR 3.9.4.2 and associated Bases.
3.9.5, DHR and Coolant Circulation - Low Water Level	Revise LCO Bases. Add new SR 3.9.5.3 and associated Bases.
<b>NUREG-1431 (Westinghouse Plants)</b>	
3.4.6, RCS Loops - MODE 4	Revise LCO Bases. Add new SR 3.4.6.4 and associated Bases
3.4.7, RCS Loops - MODE 5, Loops Filled	Revise LCO Bases. Add new SR 3.4.7.4 and associated Bases
3.4.8, RCS Loops - MODE 5, Loops Not Filled	Revise LCO Bases. Add new SR 3.4.8.3 and associated Bases
3.5.2, ECCS - Operating	Revise LCO Bases. Revise SR 3.5.2.2 and SR 3.5.2.3 and associated Bases
3.5.3, ECCS - Shutdown	Revise LCO Bases. Note: SR 3.5.3.1 references the SRs and Bases in LCO 3.5.2.
3.6.6A, Containment Spray and Cooling Systems (Atmospheric and Dual)	Revise LCO Bases. Revise SR 3.6.6A.1 and associated Bases. Add new SR 3.6.6A.4 and associated Bases. Renumber subsequent SRs.
3.6.6B, Containment Spray and Cooling Systems (Atmospheric and Dual)	Revise LCO Bases. Revise SR 3.6.6B.1 and associated Bases. Add new SR 3.6.6B.4 and associated Bases. Renumber subsequent SRs.
3.6.6C, Containment Spray System (Ice Condenser)	Revise LCO Bases. Revise SR 3.6.6C.1 and associated Bases. Add new SR 3.6.6C.2 and associated Bases. Renumber subsequent SRs.

3.6.6D, Quench Spray System (Subatmospheric)	Revise LCO Bases. Revise SR 3.6.6D.1 and associated Bases. Add new SR 3.6.6D.2 and associated Bases. Renumber subsequent SRs.
3.6.6E, Recirculation Spray System (Subatmospheric)	Revise LCO Bases. Revise SR 3.6.6E.4 and associated Bases. Add new SR 3.6.6E.5 and associated Bases. Renumber subsequent SRs.
3.9.5, RHR and Coolant Circulation - High Water Level	Revise LCO Bases. Add new SR 3.9.5.2 and associated Bases.
3.9.6, RHR and Coolant Circulation - Low Water Level	Revise LCO Bases. Add new SR 3.9.6.3 and associated Bases.
<b>NUREG-1432 (Combustion Engineering Plants)</b>	
3.4.6, RCS Loops - MODE 4	Revise LCO Bases. Add new SR 3.4.6.4 and associated Bases
3.4.7, RCS Loops - MODE 5, Loops Filled	Revise LCO Bases. Add new SR 3.4.7.4 and associated Bases
3.4.8, RCS Loops - MODE 5, Loops Not Filled	Revise LCO Bases. Add new SR 3.4.8.3 and associated Bases
3.5.2, ECCS - Operating	Revise LCO Bases. Revise SR 3.5.2.2 and SR 3.5.2.3 and associated Bases
3.5.3, ECCS - Shutdown	Revise LCO Bases. Note: SR 3.5.3.1 references the SRs and Bases in LCO 3.5.2.
3.6.6A, Containment Spray and Cooling Systems (Atmospheric and Dual)	Revise LCO Bases. Revise SR 3.6.6A.1 and associated Bases. Add new SR 3.6.6A.5 and associated Bases. Renumber subsequent SRs.
3.6.6B, Containment Spray and Cooling Systems (Atmospheric and Dual)	Revise LCO Bases. Revise SR 3.6.6B.1 and associated Bases. Add new SR 3.6.6B.5 and associated Bases. Renumber subsequent SRs.
3.9.4, SDC and Coolant Circulation - High Water Level	Revise LCO Bases. Add new SR 3.9.4.2 and associated Bases.
3.9.5, SDC and Coolant Circulation - Low Water Level	Revise LCO Bases. Add new SR 3.9.5.3 and associated Bases.
<b>NUREG-1433 (BWR/4 Plants)</b>	
3.4.8, RHR Shutdown Cooling System - Hot Shutdown	Revise LCO Bases. Add new SR 3.4.8.2 and associated Bases
3.4.9, RHR Shutdown Cooling System - Cold Shutdown	Revise LCO Bases. Add new SR 3.4.9.2 and associated Bases
3.5.1, ECCS - Operating	Revise LCO Bases. Revise SR 3.5.1.1 and SR 3.5.1.2 and associated Bases.
3.5.2, ECCS - Shutdown	Revise LCO Bases. Revise SR 3.5.2.3 and SR 3.5.2.4 and associated Bases.

3.5.3, RCIC System	Revise LCO Bases. Revise SR 3.5.3.1 and SR 3.5.3.2 and associated Bases. <u>See Note 1 below.</u>
3.6.2.3, RHR Suppression Pool Cooling	Revise LCO Bases. Add new SR 3.6.2.3.2 and associated Bases. Renumber subsequent SRs.
3.6.2.4, RHR Suppression Pool Spray	Revise LCO Bases. Add new SR 3.6.2.4.2 and associated Bases. Renumber subsequent SRs.
3.9.8, RHR - High Water Level	Revise LCO Bases. Add new SR 3.9.8.2 and associated Bases.
3.9.9, RHR - Low Water Level	Revise LCO Bases. Add new SR 3.9.9.2 and associated Bases.
<b>NUREG-1434 (BWR/6 Plants)</b>	
3.4.9, RHR Shutdown Cooling System - Hot Shutdown	Revise LCO Bases. Add new SR 3.4.9.2 and associated Bases
3.4.10, RHR Shutdown Cooling System - Cold Shutdown	Revise LCO Bases. Add new SR 3.4.10.2 and associated Bases
3.5.1, ECCS - Operating	Revise LCO Bases. Revise SR 3.5.1.1 and SR 3.5.1.2 and associated Bases
3.5.2, ECCS - Shutdown	Revise LCO Bases. Revise SR 3.5.2.3 and SR 3.5.2.4 and SR 3.5.2.4 Bases
3.5.3, RCIC System	Revise LCO Bases. Revise SR 3.5.3.1 and SR 3.5.3.2 and associated Bases. <u>See Note 1 below.</u>
3.6.1.7, RHR Containment Spray System	Revise LCO Bases. Revise SR 3.6.1.7.1 and associated Bases. Add new SR 3.6.1.7.2 and associated Bases. Renumber subsequent SRs.
3.6.2.3, RHR Suppression Pool Cooling	Revise LCO Bases. Add new SR 3.6.2.3.2 and associated Bases. Renumber subsequent SRs.
3.9.8, RHR - High Water Level	Revise LCO Bases. Add new SR 3.9.8.2 and associated Bases.
3.9.9, RHR - Low Water Level	Revise LCO Bases. Add new SR 3.9.9.2 and associated Bases.

Note 1: The Reactor Core Isolation Cooling (RCIC) System does not fall within the scope of GL 2008-01. However, the existing SR related to gas accumulation is revised to be consistent with the similar SRs affected by the proposed change in order to maintain consistency within the ISTS.

NUREG-1432 (Ref. 4) Technical Specifications (TS) 3.6.6A and 3.6.6B, "Containment Spray and Cooling Systems" contain SR 3.6.6.4, which states: "Verify the containment spray piping is full of water to the [100] ft level in the containment spray header." These SRs are not included in the proposed change because the SR Bases states, "This ensures that spray flow will be admitted to the containment atmosphere within the time frame assumed in the containment analysis." Based on this description, the SR is not related to gas accumulation and it is not included in the proposed change.

### 3. Technical Evaluation

In GL 2008-01, the NRC provided a detailed discussion of the regulatory basis for requiring licensees to ensure that the Operability of the subject systems is not impaired by entrained gas. This discussion referenced General Design Criteria (GDC) 1, 34, 35, 36, 37, 38, 39, and 40 in Title 10 of the Code of Federal Regulations (CFR), Part 50, Appendix A, and Quality Assurance (QA) Criteria III, V, XI, XVI, and XVII in 10 CFR 50, Appendix B. (Not all licensees are committed to comply with the GDCs, but may be committed to comply with similar design requirements as stated in their licensing basis.) The NRC also referenced licensee commitments or license requirements to follow other QA documents, such as Regulatory Guide 1.33, "Quality Assurance Requirements (Operation)" (Ref. 7). It was noted that Regulatory Guide 1.33, Appendix A specifically requires instructions for filling and venting the ECCS and DHR/RHR/SCD Systems, as well as for draining and refilling heat exchangers.

In the GL, the NRC noted that the ISTS and most licensees' TS contain SRs to verify that some of the subject systems are full of water. However, the scope of systems to which the SRs apply and the frequency of the verification varies between designs and plants, and some licensees do not have similar SRs. Furthermore, the current TS requirements to verify that piping is full of water may exceed the necessary requirements for system Operability, since the piping may contain an acceptable amount of entrained gas or voids which does not affect system Operability. As a result, the NRC determined that changes to the TS were needed.

In order to utilize to the greatest extent possible the work that licensees and the NRC have performed in response to GL 2008-01, the proposed change is generic and can be adopted by licensees without plant-specific variations or plant-specific evaluations beyond those previously performed in response to the GL and reviewed by the NRC. The evaluations performed by licensees in response to the GL identified a wide variation in the susceptibility to entrained gas between plants, systems, portions of systems, and operating conditions. As a result, the proposed change provides sufficient flexibility for the licensee to adjust the scope (including within systems) and frequency of inspections based on past performance, industry experience, and plant-specific vulnerabilities.

The acceptance criteria for the volume of entrained gas identified during inspections will vary by plant, system, location, and plant condition. The acceptance criteria will also likely change as additional inspections are performed and mitigating actions and vulnerabilities are identified. Therefore, the acceptance criteria are specified in plant procedures to provide licensees the flexibility to revise the acceptance criteria. However, failure to meet the acceptance criteria specified in plant procedures results in the SR not being met unless and until an evaluation determines that the amount of entrained gas is acceptable.

#### 3.1 Revise or Add Surveillance Requirements

New or revised SRs are included for the ECCS, the RCIC System (BWR/4 and BWR/6 ISTS only), the RHR/DHR/SDC System, and the CS System. The proposed SRs are similar to:

"Verify the [system name] locations susceptible to gas accumulation are sufficiently filled with water."



The Frequency is:

"[31 days

OR

In accordance with the Surveillance Frequency Control Program]"

The proposed SR wording is discussed below:

- The wording "sufficiently filled with water" was chosen instead of the existing phrase "full of water" or the more typical wording of "within limits."

In Task Interface Agreement (TIA) 2008-03, dated October 21, 2008 from L. Wert (NRC) to T. Blount (NRC), "Task Interface Agreement - Emergency Core Cooling System (ECCS) Voiding Relative To Compliance With Surveillance Requirements (SR) 3.5.1.1, 3.5.2.3, and 3.5.3.1," the NRC stated that the intent of the existing TS SRs, which state "full of water," may be met if the licensee can establish through an Operability determination that there is a reasonable expectation that the system in question will perform its specified safety function." Therefore the phrase, "sufficiently filled with water" is recommended for the proposed TS changes. In the ISTS, this is understood to mean "sufficiently filled with water to support Operability," as the purpose of SRs, as stated in 10 CFR 50.36(c)(3), is to verify that the LCO is met and the LCO requires the system to be Operable.

The term "within limits" was not chosen because not all portions of a system may have pre-established Operability limits on accumulated gas (i.e., the procedural limit may be zero). Stating "within limits" would require licensees to establish Operability limits for all locations and for all plant conditions within the Applicability of the LCO. This is not the intended implementation of the SR. Instead, licensees may determine conservative limits on gas accumulation (or set a limit of no gas accumulation). If accumulated gas is discovered that exceeds the established limit, the Surveillance is not met. However, if it is determined by subsequent evaluation that the system is not rendered inoperable by the accumulated gas (i.e., the system is "sufficiently filled with water"), the Surveillance may be declared met.

- The wording "locations susceptible to gas accumulation" was chosen in recognition that not all locations in a system are susceptible to gas accumulation.

The wording was chosen so that portions of the system known to not be susceptible to gas accumulation do not need to be verified.

Although individual plant responses to GL 2008-01 may vary, common elements in the industry guidance for responding to the GL resulted in the identification of system locations susceptible to gas accumulation. The following summarizes the activities performed by plants in order to respond to GL 2008-01. Results of these activities have been reviewed by the NRC.

1. Review of Design Basis Documents, including such items as Calculations, Engineering Evaluations and Vendor Technical Manuals, with respect to gas accumulation for the systems.
2. Review of the system P&ID and isometric drawings to identify all system vents and high points.
3. Identification of new vent valve locations, modifications to existing vent valves or utilization of existing vent valves that were previously considered to be in inaccessible areas.
4. Review of the fill and vent activities and procedures for each affected system.
5. System confirmation walk downs for the portions of the systems that require venting to ensure that they are sufficiently filled with water.
6. Identification of potential gas intrusion mechanisms for each piping segment that is vulnerable to gas intrusion.

From these activities, licensees identified system locations susceptible to gas accumulation. These locations must be sufficiently filled with water to support system Operability.

The proposed Frequency is "[31 days OR In accordance with the Surveillance Frequency Control Program]". This presentation describes a plant-specific option.

For licensees with a Surveillance Frequency Control Program (Reference 8), the Frequency will state:

"In accordance with the Surveillance Frequency Control Program".

For licensees without a Surveillance Frequency Control Program, the Frequency will be:

"31 days".

The Surveillance Frequency Control Program is described in a specification in Section 5.5, "Programs," in Chapter 5, "Administrative Controls," of the TS. Plants that have adopted the Surveillance Frequency Control Program have relocated periodic SR frequencies to licensee control. The TS program ensures that SRs are performed at intervals sufficient to assure the associated LCOs are met. The initial Frequency for the proposed SRs in the Surveillance Frequency Control Program will be 31 days. Changes to the Frequency may be made in accordance with the methodology described in NEI 04-10, "Risk-Informed Method for Control of Surveillance Frequencies," Revision 1. It is recognized that the required Frequency for verifying for gas accumulation will vary based on susceptible location. Therefore, the Bases for the Surveillance include the statement, "The Surveillance Frequency may vary by location susceptible to gas accumulation."

For licensees that have not implemented a Surveillance Frequency Control Program the SR Frequency would be fixed at 31 days. The 31 day Frequency is based on the gradual nature

of gas accumulation, the procedural controls governing system operation, and operating experience. Note that SR 3.0.1 states, "Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performances of the Surveillance, shall be failure to meet the LCO" (emphasis added).

Some LCOs only require one train or loop of DHR/RHR/SDC to be Operable at a given time. The proposed SR for those TS state "Verify the required [system] [loop/train/subsystem] locations..." In the ISTS, the term "required" means "required by the LCO." The word "required" is added as a convention to avoid confusion since SRs are not applicable to equipment that is not required to be Operable. Corresponding changes are made to the Bases.

A Note is added to the gas accumulation SR for the RHR system LCOs that are initially applicable during a plant shutdown. These are:

- LCO 3.4.6, "RCS Loops – MODE 4" for PWR designs;
- LCO 3.4.8, "RHR Shutdown Cooling System - Hot Shutdown" for BWR/4 designs; and
- LCO 3.4.9, "RHR Shutdown Cooling System - Hot Shutdown" for BWR/6 designs.

The Note states that the SR does not have to be performed until 12 hours after entering the Applicability of the LCO (Mode 4 for PWRs and Mode 3 with reactor steam dome pressure < [the RHR cut in permissive pressure] for BWRs). Surveillances are normally performed prior to entering the Applicability. During a rapid shutdown, there may be insufficient time to verify all susceptible locations in the RHR System before entering the Applicability. The Note provides a limited time to perform the Surveillance after entering the Applicability of the LCO; however, under the ISTS usage rules (ISTS Section 1.4), the requirement to manage gas accumulation is not affected. Licensees must have confidence that the SR can be met or the LCO must be declared not met.

A Note is added to SRs that require verification that manual valves are in the correct position. For system vent flow paths, the correct position is closed. The Note allows the SR to not be met for system vent flow paths opened under administrative control, to allow system venting and performance of the proposed gas accumulation SR.

The affected SRs are:

NUREG-1430

SR 3.5.2.2, "ECCS - Operating"

SR 3.6.6.1, "Containment Spray and Cooling Systems"

NUREG-1430

SR 3.5.2.2, "ECCS - Operating"

SR 3.6.6A.1, "Containment Spray and Cooling Systems"

SR 3.6.6B.1, "Containment Spray and Cooling Systems"

SR 3.6.6C.1, "Containment Spray System"

SR 3.6.6D.1, "Quench Spray (QS) System"

SR 3.6.6E.4, "Recirculation Spray (RS) System"

NUREG-1432

SR 3.5.2.2, "ECCS - Operating"

SR 3.6.6A.1, "Containment Spray and Cooling Systems"

SR 3.6.6B.1, "Containment Spray and Cooling Systems"

NUREG-1433

SR 3.5.1.2, "ECCS- Operating"

SR 3.5.2.4, "ECCS- Shutdown"

SR 3.5.3.2, "RCIC System"

NUREG-1434

SR 3.5.1.2, "ECCS- Operating"

SR 3.5.2.4, "ECCS- Shutdown"

SR 3.5.3.2, "RCIC System"

SR 3.6.1.7.1, "RHR Containment Spray System"

The SR Bases are revised to describe the administrative control, which should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.

This exception allows a licensee to credit administratively controlled manual action to close the system vent flow path in order to maintain system Operability during venting and performance of the proposed gas accumulation SR.

This exception is not needed for valve position SRs that state that the valve is "in the correct position or can be aligned to the correct position" as the SR currently contains the allowance provided by the proposed Note. The exception also is not needed for systems that are started manually, such as RHR/DHR/SDC. Manual alignment of valves to place an Operable RHR train into operation is currently permitted, including system vent flow paths. In addition, the specifications typically require only one RHR/DHR/SDC loop to be Operable and testing can be performed on the redundant loop. Those specifications that require two RHR/DHR/SDC loops to be Operable contain an existing LCO Note that allows one loop to be inoperable for a limited period of time to perform surveillance testing.

Surveillance Requirement Bases

The Bases for the proposed gas accumulation SR are revised or added to describe the required verification. The Bases discuss acceptable methods of identifying locations susceptible to gas accumulation, gas volume acceptance criteria, and acceptable methods for performing the SR. The Bases information is consistent with licensee actions and on-going programs related to GL 2008-01.

The first paragraph states the purpose of the SR:

"[System name] piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the [system name] loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel."

There are variations in this paragraph.

1. If the SR states "Verify the required...", the SR Bases state "Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required [system name] loop(s)..." (emphasis added).
2. The CS System does not inject into the reactor vessel. Therefore, in the CS SR Bases the last sentence of the paragraph does not include the phrase "and pumping of noncondensable gas into the reactor vessel."

The second paragraph discusses the selection of locations susceptible to gas accumulation:

"Selection of [system name] System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions."

The locations susceptible to gas accumulation were determined during the licensee response to GL 2008-01 using the methods described in the Bases. This determination was reviewed by the NRC. Licensee programs instituted in response to the GL will continue to evaluate system locations for susceptibility to gas accumulation as needed to meet the SR requirement that the system be "sufficiently filled."

As discussed in Section 2.1, the existing BWR RCIC System SR is revised to be consistent with the new and revised gas accumulation SRs in order to maintain consistency within the TS. The second paragraph of the SR Bases describes the system review performed for those systems within the scope of Generic Letter 2008-01 to identify locations susceptible to gas accumulation. The RCIC System is not within the scope of the Generic Letter and the Bases paragraph is not applicable. The second paragraph in the RCIC System SR Bases is replaced with the following paragraph, which describes the RCIC System review performed by licensees in response to Institute of Nuclear Power Operations (INPO) Significant Event Report 2-025, Revision 1, "Gas Intrusion in Safety Systems."

"Selection of RCIC System locations susceptible to gas accumulation is based on a self-assessment of the piping configuration to identify where gases may accumulate and remain even after the system is filled and vented, and to identify vulnerable potential degassing flow paths. The review is supplemented by verification that installed high-point vents are actually at the system high points, including field verification to ensure pipe shapes and construction tolerances have not inadvertently created additional high points."

Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions."

The third paragraph discusses the acceptance criteria for the SR:

"The [system] System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the [system name] System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits."

It is not the intent of the SR that licensees must determine the amount of entrained gas allowed at every location before system Operability is affected. Instead, it is intended that licensees may set conservative limits on gas accumulation based on system location and operating condition. This limit may be that no gas accumulation is allowed. Should gas accumulation be discovered, the SR is declared not met and the Conditions and Required Actions of the LCO will be followed. If subsequent evaluation determines that the accumulated gas does not render the subject system inoperable (i.e., the system is "sufficiently filled with water"), the SR may be declared met and the Conditions and Required Actions be exited. However, it is intended that the accumulated gas be eliminated or reduced to within the procedural acceptance criteria even if the system is determined to be Operable.

The fourth paragraph discusses the methods of monitoring for gas accumulation:

"[System] System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval."

Given the purpose of the SR is to verify system Operability, the total amount of gas accumulated in a system flow path may be more important than the gas accumulated at a particular location. Therefore, it may be more practical to establish a limit on the total amount of gas accumulation in a flow path and to determine the total amount by measuring representative locations. It may not be practicable to monitor all locations susceptible to gas accumulation and surrogate methods may be used. It is also not necessary to monitor for gas accumulation in locations in which the

maximum amount of gas that may accumulate is less than the amount that could affect system Operability (i.e., the system will always be "sufficiently filled with water" to support Operability). As stated in SR 3.0.1, Surveillances must be met between performances. Therefore, the method used to monitor for gas accumulation must have sufficient accuracy to assure the system will be Operable until the next scheduled performance.

The fifth paragraph describes the Surveillance Frequency and will vary in plant-specific TS depending on whether or not the licensee has adopted a Surveillance Frequency Control Program.

The SR Bases for licensees that have not adopted a Surveillance Frequency Control Program will state:

"The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the [system] System piping and the procedural controls governing system operation."

The SR Bases for licensees that have adopted a Surveillance Frequency Control Program will state.

"The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation."

The ISTS Bases contain a Reviewers' Note that describes the selection of the appropriate Bases text.

In conclusion, the proposed change incorporates requirements into the TS which assure that the concerns discussed in GL 2008-01 will not affect the subject systems.

### 3.2 Revise the LCO Bases

The LCO Bases of the affected specifications are revised to add a statement similar to:

"Management of gas voids is important to [system name] OPERABILITY."

The LCO Bases describe what is required for Operability of the system. The ISTS definition of Operability states:

"A system, subsystem, [train/division], component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, [train/division], component, or device to perform its specified safety function(s) are also capable of performing their related support function(s)."

Note that 76 of 104 units have TSs consistent with the ISTS definition. The remaining plants' definitions of Operability are consistent with this definition in the aspects relevant to this issue.

Failure to manage gas accumulation can result in water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel. These effects may result in the subject system being unable to perform its specified safety function. Therefore, management of gas is an aspect of maintaining system Operability. Adding the statement to the LCO bases emphasizes the importance of managing gas accumulation.

#### **4. Regulatory Evaluation**

##### 4.1 Applicable Regulatory Requirements/Criteria

The following regulatory requirements/criteria are applicable, as addressed above in Section 3:

- Section 182a of the Atomic Energy Act of 1954, as amended (the Act) requires applicants for nuclear power plant operating licenses to include the TS as part of the license. The Commission's regulatory requirements related to the content for the TS are set forth in 10 CFR 50.36. That regulation requires that the TS include items in eight specific categories. The categories are: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; (5) administrative controls; (6) decommissioning; (7) initial notification; and (8) written reports. However, the regulation does not specify the particular requirements to be included in a plant's TS.
- Title 10 of the Code of Federal Regulations, Part 50, Paragraph 50.36(c)(3), states, "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."
- General Design Criteria (GDC) 1, 34, 35, 36, 37, 38, 39, and 40 in Title 10 of the Code of Federal Regulations, Part 50, Appendix A, and the Quality Assurance (QA) Criteria III, V, XI, XVI, and XVII in 10 CFR 50, Appendix B, address aspects of ensuring that systems are not impaired by entrained gas.

The proposed change does not affect the plant design, hardware, or system operation and will not affect the ability of the plant to perform its design function in mitigating the consequences of a postulated design basis accident. Therefore, the proposed change does not adversely affect nuclear safety or plant operations.

##### 4.2 No Significant Hazards Consideration Determination

The Technical Specifications Task Force (TSTF) has evaluated whether or not a significant hazards consideration is involved with the proposed generic change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.



The proposed change adds or modifies Surveillance Requirement(s) (SRs) to require verification that the Emergency Core Cooling System (ECCS), the [Decay Heat Removal (DHR) / Residual Heat Removal (RHR) / Shutdown Cooling (SDC)] System, [and] the Containment Spray (CS) System, [and the Reactor Core Isolation Cooling (RCIC) System] are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. Gas accumulation in the subject systems is not an initiator of any accident previously evaluated. As a result, the probability of any accident previously evaluated is not significantly increased. The proposed SRs ensure that the subject systems continue to be capable to perform their assumed safety function and are not rendered inoperable due to gas accumulation. Thus, the consequences of any accident previously evaluated are not significantly increased.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed change adds or modifies SRs to require verification that the ECCS, the [DHR / RHR / SDC] System, [and] the CS System, [and the RCIC System] are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. The proposed change does not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. In addition, the proposed change does not impose any new or different requirements that could initiate an accident. The proposed change does not alter assumptions made in the safety analysis and is consistent with the safety analysis assumptions.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed change adds or modifies SRs to require verification that the ECCS, the [DHR / RHR / SDC] System, [and] the CS System, [and the RCIC System] are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. The proposed change clarifies requirements for management of gas accumulation in order to ensure the subject systems are capable of performing their assumed safety functions. The proposed SRs are more specific than the current SRs and will ensure that the assumptions of the safety analysis are protected. The proposed change does not adversely affect any current plant safety margins or the reliability of the equipment assumed in the safety analysis. Therefore, there are no changes being made to any safety analysis assumptions, safety limits or limiting safety system settings that would adversely affect plant safety as a result of the proposed change.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, the TSTF concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

#### 4.3 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

### 5. **Environmental Consideration**

A review has determined that the proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

### 6. **References**

1. Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008.
2. NUREG-1430, "Standard Technical Specifications Babcock and Wilcox Plants."
3. NUREG-1431, "Standard Technical Specifications Westinghouse Plants."
4. NUREG-1432, "Standard Technical Specifications Combustion Engineering Plants."
5. NUREG-1433, "Standard Technical Specifications General Electric Plants, BWR/4."
6. NUREG-1434, "Standard Technical Specifications General Electric Plants, BWR/6."
7. Regulatory Guide 1.33, "Quality Assurance Requirements (Operation)," Rev. 2, February 1978.
8. Federal Register Notice 74 FRN 31996, "Notice of Availability of Technical Specification Improvement to Relocate Surveillance Frequencies to Licensee Control—Risk-Informed Technical Specification Task Force (RITSTF) Initiative 5b, Technical Specification Task Force-425, Revision 3," July 6, 2009.

**Attachment 1**  
**Model Application**

[DATE]

10 CFR 50.90

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

SUBJECT: PLANT NAME  
DOCKET NO. 50-[xxx]  
APPLICATION TO REVISE TECHNICAL SPECIFICATIONS TO  
ADOPT TSTF-523, "GENERIC LETTER 2008-01, MANAGING GAS  
ACCUMULATION," USING THE CONSOLIDATED LINE ITEM  
IMPROVEMENT PROCESS

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, [LICENSEE] is submitting a request for an amendment to the Technical Specifications (TS) for [PLANT NAME, UNIT NOS.].

The proposed amendment would modify TS requirements to address Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," as described in TSTF-523, Revision 1, "Generic Letter 2008-01, Managing Gas Accumulation." [LICENSEE committed to submit this proposed change in [reference letter].]

Attachment 1 provides a description and assessment of the proposed change. Attachment 2 provides the existing TS pages marked up to show the proposed change. Attachment 3 provides revised (clean) TS pages. Attachment 4 provides existing TS Bases pages marked to show the proposed change. Changes to the existing TS Bases, consistent with the technical and regulatory analyses, will be implemented under the Technical Specification Bases Control Program. They are provided in Attachment 4 for information only.

Approval of the proposed amendment is requested by [date]. Once approved, the amendment shall be implemented within [ ] days.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated [STATE] Official.

[In accordance with 10 CFR 50.30(b), a license amendment request must be executed in a signed original under oath or affirmation. This can be accomplished by attaching a notarized affidavit confirming the signature authority of the signatory, or by including the following statement in the cover letter: "I declare under penalty of perjury that the foregoing is true and correct. Executed on (date)." The alternative statement is pursuant to 28 USC 1746. It does not require notarization.]

If you should have any questions regarding this submittal, please contact [NAME, TELEPHONE NUMBER].

Sincerely,

[Name, Title]

Attachments:

1. Description and Assessment
2. Proposed Technical Specification Changes (Mark-Up)
3. Revised Technical Specification Pages
4. Proposed Technical Specification Bases Changes (Mark-Up) (For information only)

cc: NRC Project Manager  
NRC Regional Office  
NRC Resident Inspector  
State Contact

## ATTACHMENT 1 - DESCRIPTION AND ASSESSMENT

### 1.0 DESCRIPTION

The proposed change revises or adds Surveillance Requirements to verify that the system locations susceptible gas accumulation are sufficiently filled with water and to provide allowances which permit performance of the verification. The changes are being made to address the concerns discussed in Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems."

The proposed amendment is consistent with TSTF-523, Revision 1, "Generic Letter 2008-01, Managing Gas Accumulation."

### 2.0 ASSESSMENT

#### 2.1 Applicability of Published Safety Evaluation

[LICENSEE] has reviewed the model safety evaluation dated [DATE] as part of the Federal Register Notice of Availability. This review included a review of the NRC staff's evaluation, as well as the information provided in TSTF-523. [As described in the subsequent paragraphs, ][LICENSEE] has concluded that the justifications presented in the TSTF-523 proposal and the model safety evaluation prepared by the NRC staff are applicable to [PLANT, UNIT NOS.] and justify this amendment for the incorporation of the changes to the [PLANT] TS.

#### 2.2 Optional Changes and Variations

[LICENSEE is not proposing any variations or deviations from the TS changes described in the TSTF-523, Revision 1, or the applicable parts of the NRC staff's model safety evaluation dated [DATE].] [LICENSEE is proposing the following variations from the TS changes described in the TSTF-523, Revision 1, or the applicable parts of the NRC staff's model safety evaluation dated [DATE].]

[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical Specifications on which TSTF-523 was based. Specifically, [describe differences between the plant-specific TS numbering and/or titles and the TSTF-523 numbering and titles.] These differences are administrative and do not affect the applicability of TSTF-523 to the [PLANT] TS.]

[The [PLANT] TS does not have [the / some of the] existing Surveillance Requirements revised by TSTF-523. This difference does not affect the applicability of TSTF-523 to the [PLANT] TS.]

### 3.0 REGULATORY ANALYSIS

#### 3.1 No Significant Hazards Consideration Determination

[LICENSEE] requests adoption of TSTF-523, Rev. 1, "Generic Letter 2008-01, Managing Gas Accumulation," which is an approved change to the standard technical specifications (STS), into the [PLANT NAME, UNIT NOS] technical specifications (TS). The proposed change revises or adds Surveillance Requirements to verify that the system locations susceptible gas accumulation are sufficiently filled with water and to provide allowances which permit performance of the verification.

[LICENSEE] has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed change revises or adds Surveillance Requirement(s) (SRs) that require verification that the Emergency Core Cooling System (ECCS), the [Decay Heat Removal (DHR) / Residual Heat Removal (RHR) / Shutdown Cooling (SDC)] System, [and] the Containment Spray (CS) System, [and the Reactor Core Isolation Cooling (RCIC) System] are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. Gas accumulation in the subject systems is not an initiator of any accident previously evaluated. As a result, the probability of any accident previously evaluated is not significantly increased. The proposed SRs ensure that the subject systems continue to be capable to perform their assumed safety function and are not rendered inoperable due to gas accumulation. Thus, the consequences of any accident previously evaluated are not significantly increased.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed change revises or adds SRs that require verification that the ECCS, the [DHR / RHR / SDC] System, [and] the CS System, [and the RCIC System] are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. The proposed change does not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. In addition, the proposed change does not impose any new or different requirements that could initiate an

accident. The proposed change does not alter assumptions made in the safety analysis and is consistent with the safety analysis assumptions.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed change revises or adds SRs that require verification that the ECCS, the [DHR / RHR / SDC] System, [and] the CS System, [and the RCIC System] are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. The proposed change adds new requirements to manage gas accumulation in order to ensure the subject systems are capable of performing their assumed safety functions. The proposed SRs are more comprehensive than the current SRs and will ensure that the assumptions of the safety analysis are protected. The proposed change does not adversely affect any current plant safety margins or the reliability of the equipment assumed in the safety analysis. Therefore, there are no changes being made to any safety analysis assumptions, safety limits or limiting safety system settings that would adversely affect plant safety as a result of the proposed change.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, [LICENSEE] concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

#### 4.0 ENVIRONMENTAL EVALUATION

The proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure.

Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.



SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.4.6.2</p> <p>-----NOTE-----  Not required to be performed until 24 hours after a required pump is not in operation.  -----</p> <p>Verify correct breaker alignment and indicated power available to each required pump.</p>	<p>[ 7 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<p><u>SR 3.4.6.3</u></p> <p>-----NOTE-----  <u>Not required to be performed until 12 hours after entering MODE 4.</u>  -----</p> <p><u>Verify required DHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u></p> <p><u>OR</u></p> <p><u>In accordance with the Surveillance Frequency Control Program ]</u></p>



SURVEILLANCE	FREQUENCY
	<u>Control Program I</u>

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.4.8.2</p> <p>-----NOTE-----            Not required to be performed until 24 hours after a            required pump is not in operation.            -----</p> <p>Verify correct breaker alignment and indicated            power available to each required DHR pump.</p>	<p>[ 7 days</p> <p><u>OR</u></p> <p>In accordance            with the            Surveillance            Frequency            Control Program ]</p>
<p><u>SR 3.4.8.3</u>      <u>Verify DHR loop locations susceptible to gas            accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u></p> <p><u>OR</u></p> <p><u>In accordance</u>  <u>with the</u>  <u>Surveillance</u>  <u>Frequency</u>  <u>Control Program ]</u></p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY												
SR 3.5.2.1	<p>[ Verify the following valves are in the listed position with power to the valve operator removed.</p> <table border="1"> <thead> <tr> <th><u>Valve Number</u></th> <th><u>Position</u></th> <th><u>Function</u></th> </tr> </thead> <tbody> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> </tbody> </table>	<u>Valve Number</u>	<u>Position</u>	<u>Function</u>	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	<p>[ 12 hours</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ] ]</p>
<u>Valve Number</u>	<u>Position</u>	<u>Function</u>												
[ ]	[ ]	[ ]												
[ ]	[ ]	[ ]												
[ ]	[ ]	[ ]												
SR 3.5.2.2	<p><u>-----NOTE-----</u>  <u>Not required to be met for system vent flow paths opened under administrative control.</u>  <u>-----</u></p> <p>Verify each ECCS 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>												
SR 3.5.2.3	<p><u>Verify ECCS locations susceptible to gas accumulation are sufficiently filled with water</u><del>[ Verify ECCS piping is full of water.</del></p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ] ]</p>												
SR 3.5.2.4	<p>Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.</p>	<p>In accordance with the Inservice Testing Program</p>												



## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.6.2	Operate each [required] containment cooling train fan unit for $\geq 15$ minutes.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6.3	Verify each [required] containment cooling train cooling water flow rate is $\geq [1780]$ gpm.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.6.6.4</u>	<u>Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.6. <del>54</del>	Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.6. <del>65</del>	Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency

	Control Program ]
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## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6. <del>76</del> Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6. <del>87</del> Verify each [required] containment cooling train starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6. <del>98</del> Verify each spray nozzle is unobstructed.	[ At first refueling ]  <u>AND</u>  [ 10 years  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.4 Close equipment hatch and secure with [four] bolts.  <u>AND</u>	4 hours
	A.5 Close one door in each air lock.  <u>AND</u>	4 hours
	A.6.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent.  <u>OR</u>	4 hours
	A.6.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.4.1 Verify one DHR loop is in operation and circulating reactor coolant at a flow rate of $\geq$ [2800] gpm.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

<u>SR 3.9.4.2</u>	<u>Verify required DHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u> <u>OR</u> <u>In accordance</u> <u>with the</u> <u>Surveillance</u> <u>Frequency</u> <u>Control Program.]</u>
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## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.5.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify one DHR loop is in operation.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.9.5.2	Verify correct breaker alignment and indicated power available to the required DHR pump that is not in operation.	[ 7 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.9.5.3</u>	<u>Verify DHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

## BASES

## LCO (continued)

the DHR System depends on the core decay heat load and the length of time that the DHR pumps are stopped. As decay heat diminishes, the effects on RCS temperature and pressure diminish. Without cooling by DHR, higher heat loads will cause the reactor coolant temperature and pressure to increase at a rate proportional to the decay heat load. Because pressure can increase, the applicable system pressure limits (pressure and temperature (P/T) or low temperature overpressure protection (LTOP) limits) must be observed and forced DHR flow or heat removal via the SGs must be re-established prior to reaching the pressure limit. The circumstances for stopping both DHR trains are to be limited to situations where:

- a. Pressure and pressure and temperature increases can be maintained well within the allowable pressure (P/T and LTOP) and 10°F subcooling limits or
- b. An alternate heat removal path through the SG is in operation.

An OPERABLE RCS loop consists of at least one OPERABLE RCP and an SG that is OPERABLE.

Similarly for the DHR System, an OPERABLE DHR loop is comprised of the OPERABLE DHR pump(s) capable of providing forced flow to the DHR heat exchanger(s). DHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Management of gas voids is important to DHR System OPERABILITY.

## APPLICABILITY

In MODE 4, this LCO applies because it is possible to remove core decay heat and to provide proper boron mixing with either the RCS loops and SGs or the DHR System.

Operation in other MODES is covered by:

- LCO 3.4.4, "RCS Loops - MODES 1 and 2,"
- LCO 3.4.5, "RCS Loops - MODE 3,"
- LCO 3.4.7, "RCS Loops – MODE 5, Loops Filled,"
- LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled,"
- LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation – High Water Level" (MODE 6), and
- LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation – Low Water Level" (MODE 6).

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.6.3

DHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required DHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of DHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The DHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the DHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

DHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after entering MODE 4. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering MODE 4.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the DHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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- |            |   |
|------------|---|
| REFERENCES | 1. BAW-2441-A, Revision 2, Risk Informed Justification for LCO End-State Changes, September 2006. |
|------------|---|
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## BASES

## LCO (continued)

An OPERABLE DHR loop is composed of an OPERABLE DHR pump and an OPERABLE DHR heat exchanger.

DHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. A SG can perform as a heat sink when it has an adequate water level and is OPERABLE. Management of gas voids is important to DHR System OPERABILITY.

## APPLICABILITY

In MODE 5 with loops filled, forced circulation is provided by this LCO to remove decay heat from the core and to provide proper boron mixing. One loop of DHR provides sufficient circulation for these purposes.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2,"

LCO 3.4.5, "RCS Loops - MODE 3,"

LCO 3.4.6, "RCS Loops - MODE 4,"

LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled,"

LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation - High Water Level" (MODE 6), and

LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation - Low Water Level" (MODE 6).

## ACTIONS

A.1, A.2, B.1, and B.2

If one DHR loop is OPERABLE and any required SG has secondary side water level < [50]% or one required DHR loop inoperable, redundancy for heat removal is lost. Action must be initiated to restore a second DHR loop to OPERABLE status or initiate action to restore the secondary side water level in the SGs, and action must be taken immediately. Either Required Action will restore redundant decay heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

C.1 and C.2

If no required DHR loop is in operation, except as provided in Note 1, or no required DHR loop is OPERABLE, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action to restore a DHR loop to OPERABLE status and operation must be initiated. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of



## BASES

## SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.4.7.3

Verification that each required DHR pump is OPERABLE ensures that redundant paths for heat removal are available. The requirement also ensures that the additional loop can be placed in operation if needed to maintain decay heat removal and reactor coolant circulation. If the secondary side water level is  $\geq$  [50]% in both SGs, this Surveillance is not needed. Verification is performed by verifying proper breaker alignment and power available to each required pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. [ The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.7.4

DHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required DHR

loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of DHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The DHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the DHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

DHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the DHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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REFERENCES      None.

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## BASES

## LCO (continued)

Note 1 permits the DHR pumps to be removed from operation for  $\geq 15$  minutes when switching from one train to the other. The circumstances for stopping both DHR pumps are to be limited to situations where the outage time is short [and temperature is maintained  $\geq [160]^{\circ}\text{F}$ ]. The Note prohibits boron dilution with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1 is maintained or draining operations when DHR forced flow is stopped.

Note 2 allows one DHR loop to be inoperable for a period of 2 hours provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

An OPERABLE DHR loop is composed of an OPERABLE DHR pump capable of providing forced flow to an OPERABLE DHR heat exchanger. DHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Management of gas voids is important to DHR System OPERABILITY.

## APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the DHR System.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2,"

LCO 3.4.5, "RCS Loops - MODE 3,"

LCO 3.4.6, "RCS Loops - MODE 4,"

LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled,"

LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation - High Water Level" (MODE 6), and

LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation - Low Water Level" (MODE 6).

## ACTIONS

A.1

If one required DHR loop is inoperable, redundancy for heat removal is lost. Required Action A.1 is to immediately initiate activities to restore a second loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.8.2

Verification that each required pump is OPERABLE ensures that redundancy for heat removal is provided. The requirement also ensures that an additional loop can be placed in operation if needed to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to each required pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. [ The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.8.3

DHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the DHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of DHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations

depend on plant and system configuration, such as stand-by versus operating conditions.

The DHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the DHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

DHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the DHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

BASES

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## LCO

In MODES 1, 2, and 3, two independent (and redundant) ECCS trains are required to ensure that at least one is available, assuming a single failure in the other train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODES 1, 2, and 3, an ECCS train consists of an HPI subsystem and an LPI subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the BWST upon an ESFAS signal and manually transferring suction to the containment sump.

During an event requiring ECCS actuation, a flow path is provided to ensure an abundant supply of water from the BWST to the RCS via the HPI and LPI pumps and their respective discharge flow paths to each of the four cold leg injection nozzles and the reactor vessel. In the long term, this flow path may be manually transferred to take its supply from the containment sump and to supply its flow to the RCS via two paths, as described in the Background section. *Management of gas voids is important to ECCS OPERABILITY.*

The flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.

As indicated in the Note, operation in MODE 3 with ECCS trains de-activated pursuant to LCO 3.4.12 is necessary for plants with an LTOP System arming temperature at or near the MODE 3 boundary temperature of [350]°F. LCO 3.4.12 requires that certain components be de-activated at and below the LTOP System arming temperature. When this temperature is at or near the MODE 3 boundary temperature, time is needed to restore the systems to OPERABLE status.

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## APPLICABILITY

In MODES 1, 2, and 3, the ECCS train OPERABILITY requirements for the limiting Design Basis Accident, a large break LOCA, are based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The HPI pump performance is based on the small break LOCA, which establishes the pump performance curve and is less dependent on power. The HPI pump performance requirements are based on a small break LOCA. MODES 2 and 3 requirements are bounded by the MODE 1 analysis.

In MODES 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops - MODE 5, Loops

BASES

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SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.5.2.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS 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 that receives an actuation signal is allowed to be in a nonaccident position provided the valve will automatically reposition within the proper stroke time. This Surveillance does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. [ The 31 day Frequency is appropriate because the valves are operated under administrative control, and an inoperable valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the*



*operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.3

~~ECCS piping and components have the With the exception of systems in operation, the ECCS pumps are normally in a standby, nonoperating mode. As such, the flow path piping has the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for Maintaining the piping from the ECCS pumps to the RCS full of water proper operation of the ECCS and may also ensures that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, and pumping of noncondensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel. following an ESFAS signal or during shutdown cooling.~~

*Selection of ECCS locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The ECCS is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*ECCS locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location.*

*Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the existence of procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. *The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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#### SR 3.5.2.4

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code (Ref. 6). This type of testing may be accomplished by measuring the pump's developed head at only one point of the pump's characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant accident analysis. SRs are specified in the Inservice Testing Program of the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

## B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

## B 3.5.3 ECCS - Shutdown

## BASES

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BACKGROUND	<p>The Background section for Bases B 3.5.2, "ECCS - Operating," is applicable to these Bases, with the following modifications.</p> <p>In MODE 4, the required ECCS train consists of two separate subsystems: high pressure injection (HPI) and low pressure injection (LPI), each consisting of two redundant, 100% capacity trains.</p> <p>The ECCS flow paths consist of piping, valves, heat exchangers, and pumps, such that water from the borated water storage tank (BWST) can be injected into the Reactor Coolant System (RCS) following the accidents described in Bases 3.5.2.</p>
APPLICABLE SAFETY ANALYSES	<p>The Applicable Safety Analyses section of Bases 3.5.2 is applicable to these Bases.</p> <p>Due to the stable conditions associated with operation in MODE 4 and the reduced probability of occurrence of a Design Basis Accident (DBA), the ECCS operational requirements are reduced. Included in these reductions is that certain automatic Engineered Safety Feature Actuation System (ESFAS) actuation is not available. In this MODE sufficient time exists for manual actuation of the required ECCS to mitigate the consequences of a DBA.</p> <p>Only one ECCS train is required for MODE 4. This requirement dictates that single failures are not considered during this MODE. The ECCS train - shutdown satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>In MODE 4, one of the two independent (and redundant) ECCS trains is required to ensure sufficient ECCS flow is available to the core following a DBA.</p> <p>In MODE 4, an ECCS train consists of an HPI subsystem and an LPI subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the BWST and transferring suction to the containment sump.</p> <p>During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the BWST to the RCS, via the ECCS pumps and their respective supply headers, to each of the four cold leg injection nozzles. In the long term, this flow path may be switched to take its supply from the containment sump and to supply its flow to the RCS hot and cold legs. <u>Management of gas voids is important to ECCS OPERABILITY.</u></p>

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## BASES

## APPLICABLE SAFETY ANALYSES (continued)

The Containment Spray System and the Containment Cooling System satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

During a DBA, a minimum of one containment cooling train and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits. Additionally, one containment spray train is required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling units must be OPERABLE. Therefore, in the event of an accident, the minimum requirements are met, assuming the worst-case single active failure occurs.

Each Containment Spray System typically includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the BWST upon an Engineered Safety Features Actuation System signal and manually transferring suction to the containment sump. *Management of gas voids is important to Containment Spray System OPERABILITY.*

Each Containment Cooling System typically includes demisters, cooling coils, dampers, an axial flow fan driven by a two speed water cooled electrical motor, instruments, and controls to ensure an OPERABLE flow path.

## APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature, requiring the operation of the containment spray trains and containment cooling trains.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the Containment Spray System and the Containment Cooling System are not required to be OPERABLE in MODES 5 and 6.

## ACTIONS

A.1

With one containment spray train inoperable, action must be taken to restore it to OPERABLE status within [7] days. In this condition, the remaining OPERABLE containment spray train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure to the remaining containment spray train could result in loss of spray function. The [7] day Completion Time is reasonable to perform corrective maintenance on the inoperable containment spray

## BASES

SURVEILLANCE  
REQUIREMENTSSR 3.6.6.1

Verifying the correct alignment for manual, power operated, and automatic valves in the containment spray flow path provides assurance that the proper flow paths will exist for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This SR 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 31 day Frequency is appropriate because the valves are operated under administrative control, and an inoperable valve position would only affect a single train. The Frequency has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

## -----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6.2

Operating each [required] containment cooling train fan unit for  $\geq 15$  minutes ensures that all trains 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. [ The 31 day Frequency was developed considering the known reliability of the fan units and controls, the two train redundancy available, and the low probability of a significant degradation of the

containment cooling trains occurring between surveillances and has been shown to be acceptable through operating experience.

OR

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6.3

Verifying that each [required] containment cooling train provides an essential raw water cooling flow rate of  $\geq$  [1780] gpm to each cooling unit provides assurance that the design flow rate assumed in the safety analyses will be achieved (Ref. 1). [ The Frequency was developed considering the known reliability of the Cooling Water System, the two train redundancy available, and the low probability of a significant degradation of flow occurring between surveillances.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6.4

*Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required containment spray trains and may also prevent water hammer and pump cavitation.*

*Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is*



*supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation.*

*OR*

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

*-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency*

*description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*

SR 3.6.6.54

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 7). Since the Containment Spray System pumps cannot be tested with flow through the

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests 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.

SR 3.6.6.65 and SR 3.6.6.76

These SRs require verification that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated actuation signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. [ The [18] month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

## -----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

SR 3.6.6.87

This SR requires verification that each [required] containment cooling train actuates upon receipt of an actual or simulated actuation signal. [ The [18] month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.6.65 and SR 3.6.6.76, above, for further discussion of the basis for the [18] month Frequency.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6.98

With the containment spray header isolated and drained of any solution, low pressure air or smoke can be blown through test connections. Performance of this Surveillance demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded. [ Due to the passive nature of the design of the nozzles, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

## REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40, GDC 41, GDC 42, and GDC 43.
2. FSAR, Section [14.1].
3. FSAR, Section [6.3].

BASES

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## LCO (continued)

- a. Removal of decay heat,
- b. Mixing of borated coolant to minimize the possibility of criticality, and
- c. Indication of reactor coolant temperature.

An OPERABLE DHR loop includes a DHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

Management of gas voids is important to DHR System OPERABILITY.

Additionally, each DHR loop is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. Operation of one subsystem can maintain the reactor coolant temperature as required.

The LCO is modified by a Note that allows the required DHR loop to be removed from operation for up to 1 hour in an 8 hour period, provided no operations are permitted that would dilute the RCS boron concentration by introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with coolant at boron concentrations less than required to assure the RCS boron concentration is maintained is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles and RCS to DHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity.

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APPLICABILITY

One DHR loop must be OPERABLE and in operation in MODE 6, with the water level  $\geq 23$  ft above the top of the reactor vessel flange, to provide decay heat removal. The 23 ft water level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.6, "Refueling Canal Water Level." Requirements for the DHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). DHR loop requirements in MODE 6, with the water level  $< 23$  ft above the top of the reactor vessel flange, are located in LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation - Low Water Level."

## BASES

## ACTIONS (continued)

With DHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Performing the actions stated above ensures that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded.

The Completion Time of 4 hours allows fixing of most DHR problems and is reasonable, based on the low probability of the coolant boiling in that time.

SURVEILLANCE  
REQUIREMENTSSR 3.9.4.1

This Surveillance demonstrates that the DHR loop is in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. [ The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the control room for monitoring the DHR System.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

SR 3.9.4.2

DHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required DHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of DHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the

location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The DHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the DHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

DHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the DHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

## BASES

## LCO (continued)

This LCO is modified by two Notes. Note 1 permits the DHR pumps to be removed from operation for  $\leq 15$  minutes when switching from one train to another. The circumstances for stopping both DHR pumps are to be limited to situations when the outage time is short [and the core outlet temperature is maintained  $> 10$  degrees F below saturation temperature]. The Note prohibits boron dilution of draining operations by introduction of coolant into the RCS with boron concentrations less than required to meet the minimum boron concentration of LCO 3.9.1 when DHR forced flow is stopped.

Note 2 allows one DHR loop to be inoperable for a period of 2 hours provided the other loop is OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that the capability exists to inject borated water into the reactor vessel. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

An OPERABLE DHR loop consists of a DHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

Management of gas voids is important to DHR System OPERABILITY.

Both DHR pumps may be aligned to the Refueling Water Storage Tank to support filling or draining the refueling cavity or for performance of required testing.

## APPLICABILITY

Two DHR loops are required to be OPERABLE, and one in operation in MODE 6, with the water level  $< 23$  ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the DHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). DHR loop requirements in MODE 6, with the water level  $\geq 23$  ft above the top of the reactor vessel flange, are located in LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation - High Water Level."

## ACTIONS

A.1 and A.2

With fewer than the required loops OPERABLE, action shall be immediately initiated and continued until the DHR loop is restored to OPERABLE status or until  $\geq 23$  ft of water level is established above the reactor vessel flange. When the water level is established at  $\geq 23$  ft above the reactor vessel flange, the Applicability will change to that of



## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.5.2

Verification that the required pump is OPERABLE ensures that an additional DHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump. [ The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.9.5.3

DHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the DHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of DHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The DHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of

accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the DHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

DHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the DHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## REFERENCES

1. FSAR, Section [ ] .
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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.4.6.2      Verify SG secondary side water levels are <math>\geq</math> [17]% for required RCS loops.</p>	<p>[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]</p>
<p>SR 3.4.6.3      -----NOTE-----  Not required to be performed until 24 hours after a required pump is not in operation.  -----   Verify correct breaker alignment and indicated power are available to each required pump.</p>	<p>[ 7 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]</p>
<p><u>SR 3.4.6.4</u>      -----NOTE-----  <u>Not required to be performed until 12 hours after entering MODE 4.</u>  -----   <u>Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u></p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.7.1	Verify required RHR loop is in operation.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.4.7.2	Verify SG secondary side water level is $\geq$ [17]% in required SGs.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.4.7.3	-----NOTE----- Not required to be performed until 24 hours after a required pump is not in operation. -----  Verify correct breaker alignment and indicated power are available to each required RHR pump.	[ 7 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.4.7.4</u>	<u>Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	[ <u>31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency</u>

SURVEILLANCE	FREQUENCY
	<u>Control Program I</u>

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.4.8.2</p> <p>-----NOTE-----            Not required to be performed until 24 hours after a            required pump is not in operation.            -----</p> <p>Verify correct breaker alignment and indicated            power are available to each required RHR pump.</p>	<p>[ 7 days</p> <p><u>OR</u></p> <p>In accordance            with the            Surveillance            Frequency            Control Program ]</p>
<p><u>SR 3.4.8.3</u>      <u>Verify RHR loop locations susceptible to gas            accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u></p> <p><u>OR</u></p> <p><u>In accordance</u>  <u>with the</u>  <u>Surveillance</u>  <u>Frequency</u>  <u>Control Program ]</u></p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY												
SR 3.5.2.1	<p>[ Verify the following valves are in the listed position with power to the valve operator removed.</p> <table border="0"> <thead> <tr> <th><u>Number</u></th> <th><u>Position</u></th> <th><u>Function</u></th> </tr> </thead> <tbody> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> </tbody> </table>	<u>Number</u>	<u>Position</u>	<u>Function</u>	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	<p>[ 12 hours</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<u>Number</u>	<u>Position</u>	<u>Function</u>												
[ ]	[ ]	[ ]												
[ ]	[ ]	[ ]												
[ ]	[ ]	[ ]												
SR 3.5.2.2	<p><del>Verify each ECCS 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.</del></p> <p><u>-----NOTE-----</u>  <u>Not required to be met for system vent flow paths opened under administrative control.</u>  <u>-----</u></p> <p>Verify each ECCS 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>												
SR 3.5.2.3	<p><del>Verify ECCS locations susceptible to gas accumulation are sufficiently filled with water. Verify ECCS piping is full of water.</del></p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>												
SR 3.5.2.4	<p>Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.</p>	<p>In accordance with the Inservice Testing Program</p>												

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Two containment spray trains inoperable.  <u>OR</u>  Any combination of three or more trains inoperable.	F.1 Enter LCO 3.0.3.	Immediately

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.6A.1  <div style="border: 1px solid red; padding: 5px; margin: 5px 0;"> <p style="text-align: center;">-----NOTE-----</p> <p style="text-align: center;"><u>Not required to be met for system vent flow paths opened under administrative control.</u></p> </div> Verify each containment spray 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.	[ 31 days  <u>OR</u> In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6A.2  Operate each [required] containment cooling train fan unit for $\geq 15$ minutes.	[ 31 days  <u>OR</u> In accordance with the Surveillance Frequency Control Program ]



Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6A.3      Verify each [required] containment cooling train cooling water flow rate is $\geq$ [700] gpm.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.6.6A.4</u> <u>Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.6A. <u>45</u> Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.6A. <u>56</u> Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6A. <u>67</u> Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

	Frequency Control Program ]
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Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6A. <del>78</del> Verify each [required] containment cooling train starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6A. <del>89</del> Verify each spray nozzle is unobstructed.	[At first refueling]  <u>AND</u>  [ 10 years  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Two [required] containment cooling trains inoperable.	E.1 Restore one [required] containment cooling train to OPERABLE status.	72 hours
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met.	F.1 Be in MODE 3. <u>AND</u> F.2 Be in MODE 5.	6 hours  36 hours
G. Any combination of three or more trains inoperable.	G.1 Enter LCO 3.0.3.	Immediately

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.6B.1 <p style="text-align: center;"><u>-----NOTE-----</u>  <u>Not required to be met for system vent flow paths opened under administrative control.</u>  <u>-----</u></p> Verify each containment spray 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.	[ 31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program ]

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6B.2      Operate each [required] containment cooling train fan unit for $\geq 15$ minutes.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6B.3      Verify each [required] containment cooling train cooling water flow rate is $\geq [700]$ gpm.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.6.6B.4</u> <u>Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.6B. <u>54</u> Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.6B. <u>65</u> Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the

Containment Spray and Cooling Systems (Atmospheric and Dual)

3.6.6B

	Surveillance Frequency Control Program ]
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Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6B. <del>76</del> Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6B. <del>87</del> Verify each [required] containment cooling train starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6B. <del>98</del> Verify each spray nozzle is unobstructed.	[At first refueling]  <u>AND</u>  [ 10 years  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

Containment Spray System (Ice Condenser)  
3.6.6C

## 3.6 CONTAINMENT SYSTEMS

## 3.6.6C Containment Spray System (Ice Condenser)

LCO 3.6.6C Two containment spray trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

## ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One containment spray train inoperable.	A.1 Restore containment spray train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u> B.2 Be in MODE 5.	84 hours

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.6C.1 <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p style="text-align: center;"><del>-----NOTE-----</del></p> <p style="text-align: center;"><u>Not required to be met for system vent flow paths opened under administrative control.</u></p> </div> <p>Verify each containment spray 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.</p>	[ 31 days  <u>OR</u> In accordance with the Surveillance Frequency Control Program ]



## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p><u>SR 3.6.6C.2</u>     <u>Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.</u></p>	<p>[ 31 days</p> <p><u>OR</u></p> <p><u>In accordance with the Surveillance Frequency Control Program ]</u></p>
<p>SR 3.6.6C.<del>32</del>     Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.</p>	<p>In accordance with the Inservice Testing Program</p>
<p>SR 3.6.6C.<del>43</del>     Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.</p>	<p>[ [18] months</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<p>SR 3.6.6C.<del>54</del>     Verify each containment spray pump starts automatically on an actual or simulated actuation signal.</p>	<p>[ [18] months</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<p>SR 3.6.6C.<del>65</del>     Verify each spray nozzle is unobstructed.</p>	<p>[At first refueling]</p> <p><u>AND</u></p> <p>[ 10 years</p> <p><u>OR</u></p>

	In accordance with the Surveillance Frequency Control Program ]
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## 3.6 CONTAINMENT SYSTEMS

## 3.6.6D Quench Spray (QS) System (Subatmospheric)

LCO 3.6.6D Two QS trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

## ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One QS train inoperable.	A.1 Restore QS train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u> B.2 Be in MODE 5.	36 hours

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.6D.1 <p style="text-align: center;"><del>-----NOTE-----</del>  <u>Not required to be met for system vent flow paths opened under administrative control.</u></p> <hr/> Verify each QS 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.	[ 31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.6.6D.2</u> <u>Verify QS locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u> <u>OR</u>

SURVEILLANCE	FREQUENCY
	<u>In accordance with the Surveillance Frequency Control Program.]</u>
SR 3.6.6D. <del>32</del> Verify each QS pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6D. <del>43</del> Verify each QS automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6D. <del>54</del> Verify each QS pump starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6D. <del>65</del> Verify each spray nozzle is unobstructed.	[At first refueling]  <u>AND</u>  [ 10 years  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6E.1	Verify casing cooling tank temperature is $\geq [35]^{\circ}\text{F}$ and $\leq [50]^{\circ}\text{F}$ .	[ 24 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6E.2	Verify casing cooling tank contained borated water volume is $\geq [116,500]$ gal.	[ 7 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6E.3	Verify casing cooling tank boron concentration is $\geq [2300]$ ppm and $\leq [2400]$ ppm.	[ 7 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6E.4	<p>-----<u>NOTE</u>-----  <u>Not required to be met for system vent flow paths opened under administrative control.</u>  -----</p> <p>Verify each RS [and casing cooling] 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.</p>	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p><u>SR 3.6.6E.5</u>     <u>Verify RS locations susceptible to gas accumulation are sufficiently filled with water.</u></p>	<p>[ 31 days</p> <p><u>OR</u></p> <p><u>In accordance with the Surveillance Frequency Control Program ]</u></p>
<p>SR 3.6.6E.<u>65</u>     Verify each RS [and casing cooling] pump's developed head at the flow test point is greater than or equal to the required developed head.</p>	<p>In accordance with the Inservice Testing Program</p>
<p>SR 3.6.6E.<u>76</u>     Verify on an actual or simulated actuation signal(s):</p> <ul style="list-style-type: none"> <li>a. Each RS automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position,</li> <li>b. Each RS pump starts automatically, and</li> <li>c. [ Each casing cooling pump starts automatically. ]</li> </ul>	<p>[ [18] months</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<p>SR 3.6.6E.<u>87</u>     Verify each spray nozzle is unobstructed.</p>	<p>[ At first refueling ]</p> <p><u>AND</u></p> <p>[ 10 years</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>

RHR and Coolant Circulation - High Water Level  
3.9.5

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.4 Close equipment hatch and secure with [four] bolts.  <u>AND</u>	4 hours
	A.5 Close one door in each air lock.  <u>AND</u>	4 hours
	A.6.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent.  <u>OR</u>	4 hours
	A.6.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.5.1 Verify one RHR loop is in operation and circulating reactor coolant at a flow rate of $\geq$ [2800] gpm.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]



RHR and Coolant Circulation - High Water Level  
3.9.5

SURVEILLANCE	FREQUENCY
<u>SR 3.9.5.2</u> <u>Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.5.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.6.1 Verify one RHR loop is in operation and circulating reactor coolant at a flow rate of $\geq$ [2800] gpm.	[ 12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program ]
SR 3.9.6.2 Verify correct breaker alignment and indicated power available to the required RHR pump that is not in operation.	[ 7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.9.6.3</u> <u>Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u> <u>OR</u> <u>In accordance with the Surveillance Frequency Control Program ]</u>

BASES

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## LCO (continued)

stopped for a short period of time. The Note permits the stopping of the pumps in order to perform this test and validate the assumed analysis values. If changes are made to the RCS that would cause a change to the flow characteristics of the RCS, the input values must be revalidated by conducting the test again. The 1 hour time period is adequate to perform the test, and operating experience has shown that boron stratification is not a problem during this short period with no forced flow.

Utilization of Note 1 is permitted provided the following conditions are met along with any other conditions imposed by initial startup test procedures:

- a. No operations are permitted that would dilute the RCS boron concentration with coolant with boron concentrations less than required to meet SDM of LCO 3.1.1, therefore maintaining the margin to criticality. Boron reduction with coolant at boron concentrations less than required to assure SDM is maintained is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation and
- b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 requires that the secondary side water temperature of each SG be  $\leq [50]^{\circ}\text{F}$  above each of the RCS cold leg temperatures before the start of an RCP with any RCS cold leg temperature  $\leq [275^{\circ}\text{F}]$  [Low Temperature Overpressure Protection (LTOP) arming temperature specified in the PTLR]. This restraint is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

An OPERABLE RCS loop comprises an OPERABLE RCP and an OPERABLE SG, which has the minimum water level specified in SR 3.4.6.2.

Similarly for the RHR System, an OPERABLE RHR loop comprises an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RCPs and RHR pumps are OPERABLE if they are capable of being powered and are able to provide forced flow if required. Management of gas voids is important to RHR System OPERABILITY.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

## -----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.6.4

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be

verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after entering MODE 4. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering MODE 4.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES      None.

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## BASES

## LCO (continued)

Note 3 requires that the secondary side water temperature of each SG be  $\leq$  [50] $^{\circ}$ F above each of the RCS cold leg temperatures before the start of a reactor coolant pump (RCP) with an RCS cold leg temperature  $\leq$  [275 $^{\circ}$ F] [Low Temperature Overpressure Protection (LTOP) arming temperature specified in the PTLR]. This restriction is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting removal of RHR loops from operation when at least one RCS loop is in operation. This Note provides for the transition to MODE 4 where an RCS loop is permitted to be in operation and replaces the RCS circulation function provided by the RHR loops.

RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. A SG can perform as a heat sink via natural circulation when it has an adequate water level and is OPERABLE. Management of gas voids is important to RHR System OPERABILITY.

## APPLICABILITY

In MODE 5 with RCS loops filled, this LCO requires forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. One loop of RHR provides sufficient circulation for these purposes. However, one additional RHR loop is required to be OPERABLE, or the secondary side water level of at least [two] SGs is required to be  $\geq$  [17]%.

Operation in other MODES is covered by:

- LCO 3.4.4, "RCS Loops - MODES 1 and 2;"
- LCO 3.4.5, "RCS Loops - MODE 3;"
- LCO 3.4.6, "RCS Loops - MODE 4;"
- LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled;"
- LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6)," and
- LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6)."

## ACTIONS

A.1, A.2, B.1 and B.2

If one RHR loop is OPERABLE and either the required SGs have secondary side water levels  $<$  [17]%, or one required RHR loop is inoperable, redundancy for heat removal is lost. Action must be initiated immediately to restore a second RHR loop to OPERABLE status or to restore the required SG secondary side water levels. Either Required

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.7.4

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be

verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES

1. NRC Information Notice 95-35, "Degraded Ability of Steam Generators to Remove Decay Heat by Natural Circulation."
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## BASES

## LCO (continued)

Note 2 allows one RHR loop to be inoperable for a period of  $\leq 2$  hours, provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

An OPERABLE RHR loop is comprised of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Management of gas voids is important to RHR System OPERABILITY.

## APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the RHR System.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2,"

LCO 3.4.5, "RCS Loops - MODE 3,"

LCO 3.4.6, "RCS Loops - MODE 4,"

LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled,"

LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6)," and

LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6)".

## ACTIONS

A.1

If one required RHR loop is inoperable, redundancy for RHR is lost. Action must be initiated to restore a second loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1 and B.2

If no required loop is OPERABLE or the required loop is not in operation, except during conditions permitted by Note 1, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action must be initiated immediately to restore an RHR loop to OPERABLE status and operation. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation,

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.8.3

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be

verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES      None.

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## BASES

## LCO (continued)

In MODES 1, 2, and 3, an ECCS train consists of a centrifugal charging subsystem, an SI subsystem, and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an SI signal and automatically transferring suction to the containment sump.

During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the ECCS pumps and their respective supply headers to each of the four cold leg injection nozzles. In the long term, this flow path may be switched to take its supply from the containment sump and to supply its flow to the RCS hot and cold legs. *Management of gas voids is important to ECCS OPERABILITY.*

The flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.

As indicated in Note 1, the SI flow paths may be isolated for 2 hours in MODE 3, under controlled conditions, to perform pressure isolation valve testing per SR 3.4.14.1. The flow path is readily restorable from the control room.

As indicated in Note 2, operation in MODE 3 with ECCS trains made incapable of injecting in order to facilitate entry into or exit from the Applicability of LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," is necessary for plants with an LTOP arming temperature at or near the MODE 3 boundary temperature of 350°F. LCO 3.4.12 requires that certain pumps be rendered incapable of injecting at and below the LTOP arming temperature. When this temperature is at or near the MODE 3 boundary temperature, time is needed to make pumps incapable of injecting prior to entering the LTOP Applicability, and provide time to restore the inoperable pumps to OPERABLE status on exiting the LTOP Applicability.

## APPLICABILITY

In MODES 1, 2, and 3, the ECCS OPERABILITY requirements for the limiting Design Basis Accident, a large break LOCA, are based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The centrifugal charging pump performance is based on a small break LOCA, which establishes the pump performance curve and has less dependence on power. The SI pump performance requirements are based on a small break LOCA. MODE 2 and MODE 3 requirements are bounded by the MODE 1 analysis.

BASES

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SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.5.2.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an actuation signal is allowed to be in a nonaccident position provided the valve will automatically reposition within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position. [ The 31 day Frequency is appropriate because the valves are operated under administrative control, and an improper valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.5.2.3

*ECCS piping and components have the ~~With the exception of the operating centrifugal charging pump, the ECCS pumps are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for~~ Maintaining the piping from the ECCS pumps to the RCS full of water proper operation of the ECCS and may also ensure that the system will perform properly, injecting its full capacity into the RCS upon demand. This will ~~also~~ prevent water hammer, pump cavitation, and pumping of noncondensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an SI signal or during shutdown cooling.*

*Selection of ECCS locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The ECCS is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*ECCS locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for*

*the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. *The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

## B 3.5.3 ECCS - Shutdown

## BASES

BACKGROUND	<p>The Background section for Bases 3.5.2, "ECCS - Operating," is applicable to these Bases, with the following modifications.</p> <p>In MODE 4, the required ECCS train consists of two separate subsystems: centrifugal charging (high head) and residual heat removal (RHR) (low head).</p> <p>The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the refueling water storage tank (RWST) can be injected into the Reactor Coolant System (RCS) following the accidents described in Bases 3.5.2.</p>
APPLICABLE SAFETY ANALYSES	<p>The Applicable Safety Analyses section of Bases 3.5.2 also applies to this Bases section.</p> <p>Due to the stable conditions associated with operation in MODE 4 and the reduced probability of occurrence of a Design Basis Accident (DBA), the ECCS operational requirements are reduced. It is understood in these reductions that certain automatic safety injection (SI) actuation is not available. In this MODE, sufficient time exists for manual actuation of the required ECCS to mitigate the consequences of a DBA.</p> <p>Only one train of ECCS is required for MODE 4. This requirement dictates that single failures are not considered during this MODE of operation. The ECCS trains satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>In MODE 4, one of the two independent (and redundant) ECCS trains is required to be OPERABLE to ensure that sufficient ECCS flow is available to the core following a DBA.</p> <p>In MODE 4, an ECCS train consists of a centrifugal charging subsystem and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST and transferring suction to the containment sump.</p> <p>During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the ECCS pumps and their respective supply headers to each of the four cold leg injection nozzles. In the long term, this flow path may be switched to take its supply from the containment sump and to deliver its flow to the RCS hot and cold legs. <u>Management of gas voids is important to ECCS OPERABILITY.</u></p>



Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

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BASES

LCO

During a DBA, a minimum of one containment cooling train and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 7). Additionally, one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling trains must be OPERABLE. Therefore, in the event of an accident, at least one train in each system operates, assuming the worst case single active failure occurs.

Each Containment Spray System typically includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an ESF actuation signal and automatically transferring suction to the containment sump. *Management of gas voids is important to Containment Spray System OPERABILITY.*

Each Containment Cooling System typically includes demisters, cooling coils, dampers, fans, instruments, and controls to ensure an OPERABLE flow path.

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APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the containment spray trains and containment cooling trains.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the Containment Spray System and the Containment Cooling System are not required to be OPERABLE in MODES 5 and 6.

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ACTIONS

A.1

With one containment spray train inoperable, the inoperable containment spray train must be restored to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE spray and cooling trains are adequate to perform the iodine removal and containment cooling functions. The 72 hour Completion Time takes into account the redundant heat removal capability afforded by the Containment Spray System, reasonable time for repairs, and low probability of a DBA occurring during this period.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6A.2

Operating each [required] containment cooling train fan unit for  $\geq 15$  minutes ensures that all trains 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. [ The 31 day Frequency was developed considering the known reliability of the fan units and controls, the two train redundancy available, and the low probability of significant degradation of the containment cooling train occurring between surveillances. It has also been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6A.3

Verifying that each [required] containment cooling train ESW cooling flow rate to each cooling unit is  $\geq [700]$  gpm provides assurance that the design flow rate assumed in the safety analyses will be achieved (Ref. 3). [ The Frequency of 3 days was developed considering the known

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

BASES

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SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6A.4

*Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the containment spray trains and may also prevent water hammer and pump cavitation.*

*Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

*Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation.*

OR

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*  
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SR 3.6.6A.45

Verifying each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 8). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by abnormal performance. The Frequency of the SR is in accordance with the Inservice Testing Program.

SR 3.6.6A.5-6 and SR 3.6.6A.67

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

These SRs require verification that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated actuation of a containment High-3 pressure signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. [ The [18] month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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The surveillance of containment sump isolation valves is also required by SR 3.5.2.5. A single surveillance may be used to satisfy both requirements.

SR 3.6.6A.78

This SR requires verification that each [required] containment cooling train actuates upon receipt of an actual or simulated safety injection signal. [ The [18] month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.6A.5-6 and SR 3.6.6A.67, above, for further discussion of the basis for the [18] month Frequency. ]

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6A.89

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded. [ Due to the passive design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40, GDC 41, GDC 42, and GDC 43.
2. 10 CFR 50, Appendix K.
3. FSAR, Section [ ].
4. FSAR, Section [ ].
5. FSAR, Section [ ].
6. FSAR, Section [ ].
7. FSAR, Section [ ].
8. ASME Code for Operation and Maintenance of Nuclear Power Plants.

## BASES

## APPLICABLE SAFETY ANALYSES (continued)

The effect of an inadvertent containment spray actuation has been analyzed. An inadvertent spray actuation results in a [-2.0] psig containment pressure and is associated with the sudden cooling effect in the interior of the leak tight containment. Additional discussion is provided in the Bases for LCO 3.6.4A.

The modeled Containment Spray System actuation from the containment analysis is based upon a response time associated with exceeding the containment High-3 pressure setpoint to achieving full flow through the containment spray nozzles. The Containment Spray System total response time of [60] seconds includes diesel generator (DG) startup (for loss of offsite power), block loading of equipment, containment spray pump startup, and spray line filling (Ref. 3).

Containment cooling train performance for post accident conditions is given in Reference 4. The result of the analysis is that each train can provide 100% of the required peak cooling capacity during the post accident condition. The train post accident cooling capacity under varying containment ambient conditions, required to perform the accident analyses, is also shown in Reference 5.

The modeled Containment Cooling System actuation from the containment analysis is based on a response time associated with exceeding the containment High-3 pressure setpoint to achieving full Containment Cooling System air and safety grade cooling water flow. The Containment Cooling System total response time of [60] seconds includes signal delay, DG startup (for loss of offsite power), and Service Water pump startup times (Ref. 6).

The Containment Spray System and the Containment Cooling System satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

During a DBA, a minimum of one containment cooling train and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 7). To ensure that these requirements are met, two containment spray trains and two containment cooling units must be OPERABLE. Therefore, in the event of an accident, at least one train in each system operates, assuming the worst case single active failure occurs.

Each Containment Spray System typically includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an ESF actuation signal and automatically transferring suction to the containment sump. *Management of gas voids is important to Containment Spray System OPERABILITY.*



Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

BASES

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SURVEILLANCE  
REQUIREMENTS

SR 3.6.6B.1

Verifying the correct alignment for manual, power operated, and automatic valves, excluding check valves, in the Containment Spray System flow path provides assurance that the proper flow path exists for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct positions prior to being secured. This SR does not require testing or valve manipulation. Rather, it involves verification that those valves outside containment (only check valves are inside containment) and capable of potentially being mispositioned are in the correct position.

[ The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6B.2

Operating each [required] containment cooling train fan unit for  $\geq 15$  minutes ensures that all trains are OPERABLE and all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. [ The 31 day Frequency was developed based on the known reliability of the fan units and controls, the two train redundancy available, and the low probability of significant degradation of the containment cooling train occurring between surveillances.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6B.3

Verifying that each [required] containment cooling train ESW cooling flow rate to each cooling unit is  $\geq$  [700] gpm provides assurance that the design flow rate assumed in the analyses will be achieved (Ref. 3). [ The Frequency of 31 days was developed considering the known reliability of the Cooling Water System, the two train redundancy available, and the low probability of a significant degradation of flow occurring between surveillances.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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[SR 3.6.6B.4](#)

*Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the containment spray trains and may also prevent water hammer and pump cavitation.*

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

*Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation.*

*OR*

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

## -----REVIEWER'S NOTE-----

*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*

SR 3.6.6B.54

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 8). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

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.

SR 3.6.6B.65 and SR 3.6.6B.76

These SRs require verification that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated containment High-3 pressure signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. [ The [18] month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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The surveillance of containment sump isolation valves is also required by SR 3.5.2.5. A single surveillance may be used to satisfy both requirements.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6B.87

This SR ensures that each [required] containment cooling train actuates upon receipt of an actual or simulated safety injection signal. [ The [18] month Frequency is based on engineering judgment and has been proven acceptable through operating experience. See SR 3.6.6B.65 and SR 3.6.6B.76, above, for further discussion of the basis for the [18] month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6B.98

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. [ Because of the passive design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

## BASES

## APPLICABLE SAFETY ANALYSES (continued)

provides conservative analyses of peak calculated containment temperature and pressure responses. The Containment Spray System total response time of [45] seconds is composed of signal delay, diesel generator startup, and system startup time.

For certain aspects of transient accident analyses, maximizing the calculated containment pressure is not conservative. In particular, the ECCS cooling effectiveness during the core reflood phase of a LOCA analysis increases with increasing containment backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the calculated transient containment pressures in accordance with 10 CFR 50, Appendix K (Ref. 4).

Inadvertent actuation of the Containment Spray System is evaluated in the analysis, and the resultant reduction in containment pressure is calculated. The maximum calculated reduction in containment pressure resulted in a containment external pressure load of [1.2] psid, which is below the containment design external pressure load.

The Containment Spray System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

During a DBA, one train of Containment Spray System is required to provide the heat removal capability assumed in the safety analyses. Additionally, a minimum of one train of the Containment Spray System, with spray pH adjusted by the Spray Additive System, is required to scavenge iodine fission products from the containment atmosphere and ensure their retention in the containment sump water. To ensure that these requirements are met, two containment spray trains must be OPERABLE with power from two safety related, independent power supplies. Therefore, in the event of an accident, at least one train in each system operates.

Each Containment Spray System typically includes a spray pump, headers, valves, heat enhancers, nozzles, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an ESF actuation signal and automatically transferring suction to the containment sump. *Management of gas voids is important to Containment Spray System OPERABILITY.*

## APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the Containment Spray System.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6C.2

*Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the containment spray trains and may also prevent water hammer and pump cavitation.*

*Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by*



*subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation.*

OR

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*  
 ----- ]

#### SR 3.6.6C.32

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential head are normal tests of centrifugal pump performance required by the ASME Code (Ref. 5). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on bypass flow. This test confirms one point on the pump design curve and is 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.

SR 3.6.6C.43 and SR 3.6.6C.54

These SRs require verification that each automatic containment spray valve actuates to its correct position and each containment spray pump starts upon receipt of an actual or simulated containment spray actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. [ The [18] month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillances when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

The surveillance of containment sump isolation valves is also required by SR 3.6.6.43. A single surveillance may be used to satisfy both requirements.

SR 3.6.6C.65

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. [ Because of the passive design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

## REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40, GDC 41, GDC 42, and GDC 43.
2. FSAR, Section [6.2].

## BASES

## APPLICABLE SAFETY ANALYSES (continued)

For certain aspects of accident analyses, maximizing the calculated containment pressure is not conservative. In particular, the cooling effectiveness of the Emergency Core Cooling System during the core reflood phase of a LOCA analysis increases with increasing containment backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the calculated transient containment pressures in accordance with 10 CFR 50, Appendix K (Ref. 3).

Inadvertent actuation of the QS System is evaluated in the analysis, and the resultant reduction in containment pressure is calculated. The maximum calculated reduction in containment pressure resulted in a containment external pressure load of [unit specific pressure], which is below the containment design external pressure load.

The QS System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

During a DBA, one train of the QS System is required to provide the heat removal capability assumed in the safety analyses for containment. In addition, one QS System train, with spray pH adjusted by the Spray Additive System, is required to scavenge iodine fission products from the containment atmosphere and ensure their retention in the containment sump water. To ensure that these requirements are met, two QS System trains must be OPERABLE with power from two safety related, independent power supplies. Therefore, in the event of an accident, at least one train in each system will operate, assuming that the worst case single active failure occurs.

Each QS System includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST. *Management of gas voids is important to QS System OPERABILITY.*

## APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the QS System.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the QS System is not required to be OPERABLE in MODE 5 or 6.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
 Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
 ----- ]

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6D.2

*QS System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the QS trains and may also prevent water hammer and pump cavitation.*

*Selection of QS System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The QS System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the QS System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*QS System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the QS System piping and the procedural controls governing system operation.*

OR

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*  
 ----- ]

SR 3.6.6D.23

Verifying that each QS pump's developed head at the flow test point is greater than or equal to the required developed head ensures that QS pump performance has not degraded during the cycle. Flow and differential head are normal tests of centrifugal pump performance required by the ASME Code (Ref. 4). Since the QS System pumps cannot be tested with flow through the spray headers, they are tested on bypass flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests 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.

SR 3.6.6D.43 and SR 3.6.6D.54

These SRs ensure that each QS automatic valve actuates to its correct position and each QS pump starts upon receipt of an actual or simulated containment spray actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. [ The [18] month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at an [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6D.65

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. [ Due to the passive nature of the design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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- 
- REFERENCES
1. FSAR, Section [6.2].
  2. 10 CFR 50.49.
  3. 10 CFR 50, Appendix K.
  4. ASME Code for Operation and Maintenance of Nuclear Power Plants.
-



## BASES

## APPLICABLE SAFETY ANALYSES (continued)

backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the calculated transient containment pressures in accordance with 10 CFR 50, Appendix K (Ref. 3).

The RS System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

During a DBA, one train (two subsystems) of the RS System is required to provide the minimum heat removal capability assumed in the safety analysis. To ensure that this requirement is met, four RS subsystems [and a casing cooling tank] must be OPERABLE. This will ensure that at least one train will operate assuming the worst case single failure occurs, which is in the ESF power supply. *Management of gas voids is important to RS System OPERABILITY.*

## APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause an increase in containment pressure and temperature requiring the operation of the RS System.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the RS System is not required to be OPERABLE in MODE 5 or 6.

## ACTIONS

A.1

With one of the RS subsystems inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. The components in this degraded condition are capable of providing at least 100% of the heat removal needs (i.e., 150% when one RS subsystem is inoperable) after an accident. The 7 day Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the RS and QS systems and the low probability of a DBA occurring during this period.

B.1

With two of the required RS subsystems inoperable in the same train, at least one of the inoperable RS subsystems must be restored to OPERABLE status within 72 hours. The components in this degraded condition are capable of providing 100% of the heat removal needs after an accident. The 72 hour Completion Time was developed taking into account the redundant heat removal capability afforded by the OPERABLE subsystems, a reasonable amount of time for repairs, and the low probability of a DBA occurring during this period.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

----- ]

SR 3.6.6E.3

Verifying the boron concentration of the solution in the casing cooling tank provides assurance that borated water added from the casing cooling tank to RS subsystems will not dilute the solution being recirculated in the containment sump. [ The 7 day Frequency of this SR was developed considering the known stability of stored borated water and the low probability of any source of diluting pure water.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

----- ]

SR 3.6.6E.4

Verifying the correct alignment of manual, power operated, and automatic valves, excluding check valves, in the RS System and casing cooling tank provides assurance that the proper flow path exists for operation of the RS System. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified as being in the correct position prior to being secured. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves outside containment and capable of potentially being mispositioned are in the correct position.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

[ The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6E.5

*RS System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RS trains and may also prevent water hammer and pump cavitation.*

*Selection of RS System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The RS System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of*

*accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RS System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*RS System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RS System piping and the procedural controls governing system operation.*

OR

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*  
 ----- ]

#### SR 3.6.6E.65

Verifying that each RS [and casing cooling] pump's developed head at the flow test point is greater than or equal to the required developed head ensures that these pumps' performance has not degraded during the cycle. Flow and differential head are normal tests of centrifugal pump performance required by the ASME Code (Ref. 4). Since the QS System pumps cannot be tested with flow through the spray headers, they are

tested on bypass flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests 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.

SR 3.6.6E.76

These SRs ensure that each automatic valve actuates and that the RS System and casing cooling pumps start upon receipt of an actual or simulated High-High containment pressure signal. Start delay times are also verified for the RS System pumps. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. [ 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

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

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

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.6.6E.87

This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment will meet its design bases objective. An air or smoke test is performed through each spray header. [ Due to the passive design of the spray header and its normally dry state, a test at [the first refueling and at] 10 year intervals is considered adequate for detecting obstruction of the nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

## BASES

## LCO (continued)

An OPERABLE RHR loop includes an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

Management of gas voids is important to RHR System OPERABILITY.

The LCO is modified by a Note that allows the required operating RHR loop to be removed from operation for up to 1 hour per 8 hour period, provided no operations are permitted that would dilute the RCS boron concentration by introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with coolant at boron concentrations less than required to assure the RCS boron concentration is maintained is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles and RCS to RHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity.

## APPLICABILITY

One RHR loop must be OPERABLE and in operation in MODE 6, with the water level  $\geq$  23 ft above the top of the reactor vessel flange, to provide decay heat removal. The 23 ft water level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.7, "Refueling Cavity Water Level." Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level  $<$  23 ft are located in LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level."

## ACTIONS

RHR loop requirements are met by having one RHR loop OPERABLE and in operation, except as permitted in the Note to the LCO.

A.1

If RHR loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that what would be required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

## BASES

SURVEILLANCE  
REQUIREMENTSSR 3.9.5.1

This Surveillance demonstrates that the RHR loop is in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. [ The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the control room for monitoring the RHR System.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.9.5.2

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump).



the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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REFERENCES      1. FSAR, Section [5.5.7].

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## BASES

## LCO (continued)

temperature is maintained > 10 degrees F below saturation temperature]. The Note prohibits boron dilution or draining operations when RHR forced flow is stopped.

Note 2 allows one RHR loop to be inoperable for a period of 2 hours provided the other loop is OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that the capability exists to inject borated water into the reactor vessel. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

An OPERABLE RHR loop consists of an RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

Management of gas voids is important to RHR System OPERABILITY.

Both RHR pumps may be aligned to the Refueling Water Storage Tank to support filling or draining the refueling cavity or for performance of required testing.

## APPLICABILITY

Two RHR loops are required to be OPERABLE, and one RHR loop must be in operation in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level  $\geq$  23 ft are located in LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level."

## ACTIONS

A.1 and A.2

If less than the required number of RHR loops are OPERABLE, action shall be immediately initiated and continued until the RHR loop is restored to OPERABLE status and to operation or until  $\geq$  23 ft of water level is established above the reactor vessel flange. When the water level is  $\geq$  23 ft above the reactor vessel flange, the Applicability changes to that of LCO 3.9.5, and only one RHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

SR 3.9.6.3

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.6.2	Verify secondary side water level in required SG(s) is $\geq$ [25]%.  	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.4.6.3	-----NOTE----- Not required to be performed until 24 hours after a required pump is not in operation.  -----  Verify correct breaker alignment and indicated power available to each required pump.	[ 7 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.4.6.4</u>	-----NOTE----- <u>Not required to be performed until 12 hours after entering MODE 4.</u>  -----  <u>Verify required SDC train locations susceptible to gas accumulation are sufficiently filled with water.</u>	[ <u>31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>



SURVEILLANCE	FREQUENCY
	<u>Control Program I</u>

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.4.8.2</p> <p>-----NOTE-----            Not required to be performed until 24 hours after a            required pump is not in operation.            -----</p> <p>Verify correct breaker alignment and indicated            power available to each required SDC pump.</p>	<p>[ 7 days</p> <p><u>OR</u></p> <p>In accordance            with the            Surveillance            Frequency            Control Program ]</p>
<p><u>SR 3.4.8.3</u>      <u>Verify SDC train locations susceptible to gas            accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u></p> <p><u>OR</u></p> <p><u>In accordance</u>  <u>with the</u>  <u>Surveillance</u>  <u>Frequency</u>  <u>Control Program ]</u></p>



ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Less than 100% of the ECCS flow equivalent to a single OPERABLE train available.	D.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY												
SR 3.5.2.1	<p>[ Verify the following valves are in the listed position with power to the valve operator removed [and key locked in position].</p> <table border="0"> <thead> <tr> <th><u>Valve Number</u></th> <th><u>Position</u></th> <th><u>Function</u></th> </tr> </thead> <tbody> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> <tr> <td>[ ]</td> <td>[ ]</td> <td>[ ]</td> </tr> </tbody> </table>	<u>Valve Number</u>	<u>Position</u>	<u>Function</u>	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	<p>[ 12 hours</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ] ]</p>
<u>Valve Number</u>	<u>Position</u>	<u>Function</u>												
[ ]	[ ]	[ ]												
[ ]	[ ]	[ ]												
[ ]	[ ]	[ ]												
SR 3.5.2.2	<p>-----<u>NOTE</u>-----  <u>Not required to be met for system vent flow paths opened under administrative control.</u>        -----</p> <p>Verify each ECCS 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>												

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.5.2.3 <u>Verify ECCS locations susceptible to gas accumulation are sufficiently filled with water</u> <del>[Verify ECCS piping is full of water.</del>	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.2.4 Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.2.5 [ Verify each charging pump develops a flow of $\geq$ [36] gpm at a discharge pressure of $\geq$ [2200] psig.	In accordance with the Inservice Testing Program ]
SR 3.5.2.6 Verify each ECCS automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.2.7 Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Two containment cooling trains inoperable.	E.1 Restore one containment cooling train to OPERABLE status.	72 hours
F. Required Action and associated Completion Time of Condition C, D, or E not met.	F.1 Be in MODE 3.	6 hours
	<p><u>AND</u></p> <p>F.2 -----NOTE----- LCO 3.0.4.a is not applicable when entering MODE 4. -----</p> <p>Be in MODE 4.</p>	12 hours
<p>G. Two containment spray trains inoperable.</p> <p><u>OR</u></p> <p>Any combination of three or more trains inoperable.</p>	G.1 Enter LCO 3.0.3.	Immediately

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.6A.1</p> <p style="text-align: center;"><u>-----NOTE-----</u> <u>Not required to be met for system vent flow paths opened under administrative control.</u> <u>-----</u></p> <p>Verify each containment spray 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6A.2      Operate each containment cooling train fan unit for $\geq 15$ minutes.	[31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6A.3      Verify each containment cooling train cooling water flow rate is $\geq [2000]$ gpm to each fan cooler.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6A.4      [ Verify the containment spray piping is full of water to the [100] ft level in the containment spray header.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ] ]
<u>SR 3.6.6A.5</u> <u>Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.6A. <del>65</del> Verify each containment spray pump's developed	In accordance

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

head at the flow test point is greater than or equal to the required developed head.	with the Inservice Testing Program
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Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6A. <del>76</del> Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6A. <del>87</del> Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6A. <del>98</del> Verify each containment cooling train starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6A

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6A.109 Verify each spray nozzle is unobstructed.	[ At first refueling ]  <u>AND</u>  [ 10 years  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Two containment cooling trains inoperable.	E.1 Restore one containment cooling train to OPERABLE status.	72 hours
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met.	F.1 Be in MODE 3.	6 hours
	<p><u>AND</u></p> <p>F.2 -----NOTE----- LCO 3.0.4.a is not applicable when entering MODE 4. -----</p> <p>Be in MODE 4.</p>	12 hours
G. Any combination of three or more trains inoperable.	G.1 Enter LCO 3.0.3.	Immediately

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.6B.1</p> <p style="text-align: center;"><del>-----NOTE-----</del></p> <p style="text-align: center;"><u>Not required to be met for system vent flow paths opened under administrative control.</u></p> <p>Verify each containment spray 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>



Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6B.2      Operate each containment cooling train fan unit for $\geq$ 15 minutes.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6B.3      Verify each containment cooling train cooling water flow rate is $\geq$ [2000] gpm to each fan cooler.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6B.4      [ Verify the containment spray piping is full of water to the [100] ft level in the containment spray header.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ] ]
<u>SR 3.6.6B.5</u> <u>Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.6B. <del>65</del> Verify each containment spray pump's developed	In accordance

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

head at the flow test point is greater than or equal to the required developed head.	with the Inservice Testing Program
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Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6B. <del>76</del> Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to its correct position on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6B. <del>87</del> Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.6B. <del>98</del> Verify each containment cooling train starts automatically on an actual or simulated actuation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

Containment Spray and Cooling Systems (Atmospheric and Dual)  
3.6.6B

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6B. <del>109</del> Verify each spray nozzle is unobstructed.	[ At first refueling ]  AND  [ 10 years  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.4.1      Verify one SDC loop is in operation and circulating reactor coolant at a flow rate of $\geq$ [2200] gpm.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.9.4.2      Verify required SDC loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify required SDC loops are OPERABLE and one SDC loop is in operation.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.9.5.2	Verify correct breaker alignment and indicated power available to the required SDC pump that is not in operation.	[ 7 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.9.5.3</u>	<u>Verify SDC loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

BASES

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## LCO (continued)

pumps are stopped. As decay heat diminishes, the effects on RCS temperature and pressure diminish. Without cooling by forced flow, higher heat loads will cause the reactor coolant temperature and pressure to increase at a rate proportional to the decay heat load. Because pressure can increase, the applicable system pressure limits (pressure and temperature (P/T) limits or low temperature overpressure protection (LTOP) limits) must be observed and forced SDC flow or heat removal via the SGs must be re-established prior to reaching the pressure limit. The circumstances for stopping both RCPs or SDC pumps are to be limited to situations where:

- a. Pressure and temperature increases can be maintained well within the allowable pressure (P/T limits and LTOP) and 10°F subcooling limits or
- b. An alternate heat removal path through the SGs is in operation.

Note 2 requires that either of the following two conditions be satisfied before an RCP may be started with any RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR:

- a. Pressurizer water level is < [60]% or
- b. Secondary side water temperature in each SG is < [100]°F above each of the RCS cold leg temperatures.

Satisfying either of the above conditions will preclude a large pressure surge in the RCS when the RCP is started.

An OPERABLE RCS loop consists of at least one OPERABLE RCP and an SG that is OPERABLE and has the minimum water level specified in SR 3.4.6.2.

Similarly, for the SDC System, an OPERABLE SDC train is composed of the OPERABLE SDC pump(s) capable of providing forced flow to the SDC heat exchanger(s). RCPs and SDC pumps are OPERABLE if they are capable of being powered and are able to provide flow if required.

[Management of gas voids is important to SDC System OPERABILITY.](#)

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.6.3

Verification that each required pump is OPERABLE ensures that an additional RCS loop or SDC train can be placed in operation, if needed to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to each required pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. [ The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.6.4

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required SDC train(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.



The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after entering MODE 4. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering MODE 4.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

BASES

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## LCO (continued)

Note 3 requires that either of the following two conditions be satisfied before an RCP may be started with any RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR:

- a. Pressurizer water level must be < [60]% or
- b. Secondary side water temperature in each SG must be < [100]°F above each of the RCS cold leg temperatures.

Satisfying either of the above conditions will preclude a low temperature overpressure event due to a thermal transient when the RCP is started.

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting SDC trains to not be in operation when at least one RCP is in operation. This Note provides for the transition to MODE 4 where an RCP is permitted to be in operation and replaces the RCS circulation function provided by the SDC trains.

An OPERABLE SDC train is composed of an OPERABLE SDC pump and an OPERABLE SDC heat exchanger. Management of gas voids is important to SDC System OPERABILITY.

SDC pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. A SG can perform as a heat sink via natural circulation when it has an adequate water level and is OPERABLE.

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## APPLICABILITY

In MODE 5 with RCS loops filled, this LCO requires forced circulation to remove decay heat from the core and to provide proper boron mixing. One SDC train provides sufficient circulation for these purposes.

Operation in other MODES is covered by:

- LCO 3.4.4, "RCS Loops - MODES 1 and 2,"
- LCO 3.4.5, "RCS Loops - MODE 3,"
- LCO 3.4.6, "RCS Loops - MODE 4,"
- LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled,"
- LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation - High Water Level" (MODE 6), and
- LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation - Low Water Level" (MODE 6).

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.7.3

Verification that each required SDC train is OPERABLE ensures that redundant paths for decay heat removal are available. The requirement also ensures that the additional train can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to each required pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. The Surveillance is required to be performed when the LCO requirement is being met by one of two SDC trains, e.g., both SGs have < [25]% water level. [ The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.7.4

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required SDC train(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to

remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## BASES

## LCO (continued)

An OPERABLE SDC train is composed of an OPERABLE SDC pump capable of providing forced flow to an OPERABLE SDC heat exchanger, along with the appropriate flow and temperature instrumentation for control, protection, and indication. SDC pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Management of gas voids is important to SDC System OPERABILITY.

## APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the SDC System.

Operation in other MODES is covered by:

- LCO 3.4.4, "RCS Loops - MODES 1 and 2,"
- LCO 3.4.5, "RCS Loops - MODE 3,"
- LCO 3.4.6, "RCS Loops - MODE 4,"
- LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled,"
- LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation - High Water Level" (MODE 6), and
- LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation - Low Water Level" (MODE 6).

## ACTIONS

A.1

If one required SDC train is inoperable, redundancy for heat removal is lost. Action must be initiated immediately to restore a second train to OPERABLE status. The Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1 and B.2

If no required SDC train is OPERABLE or the required train is not in operation, except as provided in Note 1, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended. Action to restore one SDC train to OPERABLE status and operation must be initiated immediately. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Time reflects the importance of maintaining operation for decay heat removal.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.8.3

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the SDC trains and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be

verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES      None.

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## BASES

## APPLICABLE SAFETY ANALYSES (continued)

The LCO ensures that an ECCS train will deliver sufficient water to match decay heat boiloff rates soon enough to minimize core uncover for a large LOCA. It also ensures that the HPSI pump will deliver sufficient water during a small break LOCA and provide sufficient boron to maintain the core subcritical following an SLB. For smaller LOCAs, the charging pumps deliver sufficient fluid to maintain RCS inventory until the RCS can be depressurized below the HPSI pumps' shutoff head. During this period of a small break LOCA, the SGs continue to serve as the heat sink providing core cooling.

ECCS - Operating satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

In MODES 1, 2, and 3, with pressurizer pressure  $\geq 1700$  psia, two independent (and redundant) ECCS trains are required to ensure that sufficient ECCS flow is available, assuming there is a single failure affecting either train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODES 1 and 2, and in MODE 3 with pressurizer pressure  $\geq 1700$  psia, an ECCS train consists of an HPSI subsystem, an LPSI subsystem, and a charging pump.

Each train includes the piping, instruments, and controls to ensure the availability of an OPERABLE flow path capable of taking suction from the RWT on an SIAS and automatically transferring suction to the containment sump upon a recirculation actuation signal (RAS).

*Management of gas voids is important to ECCS OPERABILITY.*

During an event requiring ECCS actuation, a flow path is provided to ensure an abundant supply of water from the RWT to the RCS, via the HPSI and LPSI pumps and their respective supply headers, to each of the four cold leg injection nozzles. In the long term, this flow path may be switched to take its supply from the containment sump and to supply part of its flow to the RCS hot legs via the shutdown cooling (SDC) suction nozzles. The charging pump flow path takes suction from the RWT and supplies the RCS via the normal charging lines.

The flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.



## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS 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 that receives an actuation signal is allowed to be in a nonaccident position provided the valve automatically repositions within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position.

[ The 31 day Frequency is appropriate because the valves are operated under procedural control and an improper valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.5.2.3

*ECCS piping and components have the ~~With the exception of systems in operation, the ECCS pumps are normally in a standby, nonoperating mode. As such, flow path piping has the~~ potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for ~~Maintaining the piping from the ECCS~~*

~~pumps to the RCS full of water proper operation of the ECCS and may also ensure that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, and pumping of noncondensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an SIAS or during SDG.~~

*Selection of ECCS locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The ECCS is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*ECCS locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the adequacy of the procedural controls governing system operation.

BASES

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SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. *The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.5.2.4

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the unit safety analysis. SRs are specified in the Inservice Testing Program of the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.5

Discharge head at design flow is a normal test of charging pump performance required by the ASME Code. A quarterly Frequency for such tests is a Code requirement. Such inservice inspections detect component degradation and incipient failures.

SR 3.5.2.6, SR 3.5.2.7, and SR 3.5.2.8

These SRs demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SIAS and on an RAS, that each ECCS pump starts on receipt of an actual or simulated SIAS, and that the LPSI pumps stop on receipt of an actual or simulated RAS. This Surveillance is not required for valves that are locked, sealed, or

## B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

## B 3.5.3 ECCS - Shutdown

## BASES

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BACKGROUND	<p>The Background section for Bases B 3.5.2, "ECCS - Operating," is applicable to these Bases, with the following modifications.</p> <p>In MODE 3 with pressurizer pressure &lt; 1700 psia and in MODE 4, an ECCS train is defined as one high pressure safety injection (HPSI) subsystem. The HPSI flow path consists of piping, valves, and pumps that enable water from the refueling water tank (RWT) to be injected into the Reactor Coolant System (RCS) following the accidents described in Bases 3.5.2.</p>
APPLICABLE SAFETY ANALYSES	<p>The Applicable Safety Analyses section of Bases 3.5.2 is applicable to these Bases.</p> <p>Due to the stable conditions associated with operation in MODE 4, and the reduced probability of a Design Basis Accident (DBA), the ECCS operational requirements are reduced. Included in these reductions is that certain automatic safety injection (SI) actuation signals are not available. In this MODE, sufficient time exists for manual actuation of the required ECCS to mitigate the consequences of a DBA.</p> <p>Only one train of ECCS is required for MODE 4. Protection against single failures is not relied on for this MODE of operation.</p> <p>ECCS - Shutdown satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>In MODE 3 with pressurizer pressure &lt; 1700 psia, an ECCS subsystem is composed of a single HPSI subsystem. Each HPSI subsystem includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWT and transferring suction to the containment sump.</p> <p>During an event requiring ECCS actuation, a flow path is required to supply water from the RWT to the RCS via the HPSI pumps and their respective supply headers to each of the four cold leg injection nozzles. In the long term, this flow path may be switched to take its supply from the containment sump and to deliver its flow to the RCS hot and cold legs. <u>Management of gas voids is important to ECCS OPERABILITY.</u></p>

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## BASES

## APPLICABLE SAFETY ANALYSES (continued)

Containment Spray System total response time of [60] seconds includes diesel generator startup (for loss of offsite power), block loading of equipment, containment spray pump startup, and spray line filling (Ref. 2).

The performance of the containment cooling train for post accident conditions is given in Reference 3. The result of the analysis is that each train can provide 50% of the required peak cooling capacity during the post accident condition. The train post accident cooling capacity under varying containment ambient conditions, required to perform the accident analyses, is also shown in Reference 4.

The modeled Containment Cooling System actuation from the containment analysis is based upon the unit specific response time associated with exceeding the CCAS to achieve full Containment Cooling System air and safety grade cooling water flow.

The Containment Spray System and the Containment Cooling System satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

During a DBA, a minimum of two containment cooling trains or two containment spray trains, or one of each, is required to maintain the containment peak pressure and temperature below the design limits (Ref. 5). Additionally, one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling units must be OPERABLE. Therefore, in the event of an accident, the minimum requirements are met, assuming that the worst case single active failure occurs.

Each Containment Spray System includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWT upon an ESF actuation signal and automatically transferring suction to the containment sump. *Management of gas voids is important to Containment Spray System OPERABILITY.*

Each Containment Cooling System includes demisters, cooling coils, dampers, fans, instruments, and controls to ensure an OPERABLE flow path.

## APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature, requiring the operation of the containment spray trains and containment cooling trains.

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

BASES

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ACTIONS (continued)

If the Required Actions and associated Completion Times of Condition C, D, or E of this LCO are not met, the plant must be brought to a MODE in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours.

Remaining within the Applicability of the LCO is acceptable because the plant risk in MODE 4 is similar to or lower than MODE 5 (Ref. 6). In MODE 4 there are more accident mitigation systems available and there is more redundancy and diversity in core heat removal mechanisms than in MODE 5. However, voluntary entry into MODE 5 may be made as it is also an acceptable low-risk state.

Required Action F.2 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 4. This Note prohibits the use of LCO 3.0.4.a to enter MODE 4 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 4, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

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.

G.1

With two containment spray trains or any combination of three or more Containment Spray System and Containment Cooling System trains inoperable, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE  
REQUIREMENTS

SR 3.6.6A.1

Verifying the correct alignment for manual, power operated, and automatic valves in the containment spray flow path provides assurance that the proper flow paths will exist for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these were verified to be in the correct position prior to being secured. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

This SR does not require any testing or valve manipulation. Rather, it involves verifying that those valves outside containment and capable of potentially being mispositioned are in the correct position.

[The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6A.2

Operating each containment cooling train fan unit for  $\geq 15$  minutes ensures that all trains 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 and corrective action taken. [ The 31 day Frequency of this SR was developed considering the known reliability of the fan units and controls, the two train redundancy available, and the low probability of a significant degradation of the containment cooling train occurring between surveillances and has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6A.3

Verifying a service water flow rate of  $\geq$  [2000] gpm to each cooling unit provides assurance that the design flow rate assumed in the safety analyses will be achieved (Ref. 2). [ Also considered in selecting the Frequency of 31 days were the known reliability of the Cooling Water System, the two train redundancy, and the low probability of a significant degradation of flow occurring between surveillances.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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[ SR 3.6.6A.4

Verifying that the containment spray header piping is full of water to the [100] ft level minimizes the time required to fill the header. This ensures that spray flow will be admitted to the containment atmosphere within the time frame assumed in the containment analysis. [ The 31 day Frequency is based on the static nature of the fill header and the low probability of a significant degradation of water level in the piping occurring between surveillances.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6A.5

*Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required containment spray trains and may also prevent water hammer and pump cavitation.*

*Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the*

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

*susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation.*

OR

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----

*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*

SR 3.6.6A.65

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 8). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is 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.

SR 3.6.6A.76 and SR 3.6.6A.87

These SRs verify that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. [ The [18] month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the [18] month

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6A

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

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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The surveillance of containment sump isolation valves is also required by SR 3.5.2.5. A single surveillance may be used to satisfy both requirements.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6A.98

This SR verifies that each containment cooling train actuates upon receipt of an actual or simulated actuation signal. [ The [18] month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.6A.76 and SR 3.6.6A.87, above, for further discussion of the basis for the [18] month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.6.6A.109

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. Performance of this SR demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded. [ Due to the passive design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

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BASES

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APPLICABLE SAFETY ANALYSES (continued)

The modeled Containment Cooling System actuation from the containment analysis is based on the unit specific response time associated with exceeding the CCAS to achieve full Containment Cooling System air and safety grade cooling water flow.

The Containment Spray System and the Containment Cooling System satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

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LCO

During a DBA, a minimum of two containment cooling trains or two containment spray trains, or one of each, is required to maintain the containment peak pressure and temperature below the design limits (Ref. 5). To ensure that these requirements are met, two containment spray trains and two containment cooling units must be OPERABLE. Therefore, in the event of an accident, the minimum requirements are met, assuming the worst case single active failure occurs.

Each Containment Spray System typically includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWT upon an ESF actuation signal and automatically transferring suction to the containment sump. *Management of gas voids is important to Containment Spray System OPERABILITY.*

Each Containment Cooling System typically includes demisters, cooling coils, dampers, fans, instruments, and controls to ensure an OPERABLE flow path.

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APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the containment spray trains and containment cooling trains.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the Containment Spray and Containment Cooling systems are not required to be OPERABLE in MODES 5 and 6.

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ACTIONS

A.1

With one containment spray train inoperable, the inoperable containment spray train must be restored to OPERABLE status within 7 days. The components in this degraded condition are capable of providing greater than 100% of the heat removal needs (for the condition of one containment spray train inoperable) after an accident. The 7 day

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Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

BASES

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ACTIONS (continued)

addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 4, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

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.

G.1

With any combination of three or more Containment Spray System and Containment Cooling System trains inoperable, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

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SURVEILLANCE  
REQUIREMENTS

SR 3.6.6B.1

Verifying the correct alignment for manual, power operated, and automatic valves, excluding check valves, in the Containment Spray System provides assurance that the proper flow path exists for Containment Spray System operation. This SR also does not apply to valves that are locked, sealed, or otherwise secured in position since these were verified to be in the correct positions prior to being secured. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves outside containment and capable of potentially being mispositioned, are in the correct position.

[ The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency

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## BASES

## SURVEILLANCE REQUIREMENTS (continued)

description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.6.6B.2

Operating each containment cooling train fan unit for  $\geq 15$  minutes ensures that all trains 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. [ The 31 day Frequency was developed considering the known reliability of the fan units and controls, the two train redundancy available, and the low probability of a significant degradation of the containment cooling train occurring between surveillances.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

SR 3.6.6B.3

Verifying a service water flow rate of  $\geq [2000]$  gpm to each cooling unit provides assurance the design flow rate assumed in the safety analyses will be achieved (Ref. 2). [ Also considered in selecting the Frequency of 31 days were the known reliability of the cooling water system, the two train redundancy, and the low probability of a significant degradation of flow occurring between surveillances.

OR



Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

[ SR 3.6.6B.4

Verifying the containment spray header is full of water to the [100] ft level minimizes the time required to fill the header. This ensures that spray flow will be admitted to the containment atmosphere within the time frame assumed in the containment analysis. [ The 31 day Frequency is based on the static nature of the fill header and the low probability of a significant degradation of the water level in the piping occurring between surveillances.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

SR 3.6.6B.5

*Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required containment spray trains and may also prevent water hammer and pump cavitation.*

*Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

*The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation.*

*OR*

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

*-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*

SR 3.6.6B.65

Containment Spray and Cooling Systems (Atmospheric and Dual)  
B 3.6.6B

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 7). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is 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.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6B.76 and SR 3.6.6B.87

These SRs verify each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. [ The [18] month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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The surveillance of containment sump isolation valves is also required by SR 3.5.2.5. A single surveillance may be used to satisfy both requirements.

SR 3.6.6B.98

This SR verifies each containment cooling train actuates upon receipt of an actual or simulated actuation signal. [ The [18] month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.6B.76 and SR 3.6.6B.87, above, for further discussion of the basis for the [18] month Frequency.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.6.6B.109

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. Performance of this SR demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded. [ Due to the passive design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40, GDC 41, GDC 42, and GDC 43.
2. FSAR, Section [ ].
3. FSAR, Sections [ ].

BASES

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## LCO

Only one SDC loop is required for decay heat removal in MODE 6, with water level  $\geq 23$  ft above the top of the reactor vessel flange. Only one SDC loop is required because the volume of water above the reactor vessel flange provides backup decay heat removal capability. At least one SDC loop must be OPERABLE and in operation to provide:

- a. Removal of decay heat,
- b. Mixing of borated coolant to minimize the possibility of a criticality, and
- c. Indication of reactor coolant temperature.

An OPERABLE SDC loop includes an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

Management of gas voids is important to SDC System OPERABILITY.

Both SDC pumps may be aligned to the Refueling Water Storage Tank to support filling or draining the refueling cavity or for performance of required testing.

The LCO is modified by a Note that allows the required operating SDC loop to be removed from operation for up to 1 hour in each 8 hour period, provided no operations are permitted that would dilute the RCS boron concentration by introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with coolant at boron concentrations less than required to assure the RCS boron concentration is maintained is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles, and RCS to SDC isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity.

---

APPLICABILITY

One SDC loop must be in operation in MODE 6, with the water level  $\geq 23$  ft above the top of the reactor vessel flange, to provide decay heat removal. The 23 ft level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.6, "Refueling Water Level." Requirements for the SDC System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). SDC loop requirements in MODE 6, with the water level  $< 23$  ft above the top of the reactor vessel flange, are located in LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation - Low Water Level."

## BASES

## ACTIONS (continued)

- c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.

With SDC loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Performing the actions described above ensures that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded.

The Completion Time of 4 hours allows fixing of most SDC problems and is reasonable, based on the low probability of the coolant boiling in that time.

SURVEILLANCE  
REQUIREMENTSSR 3.9.4.1

This Surveillance demonstrates that the SDC loop is in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. [ The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the control room for monitoring the SDC System.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.9.4.2

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required SDC loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.



Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance  
Frequency Control Program should utilize the appropriate Frequency  
description, given above, and the appropriate choice of Frequency in the  
Surveillance Requirement.  
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REFERENCES      1. FSAR, Section [ ].

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## BASES

## LCO (continued)

- c. Indication of reactor coolant temperature.

This LCO is modified by two Notes. Note 1 permits the SDC pumps to be removed from operation for  $\leq 15$  minutes when switching from one train to another. The circumstances for stopping both SDC pumps are to be limited to situations when the outage time is short [and the core outlet temperature is maintained  $> 10$  degrees F below saturation temperature]. The Note prohibits boron dilution by introduction of coolant into the RCS with boron concentration less than that required to meet the minimum boron concentration of LCO 3.9.1, or draining operations when SDC forced flow is stopped.

Note 2 allows one SDC loop to be inoperable for a period of 2 hours provided the other loop is OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that the capability exists to inject borated water into the reactor vessel. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

An OPERABLE SDC loop consists of an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

Management of gas voids is important to SDC System OPERABILITY.

Both SDC pumps may be aligned to the Refueling Water Storage Tank to support filling or draining the refueling cavity or for performance of required testing.

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APPLICABILITY	Two SDC loops are required to be OPERABLE, and one SDC loop must be in operation in MODE 6, with the water level $< 23$ ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the SDC System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System. MODE 6 requirements, with a water level $\geq 23$ ft above the reactor vessel flange, are covered in LCO 3.9.4, "Shutdown Cooling and Coolant Circulation - High Water Level."
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ACTIONS	<u>A.1 and A.2</u>
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If one SDC loop is inoperable, action shall be immediately initiated and continued until the SDC loop is restored to OPERABLE status and to operation, or until  $\geq 23$  ft of water level is established above the reactor vessel flange. When the water level is established at  $\geq 23$  ft above the

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.5.2

Verification that the required pump is OPERABLE ensures that an additional SDC pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump. [ The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.9.5.3

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the SDC loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of

accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## REFERENCES

1. FSAR, Section [ ].
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RHR Shutdown Cooling System - Hot Shutdown  
3.4.8

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. No RHR shutdown cooling subsystem in operation.  <u>AND</u>  No recirculation pump in operation.	B.1 Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.	Immediately
	<u>AND</u>  B.2 Verify reactor coolant circulation by an alternate method.	1 hour from discovery of no reactor coolant circulation  AND  Once per 12 hours thereafter
	<u>AND</u>  B.3 Monitor reactor coolant temperature and pressure.	Once per hour

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.8.1  -----NOTE----- Not required to be met until 2 hours after reactor steam dome pressure is < [the RHR cut in permissive pressure]. -----  Verify one RHR shutdown cooling subsystem or recirculation pump is operating.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

RHR Shutdown Cooling System - Hot Shutdown  
3.4.8

SURVEILLANCE	FREQUENCY
<p><u>SR 3.4.8.2</u> -----NOTE-----</p> <p><u>Not required to be performed until 12 hours after reactor steam dome pressure is &lt; [the RHR cut in permissive pressure].</u></p> <p>-----</p> <p><u>Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u></p> <p><u>OR</u></p> <p><u>In accordance with the Surveillance Frequency Control Program ]</u></p>

RHR Shutdown Cooling System - Cold Shutdown  
3.4.9

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.2 Monitor reactor coolant temperature.	Once per hour

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.9.1 Verify one RHR shutdown cooling subsystem or recirculation pump is operating.	[ 12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.4.9.2 Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	[ <u>31 days</u> <u>OR</u> <u>In accordance with the Surveillance Frequency Control Program ]</u>



SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.5.1.1      Verify, for each ECCS injection/spray subsystem, <del>locations susceptible to gas accumulation are sufficiently filled with water, the piping is filled with water from the pump discharge valve to the injection valve.</del>	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.1.2 <del>-----NOTE-----            Not required to be met for system vent flow paths opened under administrative control.            -----</del>  Verify each ECCS injection/spray 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.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.1.3      Verify ADS [air supply header] pressure is ≥ [90] psig.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.1.4      [ Verify the [RHR] System cross tie valve[s] [is] closed and power is removed from the valve operator[s].	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ] ]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.2	<p>Verify, for each required core spray (CS) subsystem, the:</p> <p>a. Suppression pool water level is <math>\geq</math> [12 ft 2 inches] or</p> <p>b. -----NOTE-----            Only one required CS subsystem may take credit for this option during OPDRVs.            -----            Condensate storage tank water level is <math>\geq</math> [12 ft].</p>	<p>[ 12 hours</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
SR 3.5.2.3	<p>Verify, for each required ECCS injection/spray subsystem, <del>locations susceptible to gas accumulation are sufficiently filled with water</del>  <del>the piping is filled with water from the pump discharge valve to the injection valve.</del></p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
SR 3.5.2.4	<p><del>-----NOTE-----</del>  <del>Not required to be met for system vent flow paths opened under administrative control.</del>  <del>-----</del></p> <p>Verify each required ECCS injection/spray 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.5.3.1      Verify the RCIC System <u>locations susceptible to gas accumulation are sufficiently filled with water</u> <del>is filled with water from the pump discharge valve to the injection valve.</del>	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.3.2 <del>-----NOTE-----</del> <u>Not required to be met for system vent flow paths opened under administrative control.</u> <del>-----</del>  Verify each RCIC System 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.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.3.3 <del>-----NOTE-----</del> Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test. <del>-----</del>  Verify, with [reactor pressure] ≤ [1020] psig and ≥ [920] psig, the RCIC pump can develop a flow rate ≥ [400] gpm [against a system head corresponding to reactor pressure].	[ 92 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

## 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  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.6.2.3.2</u> <u>Verify RHR suppression pool cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.2.3. <del>2</del> <u>3</u> Verify each RHR pump develops a flow rate > [7700] gpm through the associated heat exchanger while operating in the suppression pool cooling mode.	[ In accordance with the Inservice Testing Program  <u>OR</u>  [92 days]  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.2.4.1      Verify each RHR suppression pool spray 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  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.6.2.4.2</u> <u>Verify RHR suppression pool spray subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.2.4. <del>2</del> <u>3</u> [ Verify each RHR pump develops a flow rate $\geq$ [400] gpm through the heat exchanger while operating in the suppression pool spray mode.	[ In accordance with the Inservice Testing Program  <u>OR</u>  [92 days]  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.8.1      Verify one RHR shutdown cooling subsystem is operating.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.9.8.2      Verify required RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

SURVEILLANCE	FREQUENCY
<u>SR 3.9.9.2</u> <u>Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

## B 3.4 REACTOR COOLANT SYSTEM (RCS)

## B 3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown

## BASES

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BACKGROUND	<p>Irradiated fuel in the shutdown reactor core generates heat during the decay of fission products and increases the temperature of the reactor coolant. This decay heat must be removed to reduce the temperature of the reactor coolant to <math>\leq 200^{\circ}\text{F}</math>. This decay heat removal is in preparation for performing refueling or maintenance operations, or for keeping the reactor in the Hot Shutdown condition.</p> <p>The two redundant, manually controlled shutdown cooling subsystems of the RHR System provide decay heat removal. Each loop consists of two motor driven pumps, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after circulation through the respective heat exchanger, to the reactor via the associated recirculation loop. The RHR heat exchangers transfer heat to the RHR Service Water System (LCO 3.7.1, "Residual Heat Removal Service Water (RHRSW) System").</p>
APPLICABLE SAFETY ANALYSES	<p>Decay heat removal by operation of the RHR System in the shutdown cooling mode is not required for mitigation of any event or accident evaluated in the safety analyses. Decay heat removal is, however, an important safety function that must be accomplished or core damage could result. The RHR shutdown cooling subsystem satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>Two RHR shutdown cooling subsystems are required to be OPERABLE, and when no recirculation pump is in operation, one shutdown cooling subsystem must be in operation. An OPERABLE RHR shutdown cooling subsystem consists of one OPERABLE RHR pump, one heat exchanger, and the associated piping and valves. The two subsystems have a common suction source and are allowed to have a common heat exchanger and common discharge piping. Thus, to meet the LCO, both pumps in one loop or one pump in each of the two loops must be OPERABLE. Since the piping and heat exchangers are passive components that are assumed not to fail, they are allowed to be common to both subsystems. Each shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. In MODE 3, one RHR shutdown cooling subsystem can provide the required cooling, but two subsystems are required to be OPERABLE to provide redundancy. Operation of one subsystem can maintain or reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly</p>

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continuous operation is required. Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

Surveillance being met (i.e., forced coolant circulation is not required for this initial 2 hour period), which also allows entry into the Applicability of this Specification in accordance with SR 3.0.4 since the Surveillance will not be "not met" at the time of entry into the Applicability.

SR 3.4.8.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the

RHR Shutdown Cooling System - Hot Shutdown  
B 3.4.8

plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours reactor steam dome pressure is < [the RHR cut in permissive pressure]. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering the Applicability.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES      None.

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## BASES

## LCO (continued)

required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.

Note 1 permits both RHR shutdown cooling subsystems to be removed from operation for a period of 2 hours in an 8 hour period. Note 2 allows one RHR shutdown cooling subsystem to be inoperable for up to 2 hours for the performance of Surveillance tests. These tests may be on the affected RHR System or on some other plant system or component that necessitates placing the RHR System in an inoperable status during the performance. This is permitted because the core heat generation can be low enough and the heatup rate slow enough to allow some changes to the RHR subsystems or other operations requiring RHR flow interruption and loss of redundancy.

## APPLICABILITY

In MODE 4, the RHR Shutdown Cooling System may be operated in the shutdown cooling mode to remove decay heat to maintain coolant temperature below 200°F. Otherwise, a recirculation pump is required to be in operation.

In MODES 1 and 2, and in MODE 3 with reactor steam dome pressure greater than or equal to the RHR cut in permissive pressure, this LCO is not applicable. Operation of the RHR System in the shutdown cooling mode is not allowed above this pressure because the RCS pressure may exceed the design pressure of the shutdown cooling piping. Decay heat removal at reactor pressures greater than or equal to the RHR cut in permissive pressure is typically accomplished by condensing the steam in the main condenser. Additionally, in MODE 2 below this pressure, the OPERABILITY requirements for the Emergency Core Cooling Systems (ECCS) (LCO 3.5.1, "ECCS - Operating") do not allow placing the RHR shutdown cooling subsystem into operation.

The requirements for decay heat removal in MODE 3 below the cut in permissive pressure and in MODE 5 are discussed in LCO 3.4.8, "Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown," LCO 3.9.8, "Residual Heat Removal (RHR) - High Water Level," and LCO 3.9.9, "Residual Heat Removal (RHR) - Low Water Level."

## ACTIONS

A Note has been provided to modify the ACTIONS related to RHR shutdown cooling subsystems. Section 1.3, Completion Times, specifies once a Condition has been entered, subsequent divisions, subsystems, components or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies Required Actions of the Condition

## BASES

## ACTIONS (continued)

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR Shutdown Cooling System or recirculation pump), the reactor coolant temperature and pressure must be periodically monitored to ensure proper function of the alternate method. The once per hour Completion Time is deemed appropriate.

SURVEILLANCE  
REQUIREMENTSSR 3.4.9.1

This Surveillance verifies that one RHR shutdown cooling subsystem or recirculation pump is in operation and circulating reactor coolant. The required flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability. [ The Frequency of 12 hours is sufficient in view of other visual and audible indications available to the operator for monitoring the RHR subsystem in the control room.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.4.9.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration.

Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## BASES

## APPLICABLE SAFETY ANALYSES (continued)

This LCO helps to ensure that the following acceptance criteria for the ECCS, established by 10 CFR 50.46 (Ref. 10), will be met following a LOCA, assuming the worst case single active component failure in the ECCS:

- a. Maximum fuel element cladding temperature is  $\leq 2200^{\circ}\text{F}$ ,
- b. Maximum cladding oxidation is  $\leq 0.17$  times the total cladding thickness before oxidation,
- c. Maximum hydrogen generation from a zirconium water reaction is  $\leq 0.01$  times the hypothetical amount that would be generated if all of the metal in the cladding surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react,
- d. The core is maintained in a coolable geometry, and
- e. Adequate long term cooling capability is maintained.

The limiting single failures are discussed in Reference 11. For a large discharge pipe break LOCA, failure of the LPCI valve on the unbroken recirculation loop is considered the most severe failure. For a small break LOCA, HPCI failure is the most severe failure. One ADS valve failure is analyzed as a limiting single failure for events requiring ADS operation. The remaining OPERABLE ECCS subsystems provide the capability to adequately cool the core and prevent excessive fuel damage.

The ECCS satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

Each ECCS injection/spray subsystem and seven ADS valves are required to be OPERABLE. The ECCS injection/spray subsystems are defined as the two CS subsystems, the two LPCI subsystems, and one HPCI System. The low pressure ECCS injection/spray subsystems are defined as the two CS subsystems and the two LPCI subsystems. *Management of gas voids is important to ECCS injection/spray subsystem OPERABILITY.*

With less than the required number of ECCS subsystems OPERABLE, the potential exists that during a limiting design basis LOCA concurrent with the worst case single failure, the limits specified in Reference 10 could be exceeded. All ECCS subsystems must therefore be OPERABLE to satisfy the single failure criterion required by Reference 10.

## BASES

SURVEILLANCE  
REQUIREMENTSSR 3.5.1.1

The *ECCS injection/spray subsystem* flow path piping *and components* ~~has have~~ the potential to develop voids and pockets of entrained ~~airgases~~. ~~Maintaining the pump discharge lines of the HPCI System, CS System, and LPCI subsystems full of water ensures that the ECCS will perform properly, injecting its full capacity into the RCS upon demand. This will also Preventing and managing gas intrusion and accumulation is necessary for proper operation of the ECCS injection/spray subsystems and may also prevent a water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel. following an ECCS initiation signal. One acceptable method of ensuring that the lines are full is to vent at the high points.~~

*Selection of ECCS injection/spray subsystem locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The ECCS injection/spray subsystem is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS injection/spray subsystems are not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*ECCS injection/spray subsystem locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for*



*susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

-[ The 31 day Frequency is based on the gradual nature of void buildup in the ECCS *injection/spray subsystem* piping, the procedural controls governing system operation, and operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. *The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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#### SR 3.5.1.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. For the HPCI System, this SR also includes the steam flow path for the turbine and the flow controller position.

[ The 31 day Frequency of this SR was derived from the Inservice Testing Program requirements for performing valve testing at least once every 92 days. The Frequency of 31 days is further justified because the valves are operated under procedural control and because improper valve position would only affect a single subsystem. This Frequency has been shown to be acceptable through operating experience.

BASES

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SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.5.1.3

Verification that ADS air supply header pressure is  $\geq$  [90] psig ensures adequate air pressure for reliable ADS operation. The accumulator on each ADS valve provides pneumatic pressure for valve actuation. The design pneumatic supply pressure requirements for the accumulator are such that, following a failure of the pneumatic supply to the accumulator, at least two valve actuations can occur with the drywell at 70% of design pressure (Ref. 11). The ECCS safety analysis assumes only one actuation to achieve the depressurization required for operation of the low pressure ECCS. This minimum required pressure of  $\geq$  [90] psig is provided by the ADS instrument air supply. [ The 31 day Frequency takes into consideration administrative controls over operation of the air system and alarms for low air pressure.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## B 3.5 EMERGENCY CORE COOLING SYSTEM (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

### B 3.5.2 ECCS - Shutdown

#### BASES

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BACKGROUND	A description of the Core Spray (CS) System and the low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System is provided in the Bases for LCO 3.5.1, "ECCS - Operating."
APPLICABLE SAFETY ANALYSES	<p>The ECCS performance is evaluated for the entire spectrum of break sizes for a postulated loss of coolant accident (LOCA). The long term cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one low pressure ECCS injection/spray subsystem is required, post LOCA, to maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown. It is reasonable to assume, based on engineering judgement, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level. To provide redundancy, a minimum of two low pressure ECCS injection/spray subsystems are required to be OPERABLE in MODES 4 and 5.</p> <p>The low pressure ECCS subsystems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>Two low pressure ECCS injection/spray subsystems are required to be OPERABLE. The low pressure ECCS injection/spray subsystems consist of two CS subsystems and two LPCI subsystems. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the reactor pressure vessel (RPV). Each LPCI subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. Only a single LPCI pump is required per subsystem because of the larger injection capacity in relation to a CS subsystem. In MODES 4 and 5, the RHR System cross tie valve is not required to be closed. <i>Management of gas voids is important to ECCS injection/spray subsystem OPERABILITY.</i></p> <p>As noted, one LPCI subsystem may be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of low pressure and low temperature</p>

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.4

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS 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 that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. [ The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

## REFERENCES

1. FSAR, Section [6.3.2].

## BASES

## BACKGROUND (continued)

up to the first isolation valve. The relative height of the feedwater line connection for RCIC is such that the water in the feedwater lines keeps the remaining portion of the RCIC discharge line full of water. Therefore, RCIC does not require a "keep fill" system.

APPLICABLE  
SAFETY  
ANALYSES

The function of the RCIC System is to respond to transient events by providing makeup coolant to the reactor. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. The RCIC System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

## LCO

The OPERABILITY of the RCIC System provides adequate core cooling such that actuation of any of the low pressure ECCS subsystems is not required in the event of RPV isolation accompanied by a loss of feedwater flow. The RCIC System has sufficient capacity for maintaining RPV inventory during an isolation event. *Management of gas voids is important to RCIC System OPERABILITY.*

## APPLICABILITY

The RCIC System is required to be OPERABLE during MODE 1, and MODES 2 and 3 with reactor steam dome pressure > 150 psig, since RCIC is the primary non-ECCS water source for core cooling when the reactor is isolated and pressurized. In MODES 2 and 3 with reactor steam dome pressure  $\leq$  150 psig, and in MODES 4 and 5, RCIC is not required to be OPERABLE since the low pressure ECCS injection/spray subsystems can provide sufficient flow to the RPV.

## ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable RCIC System. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable RCIC System and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

A.1 and A.2

If the RCIC System is inoperable during MODE 1, or MODE 2 or 3 with reactor steam dome pressure > [150] psig, and the HPCI System is verified to be OPERABLE, the RCIC System must be restored to OPERABLE status within 14 days. In this Condition, loss of the RCIC System will not affect the overall plant capability to provide makeup inventory at high reactor pressure since the HPCI System is the only high pressure system assumed to function during a loss of coolant accident (LOCA). OPERABILITY of HPCI is therefore verified immediately when

## BASES

## ACTIONS (continued)

voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action B.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is 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  
REQUIREMENTSSR 3.5.3.1

~~The *RCIC System* flow path piping *and components have has* the potential to develop voids and pockets of entrained *air/gases*. *Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RCIC System and may also prevent a water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel. Maintaining the pump discharge line of the RCIC System full of water ensures that the system will perform properly, injecting its full capacity into the Reactor Coolant System upon demand. This will also prevent a water hammer following an initiation signal. One acceptable method of ensuring the line is full is to vent at the high points.*~~

*Selection of RCIC System locations susceptible to gas accumulation is based on a self-assessment of the piping configuration to identify where gases may accumulate and remain even after the system is filled and vented, and to identify vulnerable potential degassing flow paths. The review is supplemented by verification that installed high-point vents are actually at the system high points, including field verification to ensure pipe shapes and construction tolerances have not inadvertently created additional high points. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The RCIC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of*

*accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RCIC Systems are not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*RCIC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

[ The 31 day Frequency is based on the gradual nature of void buildup in the RCIC piping, the procedural controls governing system operation, and operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. *The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.3.2

Verifying the correct alignment for manual, power operated, and automatic valves in the RCIC flow path provides assurance that the proper flow path will exist for RCIC 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 that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. For the RCIC System, this SR also includes the steam flow path for the turbine and the flow controller position.

[ The 31 day Frequency of this SR was derived from the Inservice Testing Program requirements for performing valve testing at least once every 92 days. The Frequency of 31 days is further justified because the valves are operated under procedural control and because improper valve position would affect only the RCIC System. This Frequency has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.5.3.3 and SR 3.5.3.4



BASES

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

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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.

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## ACTIONS

A.1

With one RHR suppression pool cooling subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this Condition, the remaining RHR suppression pool cooling subsystem is adequate to perform the primary containment cooling function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced primary containment cooling capability. The 7 day Completion Time is acceptable in light of the redundant RHR suppression pool cooling capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

B.1

-----REVIEWER'S NOTE -----  
Adoption of a MODE 3 end state requires the licensee to make the following commitments:

1. [LICENSEE] will follow the guidance established in Section 11 of NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Nuclear Management and Resource Council, Revision 3, July 2000.
  2. [LICENSEE] will follow the guidance established in TSTF-IG-05-02, Implementation Guidance for TSTF-423, Revision 2, "Technical Specifications End States, NEDC-32988-A," November 2009.
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## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.2.3.2

RHR Suppression Pool Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR suppression pool cooling subsystems and may also prevent water hammer and pump cavitation.

Selection of RHR Suppression Pool Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Suppression Pool Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Suppression Pool Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Suppression Pool Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the

susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Suppression Pool Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.6.2.3.32

Verifying that each RHR pump develops a flow rate  $\geq$  [7700] 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 (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.

-----REVIEWER'S NOTE-----  
If the testing is within the scope of the licensee's Inservice Testing Program, the Frequency "In accordance with the Inservice Testing Program" should be used. Otherwise, the periodic Frequency of 92 days or the reference to the Surveillance Frequency Control Program should be used.  
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[ The Frequency of this SR is [in accordance with the Inservice Testing Program] [92 days ]

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

BASES

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## LCO

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

[Management of gas voids is important to RHR Suppression Pool Spray System OPERABILITY.](#)

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## APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause 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, maintaining RHR suppression pool spray subsystems OPERABLE is not required in MODE 4 or 5.

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## ACTIONS

A.1

With one RHR suppression pool spray subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE RHR suppression pool spray subsystem is adequate to perform the primary containment bypass leakage mitigation function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced primary containment bypass mitigation capability. The 7 day Completion Time was chosen in light of the redundant RHR suppression pool spray capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

B.1

With both RHR suppression pool spray subsystems inoperable, at least one subsystem must be restored to OPERABLE status within 8 hours. In this Condition, there is a substantial loss of the primary containment bypass leakage mitigation function. The 8 hour Completion Time is based on this loss of function and is considered acceptable due to the low probability of a DBA and because alternative methods to remove heat from primary containment are available.

## BASES

SURVEILLANCE  
REQUIREMENTSSR 3.6.2.4.1

Verifying the correct alignment for manual, power operated, and automatic valves in the RHR suppression pool spray mode flow path provides assurance that the proper flow paths will exist 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, 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.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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SR 3.6.2.4.2

RHR Suppression Pool Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR suppression pool spray subsystems and may also prevent water hammer and pump cavitation.

Selection of RHR Suppression Pool Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is

supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Suppression Pool Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Suppression Pool Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Suppression Pool Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Suppression Pool Spray System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency

description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

SR 3.6.2.4.32

Verifying each RHR pump develops a flow rate  $\geq$  [400] gpm while operating in the suppression pool spray mode with flow through the heat exchanger ensures that pump performance has not degraded during the cycle. Flow is a normal test of centrifugal pump performance required by the ASME Code (Ref. 3). This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance.

## B 3.9 REFUELING OPERATIONS

## B 3.9.8 Residual Heat Removal (RHR) - High Water Level

## BASES

BACKGROUND	<p>The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34. Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of two motor driven pumps, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchangers, to the reactor via the associated recirculation loop or to the reactor via the low pressure coolant injection path. The RHR heat exchangers transfer heat to the RHR Service Water System. The RHR shutdown cooling mode is manually controlled.</p> <p>In addition to the RHR subsystems, the volume of water above the reactor pressure vessel (RPV) flange provides a heat sink for decay heat removal.</p>
APPLICABLE SAFETY ANALYSES	<p>With the unit in MODE 5, the RHR System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR System is required for removing decay heat to maintain the temperature of the reactor coolant.</p> <p>The RHR System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>Only one RHR shutdown cooling subsystem is required to be OPERABLE and in operation in MODE 5 with irradiated fuel in the RPV and the water level <math>\geq</math> [23] ft above the RPV flange. Only one subsystem is required because the volume of water above the RPV flange provides backup decay heat removal capability.</p> <p>An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path. In MODE 5, the RHR cross tie valve is not required to be closed; thus, the valve may be opened to allow pumps in one loop to discharge through the opposite loop's heat exchanger to make a complete subsystem. <u><a href="#">Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.</a></u></p> <p>Additionally, each RHR shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. Operation (either continuous or intermittent) of one subsystem can maintain and reduce the reactor coolant temperature as required. However, to ensure adequate</p>



## BASES

## SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

SR 3.9.8.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR shutdown cooling subsystem(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is

compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after entering MODE 3, with reactor steam dome pressure < [the RHR cut in permissive pressure]. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering the Applicability.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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REFERENCES      None.

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## B 3.9 REFUELING OPERATIONS

## B 3.9.9 Residual Heat Removal (RHR) - Low Water Level

## BASES

BACKGROUND	<p>The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34. Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of two motor driven pumps, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchangers, to the reactor via the associated recirculation loop or to the reactor via the low pressure coolant injection path. The RHR heat exchangers transfer heat to the RHR Service Water System. The RHR shutdown cooling mode is manually controlled.</p>
APPLICABLE SAFETY ANALYSES	<p>With the unit in MODE 5, the RHR System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR System is required for removing decay heat to maintain the temperature of the reactor coolant.</p> <p>The RHR System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>In MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and the water level &lt; 23 ft above the reactor pressure vessel (RPV) flange both RHR shutdown cooling subsystems must be OPERABLE.</p> <p>An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path. To meet the LCO, both pumps in one loop or one pump in each of the two loops must be OPERABLE. In MODE 5, the RHR cross tie valve is not required to be closed; thus, the valve may be opened to allow pumps in one loop to discharge through the opposite loop's heat exchanger to make a complete subsystem.</p> <p><u><a href="#">Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.</a></u></p> <p>Additionally, each RHR shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. Operation (either continuous or intermittent) of one subsystem can maintain and reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. A Note is provided to allow a 2 hour exception for the operating subsystem to be removed from operation every 8 hours.</p>

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

## -----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

SR 3.9.9.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-

set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES      None.

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## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.4.9.1 -----NOTE-----            Not required to be met until 2 hours after reactor steam dome pressure is &lt; [the RHR cut in permissive pressure].            -----            Verify one RHR shutdown cooling subsystem or recirculation pump is operating.</p>	<p>[ 12 hours  <u>OR</u>            In accordance with the Surveillance Frequency Control Program ]</p>
<p><u>SR 3.4.9.2 -----NOTE-----</u>  <u>Not required to be performed until 12 hours after reactor steam dome pressure is &lt; [the RHR cut in permissive pressure].</u>  <u>-----</u>  <u>Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u></p>

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. No RHR shutdown cooling subsystem in operation.  <u>AND</u>  No recirculation pump in operation.	B.1 Verify reactor coolant circulating by an alternate method.	1 hour from discovery of no reactor coolant circulation  AND  Once per 12 hours thereafter
	<u>AND</u>  B.2 Monitor reactor coolant temperature and pressure.	Once per hour

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.10.1 Verify one RHR shutdown cooling subsystem or recirculation pump is operating.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.4.10.2</u> <u>Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>H. HPCS and low pressure core spray (LPCS) inoperable.</p> <p><u>OR</u></p> <p>Three or more ECCS injection/spray subsystems inoperable.</p> <p><u>OR</u></p> <p>HPCS System and one or more ADS valves inoperable.</p> <p><u>OR</u></p> <p>Two or more ECCS injection/spray subsystems and one or more ADS valves inoperable.</p>	<p>H.1 Enter LCO 3.0.3.</p>	<p>Immediately</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.5.1.1 Verify, for each ECCS injection/spray subsystem, <u>locations susceptible to gas accumulation are sufficiently filled with water</u><del>the piping is filled with water from the pump discharge valve to the injection valve.</del></p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>



SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY															
<p>SR 3.5.1.2</p> <p style="text-align: center;"><del>-----NOTE-----</del></p> <p style="text-align: center;"><u>Not required to be met for system vent flow paths opened under administrative control.</u></p> <p>Verify each ECCS injection/spray 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>															
<p>SR 3.5.1.3</p> <p>Verify ADS [air receiver] pressure is <math>\geq</math> [150] psig.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>															
<p>SR 3.5.1.4</p> <p>Verify each ECCS pump develops the specified flow rate [against a system head corresponding to the specified reactor pressure].</p> <table border="0" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td></td> <td style="text-align: center;">[System Head Corresponding to a Reactor Pressure of]</td> </tr> <tr> <td style="text-align: center;"><u>System</u></td> <td style="text-align: center;"><u>Flow Rate</u></td> <td style="text-align: center;"><u>Pressure of]</u></td> </tr> <tr> <td>LPCS</td> <td><math>\geq</math> [7115] gpm</td> <td><math>\geq</math> [290] psig</td> </tr> <tr> <td>LPCI</td> <td><math>\geq</math> [7450] gpm</td> <td><math>\geq</math> [125] psig</td> </tr> <tr> <td>HPCS</td> <td><math>\geq</math> [7115] gpm</td> <td><math>\geq</math> [445] psig</td> </tr> </table>			[System Head Corresponding to a Reactor Pressure of]	<u>System</u>	<u>Flow Rate</u>	<u>Pressure of]</u>	LPCS	$\geq$ [7115] gpm	$\geq$ [290] psig	LPCI	$\geq$ [7450] gpm	$\geq$ [125] psig	HPCS	$\geq$ [7115] gpm	$\geq$ [445] psig	<p>[ In accordance with the Inservice Testing Program</p> <p><u>OR</u></p> <p>[92 days]</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
		[System Head Corresponding to a Reactor Pressure of]														
<u>System</u>	<u>Flow Rate</u>	<u>Pressure of]</u>														
LPCS	$\geq$ [7115] gpm	$\geq$ [290] psig														
LPCI	$\geq$ [7450] gpm	$\geq$ [125] psig														
HPCS	$\geq$ [7115] gpm	$\geq$ [445] psig														

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.5.2.2      Verify, for the required High Pressure Core Spray (HPCS) System, the:</p> <p>    a.    Suppression pool water level is <math>\geq</math> [12.67 ft] or</p> <p>    b.    Condensate storage tank water level is <math>\geq</math> [18 ft].</p>	<p>[ 12 hours</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<p>SR 3.5.2.3      Verify, for each required ECCS injection/spray subsystem, <del>locations susceptible to gas accumulation are sufficiently filled with water the piping is filled with water from the pump discharge valve to the injection valve.</del></p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<p>SR 3.5.2.4      <del>-----NOTE-----</del>  <del>Not required to be met for system vent flow paths opened under administrative control.</del></p> <p>Verify each required ECCS injection/spray 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.5.3.1      Verify the RCIC System <u>locations susceptible to gas accumulation are sufficiently filled with water</u> <del>is filled with water from the pump discharge valve to the injection valve.</del>	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.3.2 <del>-----NOTE----- Not required to be met for system vent flow paths opened under administrative control. -----</del>  Verify each RCIC System 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.	[ 31 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.5.3.3 <del>-----NOTE-----</del> Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test.  Verify, with [RCIC steam supply pressure] $\leq$ [1045] psig and $\geq$ [945] psig, the RCIC pump can develop a flow rate $\geq$ [800] gpm [against a system head corresponding to reactor pressure].	[ 92 days  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.6.1.7.1 -----NOTES-----</p> <p><u>1.</u> RHR containment spray subsystems may be considered OPERABLE during alignment and operation for decay heat removal when below [the RHR cut in permissive pressure in MODE 3] if capable of being manually realigned and not otherwise inoperable.</p> <p><u>2. Not required to be met for system vent flow paths opened under administrative control.</u></p> <p>Verify each RHR containment spray 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.</p>	<p>[ 31 days</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>
<p><u>SR 3.6.1.7.2</u> <u>Verify RHR containment spray subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u></p>	<p><u>[ 31 days</u></p> <p><u>OR</u></p> <p><u>In accordance with the Surveillance Frequency Control Program ]</u></p>
<p>SR 3.6.1.7.<del>32</del> Verify each RHR pump develops a flow rate of <math>\geq</math> [5650] gpm on recirculation flow through the associated heat exchanger to the suppression pool.</p>	<p>[ In accordance with the Inservice Testing Program</p> <p><u>OR</u></p> <p>[92 days]</p> <p><u>OR</u></p> <p>In accordance with the Surveillance Frequency Control Program ]</p>

## SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.1.7. <del>43</del> Verify each RHR containment spray subsystem automatic valve in the flow path actuates to its correct position on an actual or simulated automatic initiation signal.	[ [18] months  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
SR 3.6.1.7. <del>54</del> Verify each spray nozzle is unobstructed.	[At first refueling]  AND  [ 10 years  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

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  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.6.2.3.2</u> <u>Verify RHR suppression pool cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>
SR 3.6.2.3. <del>32</del> Verify each RHR pump develops a flow rate $\geq$ [7450] gpm through the associated heat exchanger while operating in the suppression pool cooling mode.	[ In accordance with the Inservice Testing Program  <u>OR</u>  [92 days]  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.8.1      Verify one RHR shutdown cooling subsystem is operating.	[ 12 hours  <u>OR</u>  In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.9.8.2      Verify required RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u>  <u>In accordance with the Surveillance Frequency Control Program ]</u>

## ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.3 Initiate action to restore isolation capability in each required secondary containment penetration flow path not isolated.	Immediately
C. No RHR shutdown cooling subsystem in operation.	C.1 Verify reactor coolant circulation by an alternate method.  <u>AND</u> C.2 Monitor reactor coolant temperature.	1 hour from discovery of no reactor coolant circulation  AND Once per 12 hours thereafter  Once per hour

## SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.9.1 Verify one RHR shutdown cooling subsystem is operating.	[ 12 hours  <u>OR</u> In accordance with the Surveillance Frequency Control Program ]
<u>SR 3.9.9.2 Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>[ 31 days</u>  <u>OR</u> <u>In accordance with the</u>



SURVEILLANCE	FREQUENCY
	<u>Surveillance</u> <u>Frequency</u> <u>Control Program 1</u>

## B 3.4 REACTOR COOLANT SYSTEM (RCS)

## B 3.4.9 Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown

## BASES

BACKGROUND	<p>Irradiated fuel in the shutdown reactor core generates heat during the decay of fission products and increases the temperature of the reactor coolant. This decay heat must be removed to reduce the temperature of the reactor coolant to <math>\leq 200^{\circ}\text{F}</math>. This decay heat removal is in preparation for performing refueling or maintenance operations, or for keeping the reactor in the Hot Shutdown condition.</p> <p>The two redundant, manually controlled shutdown cooling subsystems of the RHR System provide decay heat removal. Each loop consists of a motor driven pump, two heat exchangers in series, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after circulation through the respective heat exchanger, to the reactor via separate feedwater lines or to the reactor via the LPCI injection path. The RHR heat exchangers transfer heat to the Standby Service Water System (LCO 3.7.1, "[Standby Service Water (SSW)] System and [Ultimate Heat Sink (UHS)]").</p>
APPLICABLE SAFETY ANALYSES	<p>Decay heat removal by the RHR System in the shutdown cooling mode is not required for mitigation of any event or accident evaluated in the safety analyses. Decay heat removal is, however, an important safety function that must be accomplished or core damage could result. The RHR Shutdown Cooling System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>Two RHR shutdown cooling subsystems are required to be OPERABLE, and, when no recirculation pump is in operation, one shutdown cooling subsystem must be in operation. An OPERABLE RHR shutdown cooling subsystem consists of one OPERABLE RHR pump, two heat exchangers in series, and the associated piping and valves. Each shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. In MODE 3, one RHR shutdown cooling subsystem can provide the required cooling, but two subsystems are required to be OPERABLE to provide redundancy. Operation of one subsystem can maintain or reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required.</p> <p><u>Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.</u></p>

## BASES

## ACTIONS (continued)

verification of the functioning of the alternate method must be reconfirmed every 12 hours thereafter. This will provide assurance of continued temperature monitoring capability.

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR shutdown cooling subsystem or recirculation pump), the reactor coolant temperature and pressure must be periodically monitored to ensure proper function of the alternate method. The once per hour Completion Time is deemed appropriate.

SURVEILLANCE  
REQUIREMENTSSR 3.4.9.1

This Surveillance verifies that one RHR shutdown cooling subsystem or recirculation pump is in operation and circulating reactor coolant. The required flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability. [ The Frequency of 12 hours is sufficient in view of other visual and audible indications available to the operator for monitoring the RHR subsystem in the control room.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

This Surveillance is modified by a Note allowing sufficient time to align the RHR System for shutdown cooling operation after clearing the pressure interlock that isolates the system, or for placing a recirculation pump in operation. The Note takes exception to the requirements of the Surveillance being met (i.e., forced coolant circulation is not required for this initial 2 hour period), which also allows entry into the Applicability of this Specification in accordance with SR 3.0.4 since the Surveillance will not be "not met" at the time of entry into the Applicability.

SR 3.4.9.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing

and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours reactor steam dome pressure is < [the RHR cut in permissive pressure]. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering the Applicability.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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REFERENCES      None.

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## B 3.4 REACTOR COOLANT SYSTEM (RCS)

## B 3.4.10 Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown

## BASES

BACKGROUND	<p>Irradiated fuel in the shutdown reactor core generates heat during the decay of fission products and increases the temperature of the reactor coolant. This decay heat must be removed to maintain the temperature of the reactor coolant at <math>\leq 200^{\circ}\text{F}</math>. This decay heat removal is in preparation for performing refueling or maintenance operations, or for keeping the reactor in the Cold Shutdown condition.</p> <p>The two redundant, manually controlled shutdown cooling subsystems of the RHR System provide decay heat removal. Each loop consists of a motor driven pump, two heat exchangers in series, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after circulation through the respective heat exchanger, to the reactor via separate feedwater lines or to the reactor via the LPCI injection path. The RHR heat exchangers transfer heat to the Standby Service Water System.</p>
APPLICABLE SAFETY ANALYSES	<p>Decay heat removal by the RHR System in the shutdown cooling mode is not required for mitigation of any event or accident evaluated in the safety analyses. Decay heat removal is, however, an important safety function that must be accomplished or core damage could result. The RHR Shutdown Cooling System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>Two RHR shutdown cooling subsystems are required to be OPERABLE, and, when no recirculation pump is in operation, one RHR shutdown cooling subsystem must be in operation. An OPERABLE RHR shutdown cooling subsystem consists of one OPERABLE RHR pump, two heat exchangers in series, and the associated piping and valves. Each shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. In MODE 4, one RHR shutdown cooling subsystem can provide the required cooling, but two subsystems are required to be OPERABLE to provide redundancy. Operation of one subsystem can maintain and reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. <u>Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.</u></p> <p>Note 1 permits both RHR shutdown cooling subsystems and recirculation pumps to be removed from operation for a period of 2 hours in an 8 hour</p>

## BASES

SURVEILLANCE  
REQUIREMENTSSR 3.4.10.1

This Surveillance verifies that one RHR shutdown cooling subsystem or recirculation pump is in operation and circulating reactor coolant. The required flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability. [ The Frequency of 12 hours is sufficient in view of other visual and audible indications available to the operator for monitoring the RHR subsystem in the control room.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.4.10.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or

discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES      None.

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## BASES

## APPLICABLE SAFETY ANALYSES (continued)

The limiting single failures are discussed in Reference 11. For a large break LOCA, failure of ECCS subsystems in Division 1 (LPCS and LPCI-A) or Division 2 (LPCI-B and LPCI-C) due to failure of its associated diesel generator is, in general, the most severe failure. For a small break LOCA, HPCS System failure is the most severe failure. One ADS valve failure is analyzed as a limiting single failure for events requiring ADS operation. The remaining OPERABLE ECCS subsystems provide the capability to adequately cool the core and prevent excessive fuel damage.

The ECCS satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

## LCO

Each ECCS injection/spray subsystem and eight ADS valves are required to be OPERABLE. The ECCS injection/spray subsystems are defined as the three LPCI subsystems, the LPCS System, and the HPCS System. The low pressure ECCS injection/spray subsystems are defined as the LPCS System and the three LPCI subsystems. *Management of gas voids is important to ECCS injection/spray subsystem OPERABILITY.*

With less than the required number of ECCS subsystems OPERABLE during a limiting design basis LOCA concurrent with the worst case single failure, the limits specified in 10 CFR 50.46 (Ref. 10) could potentially be exceeded. All ECCS subsystems must therefore be OPERABLE to satisfy the single failure criterion required by 10 CFR 50.46 (Ref. 10).

As noted, LPCI subsystems may be considered OPERABLE during alignment and operation for decay heat removal when below the actual RHR cut in permissive pressure in MODE 3, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. At these low pressures and decay heat levels, a reduced complement of ECCS subsystems should provide the required core cooling, thereby allowing operation of RHR shutdown cooling when necessary.

## APPLICABILITY

All ECCS subsystems are required to be OPERABLE during MODES 1, 2, and 3 when there is considerable energy in the reactor core and core cooling would be required to prevent fuel damage in the event of a break in the primary system piping. In MODES 2 and 3, the ADS function is not required when pressure is  $\leq 150$  psig because the low pressure ECCS subsystems (LPCS and LPCI) are capable of providing flow into the RPV

## BASES

## ACTIONS (continued)

H.1

When multiple ECCS subsystems are inoperable, as stated in Condition H, the plant is in a condition outside of the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE  
REQUIREMENTSSR 3.5.1.1

The *ECCS injection/spray subsystem* flow path piping *and components* ~~has~~ have the potential to develop voids and pockets of entrained ~~airgases~~. ~~Maintaining the pump discharge lines of the HPCS System, LPCS System, and LPCI subsystems full of water ensures that the systems will perform properly, injecting their full capacity into the RGS upon demand. This will also~~ Preventing and managing gas intrusion and accumulation is necessary for proper operation of the ECCS injection/spray subsystems and may also prevent a water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel following an ECCS initiation signal. ~~One acceptable method of ensuring the lines are full is to vent at the high points.~~

*Selection of ECCS injection/spray subsystem locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The ECCS injection/spray subsystem is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS injection/spray subsystems are not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*ECCS injection/spray subsystem locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is*

*compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

[ The 31 day Frequency is based on operating experience, on the procedural controls governing system operation, and on the gradual nature of void buildup in the ECCS piping.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. *The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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#### SR 3.5.1.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS 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 that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves potentially 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.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

[ The 31 day Frequency of this SR was derived from the Inservice Testing Program requirements for performing valve testing at least once every 92 days. The Frequency of 31 days is further justified because the valves are operated under procedural control and because improper valve alignment would only affect a single subsystem. This Frequency has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
----- ]

*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

SR 3.5.1.3

Verification that ADS air receiver pressure is  $\geq$  [150] psig assures adequate air pressure for reliable ADS operation. The accumulator on each ADS valve provides pneumatic pressure for valve actuation. The designed pneumatic supply pressure requirements for the accumulator are such that, following a failure of the pneumatic supply to the accumulator, at least two valve actuations can occur with the drywell at 70% of design pressure (Ref. 15). The ECCS safety analysis assumes only one actuation to achieve the depressurization required for operation of the low pressure ECCS. This minimum required pressure of [150] psig is provided by the ADS Instrument Air Supply System. [ The 31 day Frequency takes into consideration administrative control over operation of the Instrument Air Supply System and alarms for low air pressure.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

## B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING SYSTEM (RCIC)

### B 3.5.2 ECCS - Shutdown

#### BASES

BACKGROUND	A description of the High Pressure Core Spray (HPCS) System, Low Pressure Core Spray (LPCS) System, and low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System is provided in the Bases for LCO 3.5.1, "ECCS - Operating."
APPLICABLE SAFETY ANALYSES	<p>The ECCS performance is evaluated for the entire spectrum of break sizes for a postulated loss of coolant accident (LOCA). The long term cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one low pressure ECCS injection/spray subsystem is required, post LOCA, to maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown. It is reasonable to assume, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level. To provide redundancy, a minimum of two low pressure ECCS injection/spray subsystems are required to be OPERABLE in MODES 4 and 5.</p> <p>The ECCS satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>Two ECCS injection/spray subsystems are required to be OPERABLE. The ECCS injection/spray subsystems are defined as the three LPCI subsystems, the LPCS System, and the HPCS System. The LPCS System and each LPCI subsystem consist of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. The HPCS System consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the RPV. <i>Management of gas voids is important to ECCS injection/spray subsystem OPERABILITY.</i></p> <p>As noted, one LPCI subsystem (A or B) may be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of low pressure and low temperature conditions in MODES 4 and 5, sufficient time will be available to manually align and initiate LPCI subsystem operation to provide core cooling prior to postulated fuel uncover.</p>

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. [ The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

## REFERENCES

1. FSAR, Section [6.3.3.4].

## BASES

APPLICABLE SAFETY ANALYSES	The function of the RCIC System is to respond to transient events by providing makeup coolant to the reactor. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. The RCIC System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).
LCO	The OPERABILITY of the RCIC System provides adequate core cooling such that actuation of any of the ECCS subsystems is not required in the event of RPV isolation accompanied by a loss of feedwater flow. The RCIC System has sufficient capacity to maintain RPV inventory during an isolation event. <i>Management of gas voids is important to RCIC System OPERABILITY.</i>
APPLICABILITY	The RCIC System is required to be OPERABLE in MODE 1, and MODES 2 and 3 with reactor steam dome pressure > 150 psig since RCIC is the primary non-ECCS water source for core cooling when the reactor is isolated and pressurized. In MODES 2 and 3 with reactor steam dome pressure ≤ 150 psig, and in MODES 4 and 5, RCIC is not required to be OPERABLE since the ECCS injection/spray subsystems can provide sufficient flow to the vessel.
ACTIONS	<p>A Note prohibits the application of LCO 3.0.4.b to an inoperable RCIC System. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable RCIC System and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.</p> <p><u>A.1 and A.2</u></p> <p>If the RCIC System is inoperable during MODE 1, or MODES 2 or 3 with reactor steam dome pressure &gt; 150 psig, and the HPCS System is verified to be OPERABLE, the RCIC System must be restored to OPERABLE status within 14 days. In this Condition, loss of the RCIC System will not affect the overall plant capability to provide makeup inventory at high RPV pressure since the HPCS System is the only high pressure system assumed to function during a loss of coolant accident (LOCA). OPERABILITY of the HPCS is therefore verified immediately when the RCIC System is inoperable. This may be performed as an administrative check, by examining logs or other information, to determine if the HPCS is out of service for maintenance or other reasons. Verification does not require performing the Surveillances needed to demonstrate the OPERABILITY of the HPCS System. If the OPERABILITY of the HPCS System cannot be verified, however, Condition B must be immediately entered. For transients and certain abnormal events with no LOCA, RCIC (as opposed to HPCS) is the</p>

## BASES

## ACTIONS (continued)

preferred source of makeup coolant because of its relatively small capacity, which allows easier control of RPV water level. Therefore, a limited time is allowed to restore the inoperable RCIC to OPERABLE status.

The 14 day Completion Time is based on a reliability study (Ref. 3) that evaluated the impact on ECCS availability, assuming that various components and subsystems were taken out of service. The results were used to calculate the average availability of ECCS equipment needed to mitigate the consequences of a LOCA as a function of allowed outage times (AOTs). Because of the similar functions of the HPCS and RCIC, the AOTs (i.e., Completion Times) determined for the HPCS are also applied to RCIC.

B.1 and B.2

If the RCIC System cannot be restored to OPERABLE status within the associated Completion Time, or if the HPCS System is simultaneously inoperable, the plant must be brought to a condition 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 reactor steam dome pressure reduced to  $\leq 150$  psig 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  
REQUIREMENTSSR 3.5.3.1

*The RCIC System flow path piping and components have has the potential to develop voids and pockets of entrained airgases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RCIC System and may also prevent a water hammer, pump cavitation, and pumping of noncondensable gas. Maintaining the pump discharge line of the RCIC System full of water ensures that the system will perform properly, injecting its full capacity into the Reactor Coolant System upon demand. This will also prevent a water hammer following an initiation signal. One acceptable method of ensuring the line is full is to vent at the high points.*

*Selection of RCIC System locations susceptible to gas accumulation is based on a self-assessment of the piping configuration to identify where gases may accumulate and remain even after the system is filled and vented, and to identify vulnerable potential degassing flow paths. The review is supplemented by verification that installed high-point vents are actually at the system high points, including field verification to ensure*



*pipe shapes and construction tolerances have not inadvertently created additional high points. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The RCIC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RCIC Systems are not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*RCIC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

[ The 31 day Frequency is based on the gradual nature of void buildup in the RCIC piping, the procedural controls governing system operation, and operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. *The Surveillance Frequency may vary by location susceptible to gas accumulation.*

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.5.3.2

Verifying the correct alignment for manual, power operated, and automatic valves in the RCIC flow path provides assurance that the proper flow path will exist for RCIC operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. For the RCIC System, this SR also includes the steam flow path for the turbine and the flow controller position.

[ The 31 day Frequency of this SR was derived from the Inservice Testing Program requirements for performing valve testing at least every 92 days. The Frequency of 31 days is further justified because the valves are operated under procedural control and because improper valve position would affect only the RCIC System. This Frequency has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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*The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at*

*the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.*

## BASES

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LCO In the event of a Design Basis Accident (DBA), a minimum of one RHR containment spray subsystem is required to mitigate potential bypass leakage paths and maintain the primary containment peak pressure below design limits. To ensure that these requirements are met, two RHR containment spray subsystems must be OPERABLE. Therefore, in the event of an accident, at least one subsystem is OPERABLE assuming the worst case single active failure. An RHR containment spray subsystem is OPERABLE when the pump, the heat exchanger, and associated piping, valves, instrumentation, and controls are OPERABLE. *Management of gas voids is important to RHR Containment Spray System OPERABILITY.*

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APPLICABILITY In MODES 1, 2, and 3, a DBA could cause 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, maintaining RHR containment spray subsystems OPERABLE is not required in MODE 4 or 5.

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## ACTIONS

A.1

With one RHR containment spray subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE RHR containment spray subsystem is adequate to perform the primary containment cooling function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced primary containment cooling capability. The 7 day Completion Time was chosen in light of the redundant RHR containment capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

B.1

With two RHR containment spray subsystems inoperable, one subsystem must be restored to OPERABLE status within 8 hours. In this Condition, there is a substantial loss of the primary containment bypass leakage mitigation function. The 8 hour Completion Time is based on this loss of function and is considered acceptable due to the low probability of a DBA and because alternative methods to remove heat from primary containment are available.

C.1

-----REVIEWER'S NOTE -----

Adoption of a MODE 3 end state requires the licensee to make the following commitments:

## BASES

## ACTIONS (continued)

of Maintenance at Nuclear Power Plants," Nuclear Management and Resource Council, Revision 3, July 2000.

2. [LICENSEE] will follow the guidance established in TSTF-IG-05-02, Implementation Guidance for TSTF-423, Revision 2, "Technical Specifications End States, NEDC-32988-A," November 2009.

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If the inoperable RHR containment spray subsystem cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 2) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action C.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is 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  
REQUIREMENTSSR 3.6.1.7.1

Verifying the correct alignment for manual, power operated, and automatic valves in the RHR containment spray mode flow path provides assurance that the proper flow paths will exist for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

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 31 day Frequency of this SR is justified because the valves are operated under procedural control and because improper valve position would affect only a single subsystem. This Frequency has been shown to be acceptable based on operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

*A-~~Two~~ Notes ~~has~~ been added to this SR. ~~The first Note that~~ allows RHR containment spray subsystems to be considered OPERABLE during alignment to and operation in the RHR shutdown cooling mode when below [the RHR cut in permissive pressure in MODE 3], if capable of being manually realigned and not otherwise inoperable. At these low pressures and decay heat levels (the reactor is shut down in MODE 3), a reduced complement of subsystems can provide the required containment pressure mitigation function thereby allowing operation of an RHR shutdown cooling loop when necessary. ~~The second Note exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.~~*

*SR 3.6.1.7.2*

*RHR Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR suppression pool spray subsystems and may also prevent water hammer and pump cavitation.*

*Selection of RHR Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.*

*The RHR Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.*

*RHR Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.*

*[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Containment Spray System piping and the procedural controls governing system operation.*

*OR*

*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.*

-----REVIEWER'S NOTE-----

*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*

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SR 3.6.1.7.32

Verifying each RHR pump develops a flow rate  $\geq$  [5650] 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. It is tested in the pool cooling mode to demonstrate pump OPERABILITY without spraying down equipment in primary containment. Flow is a normal test of centrifugal pump performance required by the ASME Code (Ref. 3). This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance.



## BASES

## SURVEILLANCE REQUIREMENTS (continued)

## -----REVIEWER'S NOTE-----

If the testing is within the scope of the licensee's Inservice Testing Program, the Frequency "In accordance with the Inservice Testing Program" should be used. Otherwise, the periodic Frequency of 92 days or the reference to the Surveillance Frequency Control Program should be used.

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[ The Frequency of this SR is [in accordance with the Inservice Testing Program] [92 days.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

## -----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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SR 3.6.1.7.43

This SR verifies that each RHR containment spray subsystem automatic valve actuates to its correct position upon receipt of an actual or simulated automatic actuation signal. Actual spray initiation is not required to meet this SR. 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 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 the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.6.1.7.54

This Surveillance is performed to verify that the spray nozzles are not obstructed and that flow will be provided when required. [ The 10 year Frequency is adequate to detect degradation in performance due to the passive nozzle design and its normally dry state and has been shown to be acceptable through operating experience.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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## REFERENCES

1. FSAR, Section [6.2.1.1.5].
2. NEDC-32988-A, Revision 2, Technical Justification to Support Risk-Informed Modification to Selected Required End States for BWR Plants, December 2002.
3. ASME Code for Operation and Maintenance of Nuclear Power Plants.

BASES

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

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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.

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## ACTIONS

A.1

With one RHR suppression pool cooling subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this Condition, the remaining RHR suppression pool cooling subsystem is adequate to perform the primary containment cooling function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced primary containment cooling capability. The 7 day Completion Time is acceptable in light of the redundant RHR suppression pool cooling capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

B.1

-----REVIEWER'S NOTE -----  
Adoption of a MODE 3 end state requires the licensee to make the following commitments:

1. [LICENSEE] will follow the guidance established in Section 11 of NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Nuclear Management and Resource Council, Revision 3, July 2000.
2. [LICENSEE] will follow the guidance established in TSTF-IG-05-02, Implementation Guidance for TSTF-423, Revision 2, "Technical Specifications End States, NEDC-32988-A," November 2009.

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.2.3.2

RHR Suppression Pool Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR suppression pool cooling subsystems and may also prevent water hammer and pump cavitation.

Selection of RHR Suppression Pool Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Suppression Pool Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Suppression Pool Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Suppression Pool Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the

susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Suppression Pool Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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SR 3.6.2.3.32

Verifying each RHR pump develops a flow rate  $\geq$  [7450] 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 (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.

-----REVIEWER'S NOTE-----  
If the testing is within the scope of the licensee's Inservice Testing Program, the Frequency "In accordance with the Inservice Testing Program" should be used. Otherwise, the periodic Frequency of 92 days or the reference to the Surveillance Frequency Control Program should be used.  
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[ The Frequency of this SR is [in accordance with the Inservice Testing Program] [92 days.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

## B 3.9 REFUELING OPERATIONS

## B 3.9.8 Residual Heat Removal (RHR) - High Water Level

## BASES

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**BACKGROUND** The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34. Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of one motor driven pump, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchangers, to the reactor via separate feedwater lines or to the upper containment pool via a common single flow distribution sparger or to the reactor via the low pressure coolant injection path. The RHR heat exchangers transfer heat to the Standby Service Water System. The RHR shutdown cooling mode is manually controlled.

In addition to the RHR subsystems, the volume of water above the reactor pressure vessel (RPV) flange provides a heat sink for decay heat removal.

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**APPLICABLE SAFETY ANALYSES** With the unit in MODE 5, the RHR System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR System is required for removing decay heat to maintain the temperature of the reactor coolant.

The RHR System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

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**LCO** Only one RHR shutdown cooling subsystem is required to be OPERABLE in MODE 5 with irradiated fuel in the RPV and the water level  $\geq$  [22 ft 8 inches] above the RPV flange. Only one subsystem is required because the volume of water above the RPV flange provides backup decay heat removal capability.

An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path. Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.

Additionally, each RHR shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. Operation (either continuous or intermittent) of one subsystem can maintain and reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. A Note is provided to

## BASES

## SURVEILLANCE REQUIREMENTS (continued)

## -----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

SR 3.9.8.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR shutdown cooling subsystem(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas

intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

[ The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

-----REVIEWER'S NOTE-----  
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.  
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REFERENCES      None.

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## B 3.9 REFUELING OPERATIONS

## B 3.9.9 Residual Heat Removal (RHR) - Low Water Level

## BASES

BACKGROUND	<p>The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34. Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of one motor driven pump, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchangers, to the reactor via separate feedwater lines, to the upper containment pool via a common single flow distribution sparger, or to the reactor via the low pressure coolant injection path. The RHR heat exchangers transfer heat to the Standby Service Water System. The RHR shutdown cooling mode is manually controlled.</p>
APPLICABLE SAFETY ANALYSES	<p>With the unit in MODE 5, the RHR System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR System is required for removing decay heat to maintain the temperature of the reactor coolant.</p> <p>The RHR System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>In MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and with the water level &lt; 22 ft 8 inches above the RPV flange both RHR shutdown cooling subsystems must be OPERABLE.</p> <p>An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path. <u>Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.</u></p> <p>Additionally, each RHR shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat. Operation (either continuous or intermittent) of one subsystem can maintain and reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. A Note is provided to allow a 2 hour exception for the operating subsystem to be removed from operation every 8 hours.</p>

SR 3.9.9.2

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