US-APWR DCD Revision 2
RAI Tracking Report

February 2010

Revision History

Revision	Page	Description
0	All	Original issued Including RAI responses that were submitted through October 31, 2009
1	All	Including RAI responses that were submitted through December 31, 2009

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General Description

This report includes a table that identifies the impact of each response to the Request for Additional Information ("RAI") relative to the Design Control Document ("DCD") Revision 2 of US-APWR. This table shows the RAI responses which have been submitted since October 2009 and also should be incorporated into Tracking Report and DCD in future revision.

The report also includes the DCD Markups and Revision List for the RAI responses that impacted the DCD.

Contents

For ease of using this Tracking Report, each chapter is organized in a stand alone fashion that includes a cover sheet and the following relevant information:

- DCD Revision List – a list of the revision resulting from RAI responses and others changes
- DCD Markups – a copy of the DCD pages that have changes resulting from RAI responses or others change.

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
3.2.1	Seismic Classification											
3.2.2	System Quality Group								CP RAI 67	CP_03.02.02-3	0	3
	Classification											
3.3.1	Wind Loadings											
3.3.2	Tornado Loadings											
3.4.1	Internal Flood Protection for											
	Onsite Equipment Failures											
3.4.2	Analysis Procedures		03.04.02-1									
			03.04.02-2									
			03.04.02-3									
			03.04.02-4									
		489	03.04.02-5	12/26/2009	N	N	N		-	-	N/A	N/A
3.5.1.1	Internally Generated Missiles											
	(Outside Containment)											
3.5.1.2	Internally-Generated Missiles											
	(Inside Containment)											
3.5.1.3	Turbine Missiles											
3.5.1.4	Missiles Generated by											
	Tornadoes and Extreme Winds											
3.5.1.5	Site Proximity Missiles											
	(Except Aircraft)											
3.5.1.6	Aircraft Hazards											
	Structures, Systems, and											
	Components to be Protected											
	from Externally-Generated											
	Missiles											
3.5.3	Barrier Design Procedures	482	03.05.03-7	2009/12/9	N	N	N		-	-	N/A	N/A
		482	03.05.03-8	2009/12/9	Y	N	N		-	DCD_03.05.03-8	1	3
3.6.1	Plant Design for Protection											
	Against Postulated Piping Failures											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
	in Fluid Systems											
	Outside Containment											
3.6.2	Determination of Rupture Locations	459	03.06.02-20	2009/10/16	Y	N	N		-	DCD_03.06.02-20	-	2
	and Dynamic Effects Associated	459	03.06.02-21	2009/10/16	N	N	N		-	-	N\A	N\A
	with the Postulated Rupture	459	03.06.02-22	2009/10/16	Y	N	N		-	DCD_03.06.02-22	-	2
	of Piping	459	03.06.02-23	2009/10/16	Y	N	N		-	DCD_03.06.02-23	-	2
		459	03.06.02-24	2009/10/16	Y	N	N		-	DCD_03.06.02-24	-	2
		459	03.06.02-25	2009/10/16	Y	N	N		-	DCD_03.06.02-25	0	3
		459	03.06.02-26	2009/10/16	N	N	N		-	-	N\A	N\A
		459	03.06.02-27	2009/10/16	Y	N	N		-	DCD_03.06.02-27	-	2
		459	03.06.02-28	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-29	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-30	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-31	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-32	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-33	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-34	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-35	2009/12/1	N	N	N		-	-	N\A	N\A
		459	03.06.02-36	2009/10/16	N	N	N		-	-	N\A	N\A
		459	03.06.02-37	10/16/2009	Y	N	N		-	DCD_03.06.02-37	-	2
		459	03.06.02-38	10/16/2009	Y	N	N		-	DCD_03.06.02-38	-	2
		459	03.06.02-39	2009/12/1	Y	N	N		-	DCD_03.06.02-39	1	3
3.6.3	Leak-Before-Break	217	3.6.3-16	2009/4/23	Y	+ part4	N		-	DCD_3.6.3-16	3	
	Evaluation Procedures		3.6.3-17									
		485	3.6.3-18	2010/1/18	N	N	N		-	-	N/A	N/A
		485	3.6.3-19	2010/1/18	Y	Y	N		-	DCD_3.6.3-19	TBD	
		485	3.6.3-20	2010/1/18	N	N	N		-	-	N/A	N/A
		485	3.6.3-21	2010/1/18	Y	N	N		-	DCD_3.6.3-21	TBD	
		485	3.6.3-22	2010/1/18	N	N	N		-	-	N/A	N/A
		485	3.6.3-23	2010/1/18	N	N	N		-	-	N/A	N/A
		485	3.6.3-24	2010/1/18	Y	N	N		-	DCD_3.6.3-24	TBD	
		485	3.6.3-25	2010/1/18	N	N	N		-	-	N/A	N/A
3.7.1	Seismic Design Parameters	494	03.07.01-2	2010/1/29	N	N	N		-	-	N/A	N/A
		494	03.07.01-3	2010/1/29	N	N	N		-	-	N/A	N/A
		494	03.07.01-4	2010/1/29	Y	Y	N		-	DCD_03.07.01-4	TBD	
		495	03.07.02-2	2010/2/2	N	N	N		-	-	N/A	N/A
3.7.2	Seismic System Analysis	212	3.7.2-3	2009/5/7	Y	N	N		-	DCD_3.7.2-3	TBD	
		495	03.07.02-3A	2010/2/2	N	N	N		-	-	N/A	N/A
		495	03.07.02-4	2010/2/2	Y	N	N		-	DCD_03.07.02-4	TBD	
		495	03.07.02-5	2010/2/2	Y	N	N		-	DCD_03.07.02-5	TBD	
		212	3.7.2-17	2009/5/7	Y	N	N		-	DCD_3.7.2-17	TBD	
		212	3.7.2-18	2009/5/7	Y	N	N		-	DCD_3.7.2-18	TBD	
		212	3.7.2-19	2009/5/7	Y	N	N		-	DCD_3.7.2-19	TBD	
3.7.3	Seismic Subsystem Analysis	493	03.07.03-2	2010/1/28	Y	N	N		-	DCD_03.07.03-2	TBD	
		493	03.07.03-3	2010/1/28	N	N	N		-	-	N/A	N/A
		493	03.07.03-4	2010/1/28	N	N	N		-	-	N/A	N/A
		493	03.07.03-5	2010/1/28	Y	N	N		-	DCD_03.07.03-5	TBD	
3.7.4	Seismic Instrumentation											
3.8.1	Concrete Containment											
		-	-	-	-	-	-	-	COL3.8(2) deleted	MAP-03-004	0	2, 3
3.8.3	Concrete and Steel											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
	Internal Structures											
	of Steel or Concrete Containments											
3.8.4	Other Seismic Category I Structures											
3.8.5	Foundations											
3.9.1	Special Topics for											
	Mechanical Components											
3.9.2	Dynamic Testing and Analysis	498	03.09.02-59	2010/1/15	N	N	N		-	-	N/A	N/A
	of Systems, Structures,	498	03.09.02-60	2010/1/15	N	N	N		-	-	N/A	N/A
	and Components		03.09.02-61									
			03.09.02-62									
		498	03.09.02-63	2010/1/15	N	N	N		-	-	N/A	N/A
			03.09.02-64									
			03.09.02-65									
			03.09.02-66									
		498	03.09.02-67	2010/1/15	N	N	N		-	-	N/A	N/A
			03.09.02-68									
			03.09.02-69									
			03.09.02-70									
			03.09.02-71									
		498	03.09.02-72	2010/1/15	N	N	N		-	-	N/A	N/A
		498	03.09.02-73	2010/1/15	N	N	N		-	-	N/A	N/A
		498	03.09.02-74	2010/1/15	N	N	N		-	-	N/A	N/A
			03.09.02-75									
		498	03.09.02-76	2010/1/15	N	N	N		-	-	N/A	N/A
		498	03.09.02-77	2010/1/15	N	N	N		-	-	N/A	N/A
		498	03.09.02-78	2010/1/15	N	N	N		-	-	N/A	N/A
		498	03.09.02-79	2010/1/15	N	N	N		-	-	N/A	N/A
			03.09.02-80									
		498	03.09.02-81	2010/1/15	N	N	N		-	-	N/A	N/A
			03.09.02-82									
		498	03.09.02-83	2010/1/15	N	N	N		-	-	N/A	N/A
3.9.3	ASME Code Class 1, 2, and 3											
	Components,											
	and Component Supports,											
	and Core Support Structures											
3.9.4	Control Rod Drive Systems											
3.9.5	Reactor Pressure Vessel Internals											
3.9.6	Functional Design, Qualification,											
	and Inservice Testing Programs											
	for Pumps, Valves,											
	and Dynamic Restraints											
3.10	Seismic/Dynamic Qual	486	03.10-10	2009/12/9	N	N	N		-	-	N/A	N/A
	of Mech/Elec Eqmt	486	03.10-11	2009/12/9	Y	N	N		-	DCD_03.10-11	1	3
		486	03.10-12	2009/12/9	Y	N	N		-	DCD_03.10-12	1	3
		486	03.10-13	2009/12/25	Y	N	N		-	DCD_03.10-13	1	3
		486	03.10-14	2009/12/25	N	N	N		-	-	N/A	N/A
		486	03.10-15	2009/12/25	N	N	N		-	-	N/A	N/A
		486	03.10-16	2009/12/25	N	N	N		-	-	N/A	N/A
		486	03.10-17	2009/12/25	N	N	N		-	-	N/A	N/A

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
3.11	Environmental Qual	445	03.11-16	2009/9/29	Y	Y 1.8	N		-	DCD_03.11-16	0	3
	of Mech/Elec Eqmt	511	03.11-17	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-18	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-19	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-20	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-21	2010/2/2	Y	N	N		-	DCD_03.11-21	TBD	
		511	03.11-22	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-23	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-24	2010/2/2	Y	N	N		-	DCD_03.11-24	TBD	
		511	03.11-25	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-26	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-27	2010/2/2	N	N	N		-	-	N/A	N/A
		511	03.11-28	2010/2/2	N	N	N		-	-	N/A	N/A
		512	03.11-29	2010/1/28	N	N	N		-	-	N/A	N/A
		512	03.11-30	2010/1/28	N	N	N		-	-	N/A	N/A
		512	03.11-31	2010/1/28	N	N	N		-	-	N/A	N/A
		512	03.11-32	2010/1/28	N	N	N		-	-	N/A	N/A
		512	03.11-33	2010/1/28	N	N	N		-	-	N/A	N/A
		512	03.11-34	2010/1/28	Y	N	N		-	DCD_03.11-34	TBD	
		512	03.11-35	2010/1/28	N	N	N		-	-	N/A	N/A
3.12	ASME Code Class 1, 2, and 3	465	03.12-17	2009/12/2	Y	N	N		-	DCD_O3.12-17	1	3
	Piping Systems,	465	03.12-18	2009/11/18	N	N	N		-	-	N/A	N/A
	Piping Components	465	03.12-19	2009/11/18	Y	N	N		-	DCD_03.12-19	0	3
	and their Associated Supports	465	03.12-20	2009/11/18	Y	N	N		-	DCD_03.12-20	0	3
		465	03.12-21	2009/11/18	N	N	N		-	-	N/A	N/A
		465	03.12-22	2009/11/18	N	N	N		-	-	N/A	N/A
		465	03.12-23	2009/12/2	Y	N	N		-	DCD_03.12-23	1	3
		465	03.12-24	2009/11/18	Y	N	N		-	DCD_03.12-24	0	3
3.13	Threaded Fasteners -											
	ASME Code Class 1, 2, and 3											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
5.2.1.1	Compliance with the Codes	264	05.02.01.01-1	2009/10/2	Y	Y	N		-	DCD_05.02.01.01-1	-	2
	and Standards Rule, 10 CFR 50.55a			2009/12/15	Y	Y	N		-	DCD_05.02.01.01-1	TBD	
5.2.1.2	Applicable Code Cases											
5.2.2	Overpressure Protection											
5.2.3	Reactor Coolant Pressure Boundary	224	05.02.03-1	2009/3/24	Y	N	N		-	DCD_05.02.03-1	3	2
	Materials			2009/10/2	Y	Y	N		-	DCD_05.02.03-1	-	2
			05.02.03-2									
			05.02.03-3									
			05.02.03-4									
			05.02.03-5									
			05.02.03-6									
			05.02.03-7									
			05.02.03-8									
			05.02.03-9									
			05.02.03-10									
			05.02.03-11									
			05.02.03-12									
			05.02.03-13									
			05.02.03-14									
			05.02.03-15									
			05.02.03-16									
			05.02.03-17									
		509	05.02.03-18	2010/1/29	N	N	N		-	-	N/A	N/A
		-	-	-	-	-	-	-	COL 5.2(4) revised	MAP-05-001	TBD	
		-	-	-	-	-	-	-	COL 5.2(5) revised	MAP-05-002	TBD	
5.2.4	Reactor Coolant Pressure Boundary	254	05.02.04-8	2009/4/17	Y	N	N		-	DCD_05.02.04.-8	3	2
	Inservice Inspection and Testing			2009/10/2	Y	Y	N		-	DCD_05.02.04-8	-	2
5.2.5	Reactor Coolant Pressure Boundary	478	05.02.05-11	2009/12/2	Y	N	N		-	DCD_05.02.05-11	1	3
	Leakage Detection											
5.3.1	Reactor Vessel Materials											
	Pressure-Temperature Limits,											
	Upper-Shelf Energy,											
	and Pressurized Thermal Shock											
5.3.3	Reactor Vessel Integrity											
5.4	Reactor Coolant System											
	Component and Subsystem Design											
5.4.1.1	Pump Flywheel Integrity (PWR)											
5.4.2.1	Steam Generator Materials											
5.4.2.2	Steam Generator Program											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
5.4.7	Residual Heat Removal (RHR)											
	System											
5.4.11	Pressurizer Relief Tank											
5.4.12	Reactor Coolant System	OI	05.04.12-1	2009/10/2	N	N	N		-	-	N/A	N/A
	High Point Vents											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
6.1.1	Engineered Safety Features	487	06.01.01-11	2009/12/3	Y	N	N		-	DCD_06.01.01-11	1	3
	Materials	487	06.01.01-12	2009/12/3	N	N	N		-	-	N/A	N/A
6.1.2	Protective Coating Systems (Paints)											
	Organic Materials											
6.2.1	Containment Functional Design											
	Organic Materials											
6.2.1.2	Subcompartment Analysis											
6.2.1.3	Mass and Energy Release											
	Analysis for Postulated											
	Loss-of-Coolant Accidents											
6.2.1.4	Mass and Energy Release											
	Analysis for Postulated											
	Secondary System Pipe Ruptures											
	(LOCAs)											
6.2.1.5	Min. Containment Pressure											
	Analysis for											
	for Emergency Core Cooling Sys.											
	Performance Capability Studies											
6.2.2	Containment	85	06.02.02-10	2009/11/12	Y	N	N	fin.	-	DCD_06.02.02-10	1	2
	Heat Removal Systems	85	06.02.02-11	2009/11/12	N	N	N	fin.	-	-	N/A	N/A
		354	06.02.02-24	2009/7/7	N	N	N		-	-	N/A	N/A
				10/16/2009	Y	N	N		-	DCD_06.02.02-24	TBD	
		354	06.02.02-31	2009/7/7	Y	Y	N		-	DCD_06.02.02-31	4	2
				10/06/2009	Y	Y	N		-	DCD_06.02.02-31	-	2
		354	06.02.02-32	2009/7/7	Y	Y	N		-	DCD_06.02.02-32	-	2
				10/06/2009	Y	N	N		-	DCD_06.02.02-32	-	2
		354	06.02.02-33	2009/7/7	Y	Y	N		-	DCD_06.02.02-33	-	2
				10/06/2009	Y	N	N		-	DCD_06.02.02-33	-	2
		354	06.02.02-34	2009/7/7	Y	Y	N		-	DCD_06.02.02-34	-	2
				10/06/2009	Y	N	N		-	DCD_06.02.02-34	-	2
		354	06.02.02-35	2009/7/7	Y	Y	N		-	DCD_06.02.02-35	-	2
				10/06/2009	Y	N	N		-	DCD_06.02.02-35	-	2
		354	06.02.02-36	2009/7/7	Y	Y	N		-	DCD_06.02.02-36	-	2
				10/06/2009	Y	N	N		-	DCD_06.02.02-36	-	2
		354	06.02.02-44	2009/7/17	Y	N	N		-	DCD_06.02.02-44	TBD	
		422	06.02.02-52	2010/1/21	N	N	N		-	-	N/A	N/A
		466	06.02.02-53	2009/11/24	N	N	N		-	-	N/A	N/A
		466	06.02.02-54	2009/11/24	N	N	N		-	-	N/A	N/A
		466	06.02.02-55	2009/11/24	Y	N	N		-	DCD_06.02.02-55	TBD	
6.2.4	Containment Isolation System											
6.2.5	Combustible Gas Control	471	6.2.5-35	11/6/2009	Y	N	N		-	DCD_6.2.5-35	0	3
	in Containment											
6.2.6	Containment Leakage Testing	472	06.02.06-23	2009/11/13	Y	N	N		-	DCD_06.02.06-23	1	3
		472	06.02.06-24	2009/11/13	Y	N	N		-	DCD_06.02.06-24	1	3
		472	06.02.06-25	2009/11/13	N	N	N		-	-	N/A	N/A
		472	06.02.06-26	2009/11/27	Y	N	N		-	DCD_06.02.06-26	1	3

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
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		472	06.02.06-27	2009/11/27	Y	N	N		-	DCD_06.02.06-27	1	3
6.2.7	Fracture Prevention											
	of											
	Containment Pressure Boundary											
6.3	Emergency Core Cooling System											
6.4	Control Room Habitability System	49	06.04-9	2008/9/16	Y	N	N	fin.	-	DCD_06.04-9	(1)	2
		473		11/13/2009	Y	N	N		-	DCD_06.04-9	0	3
		501	06.04-10	2010/1/21	N	N	N		-	-	N/A	N/A
6.5.1	ESF Atmosphere Cleanup Systems		06.05.01-1									
6.5.2	Containment Spray	460	06.05.02-7	11/13/2009	N	N	N		-	-	N/A	N/A
	as a Fission Product											
	Cleanup System											
6.5.3	Fission Product											
	Control Systems and Structures											
6.5.5	Pressure Suppression Pool											
	as a											
	Fission Product Cleanup System											
6.6	Inservice Inspection and Testing											
	of Class 2 and 3 Components											
6.6.2	Inservice Inspection and Testing											
	of Class 2 and 3 Components											
6.6.3	Inservice Inspection and Testing											
	of Class 2 and 3 Components											
6.6.4	Inservice Inspection and Testing											
	of Class 2 and 3 Components											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
9.1.1	Criticality Safety of Fresh and											
	Spent Fuel Storage and Handling											
9.1.2	New and Spent Fuel Storage											
9.1.3	Spent Fuel Pool Cooling and											
	Cleanup System											
9.1.4	Light Load Handling System											
	(Related to Refueling)											
9.1.5	Overhead Heavy Load											
	Handling Systems											
9.2.1	Station Service Water System											
9.2.2	Reactor Auxiliary											
	Cooling Water Systems											
9.2.4	Potable and Sanitary Water Systems											
9.2.5	Ultimate Heat Sink											
9.2.6	Condensate Storage Facilities											
9.3.1	Compressed Air System											
		294	09.03.02-6	2009/5/13	Y	N	N		-	DCD_09.03.02-6	0	3
9.3.2	Process and Post-accident	448	09.03.02-11	2009/9/28	Y	N	N		-	DCD_09.03.02-11	0	3
	Sampling Systems	461	09.03.02-12	2009/11/17	Y	N	N		-	DCD_09.03.02-12	1	3
9.3.3	Equipment and Floor	426	09.03.03-15	2009/9/14	Y	N	N		-	DCD_09.03.03-15	-	2
	Drainage System	426	09.03.03-16	2009/9/14	Y	N	N		-	DCD_09.03.03-16	0	3
		426	09.03.03-17	2009/9/14	Y	N	N		-	DCD_09.03.03-17	-	2
9.3.4	Chemical and Volume Control System											
	(PWR)											
	(Including Boron Recovery System)											
9.4.1	Control Room Area	327	09.04.01-9	2010/1/29	Y	N	N		-	DCD_09.04.01-9	TBD	
	Ventilation System											
		475	09.04.01-12A	2009/11/20	Y	Y	N		-	DCD_09.04.01-12A	1	3
		475	09.04.01-13A	2009/11/20	Y	N	N		-	DCD_09.04.01-13A	1	3
		475	09.04.01-14A	2009/11/20	N	N	N		-	-	N/A	N/A
		484	09.04.01-15A	2009/12/9	N	N	N		-	-	N/A	N/A
9.4.2	Spent Fuel Pool Area											
	Ventilation System											
9.4.3	Auxiliary and Radwaste Area											
	Ventilation System											
9.4.4	Turbine Area Ventilation System											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
9.4.5	Engineered Safety Feature	474	09.04.05-10	11/13/2009	Y	N	N		-	DCD_09.04.05-10	0	3
	Ventilation System											
9.5.1	Fire Protection Program											
9.5.2	Communications Systems											
9.5.3	Lighting Systems											
9.5.4	Emergency Diesel Engine Fuel	467	09.05.04-43	11/10/2009	Y	Y	N		-	DCD_09.05.04-43	1	3
	Oil Storage and Transfer System	468	09.05.04-44	2009/12/10	Y	Y	N		-	DCD_09.05.04-44	1	3
		468	09.05.04-45	2009/12/10	Y	N	N		-	DCD_09.05.04-45	1	3
		468	09.05.04-46	2009/12/10	Y	N	N		-	DCD_09.05.04-46	1	3
		468	09.05.04-47	2009/12/10	Y	N	N		-	DCD_09.05.04-47	1	3
		468	09.05.04-48	2009/12/10	Y	N	N		-	DCD_09.05.04-48	1	3
		468	09.05.04-49	2009/12/10	N	N	N		-	-	N/A	N/A
9.5.5	Emergency Diesel Engine											
	Cooling Water System											
9.5.6	Emergency Diesel Engine											
	Starting System	504	09.05.06-24	12/23/09	Y	N	N		-	DCD_09.05.06-24	1	3
		504	09.05.06-25	12/23/09	Y	N	N		-	DCD_09.05.06-25	1	3
9.5.7	Emergency Diesel Engine	469	09.05.07-18	11/6/2009	N	N	N		-	-	N/A	N/A
	Lubrication System	469	09.05.07-19	11/6/2009	N	N	N		-	-	N/A	N/A
		506	09.05.07-20	2010/1/29	Y	N	N		-	DCD_09.05.07-20	TBD	
		506	09.05.07-21	2010/1/29	N	N	N		-	-	N/A	N/A
		506	09.05.07-22	2010/1/29	Y	N	N		-	DCD_09.05.07-22	TBD	
		506	09.05.07-23	2010/1/29	Y	N	N		-	DCD_09.05.07-23	TBD	
9.5.8	Emergency Diesel Engine	470	09.05.08-18	2009/12/2	Y	N	N		-	DCD_09.05.08-18	1	3
	Combustion Air Intake and	470	09.05.08-19	2009/12/2	N	N	N		-	-	N/A	N/A
	Exhaust System	470	09.05.08-20	2009/12/2	Y	N	N		-	DCD_09.05.08-20	1	3
		470	09.05.08-21	2009/12/2	Y	N	N		-	DCD_09.05.08-21	1	3
		470	09.05.08-22	2009/12/2	Y	N	N		-	DCD_09.05.08-22	1	3
		505	09.05.08-23	2010/2/1	N	N	N		-	-	N/A	N/A
		505	09.05.08-24	2010/2/1	N	N	N		-	-	N/A	N/A
		505	09.05.08-25	2010/2/1	Y	N	N		-	DCD_09.05.08-25	TBD	

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
10.2	Turbine Generator											
10.2.3	Turbine Rotor Integrity											
10.3	Main Steam Supply System											
10.3.6	Steam and		10.03.06-1									
	Feedwater System Materials		10.03.06-2									
			10.03.06-3									
			10.03.06-4									
			10.03.06-5									
			10.03.06-6									
			10.03.06-7									
			10.03.06-8									
			10.03.06-9									
		500	10.03.06-10	12/24/2009	Y	N	N		-	DCD_10.03.06-10	1	3
		500	10.03.06-11	12/24/2009	N	N	N		-	-	N/A	N/A
		500	10.03.06-12	12/24/2009	Y	N	N		-	DCD_10.03.06-12	1	3
10.4.1	Main Condensers											
10.4.2	Main Condenser Evacuation System											
10.4.3	Turbine Gland Sealing System											
10.4.4	Turbine Bypass System											
10.4.5	Circulating Water System											
10.4.6	Condensate Cleanup System	441	10.04.06-8	2009/9/16	Y	N	N		-	DCD_10.04.06-8	0	3
10.4.7	Condensate and Feedwater System											
10.4.8	Steam Generator Blowdown System											
	(PWR)											
10.4.9	Auxiliary Feedwater System (PWR)											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
11.1	Source Terms											
11.2	Liquid Waste Management System	458	11.02-21	2009/10/26	N	N	N		-	-	N/A	N/A
		462	11.02-22	2009/11/17	Y	N	N		-	DCD_11.02-22	1	3
		462	11.02-23	2009/11/17	N	N	N		-	-	N/A	N/A
		462	11.02-24	2009/11/17	N	N	N		-	-	N/A	N/A
		462	11.02-25	2009/11/17	Y	N	N		-	DCD_11.02-25	0	3
		462	11.02-26	2009/11/17	N	N	N		-	-	N/A	N/A
		462	11.02-27	2009/11/17	Y	N	N		-	DCD_11.02-27	0	3
11.3	Gaseous Waste											
	Management System											
11.4	Solid Waste Management System											
11.5	Process and Effluent											
	Radiological Monitoring											
	Instrumentation and											
	Sampling Systems											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
14.2	Initial Plant Test Program -	455	14.02-119	2009/10/1	Y	N	N		-	DCD_14.02-119	-	2
	Design Certification and											
	New License Applicants											
14.3	Inspections, Tests, Analyses,											
	and Acceptance Criteria											
14.3.2	Structural and Systems Engineering	452	14.03.02-9	2009/10/1	Y	N	N		-	DCD_14.03.02-9	-	2
	Inspections, Tests, Analyses,	452	14.03.02-10	2009/10/1	Y	N	N		-	DCD_14.03.02-10	-	2
	and Acceptance Criteria	452	14.03.02-11	2009/10/1	Y	N	N		-	DCD_14.03.02-11	-	2
		452	14.03.02-12	2009/10/1	Y	N	N		-	DCD_14.03.02-12	-	2
		452	14.03.02-13	2009/10/8	Y	N	N		-	DCD_14.03.02-13	-	2
		452	14.03.02-14	2009/10/1	Y	N	N		-	DCD_14.03.02-14	-	2
14.3.3	Piping Systems and Components	499	14.03.03-23	2009/12/16	Y	N	N		-	DCD_14.03.03-23	1	3
	and Acceptance Criteria											
14.3.4	Reactor Systems	503	14.03.04-42	2009/12/21	Y	N	N		-	DCD_14.03.04-42	1	3
14.3.5	Instrumentation and Controls -	515	14.03.05-32	2010/1/28	Y	N	N		-	DCD_14.03.05-32	TBD	
14.3.6	Electrical Systems -											
	Inspections, Tests, Analyses,											
	and Acceptance Criteria											
14.3.7	Plant Systems -	456	14.03.07-48	2009/10/5	Y	N	N		-	DCD_14.03.07-48	-	2
	Inspections, Tests, Analyses,	456	14.03.07-49	2009/10/5	Y	N	N		-	DCD_14.03.07-49	-	2
	and Acceptance Criteria	508	14.03.07-50	2009/12/24	Y	N	N		-	DCD_14.03.07-50	1	3
14.3.8	Radiation Protection -											
	Inspections, Tests, Analyses,											
	and Acceptance Criteria											
14.3.9	Human Factors Engineering -											
	Inspections, Tests, Analyses,											
	and Acceptance Criteria											
14.3.10	Emergency Planning -											
	Inspections, Tests, Analyses,											
	and Acceptance Criteria											
14.3.11	Containment Systems -	488	14.03.11-40	12/25/09	Y	N	N					
	Inspections, Tests, Analyses,			2010/1/13	Y	N	N		-	DCD_14.3.4.11-40	1	3
	and Acceptance Criteria	488	14.03.11-41	12/25/09	N	N	N					
				2010/1/13	N	N	N		-	-	N/A	N/A
		488	14.03.11-42	12/25/09	Y	N	N					
				2010/1/13	Y	N	N		-	DCD_14.3.4.11-42	1	3
		396	14.03.12-20	2009/7/17	Y	N	N		-	DCD_14.03.12-20	TBD	
14.3.12	Physical Security Hardware -	481	14.03.12-25	11/10/2009	N	N	N		-	-	N\A	N/A
	Inspections, Tests, Analyses,	481	14.03.12-26	11/10/2009	Y	N	N		-	DCD_14.03.12-26	0	3
	and Acceptance Criteria	481	14.03.12-27	11/10/2009	Y	N	N		-	DCD_14.03.12-27	0	3
		481	14.03.12-28	11/10/2009	N	N	N		-	-	N\A	N/A
		481	14.03.12-29	11/10/2009	Y	N	N		-	DCD_14.03.12-29	0	3
		481	14.03.12-30	11/10/2009	Y	N	N		-	DCD_14.03.12-30	0	3

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	cc	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
16.1	General, Plant Sys,	463	16-299	10/28/2009	N	N	N		-	-	N/A	N/A
	Refueling, & Adm Ctrls:											
	Technical Specifications											
16.2	SLs, Reactivity,											
	Core Op Limits, & Special Ops:											
	Technical Specifications											
16.3	Instrumentation:											
	Technical Specifications											
16.4	CS & ECCS: Technical Specificatio	OI	16-146-1804/79	10/14/2009	N	N	N		-	-	N/A	N/A
		OI	16-135-1818/51	10/14/2009	Y	Y	N		-	DCD_16-135-1818/51	0	3
		OI	16-135-1818/53	10/14/2009	Y	Y	N		-	DCD_16-135-1818/53	0	3
		OI	16-2.4-50	10/16/2009	N	N	N		-		N/A	N/A
		OI	16-9.2.1-26	10/14/2009	N	N	N		-		N/A	N/A
		OI	16-133-1827/136	10/16/2009	N	N	N		-		N/A	N/A
		OI	16-133-1827/15	2009/10/28	Y	Y	N		-	DCD_16-133-1827/15	0	3
		OI	16-133-1827/20	2009/10/28	N	N	N		-	-	N/A	N/A
		OI	16-1769/284	10/28/2009	N	N	N		-	-	N/A	N/A
		OI	16-1784/172	11/10/2009	Y	Y	N		-	DCD_16-1784/172	1	3
		OI	16-1784/174	11/10/2009	Y	Y	N		-	DCD_16-1784/174	1	3
		OI	16-1784/186	11/10/2009	Y	Y	N		-	DCD_16-1784/186	-	2
		OI	16-1784/188	11/10/2009	Y	Y	N		-	DCD_16-1784/188	1	3
		OI	16-1784/192	11/10/2009	Y	Y	N		-	DCD_16-1784/192	-	2
		OI	16-1769/209	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/220	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/228	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/230	11/10/2010	N	N	N		-	-	N/A	N/A
		OI	16-1769/231	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/232	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/233	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/238	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/241	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/242	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/270	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/271	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/272	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/273	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/274	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/275	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-1769/282	11/10/2009	Y	Y	N		-	DCD_16-1769/282	-	2
		OI	16-1769/290	11/10/2009	N	N	N		-	-	N/A	N/A
		OI	16-134-1825/26	10/30/2009	Y	Y	N		-	DCD_16-134-1825/26	0	3
		OI	16-134-1825/27	10/30/2009	N	N	N		-	-	N/A	N/A
		OI	16-72-853	10/30/2009	Y	Y	N		-	DCD_16-72-853	0	3
16.5	Containment Systems:											
	Technical Specifications											
16.6	Electrical Power Sys:											
	Technical Specifications											

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SRP Section		DCD RAI Response							Other Drivers	Change ID Number for DCD forthcoming Revision	DCD Tracking Report Revision	DCD Revision
No.	Title	RAI No.	Question No.	Response Date	Impact on DCD	Impact on COLA	Impact on PRA	Response Status				
19	Probabilistic Risk Assessment	88	19-150	2008/11/27	Y	N	N	fin.	-	DCD_19-150	-	2
	and Severe Accident Evaluation	423	19-362	2009/9/7	Y	N	N		-	DCD_19-362	0	3
	for New Reactors	423	19-363	2009/9/7	Y	N	N		-	DCD_19-363	0	3
		423	19-368	2009/9/7	Y	N	N		-	DCD_19-368	0	3
		423	19-371	2009/9/7	Y	N	N		-	-	0	3
		423	19-373	2009/9/7	Y	N	Y		-	DCD_19-373	0	3
		423	19-374	2009/9/7	Y	N	N		-	DCD_19-374	-	2
		423	19-375	2009/9/7	Y	N	N		-	DCD_19-375	1	3
		423	19-376	2009/9/7	Y	N	N		-	DCD_19-376	0	3
		423	19-387	2009/9/7	Y	N	N		-	DCD_19-387	0	3
		443	19-391	2009/10/1	N	N	N		-	-	N/A	N/A
		443	19-392	2009/10/1	N	N	N		-	-	N/A	N/A
		443	19-393	2009/10/1	Y	N	N		-	DCD_19-393	-	2
		443	19-394	2009/10/1	N	N	N		-	-	N/A	N/A
		443	19-395	2009/10/1	N	N	N		-	-	N/A	N/A
		443	19-396	2009/10/1	Y	N	N		-	DCD_19-396	0	3
		443	19-397	2009/10/1	Y	N	N		-	DCD_19-397	0	3
		454	19-398	2009/10/9	N	N	Y		-	-	N/A	N/A
		454	19-399	2009/10/9	N	N	Y		-	-	N/A	N/A
		454	19-400	2009/10/9	N	N	Y		-	-	N/A	N/A
		454	19-401	2009/10/9	Y	N	Y		-	DCD_19-401	-	2
		479	19-402	2009/11/25	Y	N	N		-	DCD_19-402	1	3
		479	19-403	2009/11/25	Y	N	N		-	DCD_19-403	1	3
		479	19-404	2009/11/25	Y	N	N		-	DCD_19-404	1	3
		479	19-405	2009/11/25	N	N	N		-	-	N/A	N/A
		479	19-406	2009/11/25	N	N	N		-	-	N/A	N/A
19.1	Determining the Technical Adequacy											
	of Probabilistic Risk Assessment											
	Results for Risk-Informed Activities											
		-	-	-	-	-	-	-	COL 19.3(5) deleted	MAP-19-001	-	2
19.2	Review of Risk Information											
	Used to Support Permanent Plant -											
	Specific Changes											
	to the Licensing Basis:											
	General Guidance											

Chapter 3

US-APWR DCD Revision 2 Chapter 3 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/ sentence/ item, table with row/column, or figure)	Description of Change
3.2-57	Table 3.2-2 8th Row under System: "27. Emergency Gas Turbine Auxiliary System" 1st Column	Change: "Combustion air intake equipment" to "Combustion air intake equipment and ductwork, turbine exhaust" Reason: Clarify intake and exhaust ductwork are Quality Group C [RAI 470-3363 Question 09.05.08-21]
3.2-57	Table 3.2-2 8th Row under System: "27. Emergency Gas Turbine Auxiliary System" 1st Column	Change: "Exhaust equipment" to "GTG Room ventilation system supply side equipment and ductwork and exhaust side equipment and ductwork" Reason: Clarify intake and exhaust ductwork are Quality Group C [RAI 470-3363 Question 09.05.08-21]
3.2-57	Table 3.2-2 8th Row under System: "27. Emergency Gas Turbine Auxiliary System" 1st and 2nd Columns	Change in 1st Column: "Piping and valves" to "Piping and valves (Safety related portion)" Change in 2nd column: "PS/B" to "PS/B, PSFSV" Reason: Clarify intake and exhaust ductwork are Quality Group C [RAI 470-3363 Question 09.05.08-21]
3.2-57	Table 3.2-2 8th Row under System: "27. Emergency Gas Turbine Auxiliary System"	Add new row: "PSFSV ventilation system containing exhaust fan, backdraft dampers, in-duct electric heater and ductwork; 5; PSFSV; N/A; N/A; 5; II" Reason: Clarify intake and exhaust ductwork are Quality Group C [RAI 470-3363 Question 09.05.08-21]
3.5-15	Subsection 3.5.3.1.3 1st Paragraph Last Sentence	Delete last sentence: "In cases of extreme missile impact, steel plate thicknesses may be limited and the residual velocity of the missiles is to be absorbed by concrete determined by equations presented in "Ballistic Perforation Dynamics" (Reference 3.5-13)." Reason: Removed statement as not applicable [RAI 482-3655 Question 3.5.3-08]

<table>
<tr><th>Page</th><th>Location
(e.g., subsection with paragraph/ sentence/ item, table with row/column, or figure)</th><th>Description of Change</th></tr>
<tr><td>3.5-26</td><td>Subsection 3.5.5
Reference 3.5-13</td><td>Change Reference 3.5-13 to the following:
<table><tr><td>3.5-13</td><td>Deleted.</td></tr></table>
Reason: Reference no longer applicable [RAI 482-3655 Question 3.5.3-08]</td></tr>
<tr><td>3.6-23</td><td>Subsection 3.6.2.5</td><td>Add new Subsection 3.6.2.6:
“3.6.2.6 Pipe Break Hazard Analysis Methodology
The following information is the outline of methodology for the pipe break hazard analysis that will be completed in accordance with the closure of ITAAC described in Table 2.3-2 of Tier 1 Chapter 2.3, relating to the pipe break hazard analysis report:
Identification of pipe break locations in high energy piping
Identification of leakage crack locations in high and moderate energy piping
Identification of SSCs that are safety-related or required for safe shutdown
Evaluation of consequences of pipe whip and jet impingement
Evaluation of consequences of spray wetting, flooding, environmental conditions
Design and location of protective barriers, restraints, and enclosures”
Reason: Provide methodology, and reference to ITAAC [RAI 459-3331 Question 3.6.2-39]</td></tr>
<tr><td>3.9-223,
3.9-224</td><td>Table 3.9-14
Sheets 104 & 105
Valve Tag Nos.
EWS-MOV-503A
EWS-MOV-503B
EWS-MOV-503C
EWS-MOV-503D
7th Column (Inservice Testing Type and Frequency)</td><td>Change to: “Remote Position Indication, Exercise/ 2 Years Exercise Full Stroke/ Quarterly Operability Test”
Reason: Test frequency of EWS valves should be consistent with corresponding ESW pumps. [CP RAI 57, Question 03.09.06-6, Refer to UAP-HF-09509, dated October 30, 2009]</td></tr>
</table>

Page	Location (e.g., subsection with paragraph/ sentence/ item, table with row/column, or figure)	Description of Change
3.10-5	Subsection 3.10 8th Paragraph	Replace entire paragraph to the following: "If existing test data are not available and a system and control logic review indicates that inadvertent change of state or intermediacy must be considered, then one of the following high frequency screening tests with 0.2 g peak acceleration are used to demonstrate lack of sensitivity to high frequency vibrations above 20 Hz where the function is monitored during the screening test followed by post test functional testing: sine sweep (fast linear rate, traditional log rate); sine beat at 1/6 octave spacing; band-limited white noise; or, random multifrequency time history. Structural resonances are normally detected by observing amplifications of the input motion in the test item. Phase relationships between the sinusoidal input signal and the structural response at the point of measurement will also help in defining resonances. Therefore, for each screening test, transfer function and phase data shall be generated by performing Fast Fourier Transform analysis of excitation and response time histories. These results are used to judge whether equipment or devices are sensitive to the high-frequency excitation." Reason: Clarification consistent with MUAP-08015 Revision 1 [RAI486-3861 Questions 3.10-11 and 13]
3.10-6	Subsection 3.10 9th Paragraph	Add as new last sentence: "In addition, the start of the ZPA range at 50 Hz is adjusted upward if the site-specific RRS show frequency exceedance beyond 50 Hz. In performing the equipment seismic qualification via testing, the TRS envelopes the RRS in all frequency ranges." Reason: Provided information [RAI 486-3861 Question 3.10-13]
3.10-6	Subsection 3.10.2 11th Paragraph	Add as new 12th Paragraph: "The US-APWR provides seismic qualification of equipment utilizing the seismic qualification standards and methods as identified in Section 3.10 to the maximum extent possible. When this is not possible or feasible (potential manufacturers / vendors are no longer available, potential manufacturers / vendors cannot provide an acceptable QA program meeting the requirements of 10CFR50 Appendix B, etc), a commercial-grade dedication process is used for

Page	**Location** (e.g., subsection with paragraph/ sentence/ item, table with row/column, or figure)	Description of Change
		seismic qualification.” Reason: Provided Clarification [RAI486-3861 Question 3.10-12]
3.10-7	Subsection 3.10.2 **Testing** 1st Paragraph Last Sentence	Change: “…with exceedances in the 25-50 Hz range.” to “… with exceedances above 250 Hz.” Reason: Provided Clarification [RAI486-3861 Question 3.10-11]
3.10-11	Subsection 3.10.2.1.1 3rd Paragraph Last Sentence	Change: “…with exceedances in the 25-50 Hz range.” to “… with exceedances above 250 Hz.” Reason: Provided Clarification [RAI486-3861 Question 3.10-11]
3.12-9	Subsection 3.12.4.4 4th Paragraph	Delete 4th Paragraph in its entirety: “If amplified response spectra at the connection point can not be developed, movements of the connection point from the seismic inertia analysis of the pipe run are analyzed as anchor movements and the solution is added to the seismic analysis of the decoupled branch line by absolute summation. The envelope floor response spectrum used for the seismic analysis of the decoupled branch line includes floor response spectra applicable for the connection point or the nearest restraints on the pipe run as a component response spectrum.” Reason: Changed methodology [RAI 465-3382 Question 3.12-23]
3.12-10	Subsection 3.12.4.4	Add new last Paragraph: “If amplified response spectra at the connection point can not be developed, then the model of the branch pipe is included in the analysis model of the run pipe. The portion of the branch pipe included in the analysis ends at either (a) the first anchor (including equipment nozzle or containment penetration) or (b) four seismic supports in each of the three perpendicular directions. In case of option (b), overlapping method of USNRC NUREG/CR-1980 (Reference 3.12-41) is used.” Reason: Changed methodology [RAI 465-3382 Question 3.12-23]

Page	**Location** (e.g., subsection with paragraph/ sentence/ item, table with row/column, or figure)	Description of Change
3.12-14	Subsection 3.12.5.9 Last Paragraph	Add new last Paragraph: "Furthermore, high temperature water that flows from the RCS pipe run into isolated branch pipes occurs as swirling water, referred to as cavity flow induced by the high temperature pipe. In addition, there is a phenomenon in which stratification occurs at the surface boundary between the high temperature water entering the branch pipe and the low temperature water already in the branch. When the stratified surface boundary (top of cavity flow) occurs at horizontal pipe bends and elbows, there is a possibility of significant thermal fluctuation inducing high cycle thermal fatigue at this point. Therefore, the piping is routed such that a stratified surface boundary does not occur at horizontal pipe bends and elbows." Reason: Clarify methodology [RAI 465-3382 Question 3.12-17]
3.12-25	Subsection 3.12.8	Add new Reference: "3.12-41 Dynamic Analysis of Piping, Using the Structural Overlap Method. NUREG/CR-1980, U.S. Nuclear Regulatory Commission, Washington, DC, March 1981." Reason: New reference used [RAI 465-3382 Question 3.12-23]

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Table 3.2-2 Classification of Mechanical and Fluid Systems, Components, and Equipment (Sheet 41 of 57)

System and Components	Equipment Class	Location	Quality Group	10 CFR 50 Appendix B (Reference 3.2-8)	Codes and Standards(3)	Seismic Category(4)	Notes
Combustion air intake equipment and ductwork, turbine exhaust	3	PS/B	C	YES	5	I	
GTG Room ventilation system supply side equipment and ductwork and exhaust ~~Exhaust~~ side equipment and ductwork	3	PS/B	C	YES	5	I	
Piping and valves (Safety related portion)	3	PS/B, PSFSV	C	YES	3	I	
PSFSV ventilation system containing exhaust fan, backdraft dampers, in-duct electric heater and ductwork	5	PSFSV	N/A	N/A	5	II	
28. Fuel Handling and Refueling System							
Refueling machine	4	R/B	D	N/A	5	II	
Fuel handling machine	4	R/B	D	N/A	5	II	
Spent fuel assembly handling tool	5	R/B	N/A	N/A	5	NS	
New fuel storage rack	3	R/B	C	YES	5	I	
Spent fuel storage rack	3	R/B	C	YES	5	I	
Fuel transfer tube	2	R/B	B	YES	2	I	
Spent fuel Pit	3	R/B	C	YES	5	I	
New fuel pit	3	R/B	C	YES	5	I	
Fuel transfer canal	3	R/B	C	YES	5	I	
Cask pit	3	R/B	C	YES	5	I	
Cask washdown pit	3	R/B	C	YES	5	I	
Spent fuel pit gates	3	R/B	C	YES	5	I	
Fuel inspection pit	3	R/B	C	YES	5	I	
Fuel transfer system	4	R/B	D	N/A	5	II	
Suspension hoist and aux. hoist on spent fuel cask handling crane	4	R/B	D	N/A	5	II	
New fuel elevator	4	R/B	D	N/A	5	II	

For the design of steel targets, the minimum design thickness (t_d) is given below where the perforation thickness, T_p, is obtained from BRL Formula or SRI Formula as applicable:

$$t_d = 1.25\ T_p$$

3.5.3.1.3 Composite (Modular) Sections

Composite or multi-element barriers consider the residual velocity of the missile perforating the first element as the striking velocity for the next element. For steel-concrete modular sections, the outer steel plates satisfy minimum thicknesses as determined in Subsection 3.5.3.1. ~~In cases of extreme missile impact, steel plate thicknesses may be limited and the residual velocity of the missiles is to be absorbed by concrete determined by equations presented in "Ballistic Perforation Dynamics" (Reference 3.5-13).~~

The residual velocity after missile penetration of the first layer (or outer shield) is determined by the formula:

$$V_r = \sqrt{V^2 - V_B{}^2}$$

where

V_r = residual velocity after missile penetration of the first layer (or outer shield)

V = impact (or striking) velocity of the missile object

V_B = perforation velocity associated with the energy absorbed up to the threshold of perforation.

3.5.3.2 Evaluation of Overall Structural Effects

Elements required to remain elastic are evaluated to assure that the usable strength capacity exceeds the demand. For structures allowed to displace beyond yield (elasto-plastic response), an evaluation confirms that acceptable deformation limits to demonstrate ductile behavior are not exceeded by comparing computed demand ductility ratios with capacity values.

After it is determined that a missile will not penetrate the barrier, an equivalent static load concentrated at the impact area is applied in conjunction with other design loads. Refer to Subsection 3.3.2.2 for determination of tornado forces on structures, including equivalent static loads for tornado missile impact. In determining an appropriate equivalent static load for other missiles sources (as defined in Subsection 3.8.4), elasto-plastic behavior may be assumed with permissible ductility ratios as long as deflections will not result in loss of function of any safety-related system.

The flexural, shear, and buckling effects on structural members are determined using the equivalent static load obtained from the evaluation of missile impact on structural response. Stress and strain limits for the equivalent static load comply with "Safety-Related Concrete Structures for Nuclear Power Plants (Other than Reactor Vessels and Containments)", RG 1.142, Rev.2 (Reference 3.5-14), and "Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities",

3.5-4 Rules for Construction of Nuclear Facility Components, American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel Code Section XI, 2001 Edition through the 2003 Addenda.

3.5-5 Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder), ASME NOG-1, 2004.

3.5-6 Protection Against Low-Trajectory Turbine Missiles. Regulatory Guide 1.115, Rev. 1, U.S. Nuclear Regulatory Commission, Washington, DC, July 1977.

3.5-7 Turbine Missiles, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, NUREG-0800, Standard Review Plan, Section 3.5.1.3, Rev. 3, U.S. Nuclear Regulatory Commission, Washington, DC, March 2007.

3.5-8 Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants. Regulatory Guide 1.76, Rev. 1, U.S. Nuclear Regulatory Commission, Washington, DC, March 2007.

3.5-9 A Review of Procedures for the Analysis and Design of Concrete Structures to Resist Missile Impact Effects, R. P. Kennedy, Nuclear Engineering and Design, Volume 37, Number 2, pp 183-202, 1976.

3.5-10 Barrier Design Procedures, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, NUREG-0800, Standard Review Plan, Section 3.5.3, Rev. 3, U.S. Nuclear Regulatory Commission, Washington, DC, March 2007.

3.5-11 U.S. Reactor Containment Technology, W.B. Cottrell and A.W. Savolainen, NSIC-5, Oak Ridge National Laboratories, Volume 1, Chapter 6, 1965.

3.5-12 Reactor Safeguards, C. R. Russell, MacMillan Publishers, New York, 1962.

3.5-13 ~~Ballistic Perforation Dynamics, R. F. Recht and T. W. Ipson, ASME Journal of Applied Mechanics, Volume 30, Series E, Number 3, September 1963.~~ Deleted.

3.5-14 Safety-Related Concrete Structures for Nuclear Power Plants (Other than Reactor Vessels and Containments), Regulatory Guide 1.142, Rev. 2, U.S. Nuclear Regulatory Commission, Washington, DC, November 2001.

3.5-15 Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities, including Supplement 2 (2004), ANSI/AISC N690-1994, American National Standards Institute/American Institute of Steel Construction, 1994 & 2004.

3.5-16 Code Requirements for Nuclear Safety-Related Concrete Structures, American Concrete Institute (ACI) 349, 1997.

expected range of impact energies demonstrate the capability to withstand the impact without rupture. Effects on environment and shutdown logics associated with the failure of the impacted pipe are considered.

3.6.2.5 Placement of essential SSCs in segregated areas, which are not subject to the Implementation of Criteria Dealing with Special Features

Special features such as pipe whip restraints, barriers, and shields are discussed in Subsection 3.6.2.4.4.

3.6.2.6 Pipe Break Hazard Analysis Methodology

The following information is the outline of methodology for the pipe break hazard analysis that will be completed in accordance with the closure of ITAAC described in Table 2.3-2 of Tier 1 Chapter 2.3, relating to the pipe break hazard analysis report:

- Identification of pipe break locations in high energy piping
- Identification of leakage crack locations in high and moderate energy piping
- Identification of SSCs that are safety-related or required for safe shutdown
- Evaluation of consequences of pipe whip and jet impingement
- Evaluation of consequences of spray wetting, flooding, environmental conditions
- Design and location of protective barriers, restraints, and enclosures

3.6.3 LBB Evaluation Procedures

This subsection describes the design basis to eliminate the dynamic effects of pipe rupture (Subsection 3.6.2) for the selected high-energy piping systems of RCL piping, RCL branch piping, and main steam piping. GDC 4 of Appendix A to 10 CFR 50 (Reference 3.6-1) allows exclusion of dynamic effects associated with pipe rupture from the design basis, when analyses demonstrate that the probability of pipe rupture is extremely low for the applied loading resulting from normal conditions, anticipated transients and a postulated SSE. The LBB evaluation is performed in accordance with SRP 3.6.3 (Reference 3.6-4).

The LBB analysis combines normal and abnormal (including seismic) loads to determine a critical crack size for a postulated pipe break. The critical crack size is compared to the size of a leakage crack for which detection is certain. If the leakage crack size is sufficiently smaller than the critical crack size, the LBB requirements are satisfied.

The piping systems, for which the LBB criterion is not applied, are evaluated for dynamic effects of postulated pipe rupture at locations defined in Subsection 3.6.2. For piping systems for which LBB is demonstrated, the evaluation of environmental effects including spray wetting, and flooding is still performed for breaks or leakage cracks in accordance with Subsection 3.6.2.

The COL Applicant is to identify the types of as-built materials and material specification

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**Table 3.9-14 Valve Inservice Test Requirements
(Sheet 104 of 151)**

Valve Tag Number	Description	Valve/ Actuator Type	Safety-Related Missions	Safety Functions(2)	ASME IST Category	Inservice Testing Type and Frequency	IST Notes
EWS-VLV-502B	Essential service water pump discharge check	Check	Maintain Open Transfer Open Maintain Close Transfer Close	Active	BC	Check Exercise/ Refueling Outage	3
EWS-VLV-502C	Essential service water pump discharge check	Check	Maintain Open Transfer Open Maintain Close Transfer Close	Active	BC	Check Exercise/ Refueling Outage	3
EWS-VLV-502D	Essential service water pump discharge check	Check	Maintain Open Transfer Open Maintain Close Transfer Close	Active	BC	Check Exercise/ Refueling Outage	3
EWS-MOV-503A	Essential service water pump discharge	Remote MO Butterfly	Maintain Close Maintain Open Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ ~~Cold Shutdown~~ Quarterly Operability Test	6
EWS-MOV-503B	Essential service water pump discharge	Remote MO Butterfly	Maintain Close Maintain Open Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ ~~Cold Shutdown~~ Quarterly Operability Test	6

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Table 3.9-14 Valve Inservice Test Requirements (Sheet 105 of 151)

Valve Tag Number	Description	Valve/ Actuator Type	Safety-Related Missions	Safety Functions(2)	ASME IST Category	Inservice Testing Type and Frequency	IST Notes
EWS-MOV-503C	Essential service water pump discharge	Remote MO Butterfly	Maintain Close Maintain Open Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ ~~Cold Shutdown~~ Quarterly Operability Test	6
EWS-MOV-503D	Essential service water pump discharge	Remote MO Butterfly	Maintain Close Maintain Open Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ ~~Cold Shutdown~~ Quarterly Operability Test	6
EWS-VLV-602A	Essential service water pump cooling water check	Check	Maintain Open Transfer Open Transfer Close	Active	BC	Check Exercise/ Refueling Outage	3
EWS-VLV-602B	Essential service water pump cooling water check	Check	Maintain Open Transfer Open Transfer Close	Active	BC	Check Exercise/ Refueling Outage	3
EWS-VLV-602C	Essential service water pump cooling water check	Check	Maintain Open Transfer Open Transfer Close	Active	BC	Check Exercise/ Refueling Outage	3

Recent seismic research, including recently published attenuation relations, indicates that earthquakes in the central and eastern United States have more energy content in the high-frequency range than earthquakes in the western United States. Therefore, the COL Applicant is to investigate if site-specific in-structure response spectra generated for the COL application may exceed the standard US-APWR design's in-structure response spectra in the high-frequency range. Accordingly, the COL Applicant is to consider the functional performance of vibration-sensitive components, such as relays and other instrument and control devices whose output could be affected by high frequency excitation.

The potential failure modes of the high frequency-sensitive component types and assemblies are considered in order to demonstrate the suitability of the equipment for high-frequency seismic environments. The generic failure modes involving inadvertent change of state, contact chatter, signal change/drift, and connection problems due to high frequency effects are the main focus of the high frequency qualification testing. High frequency failures resulting from improper design of mounting, inadequate design connections and fasteners, mechanical misalignment/binding of parts and the rare case of failure of a component part, will result from the same structural failure modes as those experienced during low frequency content spectra qualification testing in accordance with IEEE Std 344-1987 (Reference 3.10-6). Because the safety-related equipment will experience higher stresses and deformations when subjected to the low frequency excitation, these failure modes are more likely to occur under the low frequency testing. Failure modes related to improper mounting, inadequate securing of connections, poor quality joints (cyclic strain effects), etc., are precluded by quality assurance inspection and process/design controls.

Potentially high frequency sensitive components include: electro-mechanical relays; electro-mechanical contactors; circuit breakers; auxiliary contacts; control switches; transfer switches; process switches and sensors; potentiometers; and digital/solid-state devices (mounting and connections only).

Acceptable methods for resolving high frequency concerns not already addressed by certified design qualification where site-specific in-structure response spectra generated for the COL application results in high frequency exceedances of the standard design in-structure response spectra include: review existing equipment qualification test data for adequate high frequency input motion; review circuits containing potentially sensitive items for inappropriate system actions due to intermediacy or set point drifts; or screening test to confirm equipment does not have high frequency vulnerabilities.

If existing test data are not available and a system and control logic review indicates that inadvertent change of state or intermediacy must be considered, then one of the following high frequency screening tests with 0.2 g peak acceleration are used to demonstrate lack of sensitivity to high frequency vibrations above 20 Hz ~~in the 25-50 Hz range~~ where the function is monitored during the screening test followed by post test functional testing: sine sweep (fast linear rate, traditional log rate); sine beat at 1/6 octave spacing; band-limited white noise; or, random multifrequency time history. Structural resonances are normally detected by observing amplifications of the input motion in the test item. Phase relationships between the sinusoidal input signal and the structural response at the point of measurement will also help in defining resonances. Therefore, for each screening test, transfer function and phase data shall be generated by performing Fast Fourier Transform analysis of excitation and response time histories.

These results are used to judge whether equipment or devices are sensitive to the high-frequency excitation.

The above testing is not a qualification test but is intended to determine if equipment is potentially sensitive to high-frequency excitation. If the screening tests determine that equipment is potentially sensitive to high-frequency excitation ("screened-in"), then full-scale qualification testing including testing over the range of high-frequency exceedances is required to assure that unacceptable components are not present in the set of qualified certified design equipment and functional systems. In addition, the start of the ZPA range at 50 Hz is adjusted upward if the site-specific RRS show frequency exceedance beyond 50 Hz. In performing the equipment seismic qualification via testing, the TRS envelopes the RRS in all frequency ranges.

In conjunction with the above, for the purpose of qualification of equipment by analysis, the rigid range is defined as having a natural frequency greater than 50 Hz. For the purpose of testing equipment that is not sensitive to response levels caused by high frequency ground motions, rigid is defined as equipment with a natural frequency greater than 33 Hz. If the equipment, to be tested, is sensitive to response caused by high frequency ground motions, then rigid is defined as equipment having a natural frequency greater than 50 Hz.

The US-APWR utilizes the following methods for seismic qualification of equipment based on the type, size, shape, and complexity of the equipment configuration, whether the safety function can be assessed in terms of operability or structural integrity alone, and the reliability of the conclusions:

- Predict the equipment's performance by analysis
- Test the equipment under simulated seismic conditions
- Qualify the equipment by a combination of test and analysis

The US-APWR provides seismic qualification of equipment utilizing the seismic qualification standards and methods as identified in Section 3.10 to the maximum extent possible. When this is not possible or feasible (potential manufacturers / vendors are no longer available, potential manufacturers / vendors cannot provide an acceptable QA program meeting the requirements of 10CFR50 Appendix B, etc), a commercial-grade dedication process is used for seismic qualification.

The US-APWR seismic category I equipment is qualified to show that it can perform its safety-related function during and after a postulated earthquake. The seismic qualification considers interfaces and the effects of the amplification within the equipment due to the interfaces and supporting structure. The function of the equipment is dependent on the equipment itself and the system in which it is to function. The safety-related function is determined as that required both during and after a postulated earthquake, which could be different. For example, an electrical device may be required to have no spurious operations during the postulated earthquake or to perform an active function both during, and after, the postulated earthquake, or it may be required to survive during the postulated earthquake and perform an active function after the

(Reference 3.10-4), this is equivalent to any of the following:

- 20 cycles of SSE,
- 50 cycles of 1/2 SSE and 10 cycles of SSE,
- 150 cycles of 1/3 SSE and 10 cycles of SSE.

Alternatively, a number of fractional peak cycles equivalent to the maximum peak cycles for five 1/2 SSE events when followed by one full SSE may be used in accordance with Appendix D of IEEE Std 344-1987 (Reference 3.10-6) and Figure D.1 of IEEE Std 344-2004 (Reference 3.10-8).

Selection of damping values for equipment to be qualified is made in accordance with "Damping Values for Seismic Design of Nuclear Power Plants", RG 1.61, Rev.1 (Reference 3.10-13) and IEEE Std 344-1987 (Reference 3.10-6). Higher damping values may be used if justified by documented test data with proper identification of the source and mechanism.

Qualification of seismic category I mechanical and electrical equipment by testing is the preferred method for complex equipment which must perform an active function during the SSE. The analysis method alone is not recommended for complex equipment that cannot be modeled to correctly predict its response and functionality. Analysis without testing is acceptable only if structural integrity alone can assure the design-intended function. When complete testing is impractical, then the qualification is performed by a combination of test and analysis.

Equipment previously qualified by means of tests and analyses equivalent to those described herein can be used if proper documentation is provided.

Testing

The seismic qualification testing inputs and methods for qualification of mechanical and electrical equipment are performed in accordance with the guidelines provided in IEEE Std 344-1987, Section 7 (Reference 3.10-6). Equipment is tested in its operational condition and functionality is verified during and after testing. Loadings for the normal operation of the equipment, such as thermal and flow-induced loads, are simulated and concurrently superimposed upon the seismic and other dynamic loading to the extent practicable. For seismic and dynamic loads, the actual test input is characterized in the same manner as the required input motion to the equipment and the conservatism in amplitude is demonstrated. The TRS envelopes the RRS except for equipment not sensitive to high frequency motion with exceedances above 20 Hz ~~in the 25-50 Hz range~~.

Seismic testing is performed by subjecting equipment to vibratory motion that conservatively simulates that postulated at the equipment mounting location. Factors considered involve the location of the equipment, the nature of the equipment, the nature of the postulated earthquakes, and whether the equipment is to be used in one application or many (proof testing or generic testing). Equipment is conservatively tested considering the multidirectional effects of the postulated earthquakes.

344-1987 (Reference 3.10-6).

Multi-frequency testing is normally used for hard mounted equipment (floor and wall mounted) where a RRS at the equipment mounting location is identified. The test results are provided in the equipment qualification file (and the EQSDS for the individual equipment) and the TRS is shown to envelope the RRS over the entire frequency range of interest, except for equipment not sensitive to high frequency motion with exceedances above 20 Hz ~~in the 25-50 Hz range~~.

Single-frequency testing can be used for line-mounted equipment and other equipment as recommended by IEEE Std 344-1987 (Reference 3.10-6) and RG 1.100 (Reference 3.10-7). Required input motion (RIM) in seismic evaluations is normally associated with components in distributions systems (piping and duct) lines where the single mode seismic input to the component is dominated by the seismic response of the distribution system (line) and qualification is performed by generic application to a wide range of line frequencies. For the US-APWR, piping and duct systems are generically designed to limit the peak acceleration experienced by the equipment mounted on them to a value less than the specified RIM acceleration, which is 6.0g horizontal and 6.0g vertical in accordance with “IEEE Standard for Qualification of Actuators for Power- Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants”, IEEE Std 382-1996 (Reference 3.10-17). For line-mounted equipment that is not qualified to the generic level of 6.0g, the seismic input motion is determined from the response of the system analysis in which it is located. The method for qualification of line-mounted equipment is performed in accordance with the guidance in IEEE Std 344-1987, Section 7.6.7 (Reference 3.10-6) and IEEE Std 382-1996 (Reference 3.10-17), with justification and test results provided in the equipment qualification file.

3.10.2.1.2 Test and Analysis

The US-APWR utilizes a combination of test and analysis to qualify seismic category I instrumentation and electrical equipment. The test methods utilized are similar to those described above for type testing along with static and/or dynamic analysis. These methods can be used to establish input response requirements at sub-component locations. This approach can be used to justify the extrapolation of tests on a single electrical cabinet, or a small number of connected cabinets, to qualify an assembly. Analysis can be used to: explain unexpected behavior during a test; obtain a better understanding of the dynamic behavior of the equipment so that the proper test can be defined; or obtain a measure of expected response before a test. The documentation is included in the equipment qualification file and the EQSDSs.

3.10.2.2 Seismic and Operability Qualification of Active Mechanical Equipment

The methods and procedures used for qualifying active mechanical equipment (i.e., valves, pumps, and dampers) are described in Section 3.9, Subsection 3.10.2, and this subsection. Analysis, test, or a combination of test and analysis are used for qualification of seismic category I active mechanical equipment to show it maintains structural integrity (including pressure retention), and operability. The methods used assure equipment functionality and operability for its intended safety-related function under required plant conditions.

where

K = 0.743

L = Mass point spacing (ft)

F_R = Cut-off frequency (Hz)

E = Modulus of elasticity of pipe material (psi)

I = Moment of inertia of pipe cross-section (in^4)

W = Mass per unit length of piping + insulation + contents (lbm/ft)

Concentrated weights of in-line components, such as valves, flanges, and instrumentation, are also modeled as lumped masses.

Torsional effects of eccentric masses are included in the analysis.

The mass contributed by the support is included in the analysis when it is greater than 10% of the total mass of the adjacent pipe span (including pipe, contents, insulation, and concentrated masses).

3.12.4.3 Piping Benchmark Program

Piping benchmark problems included in NUREG/CR-1677, Vol. 1 and 2 (Reference 3.12-17) are used to validate the PIPESTRESS computer code used in piping stress analysis. In addition, three piping benchmark problems from NUREG/CR-6414 (Reference 3.12-25) are also used to validate the PIPESTRESS computer code.

3.12.4.4 Decoupling Criteria

Branch lines and instrument connections may be decoupled from the analysis model of a larger run of piping provided that either the ratio of the branch pipe mean diameter to the pipe run mean diameter (D_b/D_r) is less than or equal to 1/3, or the ratio of the moments of inertia of the two lines (I_b/I_r) is less than or equal to 1/25.

In addition to the size limitations, the decoupled branch line must be sufficiently flexible to facilitate the thermal expansion and seismic movements of the pipe run without constraint. As such, restraints on the branch line should not be located close to the actual pipe run connection.

Seismic analysis of the decoupled branch line is performed using applicable envelope response spectra for the decoupled branch line considering the connection point as an anchor. The envelope response spectra also include amplified response spectra at the connection point to the supporting piping run as a component response spectra. The movements (displacements and rotations) of the pipe run from the thermal, SAM or pipe break analyses is applied as anchor movements with their respective load cases in the decoupled branch line analysis.

~~If amplified response spectra at the connection point can not be developed, movements of the connection point from the seismic inertia analysis of the pipe run are analyzed as anchor movements and the solution is added to the seismic analysis of the decoupled~~

~~branch line by absolute summation. The envelope floor response spectrum used for the seismic analysis of the decoupled branch line includes floor response spectra applicable for the connection point or the nearest restraints on the pipe run as a component response spectrum.~~

The pipe run seismic analysis is performed without the decoupled branch. However, the mass effect is considered when the mass of half the span of the branch pipe is greater than 10% of the mass of the pipe run span.

In the analysis of the pipe run, as well as the decoupled branch pipe, the effects of the applicable stress intensification factors and/or stress indices of the branch connection are incorporated.

If amplified response spectra at the connection point can not be developed, then the model of the branch pipe is included in the analysis model of the run pipe. The portion of the branch pipe included in the analysis ends at either (a) the first anchor (including equipment nozzle or containment penetration) or (b) four seismic supports in each of the three perpendicular directions. In case of option (b), overlapping method of USNRC NUREG/CR-1980 (Reference 3.12-41) is used.

3.12.5 Piping Stress Analysis Criteria

3.12.5.1 Seismic Input Envelope vs. Site-Specific Spectra

The development of floor response spectra for the US-APWR design is described in Subsection 3.7.2.5, “Development of Floor Response Spectra”.

If any piping is routed in tunnels or trenches in the yard, the COL Applicant is to generate site-specific seismic response spectra, which may be used for the design of these piping systems.

3.12.5.2 Design Transients

ASME Code, Section III, Class 1 (Reference 3.12-2) piping system and support component experience the RCS transients identified in Table 3.9-1. On the other hand, Class 1 piping experiences the specific transient caused by the flow injection or discharge through this piping. These transient are listed in Table 3.12-6.

3.12.5.3 Loadings and Load Combination

3.12.5.3.1 Pressure

The internal design pressure, P, is used in the design and analysis of ASME Code, Section III, Class 1, 2 and 3 piping (Reference 3.12-2). The wall thicknesses are determined using the formulations of NB/NC/ND-3640 and the design pressure, P. Table 3.12-1 provides the definition of terms associated with Tables 3.12-2, 3.12-3 and 3.12-4. The applicable design and maximum service level pressures are used in load combinations as identified in Tables 3.12-2 and 3.12-3.

2. For a single valve configuration, leakage can be detected by measuring the downstream temperature. Monitoring of downstream temperature is utilized to detect valve leakage. As a result of leakage detection, valve repair can be scheduled, thereby preventing fatigue failure from thermal stratification or oscillation.

3. In the case of a gate valve configuration, high-cycle fatigue could be caused by repeated leaks from the valve gland. Leaks would occur even when double isolation valves are installed in series. By permitting continuous leakage through the valve gland packing by valve disk position adjustment, valve disk expansion and contraction cycle is prevented and cyclic fatigue failure caused by thermal stratification or thermal oscillation is eliminated (Reference 3.12-27).

Furthermore, high temperature water that flows from the RCS pipe run into isolated branch pipes occurs as swirling water, referred to as cavity flow induced by the high temperature pipe. In addition, there is a phenomenon in which stratification occurs at the surface boundary between the high temperature water entering the branch pipe and the low temperature water already in the branch. When the stratified surface boundary (top of cavity flow) occurs at horizontal pipe bends and elbows, there is a possibility of significant thermal fluctuation inducing high cycle thermal fatigue at this point. Therefore, the piping is routed such that a stratified surface boundary does not occur at horizontal pipe bends and elbows.

3.12.5.10 Thermal Stratification

NRC Bulletin 79-13 (Reference 3.12-28) addresses the effect of thermal stratification that lead to the cracking of the feedwater line at D.C., Cook Nuclear Plant Unit 2.

Provisions of the thermal stratification of the feedwater nozzle are described in Subsection 5.4.2.1.2.12.

NRC Bulletin 88-11 (Reference 3.12-29) was issued after Portland General Electric Company experienced difficulties in setting whip restraint gap sizes on the pressurizer surge line at the Trojan plant.

At the horizontal portion of the pressurizer surge line, thermal stratification is expected to occur if the surge flow velocity is low, and to disappear if the velocity is high. At normal operation, a low flow-rate out-surge flow in the line connecting the pressurizer to the hot leg may occur due to a continuous spray, which could lead to a thermal stratification in the cross section of pressurizer surge line in accordance with the temperature difference between pressurizer and hot leg. When a high-flow rate out-surge flow or in-surge flow occurs during transient events, this thermal stratification disappears. The low flow-rate out-surge flow is recovered as soon as out-surge or in-surge ends, thus, reproducing the thermal stratification.

Structural integrity of the pressurizer surge line of the US-APWR plant is to be assured by performing the following activities for the first US-APWR plant.

1. Fatigue evaluation is to be performed by considering the repeated event of thermal stratification occurring in the pressurizer surge line. It will be confirmed

3.12-32 ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NF, 2001 Edition, The American Society Of Mechanical Engineers.

3.12-33 ASME Boiler and Pressure Vessel Code, Section III, Division 1 – Appendices, Nonmandatory Appendix F, 2001 Edition.

3.12-34 Structural Welding Code – Steel. AWS D1.1/D1.1M, 2006, American Welding Society.

3.12-35 Service Limits and Loading Combinations for Class 1 Linear-Type Supports. Regulatory Guide 1.124, Rev.2, U.S. Nuclear Regulatory Commission, Washington, DC, February 2007.

3.12-36 Service Limits and Loading Combinations for Class 1 Plate-and-Shell-Type Component Supports. Regulatory Guide 1.130, Rev.2, U.S. Nuclear Regulatory Commission, Washington, DC, March 2007.

3.12-37 Code Requirements for Nuclear Safety Related Concrete Structures." ACI-349, American Concrete Institute, 2001.

3.12-38 Anchoring Components and Structural Supports in Concrete. Regulatory Guide 1.199, U.S. Nuclear Regulatory Commission, Washington, DC, November 2003.

3.12-39 IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations, IEEE Std 344-2004, Appendix D, Institute of Electrical and Electronic Engineers Power Engineering Society, New York, New York, June 2005.

3.12-40 Evaluation of Potential for Pipe Breaks, Report of U.S. NRC Piping Review Committee. NUREG-1061, Volume 4, U.S. Nuclear Regulatory Commission, Washington, DC, 1984.

3.12-41 Dynamic Analysis of Piping, Using the Structural Overlap Method. NUREG/CR-1980, U.S. Nuclear Regulatory Commission, Washington, DC, March 1981.

Chapter 6

US-APWR DCD Revision 2 Chapter 6 Tracking Report Revision 1 Change List

Page	Location (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
6.2-16	Table 6.1-3	Replaced “Turbidity” with “Suspended Solids” Replaced “1.0” with “0.35” RAI No.487, 06.01.01-11
6.2-39	6.2.1.6	Replaced “3.8.3.7.1” with “3.8.1.7” RAI No.472, 06.02.06-27
6.2-65	6.2.6.1	Added “except for the Pre-operational ILRT” in the 5th bullet of the 4th paragraph. RAI No.472, 06.02.06-26
6.2-67	6.2.6.3	Deleted “typically” and “If the test pressurizes any of the pathway’s containment barriers in the reverse direction, it must be shown that test results are not affected in a nonconservative manner by directionality.” RAI No.472, 06.02.06-23
6.2-195-199, 204, 205	Table 6.2.4-3	Added “Note 5” in Remark column of P501, P502, P503, P504, P505, P506, P507, P508, P509, P510, P511, P512, P237R, P237L and P239L. Added “Note 9” in Remark column of P220, P222, P416, P417, P405L, P262R and P262L. Added “exchanger, and the steam generator and associated secondary system piping” in Note 5. Added Note 9. RAI 472, 06.02.06-24
6.2-315	Figure 6.2.4-1 (Sheet 12 of 51)	Added “3/4”” RAI 472, 06.02.06-24

Table 6.1-3 Water chemistry specifications of the RWSP

Analysis item	Unit	Standard value	Limited value	Recommended analysis item standard value
1 Boron	ppm	-	≥ 4000* ≤ 4200*	
2 Chloride ion	ppm	≤ 0.05	≤ 0.15	
3 Fluoride ion	ppm	≤ 0.05	≤ 0.15	
4 Sulfate ion	ppm	≤ 0.05	≤ 0.15	
5 Suspended SolidsTurbidity	ppm	≤ 0.351.0	-	
6 Silica	ppm	-	-	≤ 0.5

*: See US-APWR Technical Specification (DCD Chap. 16)

6.2.1.6 Testing and Inspection

The preoperational testing and inspection and inservice testing and inspection of the containment meet ASME Code Section III requirements for containment vessels. Testing and inspection of the containment require written nondestructive examination procedures as required by ASME Code Article CC 5000 (Ref. 6.2-21). A description of the initial test program for the containment is included in Section 14.2 that applies to construction, preoperational and startup testing. Subsection 3.8.1.7~~3.8.3.7.1~~ includes construction inspection acceptance criteria. Requirements for the containment structural integrity test, containment local leak rate, and containment integrated leak rate preoperational tests are included in Subsections 14.2.12.1.61 through 14.2.12.1.63. Preoperational testing includes quality control testing of the concrete and concrete constituents in accordance with the frequencies established by Table CC-5200-1 and examination of the reinforcing systems, prestressing systems, and welds in accordance with ASME Code. Structural integrity testing is required to demonstrate the quality of construction and to verify the acceptable performance of new design features. Leakage testing of the RWSP liner (cladding) is performed in accordance with ASME Code requirements. Inspection criteria are delineated in ASME Code Article CC-5000. Failed inspection areas are repaired in accordance with ASME Code. The containment is pressure tested at a pressure of at least 1.15 times the containment design pressure prior to acceptance in accordance with the requirements of ASME Code Section III, Article CC-6000 (Ref. 6.2-22). Preoperational testing is described in detail in Chapter 3, Subsection 3.8.1.7~~3.8.3.7~~.

Inservice testing and inspection requirements are described in Subsection 3.8.1.7~~3.8.3.7~~. Subsection 6.2.4.4 provides a description of the testing and inspection of the containment isolation system. The requirements and methods used for containment leakage testing is presented in Subsection 6.2.6. The containment isolation system testing and the containment leakage testing are performed to ensure the postulated leakage from a design basis accident will be within the assumptions provided in Chapter 15, "Transient and Accident Analyses."

6.2.1.7 Instrumentation Requirements

Instruments are installed to monitor conditions inside the containment and actuate the appropriate safety functions when an abnormal condition is sensed. Instruments monitor containment pressure, temperature, hydrogen concentration and radioactivity, and air effluent for containment depressurization.

Four narrow-range pressure detectors monitor the containment pressure over a pressure range of -7 to 80 psig. The pressure detectors are powered from independent Class-1E sources, are widely separated around the containment, and connect to their associated transmitters (outside the containment) through oil-filled instrument lines. The containment pressure activates logic to initiate a variety of ESF functions, which are discussed in the following sections. Containment pressure is indicated and alarmed in the main control room (MCR).

- All vented systems shall be drained of water or other fluids to the extent necessary to assure exposure of the system containment isolation valves to containment air test pressure and to assure they will be subjected to the post accident differential pressure.

- Systems that are required to maintain the plant in a safe condition during the test shall be operable in their normal mode, and need not be vented.

- Pathways in systems that are normally filled with fluid and operable during post-accident conditions are not required to be vented.

- Portions of the pathways outside of containment that are designed to Seismic Category I and to at least Safety Class 2 are not required to be vented.

- Pathways which are Type B or C tested within the previous 24 calendar months need not be vented or drained except for the Pre-operational ILRT.

- For planning or scheduling purposes, or ALARA considerations, pathways in systems which are required for proper conduct of the Type A test need not be vented or drained.

- Exceptions to venting and draining leakage pathways during Type A tests are in accordance with ANSI/ANS 56.8-1994 and NEI 94-01.

Type A testing is conducted in accordance with ANSIIANS-56.8-1994 (Ref. 6.2-35). The containment is slowly pressurized with clean, dry air using portable compressors, filters and dryers until the containment pressure equals the calculated accidental peak containment internal pressure, Pa. The containment atmosphere is allowed to stabilize, consistent with the guidance of ANSI/ANS-56.8 (Ref. 6.2-35), before beginning the Type A test. The test duration is consistent with the guidance of ANSI/ANS-56.8 (Ref. 6.2-35). Periodic measurements of containment pressure and humidity are collected and evaluated to determine the rate of decrease in the mass of air inside containment in accordance with the guidance of ANSI/ANS-56.8 (Ref. 6.2-35). After completing the initial Type A test, a verification test is performed to confirm the validity of the test results using the methods prescribed by ANSI/ANS-56.8 (Ref. 6.2-35).

The maximum allowable containment leakage rate, La, the calculated peak containment internal pressure for the design basis loss of coolant accident, Pa, and the acceptance criteria for the Type A tests is specified by the Technical Specifications in Subsection 5.5.16. For the initial preoperational Type A test, the integrated leak rate shall be < 0.75 La. For periodic Type A tests, the containment leakage rate acceptance criterion is 1.0 La. During the first unit startup following testing in accordance with the containment leakage rate testing program, the leakage rate acceptance criteria are < 0.75 La for Type A tests. Test methods, analysis and acceptance criteria for Type A testing meet the guidance of RG 1.163, NEI 94-01 and ANSI/ANS-56.8-1994.

6.2.6.3 Containment Isolation Valve Leakage Rate Test

As defined in 10CFR50, Appendix J, "Type C Tests" means tests intended to measure containment isolation valve leakage rates. The containment isolation valves included are those that:

1. Provide a direct connection between the inside and outside atmospheres of the primary reactor containment under normal operation, such as purge and ventilation, vacuum relief, and instrument valves;

2. Are required to close automatically upon receipt of a containment isolation signal in response to controls intended to affect containment isolation;

3. Are required to operate intermittently under post accident conditions; and

4. Are in main steam and feedwater piping and other systems which penetrate containment of direct-cycle boiling water power reactors" (Item 4 is not applicable to US-APWR)

Table 6.2.4-3 presents a listing of containment penetrations and their system isolation valves. The table identifies the test type to be performed on each penetration/valve as applicable. The provisions for testing the individual isolation valves (e.g., test connections and drains) are shown in Figure 6.2.4-1 and individual system piping and instrumentation diagrams (P&IDs). CIVs are ~~typically~~ tested so that the test pressure is applied in the same direction that would occur in a DBA. ~~If the test pressurizes any of the pathway's containment barriers in the reverse direction, it must be shown that test results are not affected in a nonconservative manner by directionality.~~

10CFR50 Appendix J Option B Type C testing is initially performed during preoperational testing following completion of the Reactor Building construction. The first periodic Type C tests are performed at a frequency of at least once per 30 months until acceptable performance is established in accordance with NEI 94-01 (Ref. 6.2-31), with subsequent testing frequencies determined in accordance with NEI 94-01 (Ref. 6.2-31) as specified in the containment leakage rate testing program, not to exceed 60 months, consistent with RG 1.163 (Ref. 6.2-30).

Type C test methods and techniques are consistent with ANSI/ANS 56.8-1994 (Ref. 6.2-35).

Type C testing leakage rate results are used to determine the combined leakage rate for all Type B and C penetrations as discussed above.

6.2.6.4 Scheduling and Reporting of Periodic Tests

The proposed schedule and test report content requirements associated with performing pre-operational and periodic leakage rate testing are in accordance with the guidance provided in NEI 94-01 (Ref. 6.2-31), as modified and endorsed by the NRC in RG 1.163(Ref. 6.2-30). The results of preoperational and periodic Type A, Band C tests must be documented to show that the performance criteria for leakage have been met.

Table 6.2.4-3 List of Containment Penetrations and System Isolation Positions (Sheet 2 of 12)

Pen NO.	GDC	System Name	Fluid	Line Size (in.)	ESF or Support System	Valve Arragmt Figure 6.2.4-1	Valve Number	Location of Valve	Type Tests	Type C Test	Length of Pipe (Note 1)	Valve: Type	Valve: Operator	Actuation Mode: Primary	Actuation Mode: Secondary	Valve Position: Normal	Valve Position: Shutdown	Valve Position: Post-Accident	Power Failure	Actuation Signal	Valve Closure Time	Power Source (Note 2)	Remark
P274	55	SIS	Borated	4	Yes	Sht. 10	SIS-VLV-010D	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
			Water	4			SIS-MOV-009D	Out			9.0 ft	Globe	Motor	RM	Manual	O	O	O	FAI	RM	20	1E	
				3/4			SIS-VLV-058D	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P152	56	SIS	Borated Water	10	Yes	Sht. 11	SIS-MOV-001A	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	O	O	FAI	RM	50	1E	Note 4 Note 7
P153	56	SIS	Borated Water	10	Yes	Sht. 11	SIS-MOV-001B	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	O	O	FAI	RM	50	1E	Note 4 Note 7
P156	56	SIS	Borated Water	10	Yes	Sht. 11	SIS-MOV-001C	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	O	O	FAI	RM	50	1E	Note 4 Note 7
P157	56	SIS	Borated Water	10	Yes	Sht. 11	SIS-MOV-001D	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	O	O	FAI	RM	50	1E	Note 4 Note 7
P209	55	RHRS	Borated	10	No	Sht. 12	RHS-MOV-002A	In	A	N	-	Gate	Motor	RM	Manual	C	O	C	FAI	RM	50	1E	Note 4
			Water	6			RHS-SRV-003A	In			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	Note 6
				3/4			SIS-VLV-225A	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P226	55	RHRS	Borated	10	No	Sht. 12	RHS-MOV-002B	In	A	N	-	Gate	Motor	RM	Manual	C	O	C	FAI	RM	50	1E	Note 4
			Water	6			RHS-SRV-003B	In			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	Note 6
				3/4			SIS-VLV-225B	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P257	55	RHRS	Borated	10	No	Sht. 12	RHS-MOV-002C	In	A	N	-	Gate	Motor	RM	Manual	C	O	C	FAI	RM	50	1E	Note 4
			Water	6			RHS-SRV-003C	In			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	Note 6
				3/4			SIS-VLV-225C	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P273	55	RHRS	Borated	10	No	Sht. 12	RHS-MOV-002D	In	A	N	-	Gate	Motor	RM	Manual	C	O	C	FAI	RM	50	1E	Note 4
			Water	6			RHS-SRV-003D	In			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	Note 6
				3/4			SIS-VLV-225D	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P212	55	RHRS	Borated	8	Yes	Sht. 13	RHS-VLV-022A	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
			Water	8			RHS-MOV-021A	Out			11.0 ft	Gate	Motor	RM	Manual	C	O	O	FAI	RM	40	1E	
				3/4			RHS-VLV-062A	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P225	55	RHRS	Borated	8	Yes	Sht. 13	RHS-VLV-022B	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
			Water	8			RHS-MOV-021B	Out			11.0 ft	Gate	Motor	RM	Manual	C	O	O	FAI	RM	40	1E	
				3/4			RHS-VLV-062B	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P259	55	RHRS	Borated	8	Yes	Sht. 13	RHS-VLV-022C	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
			Water	8			RHS-MOV-021C	Out			11.0 ft	Gate	Motor	RM	Manual	C	O	O	FAI	RM	40	1E	
				3/4			RHS-VLV-062C	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P272	55	RHRS	Borated	8	Yes	Sht. 13	RHS-VLV-022D	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
			Water	8			RHS-MOV-021D	Out			11.0 ft	Gate	Motor	RM	Manual	C	O	O	FAI	RM	40	1E	
				3/4			RHS-VLV-062D	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P501	57	FWS	Secondary	16	Yes	Sht. 14	FWS-SMV-512A	Out	A	N	37.0 ft	Gate	S/M	Auto	RM	O	O	C	FC	S,RCPS	5	1E	Note 5
			Coolant	3			EFS-MOV-019A	Out			-	Gate	Motor	Auto	RM	O	O	O	FAI	RCPS	15	1E	
P502	57	FWS	Secondary	16	Yes	Sht. 14	FWS-SMV-512B	Out	A	N	34.0 ft	Gate	S/M	Auto	RM	O	O	C	FC	S,RCPS	5	1E	Note 5
			Coolant	3			EFS-MOV-019B	Out			-	Gate	Motor	Auto	RM	O	O	O	FAI	RCPS	15	1E	
P503	57	FWS	Secondary	16	Yes	Sht. 14	FWS-SMV-512C	Out	A	N	34.0 ft	Gate	S/M	Auto	RM	O	O	C	FC	S,RCPS	5	1E	Note 5
			Coolant	3			EFS-MOV-019C	Out			-	Gate	Motor	Auto	RM	O	O	O	FAI	RCPS	15	1E	
P504	57	FWS	Secondary	16	Yes	Sht. 14	FWS-SMV-512D	Out	A	N	37.0 ft	Gate	S/M	Auto	RM	O	O	C	FC	S,RCPS	5	1E	Note 5
			Coolant	3			EFS-MOV-019D	Out			-	Gate	Motor	Auto	RM	O	O	O	FAI	RCPS	15	1E	

Table 6.2.4-3 List of Containment Penetrations and System Isolation Positions (Sheet 3 of 12)

Pen NO.	GDC	System Name	Fluid	Line Size (in.)	ESF or Support System	Valve Arragmt Figure 6.2.4-1	Valve Number	Location of Valve	Type Tests	Type C Test	Length of Pipe (Note 1)	Valve		Actuation Mode		Valve Position			Power Failure	Actuation Signal	Valve Closure Time	Power Source (Note 2)	Remark
												Type	Operator	Primary	Secondary	Normal	Shutdown	Post-Accident					
P509	57	MSS	Secondary Coolant	32	Yes	Sht. 15	MSS-SMV-515A	Out	A	N	68.0 ft	Gate	S/M	Auto	RM	O	C	C	FC	RCPS	5	1E	Note 5
				6			MSS-MOV-507A	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			EFS-MOV-101A	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			MSS-SRV-509A	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-510A	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-511A	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-512A	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-513A	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-514A	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				4			MSS-HCV-565	Out			-	Globe	Air	Auto	RM	C	C	C	FC	RCPS	20	1E	
				2			MSS-MOV-701A	Out			-	Globe	Motor	RM	Manual	O	O	O	FAI	RM	15	1E	
				3/4			MSS-VLV-533A	Out			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P510	57	MSS	Secondary Coolant	32	Yes	Sht. 15	MSS-SMV-515B	Out	A	N	65.0 ft	Gate	S/M	Auto	RM	O	C	C	FC	RCPS	5	1E	Note 5
				6			MSS-MOV-507B	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			EFS-MOV-101B	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			MSS-SRV-509B	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-510B	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-511B	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-512B	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-513B	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-514B	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				4			MSS-HCV-575	Out			-	Globe	Air	Auto	RM	C	C	C	FC	RCPS	20	1E	
				2			MSS-MOV-701B	Out			-	Globe	Motor	RM	Manual	O	O	O	FAI	RM	15	1E	
				3/4			MSS-VLV-533B	Out			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P511	57	MSS	Secondary Coolant	32	Yes	Sht. 15	MSS-SMV-515C	Out	A	N	65.0 ft	Gate	S/M	Auto	RM	O	C	C	FC	RCPS	5	1E	Note 5
				6			MSS-MOV-507C	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			EFS-MOV-101C	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			MSS-SRV-509C	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-510C	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-511C	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-512C	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-513C	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-514C	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				4			MSS-HCV-585	Out			-	Globe	Air	Auto	RM	C	C	C	FC	RCPS	20	1E	
				2			MSS-MOV-701C	Out			-	Globe	Motor	RM	Manual	O	O	O	FAI	RM	15	1E	
				3/4			MSS-VLV-533C	Out			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	

Table 6.2.4-3 List of Containment Penetrations and System Isolation Positions (Sheet 4 of 12)

Pen NO.	GDC	System Name	Fluid	Line Size (in.)	ESF or Support System	Valve Arragmt Figure 6.2.4-1	Valve Number	Location of Valve	Type Tests	Type C Test	Length of Pipe (Note 1)	Valve		Actuation Mode		Valve Position			Power Failure	Actuation Signal	Valve Closure Time	Power Source (Note 2)	Remark
												Type	Operator	Primary	Secondary	Normal	Shutdown	Post-Accident					
P512	57	MSS	Secondary Coolant	32	Yes	Sht. 15	MSS-SMV-515D	Out	A	N	68.0 ft	Gate	S/M	Auto	RM	O	C	C	FC	RCPS	5	1E	Note 5
				6			MSS-MOV-507D	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			EFS-MOV-101D	Out			-	Gate	Motor	RM	Manual	O	O	O	FAI	RM	30	1E	
				6			MSS-SRV-509D	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-510D	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-511D	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-512D	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-513D	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				6			MSS-SRV-514D	Out			-	Relief	Self	Auto	None	C	C	C	NA	NA	NA	NA	
				4			MSS-HCV-595	Out			-	Globe	Air	Auto	RM	C	C	C	FC	RCPS	20	1E	
				2			MSS-MOV-701D	Out			-	Globe	Motor	RM	Manual	O	O	O	FAI	RM	15	1E	
				3/4			MSS-VLV-533D	Out			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P214	56	CSS	Borated Water	8	Yes	Sht. 16	CSS-VLV-005A	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	Note 4
				8			CSS-MOV-004A	Out			9.0 ft	Gate	Motor	Auto	RM	C	C	O	FAI	P	40	1E	Note 8
				3/4			CSS-VLV-023A	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P224	56	CSS	Borated Water	8	Yes	Sht. 16	CSS-VLV-005B	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	Note 4
				8			CSS-MOV-004B	Out			9.0 ft	Gate	Motor	Auto	RM	C	C	O	FAI	P	40	1E	Note 8
				3/4			CSS-VLV-023B	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P261	56	CSS	Borated Water	8	Yes	Sht. 16	CSS-VLV-005C	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	Note 4
				8			CSS-MOV-004C	Out			9.0 ft	Gate	Motor	Auto	RM	C	C	O	FAI	P	40	1E	Note 8
				3/4			CSS-VLV-023C	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P271	56	CSS	Borated Water	8	Yes	Sht. 16	CSS-VLV-005D	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	Note 4
				8			CSS-MOV-004D	Out			9.0 ft	Gate	Motor	Auto	RM	C	C	O	FAI	P	40	1E	Note 8
				3/4			CSS-VLV-023D	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P151	56	CSS	Borated Water	14	Yes	Sht. 18	CSS-MOV-001A	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	C	O	FAI	RM	60	1E	
P154	56	CSS	Borated Water	14	Yes	Sht. 18	CSS-MOV-001B	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	C	O	FAI	RM	60	1E	
P155	56	CSS	Borated Water	14	Yes	Sht. 18	CSS-MOV-001C	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	C	O	FAI	RM	60	1E	
P158	56	CSS	Borated Water	14	Yes	Sht. 18	CSS-MOV-001D	Out	A	N	39.0 ft	Gate	Motor	RM	Manual	O	C	O	FAI	RM	60	1E	
P220	56	CSS	Silicone Oil	3/4	Yes	Sht. 17	-	-	A	N	-	-	-	-	-	-	-	-	-	-	-	-	Note 9
P222	56	CSS	Silicone Oil	3/4	Yes	Sht. 17	-	-	A	N	-	-	-	-	-	-	-	-	-	-	-	-	Note 9
P416	56	CSS	Silicone Oil	3/4	Yes	Sht. 17	-	-	A	N	-	-	-	-	-	-	-	-	-	-	-	-	Note 9
P417	56	CSS	Silicone Oil	3/4	Yes	Sht. 17	-	-	A	N	-	-	-	-	-	-	-	-	-	-	-	-	Note 9
P405L	56	CSS	Silicone Oil	3/4	No	Sht. 17	-	-	A	N	-	-	-	-	-	-	-	-	-	-	-	-	Note 9
P234	55	CCWS	Water with corrosion inhibitor	8	Yes	Sht. 19	NCS-VLV-403A	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
				8			NCS-MOV-402A	Out			10.0 ft	Gate	Motor	Auto	RM	O	O	C	FAI	P	40	1E	
				4			NCS-MOV-445A	Out				Globe	Motor	Manual	None	C	C	O	FAI	NA	20	1E	
				3/4			NCS-VLV-452A	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
P249	55	CCWS	Water with corrosion inhibitor	8	Yes	Sht. 19	NCS-VLV-403B	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
				8			NCS-MOV-402B	Out			10.0 ft	Gate	Motor	Auto	RM	O	O	C	FAI	P	40	1E	
				4			NCS-MOV-445B	Out				Globe	Motor	Manual	None	C	C	O	FAI	NAI	20	1E	
				3/4			NCS-VLV-452B	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	

Table 6.2.4-3 List of Containment Penetrations and System Isolation Positions (Sheet 5 of 12)

Pen NO.	GDC	System Name	Fluid	Line Size (in.)	ESF or Support System	Valve Arragmt Figure 6.2.4-1	Valve Number	Location of Valve	Type Tests	Type C Test	Length of Pipe (Note 1)	Valve: Type	Valve: Operator	Actuation Mode: Primary	Actuation Mode: Secondary	Valve Position: Normal	Valve Position: Shutdown	Valve Position: Post-Accident	Power Failure	Actuation Signal	Valve Closure Time	Power Source (Note 2)	Remark
P232	55	CCWS	Water with	8	Yes	Sht. 20	NCS-MOV-436A	In	C	Y	-	Gate	Motor	Auto	RM	O	O	C	FAI	P	40	1E	
			corrosion	8			NCS-MOV-438A	Out			10.0 ft	Gate	Motor	Auto	RM	O	O	C	FAI	P	40	1E	
			inhibitor	4			NCS-MOV-447A	In				Globe	Motor	Manual	None	C	C	O	FAI	NA	20	1E	
				4			NCS-MOV-448A	Out				Globe	Motor	Manual	None	C	C	O	FAI	NA	20	1E	
				3/4			NCS-VLV-437A	In			-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
P251	55	CCWS	Water with	8	Yes	Sht. 20	NCS-MOV-436B	In	C	Y	-	Gate	Motor	Auto	RM	O	O	C	FAI	P	40	1E	
			corrosion	8			NCS-MOV-438B	Out			10.0 ft	Gate	Motor	Auto	RM	O	O	C	FAI	P	40	1E	
			inhibitor	4			NCS-MOV-447B	In			-	Globe	Motor	Manual	None	C	C	O	FAI	NA	20	1E	
				4			NCS-MOV-448B	Out			-	Globe	Motor	Manual	None	C	C	O	FAI	NA	20	1E	
				3/4			NCS-VLV-437B	In			-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
P233	57	CCWS	Water with	4	No	Sht. 21	NCS-MOV-511	Out	A	N	9.0 ft	Gate	Motor	Auto	RM	O	O	C	FAI	T	20	1E	Note 5
P235	57	CCWS	corrosion	4	No	Sht. 21	NCS-MOV-517	Out	A	N	9.0 ft	Gate	Motor	Auto	RM	C	C	C	FAI	T	20	1E	Note 5
P252	57	CCWS	inhibitor	8	No	Sht. 22	NCS-MOV-531	Out	A	N	9.0 ft	Gate	Motor	Auto	RM	O	O	C	FAI	T	40	1E	Note 5
P250	57	CCWS		8	No	Sht. 22	NCS-MOV-537	Out	A	N	9.0 ft	Gate	Motor	Auto	RM	O	O	C	FAI	T	40	1E	Note 5
P276R	56	WMS	Gas	3/4	No	Sht. 23	LMS-AOV-052	In	C	Y	-	Dia	Air	Auto	RM	O	O	C	FC	T	15	1E	
				3/4			LMS-AOV-053	Out			11.0 ft	Dia	AIr	Auto	RM	C	C	C	FC	T	15	1E	
P284	56	WMS	Gas	2	No	Sht. 24	LMS-AOV-055	In	C	Y	-	Dia	Air	Auto	RM	O	O	C	FC	T	15	1E	
				2			LMS-AOV-056	Out			16.0 ft	Dia	Air	Auto	RM	O	O	C	FC	T	15	1E	
				2			LMS-AOV-060	Out			-	Dia	AIr	Auto	RM	O	O	C	FC	T	15	1E	
P205	56	WMS	Borated	3	No	Sht. 25	LMS-LCV-010A	In	C	Y	-	Dia	Air	Auto	RM	C	C	C	FC	T	15	1E	
			Water	3			LMS-LCV-010B	Out			9.0 ft	Dia	Air	Auto	RM	O	O	C	FC	T	15	1E	
P207	56	WMS	Primary	2	No	Sht. 26	LMS-AOV-104	In	C	Y	-	Dia	Air	Auto	RM	C	C	C	FC	T	15	1E	
			Coolant	2			LMS-AOV-105	Out			9.0 ft	Dia	Air	Auto	RM	C	C	C	FC	T	15	1E	
P267L	55	PSS	Primary	3/4	No	Sht. 27	PSS-AOV-003	In	C	Y	-	Globe	Air	Auto	RM	C	C	C	FC	T	15	1E	
			Coolant	3/4			PSS-MOV-006	In			-	Globe	Motor	Auto	RM	O	O	C	FAI	T	15	1E	
				3/4			PSS-MOV-013	In			-	Globe	Motor	Auto	RM	C	C	C	FAI	T	15	1E	
				3/4			PSS-MOV-031A	Out			14.0 ft	Globe	Motor	Auto	RM	O	O	C	FAI	T	15	1E	
P269R	55	PSS	Primary	3/4	No	Sht. 28	PSS-MOV-023	In	C	Y	-	Globe	Motor	Auto	RM	O	O	C	FAI	T	15	1E	
			Coolant	3/4			PSS-MOV-031B	Out			14.0 ft	Globe	Motor	Auto	RM	O	O	C	FAI	T	15	1E	
P267R	56	PSS	Borated	3/4	No	Sht. 29	PSS-AOV-062A	In	C	Y	-	Globe	Air	Auto	RM	C	C	C	FC	T	15	1E	
			Water	3/4			PSS-AOV-062B	In			-	Globe	Air	Auto	RM	C	C	C	FC	T	15	1E	
				3/4			PSS-AOV-062C	In			-	Globe	Air	Auto	RM	C	C	C	FC	T	15	1E	
				3/4			PSS-AOV-062D	In			-	Globe	Air	Auto	RM	C	C	C	FC	T	15	1E	
				3/4			PSS-AOV-063	Out			13.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	15	1E	
P270	56	PSS	Containment	3/4	No	Sht. 30	PSS-VLV-072	In	C	Y	-	Check	Self	Auto	None	-	-	-	NA	NA	NA	NA	
			Atmosphere	3/4			PSS-VLV-091	In			-	Globe	Manual	Manual	None	C	C	C	NA	NA	NA	NA	
				3/4			PSS-MOV-071	Out			9.0 ft	Globe	Motor	RM	Manual	C	C	C	FAI	RM	15	1E	
P237R	57	SGBDS	Secondary	3/4	No	Sht. 31	SGS-AOV-031A	Out	A	N	11.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	15	1E	Note 5
P237L	57	SGBDS	Coolant	3/4	No	Sht. 31	SGS-AOV-031B	Out	A	N	12.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	15	1E	Note 5

Table 6.2.4-3 List of Containment Penetrations and System Isolation Positions (Sheet 6 of 12)

Pen NO.	GDC	System Name	Fluid	Line Size (in.)	ESF or Support System	Valve Arragmt Figure 6.2.4-1	Valve Number	Location of Valve	Type Tests	Type C Test	Length of Pipe (Note 1)	Valve: Type	Valve: Operator	Actuation Mode: Primary	Actuation Mode: Secondary	Valve Position: Normal	Valve Position: Shutdown	Valve Position: Post-Accident	Power Failure	Actuation Signal	Valve Closure Time	Power Source (Note 2)	Remark
P239R	57	SGBDS	Secondary	3/4	No	Sht. 31	SGS-AOV-031C	Out	A	N	11.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	15	1E	Note 5
P239L	57	SGBDS	Coolant	3/4	No	Sht. 31	SGS-AOV-031D	Out	A	N	12.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	15	1E	Note 5
P505	57	SGBDS	Secondary	4	No	Sht. 31	SGS-AOV-001A	Out	A	N	22.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	20	1E	Note 5
P506	57	SGBDS	Coolant	4	No	Sht. 31	SGS-AOV-001B	Out	A	N	26.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	20	1E	Note 5
P507	57	SGBDS		4	No	Sht. 31	SGS-AOV-001C	Out	A	N	26.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	20	1E	Note 5
P508	57	SGBDS		4	No	Sht. 31	SGS-AOV-001D	Out	A	N	22.0 ft	Globe	Air	Auto	RM	O	O	C	FC	T	20	1E	Note 5
P161	56	RWS	Borated Water	6 6 3/4	No	Sht. 32	RWS-MOV-002 RWS-MOV-004 RWS-VLV-003	In Out In	C	Y	- 19.0 ft -	Gate Gate Check	Motor Motor Self	Auto Auto Auto	RM RM None	O O -	O O -	C C -	FAI FAI NA	T T NA	30 30 NA	1E 1E NA	
P162	56	RWS	Borated Water	4 4 3/4	No	Sht. 33	RWS-VLV-023 RWS-AOV-022 RWS-VLV-073	In Out In	C	Y	- 29.0 ft -	Check Dia Globe	Self Air Manual	Auto Auto Manual	None RM None	- O C	- O C	- C C	NA FC NA	NA T NA	NA 20 NA	NA 1E NA	
P253	56	PMWS	Deminrralized Water	2 2 3/4	No	Sht. 34	DWS-VLV-005 DWS-VLV-004 DWS-VLV-006	In Out In	C	Y	- 9.0 ft -	Check Dia Dia	Self Manual Manual	Auto Manual Manual	None None None	- C C	- C C	- C C	NA NA NA	NA NA NA	NA NA NA	NA NA NA	
P245	56	IAS	Compressed Air	2 2 3/4	No	Sht. 35	IAS-VLV-003 IAS-MOV-002 IAS-VLV-004	In Out In	C	Y	- 9.0 ft -	Check Globe Globe	Self Motor Manual	Auto Auto Manual	None RM None	- O C	- O C	- C C	NA FAI NA	NA P NA	NA 15 NA	NA 1E NA	
P248	56	FSS	Fire Water	3 3 3/4	No	Sht. 36	FSS-VLV-003 FSS-AOV-001 FSS-VLV-002	In Out In	C	Y	- 9.0 ft -	Check Globe Globe	Self Air Manual	Auto Auto Manual	None RM None	- C C	- C C	- C C	NA FC NA	NA T NA	NA 15 NA	NA 1E NA	
P238	56	FSS	Fire Water	6 6 3/4	No	Sht. 37	FSS-VLV-006 FSS-MOV-004 FSS-VLV-005	In Out In	C	Y	- 10.0 ft -	Check Gate Globe	Self Motor Manual	Auto Auto Manual	None RM None	- C C	- C C	- C C	NA FAI NA	NA RM NA	NA 30 NA	NA 1E NA	
P230	56	SSAS	Compressed Air	2 2 3/4	No	Sht. 38	SAS-VLV-103 SAS-VLV-101 SAS-VLV-102	In Out In	C	Y	- 9.0 ft -	Check Globe Globe	Self Manual Manual	Auto Manual Manual	None None None	- C C	- C C	- C C	NA NA NA	NA NA NA	NA NA NA	NA NA NA	
P200	-	-	(Fuel Transfer Tube)	22	No	Sht. 39	-	-	B	N	-	Flange	NA	-	-	C	C	C	NA	NA	NA	NA	
P451	56	HVAC	Containment Atmosphere	36 36	No	Sht. 40	VCS-AOV-305 VCS-AOV-304	In Out	C	Y	- 13.0 ft	B-fly B-fly	Air Air	Auto Auto	RM RM	C C	O O	C C	FC FC	V V	5 5	1E 1E	
P452	56	HVAC	Containment Atmosphere	36 36	No	Sht. 40	VCS-AOV-306 VCS-AOV-307	In Out	C	Y	- 9.0 ft	B-fly B-fly	Air Air	Auto Auto	RM RM	C C	O O	C C	FC FC	V V	5 5	1E 1E	
P410	56	HVAC	Containment Atmosphere	8 8	No	Sht. 41	VCS-AOV-356 VCS-AOV-357	In Out	C	Y	- 10.0 ft	B-fly B-fly	Air Air	Auto Auto	RM RM	C C	C C	C C	FC FC	V V	5 5	1E 1E	
P401	56	HVAC	Containment Atmosphere	8 8	No	Sht. 41	VCS-AOV-355 VCS-AOV-354	In Out	C	Y	- 10.0 ft	B-fly B-fly	Air Air	Auto Auto	RM RM	C C	C C	C C	FC FC	V V	5 5	1E 1E	
P262R	56	HVAC	Silicone Oil	3/4	No	Sht. 42	-	-	A	N	-	-	-	-		-	-	-	-	-	-	-	Note 9
P262L	56	HVAC	Silicone Oil	3/4	No	Sht. 42	-	-	A	N	-	-	-	-		-	-	-	-	-	-	-	Note 9

Table 6.2.4-3 List of Containment Penetrations and System Isolation Positions (Sheet 11 of 12)

Note 5 - The justification for not Type C testing the component cooling water lines to and from the excess letdown heat exchanger and letdown heat exchanger, and the steam generator and associated secondary system piping is that these systems are closed systems inside containment designed and constructed to ASME III, Class 2 and Seismic Category I requirements and as such they do not constitute a potential containment atmosphere leak path during or following a loss-of-coolant accident with a single active failure of a system component. Should the valves leak slightly when closed, the fluid seal within the pipe or the closed piping system inside containment would preclude release of containment atmosphere to the environs. These penetrations will be tested periodically as part of the Containment Integrated leak Rate Test. Furthermore, inservice testing and inspection of these isolation valves and the associated piping system inside the containment is performed periodically under the inservice inspection requirements of ASME XI as described in subsection 3.9.6 and section 6.6. During normal operation, the systems are water filled, and degradation of valves or piping is readily detected. Therefore, in accordance with ANS 56.8-1994, Section 3.3.1, these valves are not required to be Type C tested. (Ref. 6.2-35)

Note 6 - The lines from the RCS hot leg to the CS/RHR pump suctions each contain two remote manual (motor operated) valves, which are closed during normal plant power operation. The valves are interlocked such that they cannot be opened when the RCS pressure is greater than the design pressure of the RHR system. The valve which is located closer to the RCS inside the missile barrier is not considered a containment isolation valve. The second valve defines the limit of the reactor coolant pressure boundary. This valve also provides the containment isolation barrier inside containment and is considered to be sealed closed.

Since these lines connect to the Containment Spray recirculation loops which are filled with sump water and at least two of which is in operation post accident, there is no need for any containment isolation valves in these lines outside containment. If a leak occurs in the line upstream (toward the RCS) of the valve inside containment, the closed valve isolates the line. If a leak occurs in the recirculation system outside containment, the sump valve is closed to prevent loss of sump water and the closed valve in the RHR suction line prevents any containment atmosphere from entering the system- outside containment. If a leak should occur in the short length of pipe between the valve inside containment and the containment, any containment atmosphere will get only as far as the fluid-filled system. Since this system is filled with sump water and is most likely in operation, no gas could escape to the outside. The fluid in the RHR suction line would drop to approximately the level of fluid in the sump and any containment atmosphere which did leak into the line would be contained in this length of closed piping.

Another closed valve in .the line would do nothing except somewhat decrease the length of pipe outside containment which could possibly be exposed to containment atmosphere following a leak. It is possible that a valve in this section of pipe would increase the probability of leakage of gas through the stem packing and could not be considered as tight as a clean length of pipe. No single failure of any active or passive component anywhere in the present system can cause any release of containment atmosphere to the outside. Any additional valves would complete normal residual heat removal operation and are unnecessary for containment isolation.

This arrangement is intended to provide guidance in satisfying Criterion 55 on the other defined basis in that system reliability is enhanced by a single valve and there is at least a single mechanical barrier after a single failure.

Inservice testing and inspection of these isolation valves and the associated piping system outside the containment is performed periodically under the inservice inspection requirements of ASME XI as described-in subsection 3.9.6 and section 6.6. During normal operation, the systems are water filled, and degradation of valves or piping is readily detected.

Table 6.2.4-3 List of Containment Penetrations and System Isolation Positions (Sheet 12 of 12)

Note 7 - The lines from refueling water storage pit (RWSP) to the suctions of the safety injection (SI) pumps and containment spray /residual heat removal (CS/RHR) pumps are each provided with a single remote manual gate valve. The valve does not provide a barrier outside containment to prevent loss of sump water should a leak develop in a recirculation loop. (The valve is to be closed remotely from the control room to accomplish this. Leak detection is provided for each line, so that the operator can determine which valve is to be closed.) These lines and valves are designed to preclude a breach of piping integrity. Therefore, guard pipe are not provided in these lines. (Reference: SRP 6.2.4 Rev.3 SRP Acceptance Criteria 5) This arrangement is intended to provide guidance in satisfying Criterion 56 on the other defined basis in that system reliability is enhanced by a single valve and a single barrier is still maintained after accommodating a single active failure. Inservice testing and inspection of these isolation valves and the associated piping system outside the containment is performed periodically under the inservice inspection requirements of ASME XI as described in subsection 3.9.6 and section 6.6. During normal operation, the systems are water filled, and degradation of valves or piping is readily detected.

Note 8 - The lines from refueling water storage pit (RWSP) to the suctions of the safety injection (SI) pumps and containment spray / residual heat removal (CSIRHR) pumps are each provided with a single remote manual gate valve. The valve does not provide a barrier outside containment to prevent loss of sump water should a leak develop in a recirculation loop. (The valve is to be closed remotely from the control room to accomplish this. Leak detection is provided for each line, so that the operator can determine which valve is to be closed.) These lines and valves are designed to preclude a breach of piping integrity. Therefore, guard pipe are not provided in these lines. (Reference: SRP 6.2.4 Rev.3 SRP Acceptance Criteria 5) This arrangement is intended to provide guidance in satisfying Criterion 56 on the other defined basis in that system reliability is enhanced by a single valve and a single barrier is still maintained after accommodating a single active failure. Inservice testing and inspection of these isolation valves and the associated piping system outside the containment is performed periodically under the inservice inspection requirements of ASME XI as described in subsection 3.9.6 and section 6.6. During normal operation, the systems are water filled, and degradation of valves or piping is readily detected.

Note 9 - These lines sense the pressure of containment atmosphere on the inside and are connected to pressure transmitters on the outside. Each of channels has a separate penetration and each pressure transmitter is located immediately adjacent to the outside of the containment wall. It is connected to a sealed bellows located immediately adjacent to the inside containment wall by means of a sealed fluid filled tube. This tubing along with the transmitter and bellows is conservatively designed and subject to strict quality control and to regular in-service inspections to assure its integrity. This arrangement provides a double barrier (one inside and one outside) between the containment and the outside containment. Should a leak occur outside containment, the sealed bellows inside containment, which is designed to withstand full containment design pressure, will prevent the escape of containment atmosphere. Should a leak occur inside containment the diaphragm in the transmitter, which is designed to withstand full containment design pressure, will prevent any escape of containment atmosphere. This arrangement provides automatic double barrier isolation without operator action and without sacrificing any reliability with regard to its safeguards functions. Both the bellows and the tubing inside containment and the transmitter and tubing outside containment are enclosed by protective shielding. The shielding (box, channel, etc.) prevents mechanical damage to the components from missiles, water jets, dropping tools, etc. Because of this sealed fluid filled system, a postulated severance of the line during either normal operation or accident conditions will not result in any release from the containment. If the fluid in the tubing is heated during the accident, the flexible bellows will allow expansion of the fluid without overpressurizing the system and without significant detriment to the accuracy of the transmitter. This arrangement is intended to provide guidance in satisfying Criterion 56 on the other defined basis in that it meets NRC Regulatory Guide 1.11 and consists of a missile protected closed system inside and outside containment. Therefore, in accordance with ANS 56.8-1994, Section 3.3.1, these valves are not required to be Type C tested. (Ref. 6.2-35)

Residual Heat Removal System

Containment Spray / Residual Heat Removal (CS/RHR) Pump Suction Line

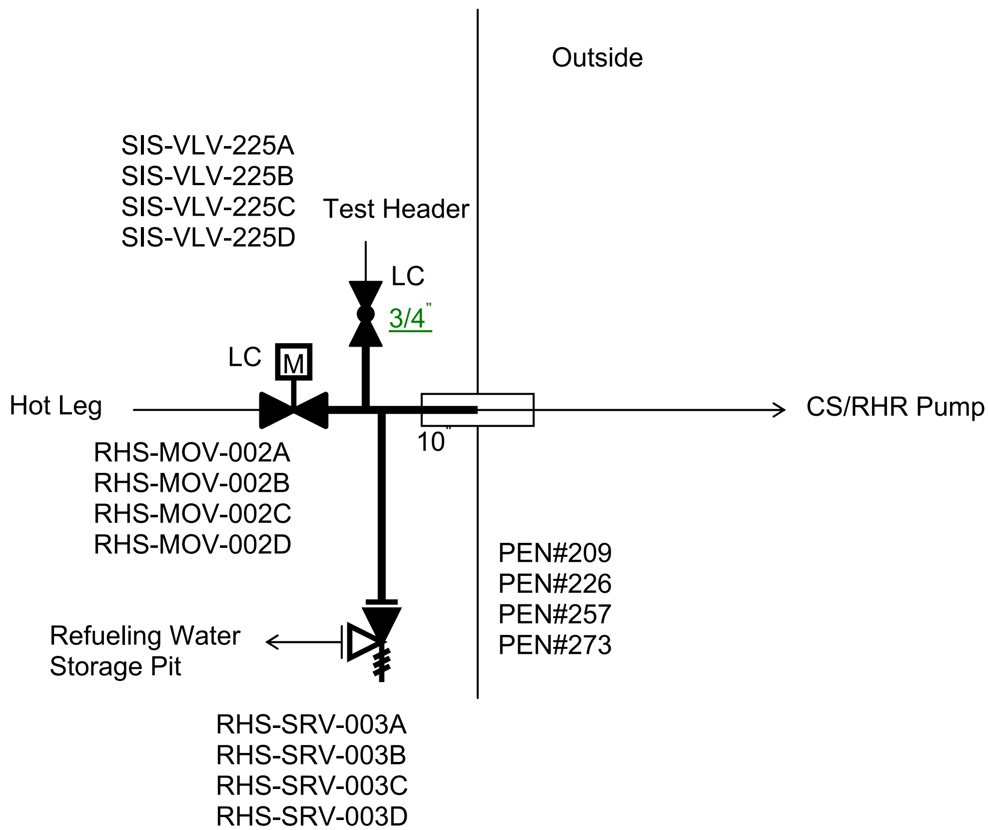

Figure 6.2.4-1 Containment Isolation Configurations (Sheet 12 of 51)

Chapter 9

US-APWR DCD Revision 2 Chapter 9 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	**Description of Change**
9.2-2	Subsection 9.2.1.1.2	CP34 COLA RAI 109, Question 09.02.01-5 (Refer to UAP-HF-09521, dated November 17, 2009) Addition of the description of the essential service water system (ESWS) being a possible backup source for the fire protection water supply system (FSS).
9.2-5; 9.2-10; 9.2-50	Subsections 9.2.1.2.2.1, 9.2.1.5.4, and 9.2.10	CP34 COLA RAI 109, Question 09.02.01-4 (Refer to UAP-HF-09521, dated November 17, 2009) Deletion of the specified mode of cooling of the ESWS pump motor, i.e. thru water cooling. In lieu, this will be identified as site specific and will be added to COL item 9.2(6).
9.2-37, 40	Subsections 9.2.7.2.1, 9.2.7.2.2	RAI No.338, Question 06.04-6 Addition of the description of the protection measure for the refrigerant of chiller unit.
9.2-56;	Tables 9.2.1- 3	CP34 COLA RAI 109, Question 09.02.01-4 (Refer to UAP-HF-09521, dated November 17, 2009) Deletion of the row containing the heat loads from the ESWS pump motor for all plant conditions listed in the table. Some values for the CCW heat exchanger heat load are also being changed for consistency with those given in Table 9.2.2-4.
9.2-57	Table 9.2.1-4	CP34 COLA RAI 109, Question 09.02.01-4 (Refer to UAP-HF-09521, dated November 17, 2009) Deletion of the flow rates to cool the ESWS pump motor and the resulting difference in the total flow rates for all plant conditions listed in the table.
9.2-80	Figure 9.2.1-1, Sheet 1 of 3	CP34 COLA RAI 109, Question 09.02.01-4 (Refer to UAP-HF-09521, dated November 17, 2009) Deletion of the ESWS pump motor cooling line

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Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
9.2-81	Figure 9.2.1-1, Sheet 2 of 3	CP34 COLA RAI 109, Question 09.02.01-4 (Refer to UAP-HF-09521, dated November 17, 2009) Deletion of the entire ESWS pump motor cooling diagram.
9.4-5	Subsection 9.4.1.2	RAI No.475, Question 09.04.01-13 Added the following in the last bullet. “The non-safety in-duct humidifier is controlled by a humidity instrument located in the MCR.”
9.4-11	Subsection 9.4.3.1.1.3	Editorial correction: Replaced “There are no safety design bases for the main steam/feedwater piping area **HVAV** system.” with “There are no safety design bases for the main steam/feedwater piping area **HVAC** system.”
9.4-15	Subsection 9.4.3.2.1 3rd paragraph from the last	Editorial correction: Replaced “This feature serves the function of further diluting the effluent stream **form** the GWMS before it is released to the environment.” with “This feature serves the function of further diluting the effluent stream **from** the GWMS before it is released to the environment.”
9.4-18	Subsection 9.4.3.3.2 2nd paragraph	Editorial correction: Replaced “A **buck** up battery exhaust fan starts automatically upon detection of the running fan’s airflow failure.” with “A **back** up battery exhaust fan starts automatically upon detection of the running fan’s airflow failure.”
9.4-41	Subsection 9.4.6.2 3rd paragraph	Editorial correction: Replaced “… proper temperature is 19,000 cfm and **13,5000** cfm, respectively.” with “… proper temperature is 19,000 cfm and **13,500** cfm, respectively.”

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Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
9.5-34	Subsection 9.5.4.2.2.1 3rd paragraph 1st and 2nd sentences	RAI No.468 Question No.09.05.04-44 with editorial change Changed: “Each fuel oil storage tank has a fill connection, which terminates in a box allowing replenishment of fuel from an outside supply source (e.g., truck) without interrupting operation of the GTG.” to” Each fuel oil storage tank has a fill connection located at grade elevation with locked-closed isolation valves and is capped and locked to prevent entry of moisture. The fill connection terminates in a box allowing replenishment of fuel from an outside supply source (e.g., truck) without interrupting operation of the GTG.”

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Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
9.5-34	Subsection 9.5.4.2.2.1 Last six paragraphs	RAI No.468 Question No.09.05.04-44 with editorial change Added: “The fuel oil storage tanks are vented to atmosphere, and the vent connection is located above the grade elevation. The vent is located above the maximum flood level. The vent has a flame arrester and fine wire mesh to prevent insects from entering. Vent and fill connections are designed with a level of protection equivalent to that for components located in the vital area. Sample connections for sampling of oil, for sediments and water contents in the Fuel Oil Storage Tanks are located outside the vault. The sample connection is capped and locked to prevent entry of moisture. The flowing sample connections are located inside the PS/B close to the fuel oil day tanks. Each Power Source Fuel Storage Vault (PSFSV) is provided with a vapor and liquid detection system that is equipped with on-site audible and visual warning devices with battery backup. Each fuel oil storage tank and the transfer pumps are located in an underground vault identified as the PSFSVs and each vault is provided with a manually operated ventilation system for personnel safety to remove any vapors when personnel enter the area. The PSFSV will not have a normally running ventilation system. The ventilation system consists of a supply air opening with a backdraft damper at the ceiling of the vault from the outside, and ducted to the bottom of one side of the vault. This duct will have an in-duct electric heater controlled by a local thermostat in the downstream ductwork. An exhaust fan at the ceiling with a backdraft damper to the outside is ducted to the bottom other side of the vault. This local ventilation system will be turned on locally (or from the MCR) only when personnel are required to enter the area for the performance of surveillances, inspections and maintenance activities.

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Page	Location (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
9.5-34 and 35		(continued) The PSFSV is 33 feet underground. This provides a natural insulation and a constant ground temperature below grade that maintains the vault temperature within the required temperature limits for the fuel oil. The in-duct electric heater is provided on the supply air duct so that during the winter, whenever the ventilation system is used the incoming cold outside air is heated and the vault area will be able to be maintained above freezing. Unit heaters are provided to maintain fuel oil temperature within specification for when the Power Source Fuel Storage Vault temperature may drop below 35ºF. The COL applicant is to address the need for installing unit heaters in the PSFSV. The tunnel between the fuel oil tank room and the PS/B is where the fuel oil piping is passing through. Within the tunnel is a 3-hour fire rated wall that separates the PS/B from the PSFSV. The door and penetrations through this wall are all 3-hour fire rated. One side of the tunnel is part of the PS/B, which is a normally heated building. The other side of the tunnel is considered a part of the PSFSV and has the same conditions of the vault area and is one of the locations that would have a unit heater if required as part of the COL applicant evaluation of extreme cold conditions.”
9.5-35	Subsection 9.5.4.2.2.3 1st paragraph Last sentence	RAI No.468 Question No.09.05.04-48 Added: “Each fuel oil day tank is in a diked enclosure designed to hold 110% of the contents of the day tank.”
9.5-38	Subsection 9.5.4.3 11th and 12th paragraphs	RAI No.468 Question No.09.05.04-44 with editorial change Added: “The PSFSV ventilation system is classified as equipment class 5 (Non-Safety) and seismic category II. This equipment is in a seismic category I structure with equipment classified as safety-related. The ventilation openings at the ceiling will have a seismic missile enclosure to protect the safety-related fuel oil tank. The ventilation backdraft dampers and exhaust fans for ease of access for maintenance are to be located within these missile enclosures. The backdraft damper is designed to withstand the effects of a tornado.”

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Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
9.5-38	Subsection 9.5.4.4 1st paragraph Last sentence	RAI No.468 Question No.09.05.04-46 Added: "Periodic inspection of the fuel oil storage tank vents is performed to assure there are no obstructions."
9.5-38	Subsection 9.5.4.4 5th paragraph	RAI No.467 Question No.09.05.04-43 Changed: "Prior to addition of new fuel oil into the storage tanks, samples will be tested for specific gravity, cloud point, and viscosity and will be visually inspected for appearance in accordance with ASTM D975 limits." to "Prior to addition of new fuel oil into the storage tanks, samples will be tested for specific gravity, cloud point, viscosity and water and sediment content in accordance with ASTM D975 limits."
9.5-39	Subsection 9.5.4.5 9th and 10th paragraph	RAI No.468 Question No.09.05.04-44 Added: "The PSFSV ventilation system can be operated from the MCR. The vapor and liquid detection systems alarm locally and in the MCR."
9.5-41	Subsection 9.5.6.2.2 1st paragraph Last sentence	RAI No.504 Question No.09.05.06-24 Added: "are" after "…these valves"
9.5-46	Subsection 9.5.8.1 Last paragraph	RAI No.470 Question No.09.05.08-18 Changed: "Codes and standards applicable to the system are listed in Section 3.2 and Table 9.5.8-1. The equipment class, seismic category, and principal design code for the various components are as shown." to "The GTG ventilation/cooling function components apply the equivalent of codes and standards for plant safety-related HVAC components."
9.5-47 and 48	Subsection 9.5.8.3.A 3rd paragraph 2nd sentence	RAI No.470 Question No.09.05.08-20 Deleted: "The carbon dioxide storage tank is located 260 ft. away."
9.5-50	COL 9.5(12)	RAI No.468 Question No.09.05.04-44 Add: "The COL applicant is to address the need for installing unit heaters in the Power Source Fuel Storage Vault during the winter for site locations where extreme cold temperature conditions exist."

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Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
9.5-159	Figure 9.5.4-1	RAI No.468 Question No.09.05.04-45 and 47 Changed: Flow sample location, Tank sample connection and Location of storage tank outlet Added: Note2
9.5-160	Figure 9.5.6-1 Note 2	RAI No.504 Question No.09.05.06-25 Added: "This boundary also indicates boundary between ASME section III for safety related portion and ASME B31.1 for non-safety related portion." Replaced: "SR|NR: Safety Related | Non-Safety Related" with "NS|SR: Non-Safety Related | Safety Related"
9A-87	9A.3.40 FA2-206, FA2-206 Corridor, Safe Shutdown Evaluation	Editorial Replaced "S-SIS" with "C-SIS".
9A-156, 157, 444	9A.3.79 FA2-416, A-Annulus Emergency Exhaust Filtration Unit & Fan Room, Fire Detection and Suppression Features Fire Protection Adequacy Evaluation Table 9A-2 (Sheet 169 of 293)	Editorial Descriptions are revised to be consistent with the design that charcoal filter is not installed in the annulus emergency exhaust filtration unit.
9A-158, 445	9A.3.80 FA2-417, B-Annulus Emergency Exhaust Filtration Unit & Fan Room, Fire Detection and Suppression Features Fire Protection Adequacy Evaluation Table 9A-2 (Sheet 170 of 293)	Editorial Descriptions are revised to be consistent with the design that charcoal filter is not installed in the annulus emergency exhaust filtration unit.

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Page	Location (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
9A-188, 467	9A.3.98 FA2-512 B-Emergency Feedwater Pit, Fire Detection and Suppression Features Table 9A-2 (Sheet 182 of 293)	Editorial Description is revised to be consistent with the FA2-501 A-Emergency Feedwater Pit.
9A-251 through 263, 9A-563 through 568	Power Source Fuel Storage Vault 9A.3.136 FA7-401 9A.3.137 FA7-402 9A.3.138 FA7-403 9A.3.139 FA7-404 9A.3.140 FA7-405 9A.3.141 FA7-406 And associated Table 9A-3	RAI No.468-3360, Question No.09.05.04-44 Description is modified as follows; The dry-pipe sprinkler system is provided for each fuel oil tank vault. In addition, to comply with Section 25.15 of NFPA 30, each vault is provided with an approved vapor and liquid detection system that is equipped with on-site audible and visual warning devices with battery backup.
9A-518	Table 9A-2 (Sheet 243 of 293)	Editorial The description of “Primary Fire Suppression” is changed from “Fire Hose Station” to “Wet Pipe Sprinkler”.

described in Section 3.5; protection against dynamic effects associated with the postulated rupture of piping as described in Section 3.6. Environmental qualification of Class 1E equipment is described in Section 3.11; seismic design is described in Section 3.7, and fire protection is described in Section 9.5.

- The ESWS is constructed in accordance with ASME Section III, Class 3 requirements.
- The ESWS is designed to permit periodic inservice testing and inspection of components to assure system integrity and capability in accordance with GDC 45 and ASME Code Section XI.
- The ESWS is designed to permit appropriate pressure and functional testing to assure the structural and leaktight integrity of components, operability and the performance of the active components of the system, and system operability during reactor shutdown, loss-of-coolant accidents, including operation of applicable portions of the protection system and the transfer between normal and emergency power sources per GDC 46.
- The ESWS is designed with the capability to isolate non–safety related portion.
- The essential service water pumps (ESWPs) are designed to have sufficient available net positive suction head to assure that they can perform their safety function at the lowest probable water level of the UHS.

9.2.1.1.2 Power Generation Design Bases

The ESWS does not provide cooling water to any nonsafety-related components during normal plant operations or design basis LOCA conditions. The ESWS may be used as a backup source of water to the fire protection water supply system (FSS) in the event the normal supply is unavailable due to earthquake. The ESWS is normally isolated from the FSS. The ESWS is not required to supply water to the FSS during any design basis event other than the safe shutdown earthquake. . However, sSome portions of the system are nonsafety-related, e. g., sections of pipe in heat exchanger drain piping after the isolation valves. These boundary isolation valves which provide separation between the safety-related and nonsafety-related portions are normally closed. During a design basis event, postulated simultaneous failure of all nonsafety-related piping would not impact operation of any ESW train and would not affect ESWS capability to perform its safety functions. The COL Applicant is to address site specific nonsafety-related system isolation (intake basin blow down system, intake basin make up water system, FSS) as applicable.

9.2.1.2 System Description

9.2.1.2.1 General Description

Figure 9.2.1-1 shows the piping and instrumentation diagram of the ESWS. The ESWS draws water from the intake basin and returns water to the UHS after passing through the

The ~~ESWP motors are water cooled~~ mode of cooling of the ESWP motors is site-specific and shall be determined by the COL Applicant.

9.2.1.2.2.2 Strainers

Two 100% capacity strainers are located in each ESWP discharge line. The differential pressure across the operating strainer is monitored. When the predetermined high differential set pressure across the strainer is reached an alarm is sent to the MCR; the clogged strainer is isolated by first shutting off the ESWP and them closing the strainer isolation valves. The standby strainer is then placed in service by manually opening the strainer isolation valves. The clogged strainer cartridge will be manually replaced. These strainers filter out most of the debris and thus provide adequate protection for ESWS components.

One 100% capacity self-cleaning type strainer is located upstream of each CCW HX. The strainer is continuously blown down at a rate of 500 gpm to prevent buildup of impurities and clogging of the CCW HXs. The blowdown water is discharged downstream of the CCW HXs. No strainer is provided for essential chller unit coolers since filtration is provided by the ESWP discharge pipe strainers and additional filtering is not deemed necessary.

9.2.1.2.2.3 CCW HX

Four 50% capacity plate type HXs, one per train, are provided. A detailed description of the HXs is discussed in Subsection 9.2.2.

9.2.1.2.2.4 Essential Chiller Units

Four 50% capacity chiller units, one per train, are provided. A detailed description of the essential chiller units is given in Subsection 9.2.7.

9.2.1.2.2.5 Piping

Carbon steel piping designed, fabricated, installed and tested in accordance with ASME Section III, class 3 requirements, is used for the safety-related portion of the ESWS. Piping is arranged to permit access for inspection. Underground piping is epoxy lined carbon steel and placed in trenches. Manholes are provided for periodic piping inspection.

9.2.1.2.2.6 Valves

The water in the ESWS does not normally contain radioactivity and, therefore, special provisions against the leakage to the atmosphere are not necessary. Isolation valves are provided upstream and downstream of each component to facilitate its removal from service.

The motor operated valve is provided at the discharge of each pump. The starting logic of the ESWP interlocks the motor operated valve with the pump operation. The closed discharge valve opens after starting the ESWP. This feature minimizes transient effects

The COL Applicant is to provide the UHS water volume, maximum operating water temperature and the lowest water level for ESWPs

9.2.1.4 Inspection and Testing Requirements

The ESWS is hydrostatically tested prior to initial startup. Preoperational testing is described in Section 14.2. System performance during normal operation is verified by monitoring system pressures, temperatures and flows.

Inservice inspection and testing of piping is performed in accordance with the requirements of ASME Section XI, as discussed in section 6.6.

Inservice testing of active pumps and valves is performed to assure operational readiness, as described in subsection 3.9.6.

The periodic performance verification of the ESWS components, including the heat exchanger which is cooled by the ESW, is performed to detect performance degradation due to fouling.

9.2.1.5 Instrumentation Requirements

The operator has functional control and monitoring capability of the ESWS in the MCR and also at the remote shutdown room (RSR). All functions described below that are available in the MCR are also available at the RSR.

9.2.1.5.1 ESWS discharge pressure

The ESWP discharge pressure is locally indicated, and pressure readings are used for ESWP performance testing.

9.2.1.5.2 ESW header line pressure

ESW header pressure is indicated in the MCR. When the pressure decreases due to the failure or inadvertent shutdown of the operating pump or valve misalignment, a low pressure alarm is transmitted to the MCR.

9.2.1.5.3 CCW HX essential service water flow

The flow rate is indicated in the MCR. A low flow alarm is transmitted to the MCR.

9.2.1.5.4 Deleted~~ESWP motor essential service water flow~~

~~The flow rate is indicated in the MCR. A low flow alarm is transmitted to the MCR.~~

9.2.1.5.5 Differential pressure of strainer

Differential pressure of strainers located in each ESWP discharge line is indicated in the MCR. High differential pressure alarm is transmitted to the MCR. Differential pressure of CCW HX inlet strainer is locally indicated.

The essential chilled water system consists of four independent trains and each train consists of one 50% capacity system. Each system includes, a water-cooled chiller, a chilled water pump, a compression tank with a make-up water line, a chilled water distribution loop, and instrumentation and control system. The condenser (heat rejection) section of each chiller is supplied with cooling water from the respective essential service water system during both normal and emergency operating conditions. The ECWS heat transfer and flow requirements for normal plant operation and abnormal conditions are shown in Table 9.2.7-2.

The motor operated three-way control valves provide the retune line of safety-related air handling unit cooling coils. These valves control a heat removal capacity of coil by modulating the flow rate of chilled water through the cooling coil in response to temperature control signal during AHU in operation. The valve failure position at the loss of a control signal and electrical power is “as is”.

During LOOP, each of the essential chilled water system is powered from the respective safety emergency power source.

The chiller of each essential chilled water system is equipped with an integral chilled water temperature control system.

The chillers are protected by a pressure-relief device to safely relieve pressure and are piped to outside of the building in accordance with ANSI/ASHRAE Standard 15. And the chiller mechanical equipment rooms meet ANSI/ASHRAE Standard 15, so that are equipped with refrigerant leak detectors and actuate a dedicated ventilation system.

The essential chilled water system control maintains the chilled water supply temperature. The compression tank maintains the system pressure within the design operating range.

Upon receipt of an ECCS actuation signal, the operating essential chillers and pumps continue to run and the standby essential chillers and pumps start.

Demineralized quality water with corrosion inhibitors is circulated in the ECWS. No outside impurities are expected to be infilterated in the system. The ECWS water the filters to protect the chillers and cooling coils are not deemed necessary and not provided.

Water chemistry control of ECWS is performed by adding chemicals to the chemical feed tank to prevent long-term corrosion that may degrade system performance. The chemical feed tank is a constructed of carbon steel. The chemical feed tanks are designed as non safety-related but seismic category II and are designed in accordance with ASME Section VIII. The isolation valves that are installed in piping between chemical addition feed and ECWS piping chemical feed line. These valves are normally locked closed.

The essential chilled water system is designed in consideration of the water hammer prevention and mitigation of its in accordance with the following as discussed in NUREG-0927.

- A compression tank to keep the system filled loop, and an instrumentation and control system. The condenser (heat rejection) section of each chiller is supplied with cooling water from a dedicated cooling tower. Each chiller is sized for one-third of the total non-essential chilled water load.

The chillers are protected by a pressure-relief device to safely relieve pressure and are piped to outside of the building in accordance with ANSI/ASHRAE Standard 15. And the chiller mechanical equipment rooms meet ANSI/ASHRAE Standard 15, so that are equipped with refrigerant leak detectors and actuate a dedicated ventilation system.

When the non-essential chilled water system is energized, the chilled water pump, the condenser water pump, and the cooling tower fans will start. When both the chilled and condenser water flows are established, the chillers will start to satisfy the plant non-safety cooling load. The non-essential chilled water system control maintains the chilled water supply temperature at the design setpoint. The compression tank maintains the system pressure within the design operating range.

During the LOOP condition, the non-essential chilled water system is powered from the alternate ac power source.

9.2.7.3 Safety Evaluation

9.2.7.3.1 Essential Chilled Water System

The essential chilled water system is designed to perform its safety function with only two out of four trains operating. The essential chilled water system is completely separate and a single failure does not compromise the system’s safety function even if one train is out of service for maintenance.

The physical separation of the redundant system and the associated components assures the continuous operation of the essential chilled water system.
The system is classified as equipment class 3, seismic category I. The system pressure boundary is designed in accordance with ASME Section III to assure the continuous integrity of the system pressure boundary under all modes of operation.

Redundant systems are powered by separate safety related buses and their heat rejection sections (condenser) are provided with cooling from separate safety related essential service water system.

Casings of the chiller refrigerant compressor and the chilled water pumps are designed to withstand penetration by internally generated missiles.

The essential chilled water system is protected from natural phenomenon by virtue of its location in a seismic category I structure.

9.2.7.3.2 Non-Essential Chilled Water System

With the exception of piping and valves between and including the containment isolation valves, the system does not perform any safety function.

COL 9.2(2) The COL Applicant is to provide the protection against adverse environmental, operating, and accident conditions that can occur, such as freezing, thermal overpressurization. The COL Applicant it to provide the preventive measures for protection against adverse environmental conditions.

COL 9.2(3) The COL Applicant is to determine source and location of the UHS.

COL 9.2(4) The COL Applicant is to determine location and design of the ESW intake structure.

COL 9.2(5) The COL Applicant is to determine location and design of the ESW discharge structure.

COL 9.2(6) The COL Applicant is to provide ESWP design details – required total dynamic head, NPSH available, and the mode of cooling of the ESWP. ~~etc.~~

COL 9.2(7) The COL Applicant is to provide the piping, valves, including those at the boundary between the safety-related and nonsafety-related portions, and other design of the ESWS related to the site specific conditions, including the safety evaluation.

COL 9.2(8) The COL Applicant is to specify the following ESW chemistry requirements:

- *A chemical injection system to provide non-corrosive, non-scale forming conditions to limit biological film formation.*
- *Type of biocide, algaecide, pH adjuster, corrosion inhibitor, scale inhibitor and silt dispersant based on the site conditions.*

COL 9.2(9) COL Applicant is to confirm the storage capacity and usage of the potable water.

COL 9.2(10) COL Applicant is to confirm that all State and Local Department of Health and Environmental Protection Standards are applied and followed.

COL 9.2(11) The COL Applicant is to confirm the source of potable water to the site and the necessary required treatment.

COL 9.2(12) COL Applicant is to confirm that the sanitary waste is sent to the onsite plant treatment area or they will use the city sewage system.

COL 9.2(13) COL Applicant is to identify the potable water supply and describe the system operation.

COL 9.2(14) COL Applicant is to confirm Table 9.2.4-1 for required components and their values.

Table 9.2.1-3 Essential Service Water System Heat Loads (in Btu/hr)

Train	Component	No. of components	Startup		Normal Power Operation		Cooldown by CS/RHRS		Accident (LOCA)		Safe Shutdown	
A & B	CCW Heat Exchanger	2	2	65.~~4~~5 x 10^6	1	50.0 x 10^6	2	220.~~4~~3 x 10^6	1	161.7 x 10^6	1	190.9 x 10^6
	Essential Chiller Unit	2	2	8.66 x 10^6	1	4.33 x 10^6	2	8.66 x 10^6	1	4.33 x 10^6	1	4.33 x 10^6
	~~ESW pump motor~~	~~2~~	~~2~~	~~0.10 x 10^6~~	~~1~~	~~0.05 x 10^6~~	~~2~~	~~0.10 x 10^6~~	~~1~~	~~0.05 x 10^6~~	~~1~~	~~0.05 x 10^6~~
	Total		2	74.16x10^6	1	54.3~~8~~3 x 10^6	2	22~~9~~8.~~1~~96x10^6	1	166.0~~8~~3x10^6	1	195.2~~8~~3x10^6
C & D	CCW Heat Exchanger	2	2	61.2 x 10^6	1	41.~~2~~3 x 10^6	2	221.2 x 10^6	1	161.7 x 10^6	1	190.9 x 10^6
	Essential Chiller Unit	2	2	8.66 x 10^6	1	4.33 x 10^6	2	8.66 x 10^6	1	4.33 x 10^6	1	4.33 x 10^6
	~~ESW pump motor~~	~~2~~	~~2~~	~~0.10 x 10^6~~	~~1~~	~~0.05 x 10^6~~	~~2~~	~~0.10 x 10^6~~	~~1~~	~~0.05 x 10^6~~	~~1~~	~~0.05 x 10^6~~
	Total		2	69.~~9~~86 x 10^6	1	45.~~58~~63x10^6	2	229.~~9~~86 x 10^6	1	166.0~~8~~3 x 10^6	1	195.2~~8~~3 x 10^6

Table 9.2.1-4 Essential Service Water System Flow Balance (in gpm)

Train	Component	No. of components	Startup		Normal Power Operation		Cooldown by CS/RHRS		Accident (LOCA)		Safe Shutdown	
A & B	CCW Heat Exchanger	2	2	22000	1	11000	2	22000	1	11000	1	11000
	Essential Chiller Unit	2	2	1086	1	543	2	1086	1	543	1	543
	~~ESW pump motor~~	~~2~~	~~2~~	~~50~~	~~1~~	~~25~~	~~2~~	~~50~~	~~1~~	~~25~~	~~1~~	~~50~~
	Continuous strainer blowdown	2	2	1000	1	500	2	1000	1	500	1	500
	Total		2	~~24136~~24086	1	~~12068~~12043	2	~~24136~~24086	1	~~12068~~12043	1	~~12068~~12043
C & D	CCW Heat Exchanger	2	2	22000	1	11000	2	22000	1	11000	1	11000
	Essential Chiller Unit	2	2	1086	1	543	2	1086	1	543	1	543
	~~ESW pump motor~~	~~2~~	~~2~~	~~50~~	~~1~~	~~25~~	~~2~~	~~50~~	~~1~~	~~25~~	~~1~~	~~25~~
	Continuous strainer blowdown	2	2	1000	1	500	2	1000	1	500	1	500
	Total		2	~~24136~~24	1	~~12068~~1204	2	~~24136~~24	1	~~12068~~12	1	12043~~12~~

				086		3		086		043		~~068~~

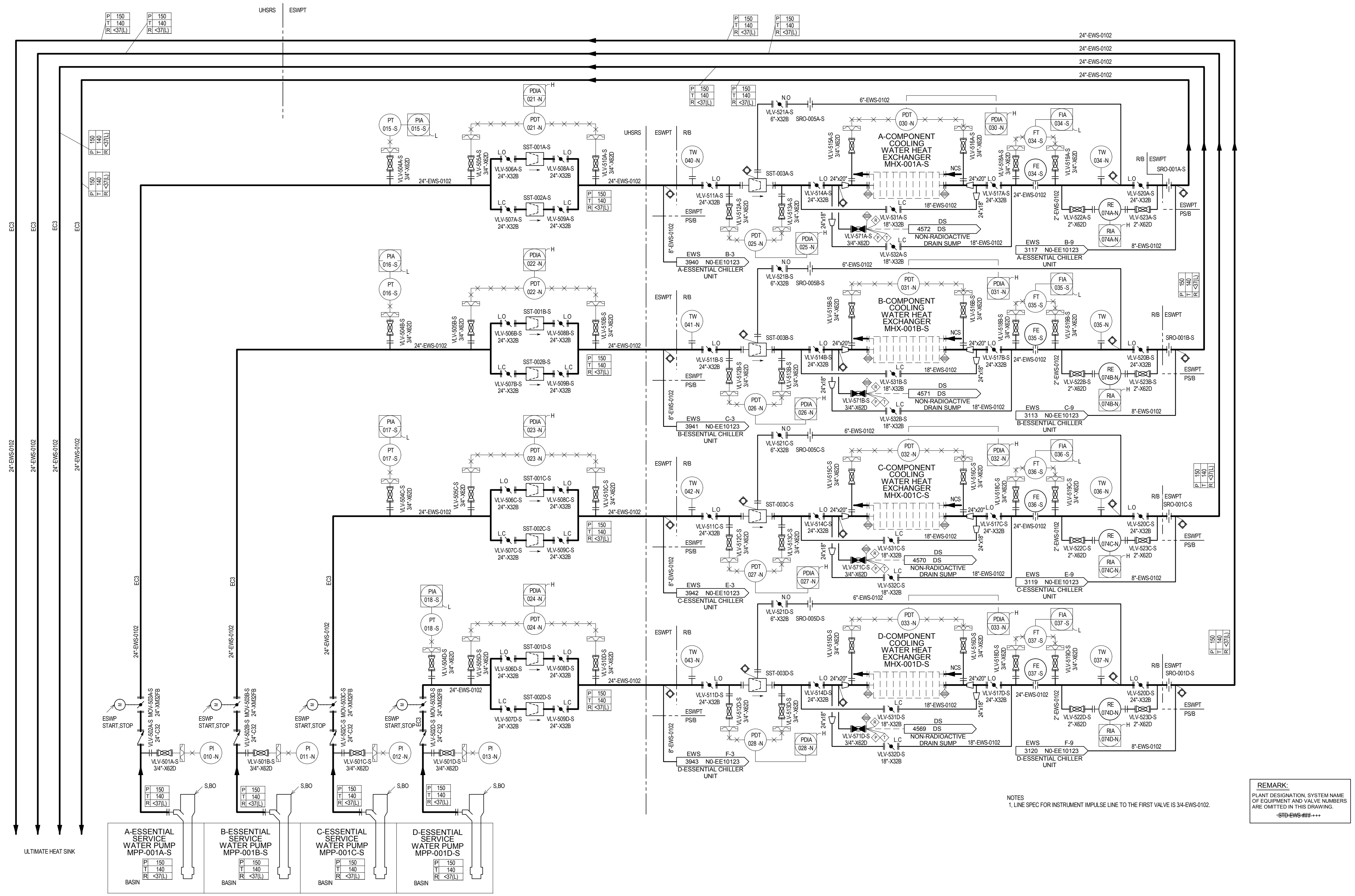

Figure 9.2.1-1 Essential Service Water System Piping and Instrumentation Diagram (Sheet 1 of 3)

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Figure 9.2.1-1 Essential Service Water System Piping and Instrumentation Diagram (Sheet 2 of 3)

- In the normal mode operation, the MCR HVAC system design airflow rate is 20,000 cfm.
- The non-safety in-duct humidifier is controlled by a humidity instrument located in the MCR.

9.4.1.2.2 Emergency Operation Mode

9.4.1.2.2.1 Pressurization Mode

Upon receipt of the MCR isolation signal (Chapter 7), the MCR HVAC system is to automatically switch to pressurization mode by initiating the following control functions:

- The toilet/kitchen exhaust line and smoke purge line isolation dampers revert to the close position.
- The toilet/kitchen exhaust fans and smoke purge fan automatically shut down or remain in the shutdown status.
- The operating air handling units continue to run and the standby air handling units will start.
- All return air dampers of all air handling units remain in the open position allowing recirculation.
- Both emergency filtration units automatically start, their isolation dampers open, and their Class 1E electric heating coils are energized so that the air entering the charcoal adsorber has a relative humidity below 70%, which assures adsorption efficiency.
- The energized emergency filtration units continue to run to remove the airborne radioactivity from the CRE ambient air prior to circulation back to the CRE through the operating air handling units.
- Following automatic initiation of the emergency operation, two of the air handling units and one of the emergency filtration units may be manually de-energized and placed on standby status.
- In the emergency pressurization mode of operation, the CRE is maintained at a positive pressure 0.125 inches w.g. as a minimum relative to external areas adjacent to the CRE boundary.
- In the emergency pressurization mode of operation, the MCR HVAC system design airflow rate is 20,000 cfm and the make-up design airflow rate is less than 1,200 cfm.

9.4.1.2.2.2 Isolation Mode

- The auxiliary building HVAC system has the capability to close the safety-related, seismic category I isolation dampers during a design basis accident.
- The safety-related isolation damper assemblies isolate the penetration and the safeguard component areas, and the vent stack from the auxiliary building HVAC system.
- The isolation damper assemblies are connected to separate electrical safety buses that satisfy the single active failure criteria.
- During a design basis accident, the penetration and the safeguard component areas are isolated in order that operation of the annulus emergency exhaust system maintains a negative pressure and mitigates the release of airborne fission product to the atmosphere (Section 9.4.5).
- During a design basis accident, the auxiliary building HVAC system discharge duct is isolated in order to prevent backflow of discharge air from the annulus emergency exhaust system into the auxiliary building HVAC system.
- The isolation damper assemblies are designed to withstand the effect of adverse environmental conditions.
- The ductwork in the reactor building and power source building will be supported to prevent adverse interaction with other safety-related systems during a seismic event. Non-safety related equipment and ductwork within areas containing safety-related equipment are supported as seismic Category II.

9.4.3.1.1.2 Non-Class 1E Electrical Room HVAC System

There are no safety design bases for the non-Class 1E electrical room HVAC system.

9.4.3.1.1.3 Main Steam/Feedwater Piping Area HVAC System

There are no safety design bases for the main steam/feedwater piping area HVAC system. However, Non-safety related equipment and ductwork within areas containing safety-related equipment are supported as seismic Category II.

9.4.3.1.1.4 Technical Support Center (TSC) HVAC System

There are no safety design bases for the TSC HVAC system.

9.4.3.1.2 Power Generation Design Bases

9.4.3.1.2.1 Auxiliary Building HVAC system

The auxiliary building HVAC system is designed to satisfy the following design bases:

modes of operation. This design complies with GDC 64, Monitoring Radioactivity Releases, and GDC 63, Monitoring fuel and waste storage, as indicated in Section 11.5.

This redirects normal exhaust from radiological controlled area to HEPA and charcoal absorber filters in the containment low volume purge system. Thereby, this system arrangement meets the requirements of GDC 61 for normal plant conditions.

The auxiliary building HVAC system and containment low volume purge system arrangement for the fuel handling area meets the GDC 60 requirements for normal plant operation based on compliance with RG 1.140. However, based on the fuel handling accident analysis (Section 15.7.4) no credit is given for any filtration of released radionuclide's and the calculated offsite dose is well within the guideline dose limit values of 10 CFR 50.34. Therefore, compliance with GDC 60 and 61 is not required for the postulated fuel handling accident condition.

To minimize the buildup of radioactive contamination within the ducts, the exhaust ducts are design/sized for the transport velocities needed to convey the radioactive contaminants without settling. Ducts for most nuclear exhaust and post-accident air cleanup systems should be sized for a minimum duct velocity of approximately 2,500 feet per minute (fpm).

The exhaust from the auxiliary building HVAC system is combined with the treated gaseous waste flow from the GWMS before being routed to the plant vent stack. This feature serves the function of further diluting the effluent stream ~~form~~from the GWMS before it is released to the environment. The combined exhaust stream is monitored for high radiation levels before being released to the environment. Radioactive effluent releases from the GWMS are discussed in Section 11.3.3.1.

Smoke detectors located in the supply and exhaust air ducts detect the presence of smoke and activate an alarm in the MCR. If the smoke is detected in the supply or exhaust ducts, the auxiliary building HVAC system is manually shutdown.

This auxiliary building HVAC system contains ductwork in the auxiliary building and the reactor building and there will be ductwork penetrating through some fire barriers. A fire damper is installed where ductwork has penetrated a fire rated barrier.

9.4.3.2.2 Non-Class 1E Electrical Room HVAC System

The non-Class 1E electrical room HVAC system is shown in Figure 9.4.3-2 and equipment design data is presented in Table 9.4.3-1. The COL Applicant is to determine the capacity of cooling and heating coils that are affected by site specific conditions. The non-Class 1E electrical room HVAC system does not serve any safety function. Therefore, it is not safety-related or seismic category I qualified.

The non-Class 1E electrical room HVAC system includes two 50% capacity air handling units, two 50% capacity return air fans, and two 100% capacity battery room exhaust fans. Each air handling unit consists of, in the direction of airflow, a low efficiency pre-filter, a high efficiency filter, a steam heating coil, a chilled water cooling coil, a supply fan, and associated controls. The cooling coil of the air handling unit is supplied with chilled

The TSC HVAC system has the same habitability considerations with respect to radiological accidents as the MCR HVAC system. 10CFR50, Appendix A, GDC 19 criteria is applicable and is consistent with the guidance provided in NUREG 0696.

DCD Subsection 15.6.5.5.1.3 provides the basis for the TSC acceptability with respect to habitability after radiological accidents, which includes compliance with 10CFR50.34. The welded ductwork design with flanged connections for the TSC, combined with its configuration, will minimize in-leakage such that no greater in-leakage than that evaluated will occur.

There is a dedicated radiation monitoring system for the TSC to ensure radiological protection of TSC personnel. This monitoring system will indentify changing conditions and provides early warning of adverse conditions affecting habitability.

9.4.3.3 Safety Evaluation

9.4.3.3.1 Auxiliary Building HVAC System

Other than the safety-related seismic category I isolation damper assemblies of penetration and safeguard component area supply and exhaust line and auxiliary building HVAC system exhaust line, the auxiliary building HVAC system has no safety-related function and therefore requires no safety evaluation. However, a part of ductwork in the reactor building is supported in accordance with seismic Category II requirements to remain in place during an SSE to preclude damage to any safety-related structures, systems or components located in the vicinity of the ductwork.

Upon receipt of the ECCS actuation signal, the penetration and the safeguard component areas are automatically isolated by the equipment class 2, seismic category I isolation dampers in order that operation of the annulus emergency exhaust system maintains a negative pressure and mitigates the release of airborne fission products to the atmosphere.

Upon receipt of the ECCS actuation signal, the auxiliary building HVAC system discharge duct is automatically isolated by the equipment class 2, seismic category I isolation dampers in order to prevent backflow of discharge air from the annulus emergency exhaust system into the auxiliary building HVAC system.

Failure mode and effects analysis Table 9.4.3-2 concludes that no signal failure coincident with a LOOP compromises the system's safety functions.

9.4.3.3.2 Non-Class 1E Electrical Room HVAC System

The non-Class 1E electrical room HVAC system has no safety-related function and therefore requires no safety evaluation.

The battery room is ventilated with sufficient supply and exhaust airflow during all modes of operation to limit the hydrogen concentration below 1% by volume of battery room. A ~~buck~~back up battery exhaust fan starts automatically upon detection of the running fan's airflow failure.

- The supply air to the containment is dehumidified and tempered to minimize the condensation on the containment ventilation system's cooling coils and supply air duct inside the containment.

9.4.6.2 System Description

9.4.6.2.1 Containment Fan Cooler System

The containment fan cooler system is shown in Figure 9.4.6-1 and the equipment and design data is presented in Table 9.4.6-1. The containment fan cooler system does not serve any safety function. Therefore, it is not safety-related. Non-safety related equipment and ductwork within areas containing safety-related equipment are supported as seismic Category II.

The system consists of four fan cooler units, each sized for 1/3 of the total containment heat load, dampers, ductwork and associated instrumentation and controls. During normal operation, three units are required to operate while the other unit remains on standby. Each fan cooler unit consists of a cooling coil and an axial fan. There are backdraft dampers located on the discharge ductwork to the header compartment.

The containment air is cooled by the operating containment fan coolers. The cooling coils are supplied with chilled water from the non-essential chilled water system. Air is distributed inside the containment through the header compartment and the distribution ductwork system. The cooling airflow that is delivered to each SG compartment and pressurizer compartment through the header compartment to maintain each compartment in proper temperature is 19,000 cfm and 13,500~~0~~ cfm, respectively.

The chilled water control valve of each unit is controlled by an area temperature controller that modulates the chilled water flow to maintain the average containment air temperature below 120° F (Table 9.4-1).

During the LOOP condition, the containment fan cooler system is powered from the alternate ac power source and maintains the average containment air temperature below 150° F. The non-essential chilled water system is powered by the alternate ac power source to supply the cooling water to the containment fan cooler unit cooling coils.

During a severe accident event, it is assumed that the containment fan cooler unit fans are non-operable and that the non-essential chilled water system is unavailable. Valves are provided to manually align the CCW to the containment fan cooler unit cooling coils.

This supplies CCW to the cooling coils in the containment fan cooler unit. The temperature difference between the containment fan cooler and containment atmosphere cause condensation of surrounding steam, promoting more natural circulation and further lowering the containment temperature and pressure, contributing to mitigation of the consequence of a severe accident. This system line-up is referred to as "Alternate Containment Cooling" and is described in Subsection 19.1.3.2.

9.4.6.2.2 Control Rod Drive Mechanism Cooling System

Each fuel oil storage tank has a fill connection located at grade elevation with locked-closed isolation valves and is capped and locked to prevent entry of moisture., which The fill connection terminates in a box allowing replenishment of fuel from an outside supply source (e.g., truck) without interrupting operation of the GTG. The fuel oil storage tank fill connection is located above flood level to prevent flood water from entering the FOS. The fuel oil storage tank fill connection includes an internal pipe and diffuser to limit inlet filling velocities to prevent turbulence of sediment on the bottom of the tank. In addition, the fuel oil storage tank outlet connections are 6 inches above the tank bottom, to reduce the potential of sediment entry into the pipeline. A moisture separator and duplex filters are provided in the fuel oil piping and a duplex fuel oil filter is provided on each GTG to prevent detrimental effects on performance from sediment.

The fuel oil storage tanks are vented to atmosphere, and the vent connection is located above the grade elevation. The vent is located above the maximum flood level. The vent has a flame arrester and fine wire mesh to prevent insects from entering. Vent and fill connections are designed with a level of protection equivalent to that for components located in the vital area.

Sample connections for sampling of oil, for sediments and water contents in the Fuel Oil Storage Tanks are located outside the vault. The sample connection is capped and locked to prevent entry of moisture. The flowing sample connections are located inside the PS/B close to the fuel oil day tanks.

Each Power Source Fuel Storage Vault (PSFSV) is provided with a vapor and liquid detection system that is equipped with on-site audible and visual warning devices with battery backup.

Each fuel oil storage tank and the transfer pumps are located in an underground vault identified as the PSFSVs and each vault is provided with a manually operated ventilation system for personnel safety to remove any vapors when personnel enter the area. The PSFSV will not have a normally running ventilation system. The ventilation system consists of a supply air opening with a backdraft damper at the ceiling of the vault from the outside, and ducted to the bottom of one side of the vault. This duct will have an in-duct electric heater controlled by a local thermostat in the downstream ductwork. An exhaust fan at the ceiling with a backdraft damper to the outside is ducted to the bottom other side of the vault. This local ventilation system will be turned on locally (or from the MCR) only when personnel are required to enter the area for the performance of surveillances, inspections and maintenance activities.

The PSFSV is 33 feet underground. This provides a natural insulation and a constant ground temperature below grade that maintains the vault temperature within the required temperature limits for the fuel oil. The in-duct electric heater is provided on the supply air duct so that during the winter, whenever the ventilation system is used the incoming cold outside air is heated and the vault area will be able to be maintained above freezing.

Unit heaters are provided to maintain fuel oil temperature within specification for when the Power Source Fuel Storage Vault temperature may drop below 35ºF. The COL applicant is to address the need for installing unit heaters in the PSFSV. The tunnel between the fuel oil tank room and the PS/B is where the fuel oil piping is passing through. Within the tunnel is a 3-hour fire rated wall that separates the PS/B from the PSFSV. The door and penetrations through this wall are all 3-hour fire rated. One side of the tunnel is part of the PS/B, which is a normally heated building. The other side of the tunnel is considered a part of the PSFSV and has the same conditions of the vault area and is one of the locations that would have a unit heater if required as part of the COL applicant evaluation of extreme cold conditions.

The Fuel Oil Storage Tanks are fabricated of carbon steel material that does not contain Cu or Zn. The exterior and interior surfaces of the fuel oil storage tanks are painted with a primer and finish coat system for corrosion protection of the tank surface. Exterior surfaces of the fuel oil transfer piping are painted for corrosion protection. The interior surfaces of the fuel oil storage tanks are coated with epoxy coating that does not contain Cu or Zn which due to exposure could promote fuel degradation and promote gel formation.

The piping material is ASTM A106, Grade B carbon steel and the valve material is carbon steel (Ref. 9.5.4-9).

Materials used (with proper coating, as necessary) are compatible with fuel oil service.

9.5.4.2.2.2 Gas Turbine Generator Fuel Oil Transfer Skids

Each GTG FOS is serviced by a modularized skid mounted fuel oil transfer assembly, consisting of suction strainers, two fuel oil transfer pumps, a moisture separator, and a fuel filter with the interconnecting piping, valves, and instrumentation. These skids are located in the same compartments as the Fuel Oil Storage Tanks.

The fuel oil transfer pump skids are powered from their respective Class 1E power buses.

The fuel oil transfer pumps are of the motor driven centrifugal type. The pump and pump motor are mounted on a common baseplate.

Fuel oil transfer pumps are located in the fuel oil storage tanks vaults such that sufficient net positive suction head is available under all design conditions, including pump runout.

9.5.4.2.2.3 Gas Turbine Generator Fuel Oil Day Tanks and Piping

Each GTG fuel oil day tank provides one and half (1 ½) hours of operation for its associated GTG at continuous rating without refilling from the corresponding fuel oil storage tank. The fuel oil day tanks are located in the GTG compartments which are separated from the adjacent GTG compartments by 3-hour rated fire barriers. Each fuel oil day tank is in a diked enclosure designed to hold 110% of the contents of the day tank.

Each fuel oil day tank is separated from sources of ignition and high-temperature surfaces. The tank elevation is selected to provide the necessary suction head for the GTG fuel oil pump. The fuel oil piping in the GTG compartment is located away from hot surfaces. Fill, vent, drain connections, and a return line to the fuel oil storage tank for overflow protection are provided for each fuel oil day tank. Tank fittings provide for water removal, vent connection, and instrumentation.

accumulated sediment removed and the tanks cleaned every ten year intervals, as a minimum or if fuel oil degradation is detected. The fuel oil from the day tank to be cleaned will be drained to the fuel oil storage tanks. The fuel oil from the storage tank to be cleaned will be pumped to an empty tanker and the accumulated sediments drained or removed manually, as necessary and collected in proper containers.

The PSFSV ventilation system is classified as equipment class 5 (Non-Safety) and seismic category II. This equipment is in a seismic category I structure with equipment classified as safety-related.

The ventilation openings at the ceiling will have a seismic missile enclosure to protect thesafety-related fuel oil tank. The ventilation backdraft dampers and exhaust fans for ease of access for maintenance are to be located within these missile enclosures. The backdraft damper is designed to withstand the effects of a tornado.

9.5.4.4 Inspection and Testing Requirements

The FOS is tested prior to initial startup. Preoperational testing is described in Section 14.2. System performance is verified during periodic GTG testing. Periodic inspection of the fuel oil storage tank vents is performed to assure there are no obstructions.

Inservice inspection of piping is performed in accordance with the requirements of ASME Section XI, as discussed in Section 6.6 (Ref. 9.5.4-11).

Technical Specification surveillance testing and inspection of the FOS is performed to assure operational readiness, without loss of system function as described in Chapter 16.

Periodic sampling of the fuel oil quality in fuel oil storage tank is performed.

Prior to addition of new fuel oil into the storage tanks, samples will be tested for specific gravity, cloud point, ~~and~~ viscosity and water and sediment content ~~will be visually inspected for appearance~~ in accordance with ASTM D975 limits.

The GTG FOS operability may be demonstrated during tests of the GTG, or testing may be performed by operation of the system in recirculation mode (bypassing the service day tank) and pumping fuel through the recirculation line back to the fuel oil storage tank.

Vents, drains, and necessary connections required for the calibration of the instrumentation shall be provided.

Fuel oil storage tanks and fuel oil day tanks interior coating will be inspected in accordance with ASTM D5163 Standard requirements. The inspection of the coating used on the interior surfaces of the tanks will be every 10-year intervals when the tanks are emptied and cleaned.

9.5.4.5 Instrumentation Requirements

The fuel oil storage tanks are provided with level instrumentation for level indication in the GTG control cabinet. Low and high fuel oil level in the fuel oil storage tanks are alarmed in the MCR.

Each fuel oil day tank is provided with level instrumentation to control the fuel oil transfer pumps, provide level indication on the GTG control cabinet, and indicate low and high level alarms in the GTG Room and in the MCR.

The fuel oil transfer pumps start and stop on low and high level, respectively, and the tank level transmitter activates a fuel oil day tank high or low level alarm. The fuel oil transfer pumps start automatically when the level in the day tank decreases to the set capacity. The day tank low-level alarm annunciates when the level decreases to a set point. The fuel oil transfer pumps are automatically stopped when the day tank level has increased to a higher set level.

The fuel oil transfer pumps can be operated locally and from the MCR.

All tank levels may also be determined by dipsticks or sounding ports.

Pressure indicators and a differential pressure alarm on the fuel oil transfer pump suction strainers are provided.

The filter in the discharge line to the fuel oil day tank is monitored by measuring differential pressures across the filter and by providing a high differential pressure alarm.

The fuel oil storage tanks are provided with temperature instrumentation for temperature indication in the GTG control panel. The temperature instrumentation is provided to control the electric heaters in the fuel oil storage tank vaults to maintain the fuel oil system above the cloud point temperature.

The PSFSV ventilation system can be operated from the MCR.

The vapor and liquid detection systems alarm locally and in the MCR.

9.5.5 Gas Turbine Generator Cooling Water System [Not Required]

The GTG does not need cooling water system. Cooling of GTG is achieved by air ventilation system (see Subsection 9.5.8).

9.5.6 Gas Turbine Generator Starting System

The GTG starting system provides for a reliable GTG start following a LOOP. Each GTG consists of two gas turbines that drive one generator.

9.5.6.1 Design Bases

A. The GTG starting system initiates a start of the GTG such that within 100 seconds after receipt of the start signal, the GTG is operating at rated speed and is ready

9.5.6.2.1.2 Air Receivers

Each starting system is equipped with two air receivers. Two air receivers are capable of providing starting air for three consecutive GTG starts without compressor assistance. Provisions are made for blowdown of air receivers to eliminate any moisture that might accumulate in them.

9.5.6.2.1.3 Air Coolers

Each air compressor is equipped with a finned coil pipe air cooler to cool the air after compression. The air cooler is installed on the compressor skid.

9.5.6.2.1.4 Air Start Distributors

Each GTG is equipped with two air start distributors, one per an air starting unit.

9.5.6.2.1.5 Air Starting Unit

Each air starting unit is equipped with two air start solenoid valves. The piping downstream of the air receiver is provided with a drain line to remove any moisture which may accumulate. A Y-strainer is installed upstream of the parallel air start valves to prevent oil and particulates from fouling the valves. Periodic testing of the GTG confirms the operability of the valves.

9.5.6.2.1.6 Air Dryer

Air dryers are equipped as part of the air compressor skid to dry starting air to a dew point of not more than 10ºC (50ºF) when installed in a normally-controlled 21ºC (70ºF) environment; otherwise, at least 5.5ºC (10ºF) less than the lowest expected ambient temperature.

9.5.6.2.2 System Operation

The air receivers for each GTG are maintained at operating pressure by compressors. The compressors start when air receiver pressure drops to 398 psig and stop when pressure is increased to 435 psig. Six air compressors are provided. Each compressor keeps one receiver pressurized. A check valve in the air receiver charging line ensures that a broken line from any of the compressors will not affect the air receiver. The valves on the cross-connect and discharge piping can be aligned manually, and these valves are normally open so that either air receiver can be recharged from any air compressor.

When the GTG receives a start signal, all four solenoid valves are energized simultaneously, allowing starting air to flow to the GTG, using air from both air distributors. As soon as the GTG has started and is running on its own power, a speed switch cuts the electrical circuit to the starting air valves and causes the valves to close.

9.5.6.3 Safety Evaluation

is discussed in Section 3.4. Missile protection is discussed in Section 3.5. Protection against dynamic effects associated with postulated rupture of piping is discussed in Section 3.6. Environmental qualification is discussed in Section 3.11.

- The combustion air intake and turbine exhaust system is capable of supplying adequate combustion air and disposing of resultant exhaust products to permit continuous operation of the GTGs for each unit at 110% of nameplate rating.
- The combustion air intake and turbine exhaust system is designed to remain functional during and after a SSE.
- The combustion air intake and turbine exhaust system is designed so that a single failure of any component, assuming a LOOP, cannot result in complete loss of the power source.
- The GTG combustion air intake and turbine exhaust system is capable of being tested during plant operation in accordance with 10 CFR 50, Appendix A, GDC 18 (Ref. 9.5.2-4).
- The ventilation/cooling portion of the system is designed to remain functional during and after a SSE.
- The ventilation/cooling portion of the system is designed so that a single failure of any component, assuming a LOOP, cannot result in complete loss of the power source.
- The ventilation/cooling portion of the system is capable of being tested during plant operation in accordance with 10 CFR 50, Appendix A, GDC 18 (Ref. 9.5.2-4).
- The emergency power supply equipment floors are painted with concrete or masonry type paint in all rooms to prevent concrete abrasive dust from becoming airborne and causing malfunctions of electric contacts.

~~Codes and standards applicable to the system are listed in Section 3.2 and Table 9.5.8-1. The equipment class, seismic category, and principal design code for the various components are as shown.~~The GTG ventilation/cooling function components apply the equivalent of codes and standards for plant safety-related HVAC components.

9.5.8.2 System Description

9.5.8.2.1 General Description

As shown in Figure 9.5.8-1, each gas turbine is provided with:

(1) A combustion air intake and exhaust system consisting of, silencer, and associated piping and flexible connections.

(2) Ventilation/cooling air to the GTG assembly consisting of ventilation fan and duct work. The system maintains GTG room temperature of 122 ºF or less.

9.5.8.2.2 Component Description

9.5.8.2.2.1 Combustion Air Intake and Exhaust Silencers

A Silencer is installed in the intake system to minimize the noise level within the GTG enclosure. A silencer is installed in the turbine exhaust system to reduce the noise emitted from the system.

9.5.8.2.2.2 Ventilation Fan

Each GTG package contains a ventilation fan.

9.5.8.2.2.3 Piping/ducts

The turbine and air exhaust piping is made of carbon steel. Duct work is made of galvanized steel. Expansion joints are strategically located to accommodate the thermal growth of the exhaust piping. The piping is of adequate size so that it can accommodate the total pressure drop when the engine is operating at 110% of continuous rating.

9.5.8.2.3 System Operation

Upon initiation of a GTG start signal, combustion air is drawn into the intake piping to the GT intake duct. The combustion air intake, silencer, and the combustion air piping are sized to supply an adequate supply of air to the GT while operating at 110% of nameplate rating. The turbine exhaust gases enter the turbine exhaust pipe, pass through the turbine exhaust silencer, and are then ducted out of the building. The exhaust piping and silencer are sized to prevent excessive backpressure on the engine when operating at 110% nameplate rating.

Cooling air is supplied and exhausted out of the building through the air exhaust piping.

9.5.8.3 Safety Evaluation

A. The GTG combustion air intake and exhaust system is capable of supplying an adequate quantity of combustion air to the GT and of disposing the exhaust gases without creating an excessive backpressure on the GT when operating at 110% of nameplate rating. Cooling air is supplied to the GTG and exhausted from the building.

   The power source buildings (PS/Bs) are equipped with a fire suppression system.

   US-APWR power block general arrangement drawings (Chapter 1) show the physical relationship of the PS/B to those plant features, which could affect the system. The PS/B is not located near any gas storage facilities. ~~The carbon~~

~~dioxide storage tank is located 260 ft. away,~~ Tthe hydrogen storage facility is 600 ft. away, and the nitrogen bulk storage is 600 ft. away.

The distances between the PS/B and those facilities are adequate to ensure that an accidental release of these gases does not degrade GTG performance.

The turbine intake and exhaust openings above the roof of the PS/B, and the portion of the piping/ducts above the roof is protected by a guard structure against precipitation and tornado missiles. The reinforced concrete guard structures are integrally attached to the roofs and act as extensions of the seismic category I PS/Bs. The guard structures are designed as seismic category I to withstand the effects of natural phenomena in accordance with GDC 2 and to withstand environmental effects in accordance with GDC 4. The turbine exhaust is located appropriately away from the engine air intake, thereby minimizing the chances of the turbine exhaust being drawn into the combustion air intake.

B. The combustion air intake, turbine exhaust, room air supply and air exhaust system are designed to seismic category I requirements as specified in Section 3.2. Systems, equipment, and components which are not seismic category I and whose failure might impair the functioning of the combustion air intake and exhaust system are designed so that failure cannot impair the functioning of safety-related equipment.

C. A single failure is assessed as a failure of the GTG with which the component is associated. In such a circumstance, safe shutdown is attained and maintained by the redundant GTG installation.

D. Cooling air for the GTG and room ventilation is drawn through a separate duct. The cooling/ventilation air is exhausted through a separate return duct system. A variable damper is installed in the air exhaust duct and their position will be aligned and set at the installation to relieve air pressure in the room.

9.5.8.4 Inspection and Testing Requirements

The combustion air intake and exhaust system is tested prior to initial startup. Preoperational testing is described in Section 14.2. System performance during normal operation is verified. The ventilation and cooling functions of the GTG combustion air intake and exhaust system are also tested as part of Class 1E GTG testing described in Subsection 14.2.12.1.44.

Inservice inspection of piping is performed in accordance with the requirements of ASME Section XI, as discussed in Section 6.6 (Ref. 9.5.4-11).

9.5.8.5 Instrumentation Requirements

The GTG combustion air intake and exhaust system is provided with instrumentation consisting of a combustion air pressure indicator and exhaust gas temperature indicators. The GTG room is provided with thermometers to monitor room and air exhaust temperature, ventilation / cooling air flow meter.

COL 9.5(10) Deleted

COL 9.5(11) The COL Applicant is to specify that adequate and acceptable sources of fuel oil are available, including the means of transporting and recharging the fuel storage tank, following a design basis accident.

COL 9.5(12) The COL applicant is to address the need for installing unit heaters in the Power Source Fuel Storage Vault during the winter for site locations where extreme cold temperature conditions exist.

9.5.10 References

9.5.1-1 "Fire protection," Energy. Title 10 Code of Federal Regulations Part 50.48, U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-2 SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria", U.S. Nuclear Regulatory Commission, Washington, DC, October 28, 2005.

9.5.1-3 "Fire Protection," Energy Title 10 Code of Federal Regulations Part 50, Appendix A, GDC 3, U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-4 "Sharing of Structures, Systems, and Components," Energy. Title 10 Code of Federal Regulations Part 50, Appendix A, GDC 5, U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-5 "MCR," Energy. Title 10 Code of Federal Regulations Part 50, Appendix A, GDC 19. U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-6 "Protection System Failure Modes," Energy. 10 Code of Federal Regulations Part 50, Appendix A, GDC 23, U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-7 "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," Energy. Title 10 Code of Federal Regulations Part 52 U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-8 "Contents of applications; technical information". Energy. Title 10 Code of Federal Regulations 52.47 U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-9 "Issuance of combined licenses." Energy. Title 10 Code of Federal Regulations 52.97(b)(1) U.S. Nuclear Regulatory Commission, Washington, DC.

9.5.1-10 "Licensing requirements for the independent storage of spent nuclear fuel, high-level radioactive waste, and reactor-related greater than class c waste."

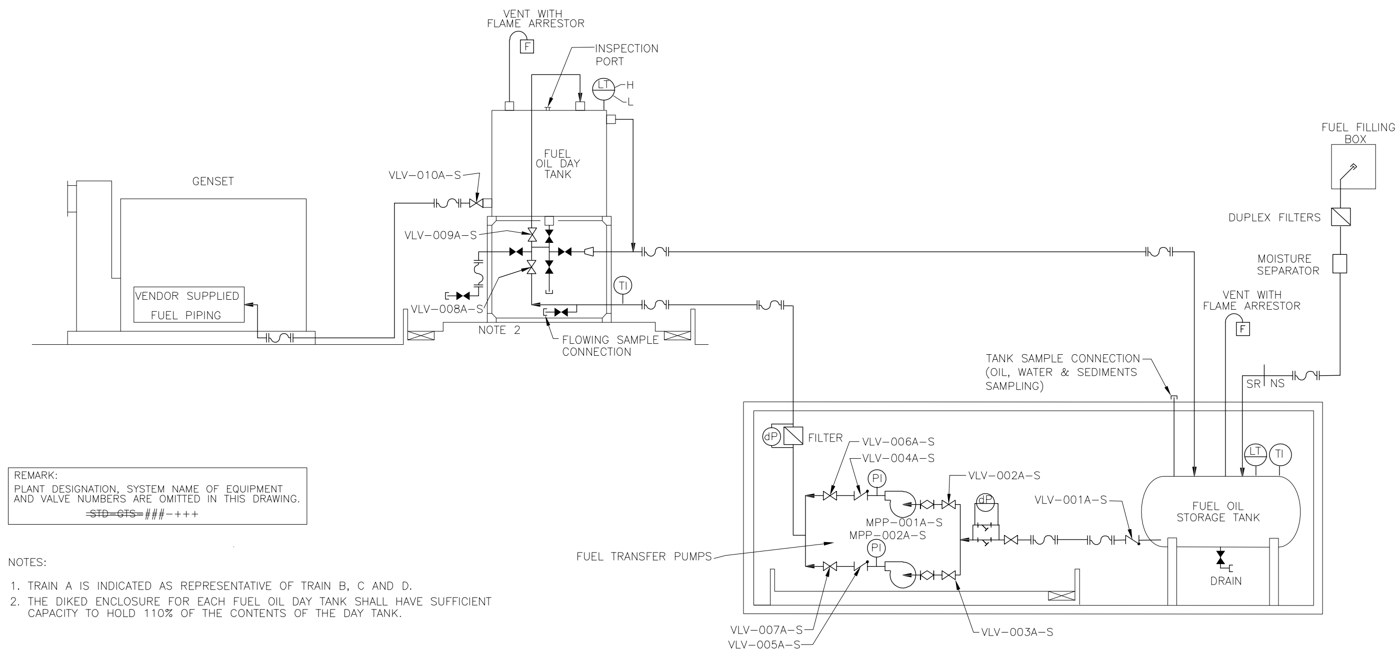
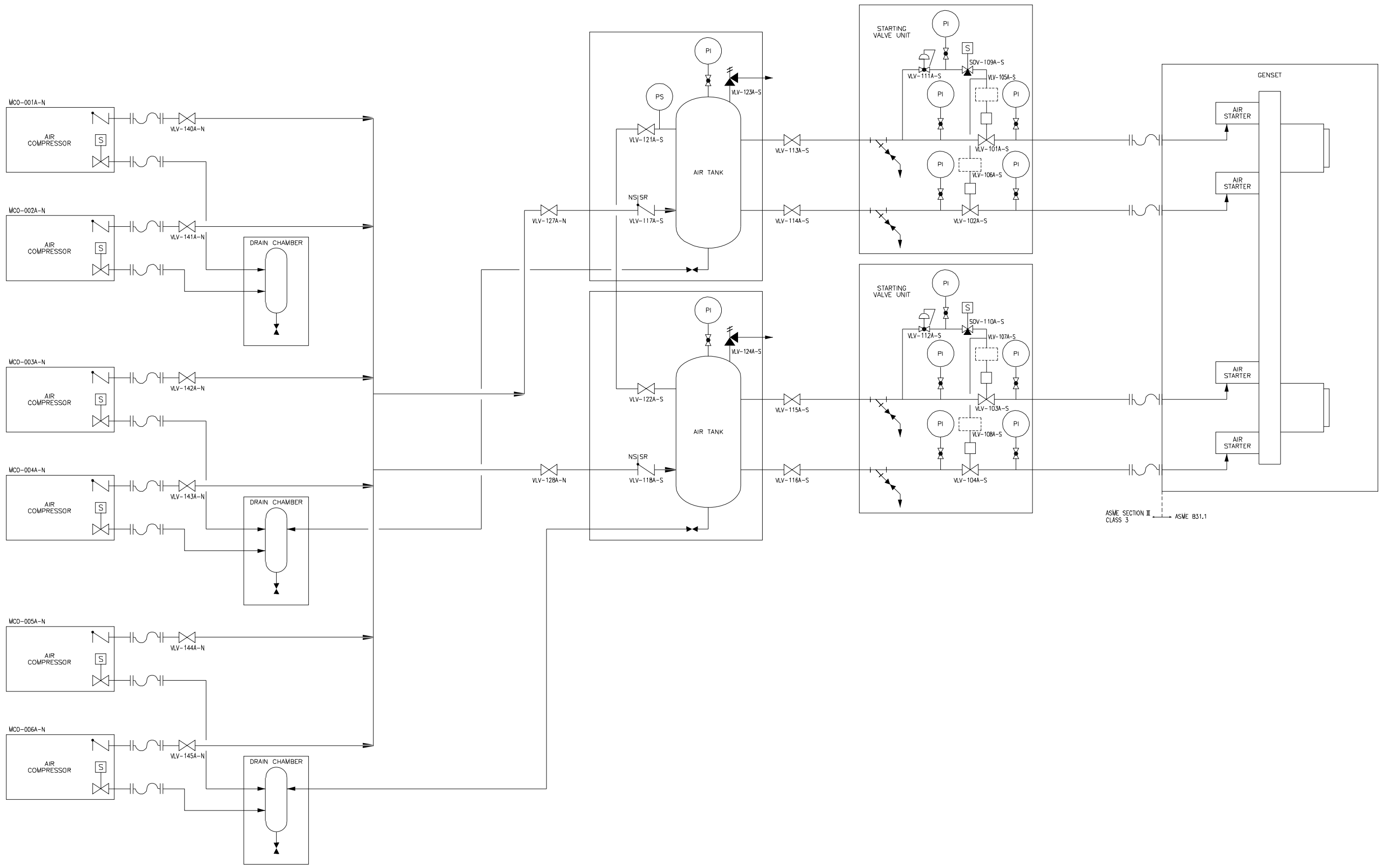


Figure 9.5.4-1 Gas Turbine Generator Fuel Oil Storage and Transfer System Schematic Diagram



NOTE
1. TRAIN A IS INDICATED AS REPRESENTATIVE OF TRAIN B , C AND D.
2. BOUNDARY BETWEEN SAFETY RELATED AND NON-SAFETY RELATED PORTION IS SHOWN BY FOLLOWING SYMBOL.
THIS BOUNDARY ALSO INDICATES BOUNDARY BETWEEN ASME SECTION III FOR SAFETY RELATED PORTION AND ASME B31.1 FOR NON-SAFETY RELATED PORTION.
NS|SR: NON-SAFETY RELATED|SAFETY RELATED.

REMARK;
PLANT DESIGNATION, SYSTEM NAME OF EQUIPMENT AND VALVE NUMBERS ARE OMITTED IN THIS DRAWING.
~~STD-GTS-~~###-+++

Figure 9.5.6-1 Gas Turbine Generator Starting System Schematic Diagram transient combustibles associated with maintenance activities during equipment outages. The fire protection system for this room is designed in accordance with NFPA 72 and 14, and is the combination of smoke detectors and manual hose stations.

The room is provided with automatic fire detection which alarms upon high smoke concentration and summons plant fire brigade. Based on the expected fire hazards within the compartment during normal operation and the maximum expected fire during equipment maintenance, the 3-hour fire rated boundaries of the compartment are more than sufficient to contain any unsuppressed fire that can be expected to occur within the compartment. On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The fire protection capability for this area is provided from manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and unlikely to release water except after extreme seismic events. The fire protection piping is seismically supported so that any failure will not cause the piping to impact any safety-related equipment. Unintended operation of the fire suppression activity is not expected since deliberate manual activation is required to operate a hose station valve and release water. In the event of a fire, the equipment within the area is protected from significant water intrusion since wiring is located in overhead areas and the small amount of panels, controls and instrumentation are located off the floor by a distance that allows for some water buildup on the floor.

Safe Shutdown Evaluation

A fire in this area has the potential to damage the following typical systems of safe-shutdown function.

- C-Safety I&C system
- C-Class 1E Power system
- C-EFWS (M/D)
- C-CS/RHRS
- C~~S~~-SIS
- C-Essential Chiller Unit HVAC System
- C-Class 1E Electrical Room HVAC System
- C-Class 1E Battery Room HVAC System
- C-Main Control Room HVAC System
- C-Safeguard Component Area HVAC System
- C-Essential Chilled Water System

Since this fire area is separated from the Train A, B, and D areas by 3-hour fire rated barriers, two safety trains of equipment in other fire areas can achieve and maintain safe-shutdown from full power, and the fire in this fire area, therefore, will not adversely impact the ability of safe-shutdown.

The FA2-416 is located on the northeastern side of the R/B as shown on Figure 9A-7. The fire area consists of single fire zone designated as fire zone FA2-416-01. Combustible content associated with the room's contents is primarily attributed to HVAC filter media and results in a maximum anticipated fire loading for the room of 3.4E+04 Btu/ft^2. The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.

The area is identified as being associated with safety train A.

Fire Detection and Suppression Features

FA2-416-01 is provided with automatic smoke~~/heat~~ detection, and manual fire alarm pull station is installed as secondary detection. ~~Charcoal filter Unit has water spray, and p~~Primary fire suppression for this zone is provided from manual fire hose stations. Secondary suppression is provided from portable fire extinguishers.

Smoke Control Features

Any HVAC ductwork passing into the area is provided with automatic closing fire dampers at fire area boundaries as required by NFPA 90A. Smoke migration into the area is mitigated by appropriately sealed penetrations and openings of the fire area boundaries. Smoke removal as required due to fire within the area can be accomplished by the plant fire brigade utilizing portable fans and flexible ducting.

Fire Protection Adequacy Evaluation

~~A fire in this area is not expected but would be alarmed in the main control room and the fire brigade would respond to extinguish the fire. A fixed water spray system and automatic fire detection is provided for the charcoal filter in the Annulus Emergency Exhaust Filtration unit. The overall combustible loading in this area is light and a fire of sufficient size and intensity to compromise the fire barrier boundaries is not deemed credible. The fire protection features of this area are adequate to assure that any unsuppressed fire that may occur in this area will not threaten the confinement capability to the adjacent fire areas.~~ The fire area boudaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors and protected penetrations and openings are provided for fire confinement. HVAC ductwork passing into this area is equipped with fire dampers in accordance with the guidance of NFPA 90A.

The combustible loading in this area is light and a fire of sufficient size and intensity to compromise the fire barrier boudaries is not deemed credible.

The fire protection system for this room is designed in accordance with NFPA 72 and 14, and is the combination of smoke detectors and namual hose stations. Based on the expected fire hazards within the compartment during normal operation and the maximum expected fire during equipment maintenance, the 3-hour fire rated boundaries of the compartment are more than sufficient to contain any unsuppressed fire that can be expected to occur within the compartment. On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The fire protection capability for this area is provided from manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and unlikely to release water except after extreme seismic events. The fire protection piping is seismically supported so that any failure will not cause the piping to impact any safety-related equipment. Unintended operation of the fire suppression activity is not expected since deliberate manual activation is required to operate a hose station valve and release water. In the event of a fire, the equipment within the area is protected from significant water intrusion since wiring is located in overhead areas and the small amount of panels, controls and instrumentation are located off the floor by a distance that allows for some water buildup on the floor.

Safe Shutdown Evaluation

A fire in this area has the potential to damage the following typical systems of safe-shutdown function.

- A-CS/RHRS
- A-Safety Depressurization Valve (train-A)
- A-Safety Control System

Since this fire area is separated from the Train B, C and D areas by 3-hour fire rated barriers, two safety trains of equipment in other fire areas can achieve and maintain safe-shutdown from full power, and the fire in this fire area, therefore, will not adversely impact the ability of safe-shutdown.

Radioactive Release to Environment Evaluation

This area is located in the south R/B portion of the plant which is within the non-radiologically controlled access area of the R/B. Radiological material is not allowed within this building area by administrative controls. There are no piping systems in the area that could contain fluids with radiological content. As such, a fire in this area is not deemed credible of causing a radioactive release to the environment.

9A.3.80 FA2-417 B-Annulus Emergency Exhaust Filtration Unit & Fan Room

The FA2-417 is located on the northwestern side of the R/B as shown on Figure 9A-7. The fire area consists of single fire zone designated as fire zone FA2-417-01. Combustible content associated with the room's contents is primarily attributed to HVAC filter media and results in a maximum anticipated fire loading for the room of 3.5E+04 Btu/ft^2. The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.

The area is identified as being associated with safety train D.

Fire Detection and Suppression Features

FA2-417-01 is provided with automatic smoke~~/heat~~ detection, and manual fire alarm pull station is installed as secondary detection. ~~Charcoal filter Unit has water spray, and p~~Primary fire suppression for this zone is provided from manual fire hose stations. Secondary suppression is provided from portable fire extinguishers.

Smoke Control Features

Any HVAC ductwork passing into the area is provided with automatic closing fire dampers at fire area boundaries as required by NFPA 90A. Smoke migration into the area is mitigated by appropriately sealed penetrations and openings of the fire area boundaries. Smoke removal as required due to fire within the area can be accomplished by the plant fire brigade utilizing portable fans and flexible ducting.

Fire Protection Adequacy Evaluation

~~A fire in this area is not expected but would be alarmed in the main control room and the fire brigade would respond to extinguish the fire. A fixed water suppression system and automatic fire detection is provided for the charcoal filter in the Annulus Emergency Exhaust Filtration unit. The overall combustible loading in this area is light and a fire of sufficient size and intensity to compromise the fire barrier boundaries is not deemed credible. The fire protection features of this area are adequate to assure that any unsuppressed fire that may occur in this area will not threaten the confinement capability to the adjacent fire areas.~~ The fire area boudaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors and protected penetrations and openings are provided for fire confinement. HVAC ductwork passing into this area is equipped with fire dampers in accordance with the guidance of NFPA 90A.

The combustible loading in this area is light and a fire of sufficient size and intensity to compromise the fire barrier boudaries is not deemed credible.

The fire protection system for this room is designed in accordance with NFPA 72 and 14, and is the combination of smoke detectors and namual hose stations. Based on the expected fire hazards within the compartment during normal operation and the maximum expected fire during equipment maintenance, the 3-hour fire rated boundaries of the compartment are more than sufficient to contain any unsuppressed fire that can be expected to occur within the compartment.On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The fire protection capability for this area is provided from manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and unlikely to release water except after extreme seismic events. The fire protection piping is seismically supported so that any failure will not cause the piping to impact any safety-related equipment. Unintended operation of the fire suppression activity is not expected since deliberate manual activation is required to operate a hose station valve and release water. In the event of a fire, the equipment within the area is protected from

The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.

The area is identified as being associated with non-safety train.

Fire Detection and Suppression Features

This fire area is provided with ~~automatic smoke detection~~manual fire alarm pull station, and manual fire alarm pull station is installed as secondary detection. Primary fire suppression is provided from manual fire hose stations. Secondary suppression is provided from portable fire extinguishers.

Smoke Control Features

Any HVAC ductwork passing into the area is provided with automatic closing fire dampers at fire area boundaries as required by NFPA 90A. Smoke migration into the area is mitigated by appropriately sealed penetrations and openings of the fire area boundaries. Smoke removal as required due to fire within the area can be accomplished by the plant fire brigade utilizing portable fans and flexible ducting.

Fire Protection Adequacy Evaluation

The walls forming the boundaries of this area are very substantial concrete construction that is capable of several hours of fire exposure to an ASTM E-119 fire exposure. There is no credible fire scenario for this inaccessible area that contains no combustible material. Even so, should a fire occur within this space, no damage to any plant function or adverse impact to plant safety would result.

Fire Protection System Integrity

The fire protection capability for this area is provided from manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and unlikely to release water except after extreme seismic events. The fire protection piping is seismically supported so that any failure will not cause the piping to impact any safety-related equipment. Unintended operation of the fire suppression activity is not expected since deliberate manual activation is required to operate a hose station valve and release water.

Safe Shutdown Evaluation

A fire in this area has no potential to damage the ability of safe-shutdown function, because they are not installed in this fire area. The fire in this fire area, therefore, will not adversely impact the ability to achieve and maintain safe-shutdown.

Radioactive Release to Environment Evaluation

FA7-104-01 is provided with manual fire alarm pull station. Primary fire suppression is provided from portable fire extinguishers.

Smoke Control Features

Any smoke generated within the tunnel would be confined to the tunnel area. The fire brigade could provide ventilation of any smoke from the tunnel using portable equipment.

Fire Protection Adequacy Evaluation

A fire is not expected to occur within this area since there is minimal fire load to support it. Should a fire occur, it would not propagate outside the fire area boundaries.

Fire Protection System Integrity

Since there are no automatic or manual system within the tunnel, the fire protection system integrity for this area is assured by the significant protection provide by the structural fire protection provided.

Safe Shutdown Evaluation

A fire in this area has the potential to damage the following typical systems of safe-shutdown function.

- D-ESWS
- D-Safety Instrumentation System

Since this fire area is separated from the train A, B, and C areas by 3-hour fire rated barriers, two safety trains of equipment in other fire areas can achieve and maintain safe-shutdown from full power, and the fire in this fire area, therefore, will not adversely impact the ability of safe-shutdown.

Radioactive Release to Environment Evaluation

The essential service water piping tunnel is a non-radiological area with no piping system containing radioactive material and no other radioactive material located within the area. As such, any fire that could occur within the piping tunnel is not deemed capable of producing a radioactive release.

9A.3.136 FA7-401 Power Source Fuel Storage Vault

Figure~~s~~ 9A-27 shows the location of this fire area adjacent to the south portion of the East PS/B. This fire area consists of the single fire zone, FA7-401-01, A-Class 1E GTG Fuel Storage Vault. This ~~room~~valut accommodates the GTG fuel storage tank with a ~~whose~~ capacity ~~is~~of 119,000 gallons. Also, in this vault are the fuel oil transfer pumps and associated equipment.

~~The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating.~~

~~Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.~~

~~The area is identified as being associated with safety train A.~~

Fire Detection and Suppression Features

FA7-401-01 is provided with a dry-pipe automatic sprinkler system for primary fire suppression~~automatic heat detection~~, and a manual fire alarm pull station is installed as primary manual fire ~~secondary~~ detection. ~~Primary fire suppression is provided from wet pipe automatic sprinkler system.~~ Secondary suppression is provided by a ~~from~~ manual hose station and a portable fire extinguisher. Vapor and liquid detection systems are provided in accordance with NFPA 30. They alarm locally and to the MCR.

Smoke Control Features

Smoke removal as required due to fire within the area can be accomplished by the existing ventilation system for the power source fuel storage vault~~plant fire brigade utilizing portable fans and flexible ducting~~.

Fire Protection Adequacy Evaluation

The fire area boundaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors. 3-hour fire-rated ~~and protected~~ penetration~~s~~ seals~~and openings~~ are provided for all penetrations into the vault~~fire confinement~~.

Fire suppression is provided by a ~~wet~~dry-pipe sprinkler system in accordance with NFPA 13 ~~code~~ and regulatory guidance. The fire area has substantial concrete reinforced walls that are designed to seismic category I criteria. ~~and are~~ They ~~constructed to~~ provide more than the required ~~a~~ minimum 3-hour fire resistance rating. Additional fire suppression capability is provided ~~with~~by fire hose streams and portable fire extinguishers. In addition, the area is provided with ~~automatic fire detection and~~a manual fire alarm pull station ~~notification~~ as backup. The combination of structural confinement with fire rated barriers, automatic fire suppression system, the manual ~~automatic~~ fire ~~alarm notification~~ hose station, ~~and manual~~automatic fire detection system and the manual fire alarm pull station as a backup provides a defense-in-depth approach toward assuring the fire protection adequacy of this fire area and preventing the spread of a fire outside this fire area.

The fire suppression ~~protection~~ system for this ~~room~~vault is designed in accordance with NFPA ~~72 and~~ 134. The ~~M~~manual hose station is also provided and designed in accordance with NFPA 14. On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The dry-pipe sprinkler system within the room is designed to NFPA 13 and is seismically supported to ensure that the system maintains its pressure boundary integrity and does not fall ~~prevent the sprinkler piping from falling~~ on the safety-related equipment during a safe shutdown earthquake (SSE)design basis earthquake. The manual fire hose station are in an alternate area and can only discharge water by deliberate manual action. The dry-pipe sprinkler fire suppression system is designed to contain the pressure of the water and sprinkler heads are designed to only discharge water only when the water if their thermal element of the sprinkler reaches its actuation temperature, which would indicated a fire condition. On this basis, there is little potential for an unintended actuation of the fire suppression system adversely affecting the operation of the plant.

The manual fire protection capability for this area is provided by manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and is unlikely to release water without an operator manual actionexcept after extreme seismic events. Since this is a safety-related area, all fire hose standpipe protection system piping is seismically supported to maintain its pressure boundary integrity and not prevent its falling on safety-related equipment during an SSE event and causing unacceptable damage. Unintended operation of the fire hose standpipe system suppression activity is not expected since deliberate manual activation is required. In the event of a fire, electrical cables and equipment in the area would be protected from significant water intrusion since they are installed above the floor elevation above expected flooding levels.

Safe Shutdown Evaluation

A fire in this area has the potential to damage the following typical system of safe-shutdown function.

- A-Class 1E Power system (Fuel Oil)

This fire area is separated from the Train B, C, and D areas by 3-hour fire rated barriers. This separation will ensure that other safety trains will not be affected by a fire originating in this area and the remaining safety trains of equipment in other fire areas can achieve and maintain safe-shutdown of the plant. Therefore, a fire originating in one of the GTG fuel oil storage vaults will not adversely impact the ability to achieve and maintain safe-shutdown.

Radioactive Release to Environment Evaluation

This area is located in non-radiological area. There are no piping systems in the area that could contain fluids with radiological content. As such, a fire in this area is not deemed credible of causing a radioactive release to the environment.

9A.3.137 FA7-402 Power Source Fuel Storage Vault

Figures 9A-27 shows the location of this fire area adjacent to the south portion of the East PS/B. This fire area consists of the single fire zone, FA7-402-01, B-Class 1E GTG Fuel Storage Vault. This roomvault accommodates the GTG fuel tank with a whose capacity ofis 119,000 gallons. Also, in this vault are the fuel oil transfer pumps and associated equipment.

~~The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.~~

~~The area is identified as being associated with safety train B.~~

Fire Detection and Suppression Features

FA7-402-01 is provided with a dry-pipe automatic sprinkler system~~heat~~ for primary fire suppression~~ detection~~, and a manual fire alarm pull station is installed as primary manual fire~~secondary~~ detection. ~~Primary fire suppression is provided from wet pipe automatic sprinkler system.~~ Secondary suppression is provided by a ~~from~~ manual hose station and a portable fire extinguisher. Vapor and liquid detection systems are provided in accordance with NFPA 30. They alarm locally and to the MCR.

Smoke Control Features

Smoke removal as required due to fire within the area can be accomplished by the existing ventilation system for the power source fuel storage vault~~plant fire brigade utilizing portable fans and flexible ducting~~.

Fire Protection Adequacy Evaluation

The fire area boundaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors. 3-hour fire-rated penetration seals~~ and protected penetrations and openings~~ are provided for all penetration into the vault~~ fire confinement~~.

Fire suppression is provided by a ~~wet~~dry-pipe sprinkler system in accordance with NFPA 13~~code~~ and regulatory guidance. The fire area has substantial concrete reinforced walls that are designed to seismic category I criteria. They ~~and are constructed to~~ provide more than the required ~~a~~ minimum 3-hour fire resistance rating. Additional fire suppression capability is provided by~~with~~ fire hose streams and portable fire extinguishers. In addition, the area is provided with ~~automatic fire detection and~~ a manual fire alarm pull station ~~notification~~as backup. The combination of structural confinement with fire rated barriers, automatic fire suppression system, the manual fire hose station, automatic fire detection system ~~alarm notification~~ and the manual fire alarm pull station as a backup provides a defense-in-depth approach toward assuring the fire protection adequacy of this fire area and preventing the spread of a fire outside this fire area.

The fire suppression ~~protection~~ system for this vault~~room~~ is designed in accordance with NFPA~~ 72 and 14~~13. The ~~M~~manual hose station is also provided and designed in accordance with NFPA 14. On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The dry-pipe sprinkler system within the room is designed to NFPA 13 and is seismically supported to ensure that the system maintains its pressure boundary integrity and does not ~~prevent the sprinkler piping from falling~~ fall on the safety-related equipment during a safe shutdown earthquake (SSE).~~design basis earthquake.~~ The manual fire hose station ~~are in an alternate area and~~ can only discharge water by deliberate manual action. The dry-pipe sprinkler ~~fire suppression~~ system is designed to ~~contain the pressure of the water and sprinkler heads are designed to only~~ discharge water only when the ~~if their~~ thermal element of the sprinkler reaches its actuation temperature, which would indicate~~d~~ a fire condition. On this basis, there is little potential for an unintended actuation of the fire suppression system adversely affecting the operation of the plant.

The manual fire protection capability for this area is provided by manual hose streams applied by the plant fire brigade. The standpipe is designed to~~ code (~~NFPA 14~~)~~ and is unlikely to release water without an operator manual action. ~~water except after extreme seismic events.~~ Since this is a safety-related area, all fire hose standpipe ~~protection~~ system piping is seismically supported to maintain its pressure boundary integrity and not ~~prevent its~~ fall~~ing~~ on safety ~~-~~related equipment during anSSE~~ event and~~ causing unacceptable damage. Unintended operation of the fire hose standpipe system~~suppression activity~~ is not expected since deliberate manual activation is required. In the event of a fire, electrical cables and equipment in the area would be protected from significant water intrusion since they are installed above the floor elevation above expected flooding levels.

Safe Shutdown Evaluation

A fire in this area has the potential to damage the following typical system of safe-shutdown function.

- B-Class 1E Power system (Fuel Oil)

This fire area is separated from the Train A, C, and D areas by 3-hour fire rated barriers. This separation will ensure that other safety trains will not be affected by a fire originating in this area and the remaining safety trains of equipment in other fire areas can achieve and maintain safe-shutdown of the plant. Therefore, a fire originating in one of the GTG fuel oil storage vaults will not adversely impact the ability to achieve and maintain safe-shutdown.

Radioactive Release to Environment Evaluation

This area is located in non-radiological area. There are no piping systems in the area that could contain fluids with radiological content. As such, a fire in this area is not deemed credible of causing a radioactive release to the environment.

9A.3.138 FA7-403 Power Source Fuel Storage Vault

Figure~~s~~ 9A-27 shows the location of this fire area adjacent to the south portion of the East PS/B. This fire area consists of the single fire zone, FA7-403-01, A-AAC GTG Fuel Storage Vault. This room accommodates GTG fuel storage tank with a ~~whose~~ capacity isof 119,000 gallons. Also, in this vault are the fuel oil transfer pumps and associated equipment.

The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.

The area is identified as being associated with non-safety train.

Fire Detection and Suppression Features

FA7-403-01 is provided with a dry-pipe automatic sprinkler system for primary fire suppressionautomatic heat detection, and a manual fire alarm pull station is installed as primary manual secondary detection. Primary fire suppression is provided from wet pipe automatic sprinkler system. Secondary suppression is provided by a from manual hose station and a portable fire extinguisher. Vapor and liquid detection systems are provided in accordance with NFPA 30. They alarm locally and to the MCR.

Smoke Control Features

Smoke removal as required due to fire within the area can be accomplished by the existing ventilation system for the fuel storage vault.plant fire brigade utilizing portable fans and flexible ducting.

Fire Protection Adequacy Evaluation

The fire area boundaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors. and protected penetrations and openings are provided for fire confinement3-hour fire-rated penetration seals are provided for all penetrations into the vault.

Fire suppression is provided by a wetdry-pipe sprinkler system in accordance with codeNFPA 13 and regulatory guidance. The fire area has substantial concrete reinforced walls that are designed to seismic category I criteria. and are constructed toThey provide more than the required a minimum 3-hour fire resistance rating. Additional fire suppression capability is provided bywith fire hose streams and portable fire extinguishers. In addition, the area is provided with automatic fire detection and a manual alarm pull stationnotification as backup. The combination of structural confinement with fire rated barriers, automatic fire suppression system, the manual fire hose stationautomatic fire alarm notification and the manual fire alarm pull station as a backup provides a defense-in-depth approach toward assuring the fire protection adequacy of this fire area and preventing the spread of a fire outside this fire area.

The fire suppression protection system for this roomvault is designed in accordance with NFPA 72 and 134. The Mmanual hose station is also designed in accordance with NFPA 14.provided. On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The dry-pipe sprinkler system within the room is designed to NFPA 13 and is seismically supported to ensure that system maintains its pressure boundary integrity and does not prevent the sprinkler piping from falling on the safety-related equipment during a safe shutdowndesign basis earthquake (SSE). The manual fire hose station are in an alternate area and can only discharge water by deliberate manual action. The dry-pipe sprinkler system fire suppression system is designed to contain the pressure of the water and sprinkler heads are designed to only discharge water only when the thermal element of the sprinkler reaches its actuation temperature, which would if their thermal element indicated a fire condition. On this basis, there is little potential for an unintended actuation of the fire suppression system adversely affecting the operation of the plant.

The manual fire protection capability for this area is provided by manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and unlikely to release water without an operator manual action.except after extreme seismic events. Since this is a safety-related area, all fire protection system piping is seismically supported to prevent its falling on safety-related equipment during an event and causing damage. Unintended operation of the fire hose standpipe system suppression activity is not expected since deliberate manual activation is required. In the event of a fire, electrical cables and equipment in the area would be protected from significant water intrusion since they are installed above the floor elevation above expected flooding levels.

Safe Shutdown Evaluation

A fire in this area will not impact any has no potential to damage the ability of safe-shutdown functions, and the equipment in four safety trains will remain unaffected by the firebecause they are not installed in this fire area. The fire in this fire area, therefore, will not adversely impact the ability to achieve and maintain safe-shutdown.

Radioactive Release to Environment Evaluation

This area is located in non-radiological area. There are no piping systems in the area that could contain fluids with radiological content. As such, a fire in this area is not deemed credible of causing a radioactive release to the environment.

9A.3.139 FA7-404 Power Source Fuel Storage Vault

Figures 9A-27 shows the location of this fire area adjacent to the south portion of the West PS/B. This fire area consists of the single fire zone, FA7-404-01, CA-Class 1E GTG Fuel Storage Vault. This roomvault accommodates GTG fuel storage tank with a whose capacity isof 119,000 gallons. Also, in this vault are the fuel oil transfer pumps and associated equipment.

The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.

The area is identified as being associated with safety train C.

Fire Detection and Suppression Features

FA7-404-01 is provided with a dry-pipe automatic sprinkler system for primary fire suppressionheat detection, and a manual fire alarm pull station is installed as primary manual firesecondary detection. Primary fire suppression is provided from wet pipe automatic sprinkler system. Secondary suppression is provided by a from manual hose station and a portable fire extinquisher. Vapor and liquid detection systems are provided in accordance with NFPA 30. They alarm locally and to the MCR.

Smoke Control Features

Smoke removal as required due to fire within the area can be accomplished by the existing ventilation system for the power source fuel storage vaultplant fire brigade utilizing portable fans and flexible ducting.

Fire Protection Adequacy Evaluation

The fire area boundaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors. 3-hour fire-rated and protected penetrations seals are provided for all penetrations into the vault.and openings are provided for fire confinement.

Fire suppression is provided by a wetdry-pipe sprinkler system in accordance with codeNFPA 13 and regulatory guidance. The fire area has substantial concrete reinforced walls that are designed to seismic category I criteria. and areThey constructed to provide more than the required a minimum 3-hour fire resistance rating. Additional fire suppression capability is provided withby fire hose streams and portable fire extinguishers. In addition, the area is provided with automatic fire detection and a manual fire alarm pull stationnotification as backup. The combination of structural confinement with fire rated barriers, automatic fire suppression system, the manual fire hose station, automatic fire detection system alarm notification and the manual fire alarm pull station as a backup provides a defense-in-depth approach toward assuring the fire protection adequacy of this fire area and preventing the spread of a fire outside this fire area.

The fire suppressionprotection system for this vaultroom is designed in accordance with NFPA 72 and 134. The Mmanual hose station is designed in accordance with NFPA 14also provided. On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The dry-pipe sprinkler system within the room is designed to NFPA 13 and is seismically supported to ensure that the system nmaintains its pressure boundary integrity and does not prevent the sprinkler piping fromfalling on the safety-related equipment during a safe shutdown a design basis earthquake (SSE). The manual fire hose station are in an alternate area and can only discharge water by deliberate manual action. The dry-pipe sprinkler fire suppression system is designed to contain the pressure of the water and sprinkler heads are designed to only discharge water onlyif their when the thermal element of the sprinkler reaches its actuation temperature, which would indicated a fire condition. On this basis, there is little potential for an unintended actuation of the fire suppression system adversely affecting the operation of the plant.

The manual fire protection capability for this area is provided by manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and is unlikely to release water without an operator namual action.except after extreme seismic events. Since this is a safety-related area, all fire hose standpipe protection system piping is seismically supported to maintain its pressure boundary integrity and notprevent its fallinq on safety- related equipment during an SSE event and causing unacceptable damage. Unintended operation of the fire hose standpite systemsuppression activity is not expected since deliberate manual activation is required. In the event of a fire, electrical cables and equipment in the area would be protected from significant water intrusion since they are installed above the floor elevation above expected flooding levels.

Safe Shutdown Evaluation

A fire in this area has the potential to damage the following typical system of safe-shutdown function.

- C-Class 1E Power system (Fuel Oil)

This fire area is separated from the Train A, B, and D areas by 3-hour fire rated barriers. This separation will ensure that other safety trains will not be affected by a fire originating in this area and the remaining safety trains of equipment in other fire areas can achieve and maintain safe-shutdown of the plant. Therefore, a fire originating in one of the GTG fuel oil storage vaults will not adversely impact the ability to achieve and maintain safe-shutdown.

Radioactive Release to Environment Evaluation

This area is located in non-radiological area. There are no piping systems in the area that could contain fluids with radiological content. As such, a fire in this area is not deemed credible of causing a radioactive release to the environment.

9A.3.140 FA7-405 Power Source Fuel Storage Vault

Figures 9A-27 shows the location of this fire area adjacent to the south portion of the West PS/B. This fire area consists of the single fire zone, FA7-405-01, DB-Class 1E GTG Fuel Storage Vault. This roomvault accommodates the GTG fuel storage tank with a whose capacity isof 119,000 gallons. Also, in this vault are the fuel oil transfer pumps and associated equipment.

The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.

The area is identified as being associated with safety train D.

Fire Detection and Suppression Features

FA7-405-01 is provided with a dry-pipe automatic sprinkler system for primary fire suppression automatic heat detection, and a manual fire alarm pull station is installed as primary manual fire secondary detection. Primary fire suppression is provided from wet pipe automatic sprinkler system. Secondary suppression is provided by a from manual hose station and a portable fire extinguisher. Vapor and liquid detection systems are provided in accordance with NFPA 30. They alarm locally and to the MCR.

Smoke Control Features

Smoke removal as required due to fire within the area can be accomplished by the existing ventilation system for the power source fuel storage vaultplant fire brigade utilizing portable fans and flexible ducting.

Fire Protection Adequacy Evaluation

The fire area boundaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors. 3-hour fire-rated petration seals are provided for all penetrations into the vault and protected penetrations and openings are provided for fire confinement.

Fire suppression is provided by a wetdry-pipe sprinkler system in accordance with codeNFPA 13 and regulatory guidance. The fire area has substantial concrete reinforced walls that are designed to seismic category I criteria. and are constructed toThey provide more than the required a minimum 3-hour fire resistance rating. Additional fire suppression capability is provided withby fire hose streams and portable fire extinguishers. In addition, the area is provided with automatic fire detection anda manual fire alarm pull stationnotification as backup. The combination of structural confinement with fire rated barriers, automatic fire suppression sysem, the manual fire hose station, automatic fire detection system alarm notification and the manual fire alarm pull station as a backup provides a defense-in-depth approach toward assuring the fire protection adequacy of this fire area and preventing the spread of a fire outside this fire area.

The fire protection system for this vaultroom is designed in accordance with NFPA 72 and 1413. The Mmanual hose station is also provided and designed in accordance with NFPA 14.also provided. On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The dry-pipe sprinkler system within the room is designed to NFPA 13 and is seismically supported to ensure that the system maintains its pressure boundary integrity and does not prevent the sprinkler piping from falling on the safety-related equipment during a safe shutdown design basis earthquake (SSE). The manual fire hose stationare in an alternate area and can only discharge water by deliberate manual action. The dry-pipe sprinkler system fire suppression system is designed to contain the pressure of the water

~~and sprinkler heads are designed to only~~ discharge water only when ~~if their~~ the thermal element of the sprinker reaches its actuation temperature, which would indicate~~d~~ a fire condition. On this basis, there is little potential for an unintended actuation of the fire suppression system adversely affecting the operation of the plant.

The manual fire protection capability for this area is provided by manual hose streams applied by the plant fire brigade. The standpipe is designed to ~~code (~~NFPA 14~~)~~ and unlikely to release water without an operator manual action~~except after extreme seismic events~~. Since this is a safety-related area, all fire hose standpipe ~~protection~~ system piping is seismically supported to maintain its pressure boundary integrity and not ~~prevent its~~ fall~~ing~~ on safety-related equipment during an SSE ~~event and~~ causing unacceptable damage. Unintended operation of the fire hose standpipe system ~~suppression activity~~ is not expected since deliberate manual activation is required. In the event of a fire, electrical cables and equipment in the area would be protected from significant water intrusion since they are installed above the floor elevation above expected flooding levels.

Safe Shutdown Evaluation

A fire in this area has the potential to damage the following typical system of safe-shutdown function.

- D-Class 1E Power system (Fuel Oil)

This fire area is separated from the Train A, B, and C areas by 3-hour fire rated barriers. This separation will ensure that other safety trains will not be affected by a fire originating in this area and the remaining safety trains of equipment in other fire areas can achieve and maintain safe-shutdown of the plant. Therefore, a fire originating in one of the GTG fuel oil storage vaults will not adversely impact the ability to achieve and maintain safe-shutdown.

Radioactive Release to Environment Evaluation

This area is located in non-radiological area. There are no piping systems in the area that could contain fluids with radiological content. As such, a fire in this area is not deemed credible of causing a radioactive release to the environment.

9A.3.141 FA7-406 Power Source Fuel Storage Vault

Figure~~s~~ 9A-27 shows the location of this fire area adjacent to the south portion of the West PS/B. This fire area consists of the single fire zone, FA7-406-01, B~~A~~-AAC GTG Fuel Storage Vault. This room accommodates GTG fuel storage tank with a~~whose~~ capacity of~~is~~ 119,000 gallons. Also, in this vault are the fuel oil transfer pumps and associated equipment.

~~The borders of this fire area are constructed using reinforced concrete and other material which results in fire resistance that provides at least a 3-hour ASTM E-119 fire rating. Openings and penetrations into this fire area are protected with fire protection features provide at least 3-hour fire resistance.~~

~~The area is identified as being associated with non-safety train.~~

Fire Detection and Suppression Features

FA7-406-01 is provided with a dry-pipe automatic sprinkler system for primary fire suppression~~automatic heat detection~~, and a manual fire alarm pull station is installed as primary manual~~secondary~~ detection. ~~Primary fire suppression is provided from wet pipe automatic sprinkler system.~~ Secondary suppression is provided by a ~~from~~ manual hose station and a portable fire extinguisher. Vapor and liquid detection systems are provided in accordance with NFPA 30. They alarm locally and to the MCR.

Smoke Control Features

Smoke removal as required due to fire within the area can be accomplished by the existing ventilation system for the fuel storage vault~~plant fire brigade utilizing portable fans and flexible ducting~~.

Fire Protection Adequacy Evaluation

The fire area boundaries are constructed with concrete walls in excess of 8 inches thick and 3-hour rated fire doors. 3-hour fire-rated ~~and protected~~ penetration~~s~~ seals ~~and openings~~ are provided for all penetrations into the vault~~fire confinement~~.

Fire suppression is provided by a dry~~wet~~-pipe sprinkler system in accordance with NFPA 13~~code~~ and regulatory guidance. The fire area has substantial concrete reinforced walls that are designed to seismic category I criteria. They ~~and are constructed to~~ provide more than the required~~a~~ minimum 3-hour fire resistance rating. Additional fire suppression capability is provided by~~with~~ fire hose streams and portable fire extinguishers. In addition the area is provided with ~~automatic fire detection and~~ a manual alarm pull station~~notification~~ as backup. The combination of structural confinement with fire rated barriers, automatic fire suppression system, ~~automatic fire alarm notification~~ the manual fire hose station and the manual fire alarm pull station as a backup provides a defense-in-depth approach toward assuring the fire protection adequacy of this fire area and preventing the spread of a fire outside this fire area.

The fire suppression~~protection~~ system for this vault~~room~~ is designed in accordance with NFPA ~~72 and~~ 134. The m~~M~~anual hose station is also designed in accordance with NFPA 14.~~also provided.~~ On this basis, there is adequate fire protection provided for this compartment (fire area).

Fire Protection System Integrity

The dry-pipe sprinkler system within the room is designed to NFPA 13 and is seismically supported to ensure that system maintains its pressure boundary integrity and not ~~prevent the sprinkler piping from~~ fall~~ing~~ on the ~~safety-related~~ equipment during a safe shutdown earthquake (SSE)~~design basis earthquake~~. The manual fire hose station ~~are in an alternate area and~~ can only discharge water by deliberate manual action. The dry-pipe sprinkler~~fire suppression~~ system is designed to ~~contain the pressure of the water and sprinkler heads are designed to only~~ discharge water only when the~~if their~~ thermal element of the sprinkler reaches its actuation temperatyre, which would indicated a fire condition. On this basis, there is little potential for an unintended actuation of the fire suppression system adversely affecting the operation of the plant.

The manual fire protection capability for this area is provided by manual hose streams applied by the plant fire brigade. The standpipe is designed to code (NFPA 14) and unlikely to release water without an operator manual action.except after extreme seismic events. Since this is a safety-related area, all fire protection system piping is seismically supported to prevent its falling on safety-related equipment during an event and causing damage. Unintended operation of the fire hose standpipe systemsuppression activity is not expected since deliberate manual activation is required. In the event of a fire, electrical cables and equipment in the area would be protected from significant water intrusion since they are installed above the floor elevation above expected flooding levels.

Safe Shutdown Evaluation

A fire in this area will not impact anyhas no potential to damage the ability of safe-shutdown functions, and the equipment in four safety trains will remain unaffected by the fire., because they are not installed in this fire area. The fire in this fire area, therefore, will not adversely impact the ability to achieve and maintain safe-shutdown.

Radioactive Release to Environment Evaluation

This area is located in non-radiological area. There are no piping systems in the area that could contain fluids with radiological content. As such, a fire in this area is not deemed credible of causing a radioactive release to the environment.

Table 9A-2 Fire Hazard Analysis Summary (Sheet 169 of 293)

Fire Zone:	**FA2-416-01**
Building:	**Reactor**
Floor(s):	**3F**
Fig:	**9A-7**
Sect:	**3.18**
Area Designation:	**A-Annulus Emergency Exhaust Filtration Unit & Fan Room**
Zone Designation:	**A-Annulus Emergency Exhaust Filtration Unit & Fan Room**
Associated Safety Division(s)	**A**
Applicable Regulatory and Code Ref(s):	**IBC, RG 1.189; NFPA 72 and 804**

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)

Wall	Floor	Ceiling
FA1-101-18	**FA2-154-05**	**FA2-210-13**
FA2-207-01	**FA2-323-02**	**FA2-506-01**
FA2-209-06		
FA2-209-07		

Fire Barrier Description:

Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	**Heat Release (Btu)**
Filters	**3.4E+06**
Instruments	**2.4E+06**
Particle Filters	**1.1E+06**
Rubber	**8.1E+05**
High Voltage Cables	**6.9E+06**
Low Voltage Cables	**5.2E+06**
Control Cables	**9.2E+06**
Instrumentation Cables	**8.0E+06**

Fire Detection - Primary	Fire Detection - Backup
Automatic smoke ~~**Automatic heat detection**~~	~~**There is no manual detection.**~~ **Manual Fire Alarm Pull Station**

Fire Suppression - Primary	Fire Suppression - Backup
~~**Charcoal Spray**~~ **Fire Hose Station**	~~**There is no backup suppression system.**~~ **Portable Fire Extinguisher**

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	**2.8E+04**
Maximum Anticipated Combustible Loading:	**3.4E+04**

Floor Area (ft^2)
1,300

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and extinguished fire in this area will minimize any potential damage.	**A fire has the potential to damage safe-shutdown functions associated with safety train A. Train B, C and D remain free from the damage.**

Table 9A-2 Fire Hazard Analysis Summary (Sheet 170 of 293)

Fire Zone:	**FA2-417-01**
Building:	**Reactor**
Floor(s):	**3F**
Fig:	**9A-7**
Sect:	**3.18**
Area Designation:	**B-Annulus Emergency Exhaust Filtration Unit & Fan Room**
Zone Designation:	**B-Annulus Emergency Exhaust Filtration Unit & Fan Room**
Associated Safety Division(s)	**D**

Applicable Regulatory and Code Ref(s):
IBC, RG 1.189; NFPA 72 and 804

Adjacent Fire Zones:
(Primary Inter face Listed See Table 9A-3 For Complete Listing)

Wall	Floor	Ceiling
FA2-411-01 **FA2-418-01**	**FA2-127-08**	**FA2-210-16** **FA2-210-21**

Fire Barrier Description:
Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	Heat Release (Btu)
Filters	**3.4E+06**
Instruments	**1.7E+06**
Particle Filters	**1.1E+06**
Rubber	**8.1E+05**
High Voltage Cables	**5.6E+06**
Low Voltage Cables	**4.2E+06**
Control Cables	**7.4E+06**
Instrumentation Cables	**6.5E+06**

Fire Detection - Primary	Fire Detection - Backup
Automatic smoke ~~**Automatic heat detection**~~	~~**There is no manual detection.**~~ **Manual Fire Alarm Pull Station**

Fire Suppression - Primary	Fire Suppression - Backup
~~**Water Spray, Fire Hose Station**~~ **Fire Hose Station**	~~**There is no backup suppression system.**~~ **Portable Fire Extinguisher**

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and extinguished fire in this area will minimize any potential damage.	**There is no safe-shutdown circuit in this zone to be damaged.**

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	**2.9E+04**
Maximum Anticipated Combustible Loading:	**3.5E+04**

Floor Area (ft^2)
1,050

Table 9A-2 Fire Hazard Analysis Summary (Sheet 192 of 293)

Fire Zone:	FA2-512-01
Building:	Reactor
Floor(s):	4F, Roof
Fig:	9A-8, 9A-9
Sect:	3.63
Area Designation:	B-Emergency Feedwater Pit
Zone Designation:	B-Emergency Feedwater Pit
Associated Safety Division(s)	N
Applicable Regulatory and Code Ref(s):	IBC, RG 1.189; NFPA 10, 14, 72 and 804

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)

Wall	Floor	Ceiling
FA2-415-01 FA2-508-01 FA2-508-02 FA2-509-01	FA2-404-01 See Table 9A-3	Roof

Fire Barrier Description:
Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles

Item	Heat Release (Btu)
Transient Only	9.3E+04

Fire Detection - Primary	Fire Detection - Backup
~~Automatic smoke~~ There is no automatic detection	Manual Fire Alarm Pull Station

Fire Suppression - Primary	Fire Suppression - Backup
Fire Hose Station	Portable Fire Extinguisher

Fire Zone Combustible Summary

	Btu/ft^2
Anticipated Combustible Loading:	nil
Maximum Anticipated Combustible Loading:	7.2E+01

Floor Area (ft^2)
1,300

Fire Impact to Zone

Suppression System Operates	Suppression System Fails to Op.
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	There is no Safe-shutdown Circuit in this zone to be damaged.

Table 9A-2 Fire Hazard Analysis Summary (Sheet 243 of 293)

Fire Zone: **FA4-101-09**

Building:	**Auxiliary**
Floor(s):	**2F**
Fig:	**9A-15**
Sect:	**3.94**

Area Designation:	**Auxiliary Building**
Zone Designation:	**Radwaste Control Room**
Associated Safety Division(s)	**N**

Applicable Regulatory and Code Ref(s): **IBC, RG 1.189; NFPA 10, 14, 72 and 804**

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)

Wall	Floor	Ceiling
FA3-113-02 **FA4-101-10**	**FA4-101-22**	**FA4-101-18** **FA4-101-19**

Fire Barrier Description:
The walls of the A/B fire area are constructed using reinforced concrete and other material which results in construction that provides at least 3-hour fire resistance. Openings and penetrations into the auxiliary building are protected with fire protection features providing at least 3-hours fire resistance. Internal zone boundaries are structural without assigned fire rating.

Potential Combustibles	
Item	Heat Release (Btu)
Lighting Transformer	**6.6E+05**
Panels	**1.3E+07**
High Voltage Cables	**2.9E+06**
Low Voltage Cables	**2.2E+06**
Control Cables	**3.9E+06**
Instrumentation Cables	**3.4E+06**

Fire Detection - Primary	Fire Detection - Backup
Automatic smoke	**Manual Fire Alarm Pull Station**

Fire Suppression - Primary	Fire Suppression - Backup
~~**Fire Hose Station**~~ **Wet Pipe Sprinkler**	**Portable Fire Extinguisher**

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	**7.4E+04**
Maximum Anticipated Combustible Loading	**8.9E+04**

Floor Area (ft^2)
350

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	**There is no safe-shutdown circuit in this zone to be damaged.**

Table 9A-2 Fire Hazard Analysis Summary (Sheet 288 of 293)

Fire Zone:	**FA7-401-01**
Building:	**O/B**
Floor(s):	
Fig:	**9A-27**
Sect:	**3.97**

Area Designation:	**Power Source Fuel Storage Vault**
Zone Designation:	**~~A-Class 1E GTG~~ Power Source Fuel Storage Vault**
Associated Safety Division(s)	**A**

Applicable Regulatory and Code Ref(s):
IBC, RG 1.189; NFPA 10, 13, 14, 30, 72 and 804

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)

Wall	Wall	Floor & Ceiling
FA3-103-02	**FA7-402-01**	**~~FA7-103-01~~**
FA3-104-02	**FA7-403-01**	**~~FA7-104-01~~**
FA7-102-01		
FA7-103-01		

Fire Barrier Description:
Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	Heat Release (Btu)
Fuel oil-	**1.7 E + 10-**

Fire Detection - Primary	Fire Detection - Backup
Automatic Heat Detection	**Manual Fire Alarm Pull Station located in the tunnel from the PS/B.**
Fire Suppression - Primary	Fire Suppression - Backup
~~Wet~~ Dry-Pipe Sprinkler	**Manual Hose Station located in the tunnel from the PS/B. Portable fire extinguishers located as appropriate for hazards and work activities during maintenance outage.**

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	**-9.2 E + 06**
Maximum Anticipated Combustible Loading:	**-**

Floor Area (ft^2)
1850

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	**A fire has the potential to damage the safe-shutdown functions associated with safety train A. Train B, C and D remain free from the damage to achieve safe-shutdown.**

Table 9A-2 Fire Hazard Analysis Summary (Sheet 289 of 293)

Fire Zone:	**FA7-402-01**
Building:	**O/B**
Floor(s):	
Fig:	**9A-27**
Sect:	**3.97**

Area Designation:	**Power Source Fuel Storage Vault**
Zone Designation:	**B-Class 1E GTG Power Source Fuel Storage Vault**
Associated Safety Division(s)	**B**

Applicable Regulatory and Code Ref(s):
IBC, RG 1.189; NFPA 10, 13,14,30,72 and 804

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)	Wall	Floor	Floor & Ceiling
	FA3-103-02 **FA7-102-01** **FA7-103-01** **FA7-401-01**	**FA7-103-01** **FA7-104-01**	**-**

Fire Barrier Description:
Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	Heat Release (Btu)
-Fuel oil	**1.7E + 10-**

Fire Detection - Primary	Fire Detection - Backup
Automatic Heat Detection	**Manual Fire Alarm Pull Station located in the tunnel from the PS/B.**

Fire Suppression - Primary	Fire Suppression - Backup
~~Wet~~Dry--Pipe Sprinkler	**Manual Hose Station located in the tunnel from the PS/B.** **Portable fire extinguishers located as appropriate for hazards and work activities during maintenance outages.**

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	**9.2E + 06-**
Maximum Anticipated Combustible Loading:	**-**

Floor Area (ft^2)
1850

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	**A fire has the potential to damage the safe-shutdown functions associated with safety train B. Train A, C and D remain free from the damage to achieve safe-shutdown.**

Table 9A-2 Fire Hazard Analysis Summary (Sheet 290 of 293)

Fire Zone:	FA7-403-01
Building:	O/B
Floor(s):	
Fig:	9A-27
Sect:	3.97

Area Designation:	Power Source Fuel Storage Vault
Zone Designation:	A-AAC GTG Power Source Fuel Storage Vault
Associated Safety Division(s)	N

Applicable Regulatory and Code Ref(s): IBC, RG 1.189; NFPA 10, 13,14,30,72 and 804

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)

Wall	Floor	Floor & Ceiling
FA3-105-03 FA7-102-01 FA7-103-01 FA7-401-01	FA7-103-01 FA7-104-01	-

Fire Barrier Description: Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	Heat Release (Btu)
-Fuel oil	-1.7E + 10

Fire Detection - Primary	Fire Detection - Backup
Automatic Heat Detection	Manual Fire Alarm Pull Station located in the tunnel from the PS/B.

Fire Suppression - Primary	Fire Suppression - Backup
~~Wet~~Dry-~~-~~Pipe Sprinkler	Manual Hose Station located in the tunnel from the PS/B. Portable fire extinguishers located as appropriate for hazards and work activities during maintenance outages.

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	9.2E + 06-
Maximum Anticipated Combustible Loading:	-

Floor Area (ft^2)
1850

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	There is no safe-shutdown circuit in this zone to be damaged.

Table 9A-2 Fire Hazard Analysis Summary (Sheet 291 of 293)

Fire Zone:	FA7-404-01
Building:	O/B
Floor(s):	
Fig:	9A-27
Sect:	3.97

Area Designation:	Power Source Fuel Storage Vault
Zone Designation:	C-Class 1E GTG Power Source Fuel Storage Vault
Associated Safety Division(s)	C

Applicable Regulatory and Code Ref(s):
IBC, RG 1.189; NFPA 10, 13,14,30,72 and 804

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)	Wall	Wall	Floor & Ceiling
	FA3-109-02 FA7-102-01 FA7-103-01 FA7-405-01	FA7-103-01 FA7-104-01	-

Fire Barrier Description:
Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	Heat Release (Btu)
-Fuel oil	-1.7E + 10

Fire Detection - Primary	Fire Detection - Backup
Automatic Heat Detection	Manual Fire Alarm Pull Station located in the tunnel from the PS/B.

Fire Suppression - Primary	Fire Suppression - Backup
~~Wet~~Dry--Pipe Sprinkler	Manual Hose Station located in the tunnel from the PS/B. Portable fire extinguishers located as appropriate for hazards and work activities during maintenance outages.

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	-9.2E + 06
Maximum Anticipated Combustible Loading:	-

Floor Area (ft^2)
1850

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	A fire has the potential to damage the safe-shutdown functions associated with safety train C. Train A, B and D remain free from the damage to achieve safe-shutdown.

Table 9A-2 Fire Hazard Analysis Summary (Sheet 292 of 293)

Fire Zone:	**FA7-405-01**
Building:	**O/B**
Floor(s):	
Fig:	**9A-27**
Sect:	**3.97**

Area Designation:	**Power Source Fuel Storage Vault**
Zone Designation:	**D-Class 1E GTG Power Source Fuel Storage Vault**
Associated Safety Division(s)	**D**

Applicable Regulatory and Code Ref(s):
IBC, RG 1.189; NFPA 10,13,14,30, 72 and 804

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)

Wall	Wall	Floor & Ceiling
FA3-111-02	**FA7-103-01**	**-**
FA7-102-01	**FA7-104-01**	
FA7-103-01		
FA7-404-01		
FA7-406-01		

Fire Barrier Description:
Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	Heat Release (Btu)
-Fuel oil	**-1.7E + 10**

Fire Detection – Primary	Fire Detection – Backup
Automatic Heat Detection	**Manual Fire Alarm Pull Station located in the tunnel from the PS/B.**

Fire Suppression - Primary	Fire Suppression - Backup
~~Wet~~Dry-Pipe Sprinkler	**Manual Hose Station located in the tunnel from the PS/B. Portable fire extinguishers located as appropriate for hazards and work activities during maintenance outages.**

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	**9.2E + 06-**
Maximum Anticipated Combustible Loading:	**-**

Floor Area (ft^2)
1850

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	**A fire has the potential to damage the safe-shutdown functions associated with safety train D. Train A, B and C remain free from the damage to achieve safe-shutdown.**

Table 9A-2 Fire Hazard Analysis Summary (Sheet 293 of 293)

Fire Zone:	**FA7-406-01**
Building:	**O/B**
Floor(s):	
Fig:	**9A-27**
Sect:	**3.97**
Area Designation:	**Power Source Fuel Storage Vault**
Zone Designation:	**B-AAC GTG Power Source Fuel Storage Vault**
Associated Safety Division(s)	**N**
Applicable Regulatory and Code Ref(s):	**IBC, RG 1.189; NFPA 10,13,14,30, 72 and 804**

Adjacent Fire Zones: (Primary Inter face Listed See Table 9A-3 For Complete Listing)	Wall	Wall	Floor & Ceiling
	FA3-113-03 **FA7-102-01** **FA7-103-01** **FA7-405-01**	**FA7-103-01** **FA7-104-01**	**-**

Fire Barrier Description:
Walls of reinforced concrete or other material providing a minimum 3-hour fire resistance rating form the boundaries of this room. The door to the room is 3-hour fire rated and all openings and penetrations into the room are rated to provide 3-hour fire resistance.

Potential Combustibles	
Item	Heat Release (Btu)
-Fuel oil	**-1.7E + 10**

Fire Detection - Primary	Fire Detection - Backup
Automatic Heat Detection	**Manual Fire Alarm Pull Station located in the tunnel from the PS/B.**

Fire Suppression - Primary	Fire Suppression - Backup
~~Wet~~Dry--Pipe Sprinkler	**Manual Hose Station located in the tunnel from the PS/B.** **Portable fire extinguishers located as appropriate for hazards and work actibities during maintenance outages.**

Fire Zone Combustible Summary	
	Btu/ft^2
Anticipated Combustible Loading:	**9.2E + 06-**
Maximum Anticipated Combustible Loading:	**-**

Floor Area (ft^2)
1850

Fire Impact to Zone	
Suppression System Operates	Suppression System Fails to Op.
A quickly detected and suppressed fire in this room will minimize fire damage to the safety-related equipment consistent with GDC-3.	**There is no safe-shutdown circuit in this zone to be damaged.**

Chapter 10

US-APWR DCD Revision 2 Chapter 10 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
10.3-18	Section 10.3.6.3 The first sentence of the second paragraph	RAI 500-4012, Question No.10.03.06-12 Deleted the first sentence.
10.3-18	Section 10.3.6.3 The second sentence of the second paragraph	RAI 500-4012, Question No.10.03.06-12 Replaced “These” with “The following”.
10.3-18	Section 10.3.6.3 The second sentence of the second paragraph	RAI 500-4012, Question No.10.03.06-12 Inserted “with potential for FAC”.
10.3-18	Section 10.3.6.3 The third sentence of the second paragraph	RAI 500-4012, Question No.10.03.06-12 Inserted “(Cr-Mo steel, austenite stainless steel)”.
10.3-18	Section 10.3.6.3 The last sentence of the second paragraph	RAI 500-4012, Question No.10.03.06-12 Inserted “For other safety/non-safety carbon pipelines with relatively-mild FAC degradation identified in NUREG-1344 attached to GL 89-08, the initial thinning rate is prepared based on the actual measurement records from Japanese PWR nuclear power plants. Setting the initial thinning rate due to FAC is $0.2x10^{-4}$ mm/hr and also estimating operational rates, the additional thickness 70 mils is applied for the 10-year of design life.”.
10.3-19	Section 10.3.6.3 The second paragraph Single-Phase Line Main feedwater line	RAI 500-4012, Question No.10.03.06-12 Inserted “Other feedwater lines upstream of feedwater equalization piping are generally made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as feedwater heater and elbows are made of FAC resistant alloy.”.
10.3-19	Section 10.3.6.3 The second paragraph Single-Phase Line	RAI 500-4012, Question No.10.03.06-12 Inserted the new bullet “Steam generator blowdown line (upstream of angle valves)”. Inserted “This portion is made of carbon steel with 10 year corrosion margin.”.

US-APWR DCD Revision 2 Chapter 10 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
10.3-19	Section 10.3.6.3 The second paragraph Single-Phase Line Main feedwater recirculation to condenser	RAI 500-4012, Question No.10.03.06-12 Replaced "This portion is made of carbon steel." with "Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as condenser and elbows are changed to FAC-resistant alloy.".
10.3-19	Section 10.3.6.3 The second paragraph Single-Phase Line Feedwater pump suction line	RAI 500-4012, Question No.10.03.06-12 Replaced "This portion is made of carbon steel." with "Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as elbows are made of FAC-resistant alloy.".
10.3-19	Section 10.3.6.3 The second paragraph Single-Phase Line Feedwater pump discharge line	RAI 500-4012, Question No.10.03.06-12 Replaced "This portion is made of carbon steel." with "Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as feedwater pump discharge, feedwater pump minimum flow line and elbows are changed to FAC-resistant alloy.".
10.3-19	Section 10.3.6.3 The second paragraph Single-Phase Line Condensate pump recirculation to condenser line	RAI 500-4012, Question No.10.03.06-12 Replaced "This portion is made of carbon steel." with "Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as elbows are made of FAC-resistant alloy.".
10.3-19	Section 10.3.6.3 The second paragraph Two-Phase Line	RAI 500-4012, Question No.10.03.06-12 Inserted the new bullet "Turbine cross-over piping". Inserted "Most of this entire portion is made of carbon steel with 10 year corrosion margin.".
10.3-19	Section 10.3.6.3 The second paragraph Two-Phase Line	RAI 500-4012, Question No.10.03.06-12 Replaced "Cross-under piping" with "Turbine cross-under piping".

US-APWR DCD Revision 2 Chapter 10 Tracking Report Revision 1 Change List

Page	Location (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
10.3-19	Section 10.3.6.3 The second paragraph Two-Phase Line Feedwater heater drain piping	RAI 500-4012, Question No.10.03.06-12 Inserted “with 10 year corrosion margin”.
10.3-20	Section 10.3.6.3 The second paragraph Two-Phase Line Steam generator blowdown line	RAI 500-4012, Question No.10.03.06-12 Inserted “(downstream of angle valves)”. Replaced “Most of this portion is entirely made of carbon steel, however, material for the portion extremely susceptible to FAC portion such as downstream of angle valves are” with “This portion is made of”.
10.3-20	Section 10.3.6.3 The first sentence of the third paragraph	RAI 500-4012, Question No.10.03.06-12 Replaced “Corrosion allowance is the difference between the actual minimum wall thicknesses after any wall thinning that occurs during fabrication, and the required design wall thickness.” with “As for the safety/non-safety carbon pipelines with relatively-mild FAC degradation, the”.
10.3-20	Section 10.3.6.3 The fourth sentence of the third paragraph	RAI 500-4012, Question No.10.03.06-12 Inserted “with consideration of minus tolerances of the thicknesses" and “and FAC aging degradation of 70 mils”.
10.3-20	Section 10.3.6.3 The fifth sentence of the third paragraph	RAI 500-4012, Question No.10.03.06-12 Replaced “The fabrication thinning is controlled by establishing fabrication tolerances.” with “As for the safety/non-safety carbon pipelines with relatively-mild FAC degradation, the FAC monitoring program based on EPRI “Recommendations for an effective Flow-Accelerated Corrosion Program (NSAC-202L-R2)” shall be prepared and implemented by using knowledge acquired from experiences of pipe wall thinning managements via Electric Power Companies in USA and Japan.”.
10.3-20	Section 10.3.6.3 The sixth sentence of the third paragraph	RAI 500-4012, Question No.10.03.06-12 Deleted “provided by COL applicant”.

US-APWR DCD Revision 2 Chapter 10 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
10.3-20	Section 10.3.6.3 The eighth sentence of the third paragraph	RAI 500-4012, Question No.10.03.06-12 Deleted "by the COL applicant".
10.3-20	Section 10.3.6.3 The eighth sentence of the third paragraph	RAI 500-4012, Question No.10.03.06-12 Replaced "over 60 years of service" with "the service life of the plant".
10.3-27	Section10.3.2 Table 10.3.2-3 Main Steam Piping	RAI 500-4012, Question No.10.03.06-10 Deleted the items in "Segment", "Material specification" and "ASME Class" of flanges.
10.3-28	Section10.3.2 Table 10.3.2-3 Feedwater Piping Main/steam feedwater piping area wall to MFIV Valves (Globe, Gate, Check)	RAI 500-4012, Question No.10.03.06-10 Inserted "Grade F22".

The material selection and fabrication methods used for Class 2 and 3 components conform to the following:

- In designing US-APWR, the material used for the piping and components of the CFS and the MSS conform with Appendix I to Section III (Reference 10.3-12), Parts A (Reference 10.3-13), Parts B (Reference 10.3-14), and Parts C (Reference 10.3-15) of Section II of the ASME Code Regulatory Guide 1.84 (Reference 10.3-16).

- Cleaning and handling of Class 2 and Class 3 components of the MSS and CFS are conducted in accordance with the acceptable procedures described in RG 1.37.

- The welding of low-alloy materials conform to the guidance provided in Regulatory Guide 1.50, "Control of Preheat Temperature for Welding of Low-Alloy Steel" (Reference 10.3-19) for the MSS and the CFS. The minimum preheat temperatures for carbon steel and low alloy materials conform to the recommendations in ASME Section III, Appendix D, Article D-1000 (Reference 10.3-6).

- As for welds in areas of limited accessibility, the qualification procedure is specified in conformances with the guidance of Regulatory Guide 1.71 (Reference 10.3-20) (i.e., assurance of the integrity of welds in locations of restricted direct physical and visual accessibility) and as described with respect to all applicable components.

- The nondestructive examination procedures and acceptance criteria used for the examination of tubular products conform to the provisions of the ASME Code, Section III, Paragraphs NC/ND-2550 through 2570 (Reference 10.3-6). Refer to Section 6.6 for details on equipment class 2 and 3 components.

10.3.6.3 Flow-Accelerated Corrosion (FAC)

As noted in Subsection 10.3.6.2, MSS and CFS piping materials selected are corrosion resistant. CFS chemistry is controlled to have an environment that minimizes corrosion. This is further described in Subsection 10.3.5.

~~The following portions have the potential for FAC from past experiences in operating power plants and are included in FAC monitoring program. These~~ The following portions with potential for FAC are basically based on NUREG-1344 attached to GL 89-08. Generally, most of these portions are entirely made of carbon steel, however, materials for the portions extremely susceptible to FAC are FAC-resistant alloy (Cr-Mo steel, austenite stainless steel) taking into consideration past experiences. For other safety/non-safety carbon pipelines with relatively-mild FAC degradation identified in NUREG-1344 attached to GL 89-08, the initial thinning rate is prepared based on the actual measurement records from Japanese PWR nuclear power plants. Setting the initial thinning rate due to FAC is 0.2×10^{-4} mm/hr and also estimating operational rates, the additional thickness 70 mils is applied for the 10-year of design life.

Single-Phase Line

- Main feedwater line
  The piping from steam generator up to and excluding main feedwater equalization piping in the upstream of feedwater flow meter is made of high content of chrome-moly materials as shown in table 10.3.2-3. This portion is resistant to FAC. Other feedwater lines upstream of feedwater equalization piping are generally made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as feedwater heater and elbows are made of FAC resistant alloy.
- Steam generator blowdown line (upstream of angle valves)
  This portion is made of carbon steel with 10 year corrosion margin.
- Main feedwater recirculation to condenser
  This portion is made of carbon steel. Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as condenser and elbows are changed to FAC-resistant alloy.
- Feedwater pump suction line
  This portion is made of carbon steel. Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as elbows are made of FAC-resistant alloy.
- Feedwater pump discharge line
  This portion is made of carbon steel. Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as feedwater pump discharge, feedwater pump minimum flow line and elbows are changed to FAC-resistant alloy.
- Condensate pump recirculation to condenser line
  This portion is made of carbon steel. Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as elbows are made of FAC-resistant alloy.

Two-Phase Line

- Main steam line
  This portion is made of carbon steel. There is no portion which is susceptible to FAC because of the low moisture is approximately 0.1 %.
- Turbine cross-over piping
  Most of this entire portion is made of carbon steel with 10 year corrosion margin.
- Turbine Ccross-under piping
  This portion is made of FAC-resistant alloy as shown in table 10.3.2-4. This portion is immune to FAC.
- Extraction steam line
  This portion is made of FAC-resistant alloy. This portion is immune to FAC.
- Feedwater heater drain piping
  Most of this entire portion is made of carbon steel with 10 year corrosion margin, however, material of extremely susceptible to FAC portion such as downstream of control valves are made of FAC-resistant alloy.

- Steam generator blowdown line (downstream of angle valves)
  Most of this portion is entirely made of carbon steel, however, material for the portion extremely susceptible to FAC portion such as downstream of angle valves are This portion is made of stainless steal or chrome-moly materials.

Corrosion allowance is the difference between the actual minimum wall thicknesses after any wall thinning that occurs during fabrication, and the required design wall thickness. As for the safety/non-safety carbon pipelines with relatively-mild FAC degradation, Tthe required design wall thickness is determined based on piping design pressure/ temperature and allowable stress in accordance with ASME Sec.III NX-3641 or ASME B31.1 paragraph 104. The specified wall thickness (prior to fabrication) is a standardized wall thickness stipulated in ASME B36.10M and ASME B36.19M. It is specified to exceed the required design wall thickness with consideration of minus tolerances of the thicknesses by a large and appropriate amount to account for the expected wall thinning during fabrication and FAC aging degradation of 70 mils. The fabrication thinning is controlled by establishing fabrication tolerances. As for the safety/non-safety carbon pipelines with relatively-mild FAC degradation, the FAC monitoring program based on EPRI "Recommendations for an effective Flow-Accelerated Corrosion Program (NSAC-202L-R2)" shall be prepared and implemented by using knowledge acquired from experiences of pipe wall thinning managements via Electric Power Companies in USA and Japan. The FAC monitoring program provided by COL applicant will include preservice thickness measurements of as-built piping considered susceptible to FAC. By performing this preservice measurement, the piping thickness margin that will be used as a wall thinning margin will be known, and then by combining the measurement with regular inspection the frequency of the pipe replacement will be predicted. Integrity and safety of a plant is assured by the COL applicant by conducting inspection and maintenance during over 60 years of the service life of the plant and replacing piping if necessary.

The US-APWR design and piping layout has considered several features for the various piping systems to minimize incidence of FAC in piping. These features include:

- elimination of high turbulence points wherever possible (example: adequate straight pipe length downstream of flow orifice or control valve, etc)
- use of long radius elbows
- smooth transition at shop or field welds
- selection of pipe diameter to have velocities within industry recommended values
- use of corrosion resistant materials
- use of austenite stainless steel and P11 and P22 chrome-moly materials

The type of fluid, flow rates, fluid temperatures and pressure of ASME Code Class 2 and 3 piping for steam and feedwater system are shown in Table 10.3.2-6.

The Combined License Applicant will provide a description of the FAC monitoring program for carbon steel portions of the steam and power conversion systems that contain water or wet steam and are susceptible to erosion-corrosion damage. The

Table 10.3.2-3 Main Steam and Feedwater Piping Design Data

Main Steam Piping

Segment	Material specification	Nominal OD	ASME Class
SG outlet to containment penetration	SA-333, Grade 6 (Seamless)	32 inch	Section III, Class 2
Containment penetration to MSIV	SA-333, Grade 6 (Seamless)	32 inch	Section III, Class 2
MSIV to main steam/feedwater piping area wall	SA-333, Grade 6 (Seamless)	32 inch	Section III, Class 3
Fittings	SA-181, Gr. 70 or SA-333, Grade 6 (Seamless)	32 inch	Note: Material Spec. for fittings~~,~~ ~~flanges~~ and valves is same between ASME Section III Class 2 and 3.
~~Flanges~~	~~SA-508 Class 1, Class 900~~		
Valves (Globe, Gate, Check)	SA-352, Grade LCB		
Main steam steam/feedwater piping area wall to equalization piping	ASTM A-672 Grade B60	32 inch	B31.1
Equalization piping	ASTM A-672 Grade B60	28 inch & 42 inch	
Lines to TSV	ASTM A-672 Grade B60	32 inch & 30 inch	
Fittings	ASTM A-105, A-672 Grade B60	28 inch, 32 inch, 42 inch	
Flanges	ASTM A-105		
Valves (Globe, Gate, Check)	ASTM A-181 Grade 70 or ASTM A-216 Grade WCB, Class 900		

Feedwater Piping

Segment	Material specification	Nominal OD	ASME Class
Feedwater pump outlet to feedwater pump discharge equalization piping	ASTM A-672 Grade B60	22 inch	B31.1
Feedwater pump discharge equalization piping	ASTM A-672 Grade B60	36 inch	
Feedwater pump discharge equalization piping to feedwater heaters 6/7	ASTM A-672 Grade B60	26 inch	
Feedwater heaters 6/7 outlet to feedwater heater 7 discharge equalization piping	ASTM A-672 Grade B60	26 inch	
Feedwater heater 7 discharge equalization piping	ASTM A-672 Grade B60	36 inch	
Fittings	ASTM A-105	22 inch, 26 inch & 36 inch	
Flanges	ASTM A-105		
Valves (Globe, Gate, Check)	ASTM A-181 Grade 70, or ASTM A-216 Grade WCB, Class 900		
Feedwater heater 7 discharge equalization piping to main/steam feedwater piping area wall	A-335 Grade P22 (Seamless)	18 inch	B31.1
Fittings	ASTM A-182 Grade F22, ASTM A-336 Grade F22 or ASTM A-335 Grade P22	18 inch	
Flanges	ASTM A-182 Grade F22		
Valves (Globe, Gate, Check)	ASTM A-182 Grade F22, or ASTM A-217 Grade WC9		
Main/steam feedwater piping area wall to MFIV	SA-335 Grade P22 (Seamless)	18 inch	Section III, Class 3
MFIV to SG	SA-335 Grade P22 (Seamless)	16 inch	Section III, Class 2
Fittings	SA-182 Grade F22 or SA-336 Grade F22 or SA-335 Grade P22	16 inch & 18 inch	Note: Material Spec. for fittings, flanges and valves is same between ASME Section III Class 2 and 3.
Flanges	SA-182 Grade F22		
Valves (Globe, Gate, Check)	SA-182 Grade F22 or SA-217 Grade WC9		

Chapter 11

US-APWR DCD Revision 2 Chapter 11 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
11.5-13	Subsection 11.5.2.5.1	RAI No.462, 11.02-22: Add information for control of radiation monitor. The mark-up for this change was included in the previous Tracking Report (Revision 0), however, the change information was not included in the change list. Therefore, this item is included in this Tracking Report again.

11.5.2.5 Effluent Liquid Monitor Component Description

11.5.2.5.1 Liquid Radwaste Discharge Radiation Monitor (RMS-RE-035)

The liquid radwaste discharge radiation monitor is a γ monitor; the detection range and other details are summarized in Table 11.5-4, item number 29. A process schematic for this monitor is shown in Figure 11.5-1d. The monitor for liquid radwaste discharge is located in the A/B as shown in Figure 11.5-2a.

This monitor is located downstream of the sample tanks and pumps in the LWMS (refer to Section 11.2). RMS-RE-035 measures the total gamma content in the discharge stream of the LWMS. The monitor is an inline monitor, measuring the liquid discharge stream before it reaches the discharge header. As discussed in Section 11.2, the treated liquid is normally recycled for plant use. If there is a surplus of liquid, then the water is discharged. The discharge valve is under supervisory control and requires approval to open for discharge. Detection of radioactivity levels in the stream exceeding the predetermined setpoint, the monitor pump is automatically shut off and automatically activates an alarm in the MCR and also automatically closes the discharge valve. These discharge valves are designed to open only when actuated by the radiation monitor for acceptable range for discharge. These valves normally stay close with all other conditions, including high radiation level and/or lack of signal (loss of power supply and/or radiation monitor failure).

The monitor is not safety-related and does not perform any safety function.

11.5.2.5.2 ESW Radiation Monitoring and Sampling System (RMS-RE-074A, RMS-RE-074B, RMS-RE-074C, RMS-RE-074D)

The ESW radiation monitors are γ monitors; their detection range, and other details as summarized in Table 11.5-4, item number 30. The process configuration of the monitor is schematically presented in Figure 11.5-1f. The monitors are located in the R/B as shown in Figure 11.5-2a.

These monitors measure the radiation level in the essential service water (ESW) due to potential contamination of radioactive material in the essential service water system (ESWS). The ESW is not normally expected to be radioactive. Detection of radioactive material in the ESW stream is an indication of leakage within the heat exchange equipment. Four monitors are provided: one for each of the four ESW trains and is located downstream of the ESW pumps. Detection of radiation exceeding the predetermined setpoints automatically activates an alarm in the MCR for operator actions.

Piping taps are provided for the purging and cleaning of the monitors. The monitors are not safety-related and do not perform any safety function.

Chapter 14

US-APWR DCD Chapter 14 Revision 2 to Revision 3 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
14.2-32	14.2.12.1.1	Added the following text as C.7: The leakage control program plant procedures which implement Technical Specifications program 5.5.2, Primary Coolant Sources Outside Containment, are performed while the plant is in hot standby. CP RAI86, 14.02-10 (MHI ref.: UAP-HF-09499) RAI 461, 09.03.02-12
14.2-74, 75	14.2.12.1.44	Added the following sentence to the end of C.9: Record outside air ambient environmental temperature. Added the following text to the end of D.7: It has been demonstrated through testing and analyses that the temperatures for the GTG room are being maintained at or around the design temperatures based on outside air ambient design conditions. RAI 470, 09.05.08-22
14.3-31 through 14.3-58	Table 14.3-1a through 14.3-1f	Added the applicable ITAAC number in “Tier 1 Ref” column to identify the specific ITAAC in Tier 1. RAI 488, 14.03.11-40
14.3-37	Table 14.3-1a (sheet 7 of 10)	Replaced Table 2.5.4-2 in the row of the design feature for the minimum inventory of human-system interfaces (HSIs) with Table 2.9-1 ITAAC Items 7f, 7g, and 7h. RAI 488, 14.03.11-40
14.3-37	Table 14.3-1a (sheet 7 of 10)	Replaced Table 2.5.4-2 in the row of the design feature for the fixed position continuously visible HSI with Table 2.9-1 ITAAC Item #7f. RAI 488, 14.03.11-40
14.3-38	Table 14.3-1a (sheet 7 of 10)	Deleted the duplicated entries for a design feature pertaining to the Class 1E gas turbine generators and their ability to accept load within 100 seconds of receiving a start signal. RAI 488, 14.03.11-40
14.3-39	Table 14.3-1a (sheet 8 of 10)	Deleted the reference to Table 2.11.2-2 in the row of the design feature for condensate and feedwater system (CFS) valves to close within 5 seconds of receiving an actuation signal. RAI 488, 14.03.11-40

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
14.3-40	Table 14.3-1a (sheet 9 of 10)	Moved the design feature of the capability to open the EFWS cross connect flow paths to Table 14.3-1d (Sheet 5 of 8). RAI 488, 14.03.11-40
14.3-42	Table 14.3-1b (sheet 1 of 2)	Replaced "(RCA) of the R/B is divided into four areas," with "(RCA) of the R/B is divided into two areas," in the column of "Key Design Features". RAI 488, 14.03.11-40
14.3-42	Table 14.3-1b (sheet 1 of 2)	Deleted "The two trains of four emergency feedwater pump rooms are isolated by concrete walls and water-tight door" from the column of "Key Design Features". RAI 488, 14.03.11-40
14.3-44	Table 14.3-1b (sheet 2 of 2)	Deleted the reference to Section 2.5.6 in the row of the design feature regarding relay chatter. RAI 488, 14.03.11-40
14.3-48	Table 14.3-1d (sheet 1 of 8)	Deleted the references to Sections 2.11.2 and 2.11.3 in the row of the design feature for RWSP suction isolation valves. RAI 488, 14.03.11-40
14.3-57	Table 14.3-1f (sheet 1 of 2)	Corrected the editorial changes in the row of postulated accidents that are analyzed for radiological consequences using main control room (MCR) and technical support center (TSC) χ/Q values RAI 488, 14.03.11-40

14.2.12.1.14 CVCS Preoperational Test - Letdown

14.2.12.1.15 RCS Lithium Addition and Distribution Test

14.2.12.1.19 Resistance Temperature Detectors (RTDs)/Thermocouple Cross-Calibration Preoperational Test

14.2.12.1.21 Main Steam Supply System Preoperational Test

14.2.12.1.22 Residual Heat Removal System (RHRS) Preoperational Test

14.2.12.1.23 Main Steam Isolation Valve (MSIV), Main Feedwater Isolation Valve (MFIV) and Main Steam Check Valve Preoperational Test

14.2.12.1.25 Turbine-Driven Emergency Feedwater System Preoperational Test

14.2.12.1.50 Dynamic State Vibration Monitoring of Safety Related and High-Energy Piping

14.2.12.1.51 Steady State Vibration Monitoring of Safety Related and High-Energy Piping

14.2.12.1.52 Thermal Expansion Test

14.2.12.1.54 Safety Injection System (SIS) Preoperational Test

14.2.12.1.56 Safety Injection Check Valve Preoperational Test

14.2.12.1.66 Reactor Cavity Cooling System Preoperational Test

14.2.12.1.69 Containment Fan Cooler System Preoperational Test

14.2.12.1.71 RCS Leak Rate Preoperational Test

14.2.12.1.72 Loose Parts Monitoring System Preoperational Test

14.2.12.1.76 Remote Shutdown Preoperational Test

14.2.12.1.83 Steam Generator Blowdown System Preoperational Test

14.2.12.1.84 Sampling System Preoperational Test

14.2.12.1.87 Component Cooling Water System Preoperational Test

14.2.12.1.107 Pressurizer Heater and Spray Capability and Continuous Spray Flow Verification Test

7. The leakage control program plant procedures which implement Technical Specifications program 5.5.2, Primary Coolant Sources Outside Containment, are performed while the plant is in hot standby.

8. The largest single load and complete load are shed and no tripping on overspeed is verified.

9. Demonstrate full load carrying capability for 24 hours, of which 22 hours are at a load equivalent to the continuous rating of the Class 1E gas turbine generator and 2 hours at a load equivalent to the two hour rating of the emergency generator. Obtain ventilation air flow rate and ambient room temperature measurements during this test. Record outside air ambient environmental temperature.

10. Demonstrate functional capability at full load temperature conditions by verifying each Class 1E gas turbine generator starts upon receipt of a manual or auto-start signal, and the generator voltage and frequency are attained within the required time limits.

11. Demonstrate the ability to:

    - Synchronize the Class 1E gas turbine generator unit with the offsite system while the unit is connected to the emergency load.
    - Transfer the emergency load to the offsite system.
    - Restore the Class 1E GTG to standby status.

12. Demonstrate that the specified automatic trip signals for the Class 1E gas turbine generator are bypassed automatically as designed.

13. With each Class 1E gas turbine generator operating in the test mode connected to its bus, a simulated ECCS actuation signal is initiated to override the test mode and return the Class 1E gas turbine generator to standby operation.

14. Demonstrate that by starting and running (unloaded) redundant units simultaneously, common failure modes that may be undetected with a single Class 1E gas turbine generator testing do not occur.

D. Acceptance Criteria

1. The controls, alarms, interlocks, and operation of the emergency generator breakers and support systems are as designed (see Subsection 8.3.1.1.3).

2. Each Class 1E gas turbine generator completes 25 consecutive starts within the required time without a failure.

3. Each Class 1E gas turbine generator attains the required voltage and frequency upon starting.

4. Each Class 1E gas turbine generator is capable of being synchronized with offsite power and supplies the maximum expected load-carrying capability for an interval of not less than 1 hour.

5. The fuel oil consumption of each Class 1E gas turbine generator while operating under continuous rating load conditions does not exceed the design requirements, including fuel oil storage capacity as described in Subsection 9.5.4.1.

6. Upon the loss of the largest single load and complete loss of load, each Class 1E gas turbine generator continues to operate without exceeding the overspeed limit.

7. Each Class 1E gas turbine generator satisfactorily completes the full-load test for 24 hours with 22 hours at a load equivalent to the continuous rating of the Class 1E gas turbine generator and 2 hours at a load equivalent to the 2 hour rating of the Class 1E gas turbine generator. Ventilation air flow rate is shown to meet design flow rate, and ambient room temperature is maintained within limits during the 24 hour run. It has been demonstrated through testing and analyses that the temperatures for the GTG room are being maintained at or around the design temperatures based on outside air ambient design conditions.

8. Each Class 1E gas turbine generator starts and attains required voltage and frequency within the required time limits at full load temperature.

9. Each Class 1E gas turbine generator is synchronized with offsite power and restored to standby status.

10. On an ECCS actuation signal, specified automatic Class 1E gas turbine generator trips are automatically bypassed.

11. On a simulated ECCS actuation signal, with each Class 1E gas turbine generator operating in the test mode connected to its bus, the test mode is overridden and the Class 1E gas turbine generator returns to standby operation.

12. Each electrical division operates independently of other divisions.

13. The Fuel Oil System operates as described in Subsection 9.5.4.

14.2.12.1.45 Class 1E Bus Load Sequence Preoperational Test

A. Objectives

1. Verify the control logic and operation of bus undervoltage and degraded voltage relays.

2. Verify the control logic of the load shed, prohibit interlock and load control.

3. To demonstrate above functions in offsite power available condition.

4. Verify each electrical division operates independently of other divisions.

B. Prerequisites

1. Required construction testing is completed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 1 of 10)

Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
1.2	US-APWR rated reactor core thermal power is 4451 MWt.	1.1.4 Table 4.4-1 Table 6.2.1-4 Table 15.0-2 Table 15.6.5-1 Ch. 16, TS 1.1
Table 2.2-4 ITAAC #7 Table 2.3-2 ITAAC #1.a Each ASME ITAAC in 2.4.1, 2.4.2, 2.4.4, 2.4.5, 2.4.6	RCPB components are designed and fabricated in accordance with 10 CFR 50.55a which requires compliance with the requirements for Class 1 components in the American Society of Mechanical Engineers (ASME) Code.	5.2 6.3 9.3.4
2.2.1.2 Table 2.2-4 ITAAC #3, #5 Table 2.11.1-1 Table 2.11.1-2 ITAAC #1, #2	The PCCV is a prestressed concrete structure designed to endure the peak pressure and temperature for LOCA, and steamline and feedline break conditions.	3.8.1.3 Table 3.8.1-1 6.2.1.1 Table 6.2.1-2
Table 2.2-1 Table 2.2-4 ITAAC #3, #5 2.11.1.1 Table 2.11.1-2 ITAAC #1, #2	The PCCV is designed and constructed in accordance with ASME Code, Section III, and the PCCV is classified as seismic Category I structure.	3.8.1.2 6.2.7
2.2.1.2 ~~Table 2.2-4~~	The liner plate is not designed or analyzed as a strength structural element. The minimum concrete design compressive strength (f'c) for the PCCV is 6000 psi. The minimum concrete design compressive strength (f'c) for the basemat is 4000 psi. The ultimate capacity for the PCCV is estimated based on cumulative yield strength of steel materials such as rebars, tendons, and liner plate.	3.8.1.1.1 Table 6.2.1-2 19.2.4.1

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features (Sheet 2 of 10)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
Figure 2.11.1-1 Table 2.11.1-2 ITAAC #3	The inner height of the containment is approximately 226.5 ft and the inside diameter of the containment cylinder measures approximately 149 ft. The containment dome is 3 ft.-8 in. or 4 ft.-4 in. thick, while the containment wall thickness is 4 ft.-4 in. The inner surface of containment includes a 0.25 in. welded steel plate liner anchored to the concrete.	6.2.1.1.2
2.2.1.2 Table 2.2-4 ITAAC #3, #5 Table 2.11.1-1 Table 2.11.1-2 ITAAC #1, #2, #3	The containment design pressure is 68 psig. The PCCV is designed for an external pressure of 3.9 psig based on conservative analysis of inadvertent CSS operation. The containment design temperature is 300°F. Free volume of containment is 2,800,000 ft^3.	Table 3.8.1-1 6.2.1.5.3 Table 6.2.1-2 Table 6.5-5 15.4.8.4 15.6.5
2.4.1 Table 2.4.1-2 ITAAC #4.b	Ferritic reactor coolant pressure boundary materials meet 10CFR50 Appendix G fracture toughness criteria and requirements for testing.	5.2.3.3 5.3.1
2.4.2.1 Table 2.4.2-5 ITAAC #10.a	The pressurizer safety valves provide overpressure protection in accordance with the ASME Code Section III. This overpressure protection is provided for the followingbounding events • Loss of external electrical load. • Loss of normal feedwater flow. • Reactor coolant pump shaft break. • Uncontrolled rod cluster control assembly bank withdrawal from a subcritical or low-power startup condition. • Spectrum of rod ejection accidents. The sum of the capacities of the pressurizer safety valves exceeds 1.728×10^6 lb/hr (432,000 lb/hr per valve).	5.2.2.1 Table 5.2.2-1
Table 2.4.2-5 ITAAC #10.a	Pressurizer safety valves set pressure; ≥ 2435 psig and ≤ 2485 psig	Table 5.2.2-1
Table 2.4.2-5 ITAAC #10.d	The reactor coolant flow rate per loop with 10% steam generator tube plugging is at least 112,000 gallons per minute.	Table 5.1-3

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 3 of 10)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
Table 2.4.2-5 ITAAC #10.c	RCPs have a rotating inertia to provide coastdown flow.	5.4.1 15.3.1.1 15.6.5.2
2.4.4.1 Table 2.4.4-5 ITAAC #7.b	The four independent ECC/CS suction strainers are designed to maintain adequate NPSH and minimize downstream effects to support ECC/CS functions, maintaining the reactor core in a long-term coolable geometry and supporting decay heat removal following a design basis accident.	6.2.2.2 Table 6.2.2-2 Table 19.1-119
2.4.4.1 Table 2.4.4-5 ITAAC #1.a	The RWSP and ECC/CS suction strainers are located at the lower elevation in containment. The coolant and associated debris from a pipe or component rupture (LOCA), and the containment spray drain into the RWSP through transfer pipes.	6.2.2.2.5 Table 19.1-119
2.4.4.1 Table 2.4.4-5 ITAAC #7.b	Insulation and coatings inside containment are consistent with the design basis evaluations of ECC/CS suction strainer performance.	6.1.2 6.1.3 6.2.2.3 Table 19.1-119
2.4.4.1 Table 2.4.4-2 Table 2.4.4-5 ITAAC #1.a, #1.b, #6.b, #6.c, #10.b	The high head safety injection system consists of four independent and dedicated SI pump trains. The SI pump trains are automatically initiated by an ECCS actuation signal, and supply borated water from the RWSP to the reactor vessel via direct vessel injection line.	6.3.2.1 Table 19.1-119
Table 2.4.4-5 ITAAC #7.b	Each safety injection pump has a pump differential head of no less than 3937 ft and no more 4527 ft at the minimum flow, and injects no less than 1259 gpm and no more than 1462 gpm of RWSP water into the reactor vessel at atmospheric pressure.	Table 6.2.1-5 6.3 Figure 6.3-4 Figure 6.3-15 Figure 6.3-16
2.4.4.1 Table 2.4.4-5 ITAAC #7.b	Four (4) ECCS accumulators store borated water under pressure and automatically inject it into the RCS if the reactor coolant pressure decreases below the accumulator pressure. The volume of each accumulator is at least 3,180 ft^3, considering the total water volume and adding the volume of gas space and dead water volume.	Table 6.2.1-4 Table 6.2.1-5 6.3.2.2.2 Table 6.3-5

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 4 of 10)

Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
Table 2.4.4-5 ITAAC #7.b Table 2.4.4-6	The water volume injected from each accumulator into reactor vessel is ≥2126 ft^3. The water volume injected from each accumulator into reactor vessel during large flow is ≥1326.8 ft^3. The calculated resistance coefficient of the accumulator system (based on a cross-section area of 0.6827 ft^2) meets the requirements shown in Tier 1 Table 2.4.4-6. The accumulators provide the integrated function of low head injection in the event of a LOCA.	6.3 Table 6.3-5 Table 19.1-119
2.4.4.1 Table 2.4.4-5 ITAAC #7.b	The RWSP is the source of borated water for emergency core cooing and containment spray systems. The volume of the RWSP is at least 81,230 ft^3. taking into account ineffective pit volume and containment cavities and pits where water may be trapped and not drain to the RWSP.	6.2.2.2.5 Table 6.2.1-3 Table 6.2.1-4 Figure 6.2.2-7 6.3 Table 6.3-5
2.4.5.1	The RHRS limits the in-containment RWSP water temperature to not greater than 120° F during normal operation.	5.4.7.1 Table 6.2.1-4 Ch. 16 TS 3.5.4
2.4.5.1 Table 2.4.5-5 ITAAC #8.a	RHRS provides long term core cooling.	5.4.7.1 Table 19.1-119
2.4.5.1 Table 2.4.5-5 ITAAC #1.a, #6.b, #6.c 2.11.3.1 Table 2.11.3-5 ITAAC #1.a, #6.b, #6.c	The CSS/RHRS consists of four independent subsystems, each of which receives electrical power from one of four safety buses. Each subsystem includes one CS/RHR pump and one CS/RHR heat exchanger, which have functions in both the CS system and the RHRS.	6.2.2 5.4.7.2.1 Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 5 of 10)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.4.5.1 Table 2.4.5-5 ITAAC #1.a, #8.a 2.11.3.1 Table 2.11.3-5 ITAAC #1.a, #7.b	CSS/RHR provide long term containment and core cooling capability.	6.2.2 6.2.5 Table 19.1-119
Table 2.4.5-5 ITAAC #8.e	The CS/RHR relief valves open at a pressure not greater than the set pressure required to provide low temperature overpressure protection for the RCS, as determined by the LTOP system.	5.4.7.1
Table 2.4.5-5 ITAAC #8.a	Each CS/RHR pump is sized to deliver 3,000 gpm at a discharge head of 410 ft, and provides at least 2645 gpm to the RCS when the RCS is at atmospheric pressure.	5.4.7 Table 5.4.7-2 Figure 5.4.7-4 6.2.2 Table 6.2.1.5
Table 2.4.5-5 ITAAC #8.a	The product of the overall heat transfer coefficient and the effective heat transfer area, UA, of each as-built CS/RHR heat exchanger is greater than or equal to 1.852×10^6 Btu/hr-°F.	5.4.7 Table 5.4.7-2 6.2.2 Table 6.2.1-5
2.4.6.1 Table 2.4.6-5 ITAAC #1, #8.a	The CVCS charging pumps are arranged in parallel with common suction and discharge headers. Each pump provides full capability for normal makeup. One charging pump is capable of maintaining normal RCS inventory with small system leak if the leakage rate is less than that from a break of a pipe 3/8 inch in inside diameter.	9.3.4.2 Table 19.1-119
2.4.6.1 Table 2.4.6-5 ITAAC #1, #8.a, #8.c	The CVCS charging pumps can take suction from the VCT, the reactor makeup control system, the refueling water storage auxiliary tank and the spent fuel pit. Normally, one charging pump is operating and takes suction from the VCT, supplies charging flow to the RCS and seal water to the reactor coolant pumps.	9.3.4.2 Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 6 of 10)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
Table 2.4.6-5 ITAAC #8.a	Each CVCS charging pump provides a flow rate of greater than or equal to 160 gpm.	9.3.4 Table 9.3.4-2
2.5.1.1 Table 2.5.1-6 ITAAC #14.a	The PSMS initiates automatic reactor trips and ESF actuations, when the plant process signals reach a predetermined limit. (Table 2.5.1-2 and 2.5.1-3)	7.2 7.3 Table 7.2-3 Table 7.3-4
2.5.1.1 Table 2.5.1-6 ITAAC #1	Reactor trip signal is provided by the reactor protection system (RPS), which consists of four redundant and independent trains. Four redundant measurements using sensors from the four separate trains are made for each variable used for reactor trip.	7.2.1 Table 19.1-119
2.5.1 Table 2.5.1-6 ITAAC #2	There are four redundant engineered safety function (ESF) trains.	7.3.1.8 Table 19.1-119
2.5.1 Table 2.5.1-6 ITAAC #29	ESF systems are automatically initiated from signals that originate in the RPS. Manual actuation of ESF systems is carried out through a diverse signal path that bypasses the RPS.	7.3.1.9 Table 19.1-119
2.5.1 Table 2.5.1-6 ITAAC #17.b	A single channel or division of the PSMS can be bypassed to allow on-line testing, maintenance or repair without impeding the safety function.	7.2.1 Table 19.1-119
2.5.4.1 Table 2.5.4-2 ITAAC #1, #2, #4	The PSMS and PCMS provide plant operators with information systems important to safety for: (1) assessing plant conditions and safety system performance, and making decisions related to plant responses to AOOs; and (2) preplanned manual operator actions related to accident mitigation.	7.5

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 7 of 10)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.5.4 Table 2.5.4-2 ITAAC #1, #3, #4	For the monitoring of the post-accident inadequate core cooling, degree of subcooling, RV water level and core exit temperature will be measured.	4.4.6.4 7.5 7.5.1.1.3
~~Table 2.5.4-2~~2.9 Table 2.9-1 ITAAC #7.f, #7.g, #7.h	The minimum inventory of HSIs are • Fixed position continuously visible HSI • Class 1E HSI for control of all safety-related components and monitoring of all safety-related plant instrumentation is provided on the safety VDUs, located on the MCR operator console and the remote shutdown console (Section 7.1). • Minimum inventory for degraded HSI conditions	7.1 18.7.3.2 Table 18.7-1
~~Table 2.5.4-2~~2.9 Table 2.9-1 ITAAC #7.f	The fixed position continuously visible HSI are provided by: The fixed area of the LDP provides indications and alarms which include : • Bypassed and inoperable status indication (BISI) parameters • Type A and B post monitoring (PAM) variables (Section 7.5, Table 7.5-3) • Safety parameter displays including status of critical safety functions and performance of credited safety systems and preferred non safety systems • Prompting alarms for credited manual operator actions and risk important HAs identified in the HRA PAM displays for Type A and B variables on the safety VDUs (Subsection 7.5.1.1) Conventional switches on the MCR operator console for system level actuation of safety functions such as reactor trip, engineering safety features actuation system (ESFAS) actuation, etc. (Tables 7.2-6 and 7.3-5)	Table 7.1-1 Table 7.2-6 Table 7.3-5 7.5 Table 7.5-3 18.7.3.2

~~2.6.1~~ ~~2.6.4.1~~ ~~Table 2.6.4-1~~	~~Each of the four divisions of the Class 1E power distribution systems is provided by a Class 1E gas turbine generator (GTG) to supply power to its dedicated safety bus as a counter measure against loss of offsite power. When loss of offsite power occurs, GTGs automatically start and would accept load in less than or equal to 100 seconds after receiving the start signal.~~	~~8.1.3.1~~ ~~8.3.1.1.3~~ ~~Table 19.1-119~~

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 8 of 10)

Tier 1 Ref.[(1)]	Key Design Features	Tier 2 Location[(2)]
2.6.4.1 Table 2.6.4-1 ITAAC #13	The Class 1E emergency power sources (EPSs) are capable to provide power at set voltage and frequency to the Class 1E 6.9kV buses within 100 seconds from the start signal.	8.3.1.1.3 Table 19.1-119
2.6.4.1 Table 2.6.4-1 ITAAC #1, #2, #13, #15.a	Each of the four divisions of the Class 1E power distribution systems is provided by a Class 1E gas turbine generator (GTG) to supply power to its dedicated safety bus as a counter measure against loss of offsite power. When loss of offsite power occurs, GTGs automatically start and would accept load in less than or equal to 100 seconds after receiving the start signal.	8.1.3.1 8.3.1.1.3
2.7.1.2.1 Table 2.7.1.2-5 ITAAC #13.a	Six main steam safety valves (MSSVs) are provided per main steam line. MSSVs with sufficient rated capacity are provided to prevent the steam pressure from exceeding 110 percent of the MSS design pressure. The sum of the rated capacities of the MSSVs exceeds 21,210,000 (lb/hr) for all 24 valves.	10.3.2.3.2
Table 2.7.1.2-~~4~~5 ITAAC #13.b	The flow restrictor within the SG main steam line discharge nozzle does not exceed 1.4 sq. ft.	15.1.5.2
2.7.1.2.1 Table 2.7.1.2-~~4~~5 ITAAC #14	The valves close within the following times after receipt of an actuation signal. The main steam isolation valves (MSIVs) close within 5 seconds to limit uncontrolled steam release from one SG in the event of steam line break. The main steam bypass isolation valves close within 5 seconds.	6.2.1.4.1 10.3.2.3.4
2.7.1.2 Table 2.7.1.2-5 ITAAC #1.a	MSIVs are installed in each of the main steam lines to (1) limit uncontrolled steam release from one steam generator in the event of a steam line break, and to (2) isolate the faulted SG in the event of SGTR.	6.2.1 10.3 Table 19.1-119
2.7.1.9.1 Table 2.7.1.9-5 ITAAC #8.b ~~Table 2.11.2-2~~	The main feedwater isolation valves (MFIVs), MFRVs, MFBRVs, SGWFCVs close within 5 seconds after receipt of an actuation signal, to limit the mass and energy release to containment consistent with the containment analysis.	6.2.1.4.1 10.4.7.2.2

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 9 of 10)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.7.1.11 Table 2.7.1.11-5 ITAAC #1.a	EFWS consists of two motor-driven pumps and two steam turbine-driven pumps with two emergency feedwater pits.	10.4.9.2 Table 19.1-119
2.7.1.11.1 Table 2.7.1.11-5	Each EFW pump discharge line connects with a cross-tie line using normally closed motor-operated isolation valves to provide separation of four trains. Operation to open the EFW cross-tie valve when an EFW pump is not available is an important feature to reduce core damage frequency.	10.4.9.2 19.1.4.1 19.2.2
2.7.1.11 Table 2.7.1.11-5 ITAAC #8.b	Upon detection of a water level increase of the SG, the EFW isolation valves and EFW control valves are automatically closed.	10.4.9.2 Table 19.1-119
2.7.1.11 Table 2.7.1.11-5 ITAAC #8.b	The motor-operated EFW isolation valves and EFW control valves are provided in each EFW pump discharge line to close automatically to terminate the flow to the affected (faulted) SG.	10.4.9.2 Table 19.1-119
2.7.1.11 Table 2.7.1.11-5 ITAAC #1.a	The common suction line from each EFW pit is connected by a tie line with two normally closed manual valves. When the two EFW pumps taking suction from the same pit are not available (OLM of one EFW pump and the single failure of other EFW pump), the tie line connections to EFW pits need to be established.	10.4.9.2 Table 19.1-119
Table 2.7.1.11-5 ITAAC #12	Two of the EFW pumps deliver at least 705 gpm to the any of two SGs against a SG pressure up to the set pressure of the first stage of main steam safety valve plus 3 percent.	10.4.9.2.1 Table 10.4.9-2
Table 2.7.1.11-5 ITAAC #13	The usable volume of each EFW pit is greater than or equal to 204,850 gallons.	10.4.9.3
2.7.3.1 Table 2.7.3.1-5 ITAAC #1.a	The ESWS is arranged into four independent trains (A, B, C, and D). Each train consists of one ESWP, two 100% strainers in the pump discharge line, one 100% strainer upstream of the CCW HX, one CCW HX, one essential chiller unit, and associated piping, valves, instrumentation and controls.	9.2.1.2.1 Table 19.1-119
2.7.3.3 Table 2.7.3.3-5 ITAAC #1.a	The CCWS consists of two independent subsystems. One subsystem consists of trains A & B, and the other subsystem consists of trains C & D, for a total of four trains.	9.2.2.2 Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1a Design Basis Accident Analysis Key Design Features

(Sheet 10 of 10)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.7.3.3 Table 2.7.3.3-5 ITAAC #7	The CCWS is designed to withstand leakage in one train without loss of the system's safety function.	9.2.2.1.1 Table 19.1-119
2.7.3.3 Table 2.7.3.3-5 ITAAC #8.b	Two motor operated valves are located at the CCW outlet of the RCP thermal barrier Hx and close automatically upon a high flow rate signal at the outlet of this line in the event of in-leakage from the RCS through the thermal barrier Hx, and prevents this in-leakage from further contaminating the CCWS.	9.2.2.2.1.5 Table 19.1-119
2.7.5.3.1.2~~Table 2.7.5.3-1~~	The containment fan cooler system is designed to maintain containment air temperature below 120°F during the normal operation of the plant. 120°F is used as the maximum containment temperature initial condition in the safety analyses.	6.2.1.1.3.5 Table 6.2.1-4 6.3.2.1 Ch. 16 TS 3.6.5
2.7.6.2.1 Table 2.7.6.2-1 ITAAC #2	To preclude unanticipated drainage, the spent fuel pit is not connected to the equipment drain system. A weir and gate provide physical isolation of the refueling canal from each of the pits. All the gates are located above the top elevation of the fuel seated in the SFP racks: they are normally closed and only opened as required.	9.1.2.2.2
Figure 2.11.2-1 Table 2.11.2-1 Table 2.11.2-2 ITAAC #1	Containment penetration isolation features are configured as in Table 6.2.4-3 and figure 6.2.4-1.	6.2.4 Table 6.2.4-1 Table 6.2.4-3 Figure 6.2.4-1 6.2.6
2.11.3.1 Table 2.11.3-5 ITAAC #1.a, #7.b	The CSS is designed to remove containment heat, and remove fission products following an accident.	6.2.2 6.5.2 15.6.5 19.1.3.1 19.1.3.2 Table 19.1-119 19.2.3.3.3
Table 2.11.3-5 ITAAC #7.b	Two CS/RHR pumps deliver no less than 5290 gpm of RWSP water into the containment.	6.2.1 Table 6.2.1-5

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1b Internal and External Hazards Analysis Key Design Features

(Sheet 1 of 2)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
Table 2.1-1	Key Site Parameters (Meteorology, Hydrologic Engineering, Geology, Seismology, and Geotechnical Engineering)	Table 2.0-1
2.2 Table 2.2-1 Table 2.2-4 ITAAC #23	Failure of buildings that are not seismic Category I (i.e., turbine building, auxiliary building and access building) does not impact SSCs designed to be seismic Category I.	3.2.1 Table 19.1-119
2.2.2.1 Table 2.2-4 ITAAC #13	The external walls of Seismic I and II structures that are below flood level are adequate thickness to protect against water seepage.	3.4.1.2
Table 2.2-4 ITAAC #16	Penetrations in the external walls below flood level are provided with flood protection features.	3.4.1.2
2.2.2.1 Table 2.2-4 ITAAC #14	Construction joints in the exterior walls and base mats are provided with water stops to prevent seepage of ground water.	3.4.1.2
2.2.2.2 Table 2.2-4 ITAAC #9, #10, #11, #15	Elevation -26 ft, 4 in. in radiological controlled area (RCA) of the R/B is divided into twofour areas, by concrete walls and water-tight door. A water-tight door is provided in each Spray/RHR pump room and SIS pump room. And also water tight doors are provided in doorways between A/B and R/B.	3.4.1.5.2.1
2.2.2.2 Table 2.2-4 ITAAC #9, #10, #11, #15	Elevation -26 ft, 4 in. in the non-radiological controlled area (NRCA) of the R/B is divided into two areas by concrete walls and water-tight door installed in the corridor. ~~The two trains of four emergency feedwater pump rooms are isolated by concrete walls and water-tight door.~~ Water-tight doors are provided in doorways at ground level between T/B and R/B.	3.4.1.5.2.2
2.2.2.2 Table 2.2-4 ITAAC #9, #10, #11, #15	Divisional walls and water tight doors provide train separation and flood barriers to prevent flood water from spreading to adjacent divisions.	3.4.1.5.2.1
Table 2.2-4 ITAAC #1, #9, #10 2.7.6.8 Table 2.7.6.8-1 ITAAC #1	R/B is divided to two divisions (e.g. east side and west side) and thus flood propagation to all four trains is prevented.	3.4.1.5.2 19.1.5.3 Table 19.1-1 Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1b Internal and External Hazards Analysis Key Design Features

(Sheet 2 of 2)

Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
2.2.2 Table 2.2-4 ITAAC #9, #10, #11, #15, #16	Areas between the reactor building and the turbine building are physically separated by flood prevention equipment.	3.4.1.5 19.1.5.3 Table 19.1-119
2.3.1 Table 2.3-2 ITAAC #4, #5	Pipe breaks (circumferential and longitudinal) are evaluated for the entire range of effects, including dynamic effects (i.e., pipe whip, jet impingement, jet thrust forces, internal forces due to system decompression, sub-compartment pressurization), environmental conditions, spray wetting, and flooding. When LBB criteria are successfully applied, evaluation of dynamic effects is not required.	3.6 6.2.1.2
Table 2.1-1 2.2.1 Table 2.2-4 ITAAC #5, #6, #212.3.1 Table 2.3-2 Table 2.5.1-6 ITAAC #8 Table 2.5.6-1 ITAAC #4	SSCs needed to achieve and maintain safe shutdown are protected or analyzed to mitigate the impacts of internal and external missile hazards	3.5
Each EQ ITAAC in aApplicable Tier 1 System Sections	Structures, systems, and components important to safety are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents.	3.11
2.5.1 Table 2.5.1-6 ITAAC #5 Other seismic qualification ITAAC in applicable Tier 1 System Sections 2.5.6	Relay chatter does not occur or does not affect safety functions during and after seismic event.	3.10.2 Table 19.1-51 Table 19.1-119

2.7.6.8 Table 2.7.6.8-1 ITAAC #1	Flood will not propagate to other areas due to the drain systems.	3.4.1.5.2 19.1.5.3 Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1c Fire Protection Key Design Features

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.2.2.3 Table 2.2-4 ITAAC #17	Redundant safe shutdown components and associated electrical divisions outside the containment and the control room complex are separated by 3-hour rated fire barriers to preserve the capability to safely shutdown the plant following a fire. The 3-hour rated fire barriers are placed as required by the fire hazard analysis and support prevention of severe accidents due to loss of multiple trains by fire.	9.5.1.2.1 Table 19.1-119
2.2.2.3 Table 2.2-4 ITAAC #18	All penetrations and openings through the fire barriers are protected with 3-hour rated components (i.e. fire doors in door openings, fire dampers in ventilation duct openings, and penetration seals).	9.5.1.2.1 Table 19.1-119
2.7.6.9.1 Table 2.7.6.9-2 ITAAC #4.b	The seismic standpipe system can be supplied from a safety-related water source which capacity is at least 18,000 gallons.	9.5.1.2.4
2.7.6.9.1 Table 2.7.6.9-2 ITAAC #3, #5	Two 100% capacity fire water pumps are provided: one pump is diesel-driven and one pump is electric motor-driven. Each pump provides sufficient water for the largest sprinkler system plus manual hose streams to support fire suppression activities for two hours or longer, but not less than 300,000 gallons. Redundant water supply capability is provided.	9.5.1.1
2.5.2.1 Table 2.5.2-3 ITAAC #2.a	Independent means to achieve safe shutdown of the reactor is provided if a fire in the MCR resulted in operator evacuation.	7.4.1.5
2.7.6.9.1 Table 2.7.6.9-2 ITAAC #1, #2	Means are provided to detect and locate fires and are indicated to control room operators	9.5.1.2.6

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

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Tier 1 Ref.[(1)]	Key Design Features	Tier 2 Location[(2)]
2.2.3.3 Table 2.2-4 ITAAC #24	SSCs that require evaluation in the seismic fragilities task of a seismic margin analysis have sufficient seismic margin.	19.1.5.1.1 Table 19.1-51 Table 19.1-119
2.4.1 Table 2.4.1-2 ITAAC #3	No penetrations through the RV are located below the top of the reactor core. This minimizes the potential for a loss of coolant accident by leakage from the reactor vessel, allowing the reactor core to be uncovered.	5.3.3.1 Table 19.1-119
2.4.2.1 Table 2.4.2-2 Figure 2.4.2-2 Table 2.4.2-5 ITAAC #2, #11.a	The reactor vessel head vent valves; the safety depressurization valve (SDV) and depressurization valves (DV) could be used for high point vents to support prevention of beyond design basis events and severe accident mitigation.	5.4.12 Table 5.4.12-3 19.1.3.1 19.1.3.2 19.2.3.3 Table 19.1-1 Table 19.1-119
2.4.2 Table 2.4.2-5 ITAAC #2, #11.a	Safety depressurization valves (SDVs) are provided at top head of the pressurizer in order to cool the reactor core by feed and bleed operation when loss of heat removal from steam generator occurs.	5.4.12.2 Table 19.1-119
2.4.2 Table 2.4.2-5 ITAAC #2, #11.a 2.4.4 Table 2.4.4-5 ITAAC #1.a, #10.a	In the event of delay in establishing RHR cooling after safety injection, the SDV and SI pump ensure long term heat removal.	Table 19.1-119
2.4.2 Table 2.4.2-5 ITAAC #2, #11.a	RCS depressurization system dedicated for severe accident is provided to prevent high pressure melt ejection.	5.4.12.2 Table 19.1-119
2.4.4 Table 2.4.4-5 ITAAC #1.a, #10.a	In the event of loss of heat removal by the RHRS and SGs, a SI pump can be manually started to maintain RCS water level.	Table 19.1-119

2.4.4 Table 2.4.4-5 ITAAC #1.a, #8 ~~2.11.2~~ ~~2.11.3~~	RWSP suction isolation valves can be closed to prevent leakage of RWSP water from SI, CS/RHR or RWS.	Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

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Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
2.4.5 Table 2.4.5-5 ITAAC #9, #11	In the case of failure of running RHRS, with RHR flow rate – low the valves on the standby RHR suction line and discharge line can be opened and the standby RHR pump started in order to maintain RHR operation.	Table 19.1-119
2.4.5.1 Table 2.4.5-5 ITAAC #1.a	Alternate core cooling/injection utilizing CSS/RHRS is available in case all safety injection fails.	Table 19.1-1 Table 19.1-119 19.2.2
2.4.5.1 Table 2.4.5-5 ITAAC #11 2.7.1.2 Table 2.7.1.2-5 ITAAC #8.a 2.7.1.11 Table 2.7.1.11-5 ITAAC #18	In high RCS pressure sequences, a fast depressurization of the RCS by using the EFW pumps to remove heat through the SGs and by manually opening the MSRVs allows alternate core cooling injection using the CS/RHR pumps.	Table 19.1-119
2.4.5.1 Table 2.4.5-5 ITAAC #1.a	CSS/RHRS provides water to flood the reactor cavity.	Table 19.1-119
2.4.5.1 Table 2.4.5-5 ITAAC #2	Upgraded piping design pressure for the residual heat removal system (RHRS) results in a negligible frequency of occurrence of an inter-system LOCA.	19.1.3.4 Table 19.1-1 Table 19.1-119
2.4.5.1 Table 2.4.5-5 ITAAC #1.a, #2, 7.a	Two motor operated valves in series on the RHR suction line with power lockout capability during normal power operation minimize the probability of RCS pressure entering the RHR system. Even if both these valves are opened during normal power operation, the RHR system is designed to discharge the RCS inventory to the in-containment RWSP. The RHRS is designed to prevent an interfacing system LOCA by having a design rating of 900 lb.	5.4.7.1 Table 19.1-119
2.4.5 Table 2.4.5-5 ITAAC #9	RHR suction isolation valves can be manually closed to isolate a LOCA in the RHR line.	Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

(Sheet 3 of ~~7~~8)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.4.5 Table 2.4.5-5 ITAAC #1.a	One normally closed air-operated valve is installed in each of two low-pressure letdown lines that are connected to two of four RHR trains.	Table 19.1-119
2.4.5.1 Table 2.4.5-5 ITAAC #1.a	To prevent loss of RCS inventory during mid-loop operation and support severe accident prevention, the low-pressure letdown line isolation valves are automatically closed and the CVCS is isolated from the RHRS, after receiving a RCS loop low-level signal.	5.4.7.2 19.1.3.4 Table 19.1-1 Table 19.1-119 19.2.2.2
2.4.6 Table 2.4.6-5 ITAAC #1.a 2.7.6.3 Table 2.7.6.3-5 ITAAC #1	CVCS charging pumps can provide decay heat removal in the event of loss of RHR and SG cooling. The RWSP can provide makeup~~meakeup~~ to the RWSAT for charging pump suction.	Table 19.1-119
2.5.1 Table 2.5.1-3 Table 2.5.1-6 ITAAC #4 2.5.4 Table 2.5.4-2 ITAAC #2	Containment isolation and heat removal can be manually actuated in the event of failure of the containment isolation signal.	Table 19.1-119
2.5.1 Table 2.5.1-3 Table 2.5.1-6 ITAAC #4 2.5.4 Table 2.5.4-2 ITAAC #2	ESF actuation can be performed manually in the event of failure of automatic ESF actuation.	Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

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Tier 1 Ref.[(1)]	Key Design Features	Tier 2 Location[(2)]
2.6.1 Table 2.6.1-3 ITAAC #1 2.6.5 Table 2.6.5-1 ITAAC #1	Non-Class 1E 6.9kV permanent buses P1 and P2 are also connected to the non-Class 1E A-AAC GTG and B-AAC GTG, respectively. The loads which are not safety-related but require operation during LOOP are connected to these buses.	8.3.1.1.1 Table 19.1-119
2.6.1 Table 2.6.1-3 ITAAC #24	Non-segregated busducts/cable buses to safety buses in the T/B electrical room are segregated into two groups by qualified fire barriers.	8.3.1.1.8 9.5.1 19.1.5.2 Table 19.1-1 Table 19.1-119
2.6.4 Table 2.6.4-1 ITAAC #3, #11, #32	The GTG does not need a cooling water system. Cooling of GTG is achieved by air ventilation system GTG combustion air intake and exhaust system for each of the four GTGs supply combustion air of reliable quality to the gas turbine and exhausts combustion products from the gas turbine to the atmosphere. The air intake also provides ventilation/cooling air to the GTG assembly.	9.5.5 9.5.8 Table 19.1-119
2.6.5.1 Table 2.6.5-1 ITAAC #1	Common cause failure between class 1E GTG and non-class 1E GTG supply is minimized by design characteristics. The AAC power sources are of different size, have different starting system from the EPS.	8.4.1.3 Table 19.1-119
2.6.5.1 Table 2.6.5-1 ITAAC #6	In the event of SBO, power to one Class 1E 6.9kV bus can be restored manually from the AAC GTG. Power to the shutdown buses can be restored from the AAC sources within 60 minutes.	8.3.1.1.2.4 8.4.1.2 8.4.1.3 Table 19.1-119
2.6.5.1 Table 2.6.5-1 ITAAC #1	Alternate ac power supported by two non-Class 1E GTGs is incorporated as a countermeasure against SBO. Alternate ac power sources can supply power to two of the four safety buses in case class 1E GTGs fail during loss of offsite power. AAC power sources are non-Class 1E and non-seismic. AAC power sources supply power to loads required to bring and maintain the plant in a safe shutdown condition for a station blackout (SBO) condition.	8.4.1.3 19.1.3.1 19.1.3.4 19.1.4.1 Table 19.1-1 19.2.2

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

(Sheet ~~4~~5 of ~~7~~8)

Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
2.6.5.1 Table 2.6.5-1 ITAAC #1, #5	AAC power sources use different rating GTGs than the Class 1E EPSs, with diverse starting system, independent and separate auxiliary and support systems to minimize common cause failure.	8.4.1.3 Table 19.1-119
2.7.1.2 Table 2.7.1.2-5 ITAAC #8.a 2.7.1.11 Table 2.7.1.11-5 ITAAC #8.a, #18	Main steam depressurization valves (MSDVs) on intact SG(s) can be opened and EFW flow established to promote heat removal and RCS depressurization.	Table 19.1-119
2.7.1.11.1 Table 2.7.1.11-5 ITAAC #1.a	Each EFW pump discharge line connects with a cross-tie line using normally closed motor-operated isolation valves to provide separation of four trains. Operation to open the EFW cross-tie valve when an EFW pump is not available is an important feature to reduce core damage frequency.	10.4.9.2 19.1.4.1 19.2.2
2.7.3.1 Table 2.7.3.1-5 ITAAC #10.a	In the case of failure of running ESWS, with ESW flow rate – low, the standby ESW pump can be started in order to maintain ESWS operation.	Table 19.1-119
2.7.3.1 Table 2.7.3.1-5 ITAAC #1.a	In the case of ESW pump discharge blockage, flow can be switched from the blocked strainer to the standby strainer.	Table 19.1-119
2.7.3.3 Table 2.7.3.3-5 ITAAC #8.a	CCW header tie line isolation valves may be manually closed to achieve header separation in the event of failure of automatic valve closure.	Table 19.1-119
2.7.3.3 Table 2.7.3.3-5 ITAAC #10.a	In the case of failure of running CCWS, with CCW flow rate – low, the standby CCW pump can be started in order to maintain CCWS operation.	Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

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Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
2.7.3.3 Table 2.7.3.3-5 ITAAC #1.a	If loss of seal injection should occur, CCW continues to provide flow to the thermal barrier heat exchanger; which cools the reactor coolant. The pump is able to maintain safe operating temperatures and operate safely long enough for safe shutdown of the pump.	5.4.1.1.3 Table 19.1-119
2.7.3.3 Table 2.7.3.3-5 ITAAC #1.a Table 2.7.3.6-3 ITAAC #1	Alternate containment cooling via natural CV circulation can be established by pressurizing CCWS with nitrogen, disconnecting nonessential heat loads and connecting to the containment fan cooler units.	Table 19.1-119
2.7.3.6.1 Table 2.7.3.6-31 ITAAC #3	Non-essential chilled water system provides alternate component cooling water to charging pumps in order to maintain RCP seal water injection.	Table 19.1-1 Table 19.1-119
2.7.3.6 Table 2.7.3.6-3 ITAAC #1 2.7.5.3.1.2 Table 2.7.5.3-1	Alternate containment cooling using the containment fan cooler system is provided to prevent containment over pressure even in case of containment spray system failure. The fan cooling units are cooled by the component cooling water system. The containment fan cooler system enhances condensation of surrounding steam by natural convection and thus enhances continuous depressurization of the containment.	9.4.6.2 19.1.3.1 Table 19.1-1 19.1.3.2 Table 19.1-119 19.2.3.3.8
2.7.6.3 Table 2.7.6.3-5 ITAAC #1	As a countermeasure for loss of RHR, RCS makeup by gravity injection from spent fuel pit is available when the RCS in atmospheric pressure.	19.1.6.1 Table 19.1-1 Table 19.1-119
2.7.6.9.1 Table 2.7.6.9-12 ITAAC #6.a	The fire protection water supply system (FSS) is available as an alternative component cooling water source for severe accident prevention, including support of CVCS for RCP seal water injection.	9.5.1.2.2 19.1.3.2 19.1.5.3.2 19.2.3.3.3 Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

(Sheet ~~6~~7 of ~~7~~8)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
~~2.7.6.9.1~~ Table 2.7.6.9-~~1~~2 ITAAC #6.b	The FSS is available to the containment spray system and water injection to the reactor cavity for severe accident mitigation.	9.5.1.2.2 19.1.3.2 19.2.3.3.3 Table 19.1-119
Table 2.11.1-2 ITAAC #4	A set of drain lines is provided from the steam generator compartments to the reactor cavity to flood the reactor cavity with containment spray water during severe accidents.	19.1.3.2 Table 19.1-119
2.11.1.1 Table 2.11.1-2 ITAAC #5	The core debris trap enhances capturing of ejected molten core in the reactor cavity to support severe accident mitigation. The consequences of a postulated high pressure melt ejection accident, including direct containment heating, are mitigated by the debris trap in the reactor cavity as well as no direct pathway to the upper compartment for the impingement of debris on the containment shell.	19.1.3.2 Table 19.1-1 Table 19.1-119 19.2.3.3.4
2.11.1.1 Table 2.11.1-2 ITAAC #6	The geometry of the reactor cavity is designed to assure adequate core debris coolability. Sufficient reactor cavity floor area and appropriate reactor cavity depth are provided to enhance spreading debris bed for better coolability to support severe accident mitigation.	19.1.3.2 Table 19.1-119 19.2.3.3.3
2.11.1.1 Table 2.11.1-2 ITAAC #7	There is a liner-plate-covering concrete as the floor surface of the reactor cavity, which supports severe accident mitigation by protecting against short-term attack by relocated core debris.	Table 19.1-119 19.2.3.3.3
2.11.2.1 Table 2.11.2-2 ITAAC #14	Main containment penetrations are isolated automatically even when SBO occurs and alternative ac generators are not available.	8.3.1.1.5 Table 8.3.1-10 Table 19.1-1 Table 19.1-119

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1d PRA and Severe Accident Analysis Key Design Features

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Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
2.11.4.1 Table 2.11.4-1 ITAAC #1, #2, #3, #4, #5, #6	The CHS includes 1. a single hydrogen monitor located outside of containment that measures hydrogen concentration in containment air extracted from the containment. 2. 20 igniters installed inside the containment, designed to burn hydrogen continuously to maintain hydrogen concentration below the low limit of global burn (approximately 10% hydrogen in air), thereby preventing further hydrogen accumulation that could become a threat to containment integrity. 3. The igniters start upon receipt of an ECCS actuation signal and are powered by two non-class 1E buses with non-class 1E GTGs.	6.2.5 Figure 6.2.5-1 19.1.3.2 19.2.3 Table 19.1-119
2.13 Table 2.13-1 ITAAC #1	US-APWR design reliability assurance program provides reasonable assurance that: 1) the US-APWR is designed, constructed, and operated in a manner that is consistent with the assumptions and risk insights for the SSCs, 2) the SSCs do not degrade to an unacceptable level during plant operations, 3) the frequency of transients that challenge SSCs is minimized, and 4) the SSCs function reliably when challenged.	17.4 Table 17.4-1

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1e ATWS Key Design Features

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.5.3.1 Table 2.5.3-4 ITAAC #3, #4	The DAS is a non-safety system that is diverse from the MELTAC platform of the PSMS and PCMS, and is diverse from the hardware used in the reactor trip function of the RT system. The DAS equipment is used for the ATWS mitigation and a countermeasure to common cause failure (CCF) that disables all functions of PSMS and PCMS.	7.8 Table 19.1-119
2.5.3.1 Table 2.5.3-4 ITAAC #1.c	The DAS is electrically and physically isolated from the PSMS	7.8.2.3

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1f Radiological Analysis Key Design Features

(Sheet 1 of 2)

Tier 1 Ref.[1]	Key Design Features	Tier 2 Location[2]
Table 2.1-1.	The χ/Q values used in determining the radiological consequences of postulated accidents (other than the MCR and the TSC).	Table 2.0-1 Table 15.0-13 Table 15A-17
Table 2.1-1	The MCR and the TSC χ/Q values used in determining the radiological consequences of postulated accidents as follows: - Steam system piping failure analysis - RCP rotor seizure analysis - Rod ejection accident analysis - Failure of small lines carrying primary coolant outside containment ~~and SGTR~~ analysis - SGTR analysis - LOCA analysis - Fuel handling accident analysis	Table 2.0-1 Table 2.3.4-1 thru 2.3.4-7 Table 15A-18 Table 15A-19 Table 15A-20 Table 15A-21 Table 15A-22 Table 15A-23 Table 15A-24
2.2.1.1 Table 2.2-4 ITAAC #4.a, #4.b Table 2.11.1-1	Containment leak rate, 0-24 hr following LOCA, is 0.15 %/d.	6.2.1 Table 6.2.1-2 15.4.8.5 Table 15.4.8-3 15.6.5.5 Table 15.6.5-4
2.4.4.1 Table 2.4.4-5 ITAAC #7.c	The sodium tetraborate decahydrate (NaTB) baskets, which provide containment pH control during a LOCA, have a total calculated weight of NaTB of 44,100 pounds.	6.3.2.2.5 Table 6.3-5
2.7.5.1.1 Table 2.7.5.1-3 ITAAC #4.b	Performance values of the MCR HVAC system used in the safety analysis are: Unfiltered CRE inleakage: 120 cfm Filtered air intake flow : 1200 cfm Filtered air recirculation flow : 2400 cfm Filter efficiency Elemental iodine : 95% Filter efficiency Organic iodine : 95% Filter efficiency Particulates : 99%	6.4.2.3 Table 15.6.5-5

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Table 14.3-1f Radiological Analysis Key Design Features

(Sheet 2 of 2)

Tier 1 Ref.(1)	Key Design Features	Tier 2 Location(2)
2.7.5.2.1.1 Table 2.7.5.2-3 ITAAC #4.a	Penetration and Safeguard Component Areas negative pressure arrival time : 240 sec Filter efficiencies for particulates: 99%	6.5.1 Table 15.6.5-4
Table 2.11.2-2 ITAAC #8.vi	The low volume containment purge isolation valves response time is within 15 seconds of accident initiation.	Table 6.2.4-3 15.6.5.5.1.1 Table 15.6.5-4 Chapter 16 Bases 3.6.3
Table 2.2-2 Table 2.2-4 ITAAC #1 Table 2.8-1 ITAAC #1.a Table 2.8-2	Shielding walls and floors for safety-related structures are provided to maintain the maximum radiation levels to meet the radiation zone.	3.8.3 Table 12.3-1 12.3.2.2
Table 2.8-1 ITAAC #1.b Table 2.8-2	Shielding walls and floors for the Auxiliary Building are provided to maintain the maximum radiation levels to meet the radiation zone.	Table 12.3-1 12.3.2.2
2.2.1.1 Table 2.2-2 Table 2.2-4 ITAAC #1, #3, #4, #5 2.11.1.1 Table 2.11.1-1 Table 2.11.1-2 ITAAC #1, #2, #3	The PCCV facility is comprised of the containment vessel and the annulus enclosing the containment penetration area, and provides an efficient leak-tight barrier and environmental radiation protection under all postulated conditions, including LOCA.	3.8 6.2.1 Table 6.2.1-2

NOTES: (1) Source: Tier 1 section or table. (2) Tier 2 location or table where addressed.

Chapter 16

US-APWR DCD Revision 2 Chapter 16 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
Technical Specifications		
3.3.3-5	Table 3.3.3-1 Function 2, 3, 10 and 16	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1784/192 Replaced “F” with “E”.
3.3.3-5	Footnote (d)	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1784/192 Revised for pair PAM function.
3.7.10-4	SR 3.7.10.5	RAI 475-3780 QUESTION No.09.04.01-12 Changed “24 months” to “ 24 months on a STAGGERED TEST BASIS”
5.5-2	5.5.2	RAI 09.03.02-12 Added “Gaseous Waste Management” in the second sentence
Bases		
B3.3.1-57	SR 3.3.1.13 1st paragraph	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1784/174 Added description for dynamic transfer function.
B3.3.1-57	SR 3.3.1.13 2nd paragraph	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1784/172 Added description for response time.
B3.3.2-69	SR 3.3.2.8 3rd paragraph	OPEN ITEM No.: 16-1784/188 Added description for dynamic transfer function
B3.3.2-69	SR 3.3.2.8 4th paragraph	OPEN ITEM No.: 16-1784/186 Added description for response time
B3.3.3-4	Item 2, 3	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1769/282 Added description for pair PAM function.
B3.3.3-6	Item 10, 11	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1769/282 Added description for pair PAM function.
B3.3.3-12	F.1 2ndand 3rd sentence	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1784/192 Deleted 2nd and 3rd sentence.
B3.3.3-12	F.1 4th sentence	OPEN ITEM 16.4.6, OPEN ITEM NO. 16-1784/192 Revised “PPERABLE” with “OPERABLE”.

US-APWR DCD Revision 2 Chapter 16 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ Item, table with column/row, or figure)	Description of Change
B3.7.10-10	SR 3.7.10.5 1st sentence	RAI 475-3780 QUESTION No.09.04.01-12 Replaced “the system” with “all potential operating configurations of two trains of 50% capacity MCRATCS air handling units”
B3.8.3-6	SR 3.8.3.3 Item c	RAI No.467 Question No. 9.5.4-43 Deleted “a clear and bright appearance with proper color when tested in accordance with ASTM D4176-04^{E1} or”
B3.8.3-8	References	RAI No.467 Question No. 9.5.4-43 Deleted “ASTM D4176-04^{E1}”

Table 3.3.3-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

	FUNCTION	REQUIRED CHANNELS	CONDITION REFERENCED FROM REQUIRED ACTION D.1	
1.	Wide Range Neutron Flux	2	E	DCD_16-1784/192
2.	Reactor Coolant System (RCS) Hot Leg Temperature (Wide Range)	1 per loop [d]	~~F~~E	
				DCD_16-1784/192
3.	RCS Cold Leg Temperature (Wide Range)	1 per loop[d]	~~F~~E	
4.	RCS Pressure (Wide Range)	2	E	
5.	Reactor Vessel Water Level	2	F	
6.	Containment Pressure	2	E	
7.	Containment Isolation Valve Position	2 per penetration flow path[a][b]	E	
8.	Containment High Range Area Radiation	2	F	
9.	Pressurizer Water Level	2	E	DCD_16-1784/192
10.	Steam Generator Water Level (Wide Range)	1 per steam generator[d]	~~F~~E	
11.	Steam Generator Water Level (Narrow Range)	2 per steam generator	E	
12.	Core Exit Temperature - Quadrant 1	2[c]	E	
13.	Core Exit Temperature - Quadrant 2	2[c]	E	
14.	Core Exit Temperature - Quadrant 3	2[c]	E	
15.	Core Exit Temperature - Quadrant 4	2[c]	E	DCD_16-1784/192
16.	Emergency Feedwater Flow	1 per SG[d]	~~F~~E	
17.	Degrees of Subcooling	2	E	
18.	Main Steam Line Pressure	2 per steam generator	E	
19.	Emergency Feedwater Pit Level	2	E	
20.	Refueling Water Storage Pit Level (Wide Range)	2	E	
21.	Refueling Water Storage Pit Level (Narrow Range)	2	E	

(a) Not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

(c) A channel consists of two core exit thermocouples.

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(d) ~~A~~ RCS hot leg temperature wide range and ~~a~~ RCS cold leg temperature wide range of the same ~~train~~loop are pair PAM functions. ~~A~~Similarly, SG water level wide range and an emergency feedwater flow of the same ~~train~~steam generator are pair PAM functions. ~~The idea is to treat~~Either parameter~~s~~ forming a pair can fulfill all PAM requirements. Therefore, only 1 per loop/SG of either parameter of the pair is required.~~as one set and choose the number of required channels to be two, providing a basis for control.~~

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.10.3	Verify each MCRVS train actuates on an actual or simulated actuation signal.	[24 months OR In accordance with the Surveillance Frequency Control Program]
SR 3.7.10.4	Perform required CRE unfiltered air inleakage testing in accordance with the Control Room Envelope Habitability Program.	In accordance with the Control Room Envelope Habitability Program
SR 3.7.10.5	Verify two MCRATCS trains have the capacity to remove the design heat load.	[24 months on a STAGGERED TEST BASIS OR In accordance with the Surveillance Frequency Control Program]

5.5 Programs and Manuals

5.5.2 Primary Coolant Sources Outside Containment

This program provides controls to minimize leakage from those portions of systems outside containment that could contain highly radioactive fluids during a serious transient or accident to levels as low as practicable. The systems include Containment Spray, Safety Injection, Chemical and Volume Control, Gaseous Waste Management and Sampling System. The program shall include the following:

a. Preventive maintenance and periodic visual inspection requirements and

b. Integrated leak test requirements for each system at least once per 24 months.

The provisions of SR 3.0.2 are applicable.

5.5.3 Post Accident Sampling

This program provides controls that ensure the capability to obtain and analyze reactor coolant, radioactive gases, and particulates in plant gaseous effluents and containment atmosphere samples under accident conditions. The program shall include the following:

a. Training of personnel,

b. Procedures for sampling and analysis, and

c. Provisions for maintenance of sampling and analysis equipment.

5.5.4 Radioactive Effluent Controls Program

This program conforms to 10 CFR 50.36a for the control of radioactive effluents and for maintaining the doses to members of the public from radioactive effluents as low as reasonably achievable. The program shall be contained in the ODCM, shall be implemented by procedures, and shall include remedial actions to be taken whenever the program limits are exceeded. The program shall include the following elements:

BASES

SURVEILLANCE REQUIREMENTS (continued)

DCD_16-1784/174

The PSMS dynamic transfer functions employ time constants that are installed as digital values and processed through digital algorithms. Therefore, the time response of the dynamic transfer functions has no potential for variation due to time or environmental drift or component aging. The COT confirms the integrity of the time constants and algorithms through the periodic software memory integrity check. The complete PSMS response time is determined one time by analysis and confirmed one time in the factory test. The response times of analog instruments that provide input to the dynamic transfer functions are periodically checked in Surveillance 3.3.1.13, because they do have the potential for response time variation. RTBs and RTDs are known to have aging or wear-out mechanisms that can impact response time and require response time measurement. Response time for other components can be affected by random failures or calibration discrepancies, which can be detected by other testing and calibration methods required by other surveillances.

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor, signal conditioning, and actuation logic response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. MUAP-09021-P "Response Time of safety I&C System" provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. Section 4.4 of MUAP-07005, "Safety System Digital Platform -MELTAC-" describes how response times of each individual MELTAC module are combined to determine the total digital system response time.

DCD_16-1784/172

The allocations for sensor, signal conditioning, and actuation logic response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. One example where response time could be affected is replacing the sensing assembly of a transmitter.

[As appropriate, each channel's response must be verified every 24 months on a STAGGERED TEST BASIS. Testing of the final actuation devices is included in the testing. Response times cannot be determined during unit operation because equipment operation is

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.8

This SR ensures the response times for all ESFAS functions are less than or equal to the maximum values assumed in the accident analysis. Accident analysis response time values are defined in Reference 2. Individual component response times are not modeled in the analyses.

The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the Trip Setpoint value at the sensor, to the point at which the equipment in all trains reaches the required functional state (e.g., pumps at rated discharge pressure, valves in full open or closed position).

DCD_16-1784/188

The PSMS dynamic transfer functions employ time constants that are installed as digital values and processed through digital algorithms. Therefore, the time response of the dynamic transfer functions has no potential for variation due to time or environmental drift or component aging. The COT confirms the integrity of the time constants and algorithms through the periodic software memory integrity check. The complete PSMS response time is determined one time by analysis and confirmed one time in the factory test. The response times of analog instruments that provide input to the dynamic transfer functions are periodically checked in Surveillance 3.3.2.8, because they do have the potential for response time variation. Electro-mechanical components in the ESFAS have aging or wear-out mechanisms that can impact response time. Response time for other components may be affected by random failures or calibration discrepancies, which are detectable by other testing and calibration methods required by other surveillances.

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor, signal conditioning and actuation logic response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. MUAP-09021-P "Response Time of Safety I&C System" provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. Section 4.4 of MUAP-07005, "Safety System Digital Platform -MELTAC-" describes how response times of each individual MELTAC module are combined to determine the total digital system response time. DCD_16-1784/186

BASES

LCO (continued)

In addition, RCS cold leg temperature is used in conjunction with RCS hot leg temperature to verify the unit conditions necessary to establish natural circulation in the RCS.

DCD_16-1769/282

The PAM function of RCS Hot Leg and Cold Leg Temperature Wide Range is to monitor the core cooling condition. There will be little temperature deviation between the Hot Leg and Cold Leg after an accident and reactor shutdown. Thus, Hot Leg and Cold Leg Temperatures can be defined as equivalent parameters to monitor the trend of core cooling. Thus, Hot Leg and Cold Leg Temperature of the same loop are pair PAM functions credited for compliance with the single failure criteria. Therefore, only one of each channel of Hot Leg Temperature and Cold Leg Temperature are required in each loop, since with a failure of either channel adequate core cooling can still be monitored.

4. Reactor Coolant System Pressure (Wide Range)

   RCS wide range pressure is provided for verification of core cooling and RCS integrity long term surveillance.

5. Reactor Vessel Water Level

   Reactor Vessel Water Level is provided for verification and long term surveillance of core cooling. It is also used for accident diagnosis and to determine reactor coolant inventory adequacy.

6. Containment Pressure

   Containment Pressure is provided for verification of RCS and containment OPERABILITY and is used to verify closure of main steam isolation valves (MSIVs), and containment spray Phase B isolation when High-3 containment pressure is reached. Additionally, Containment Pressure is provided for indication of maintaining RCS integrity and containment integrity.

7. Containment Isolation Valve Position

   Penetration Flow Path CIV Position is provided for verification of Containment OPERABILITY, and Phase A and Phase B isolation.

BASES

LCO (continued)

SG Water Level (Wide Range) is used to:

- identify the faulted SG following a tube rupture,
- verify that the intact SGs are an adequate heat sink for the reactor,
- determine the nature of the accident in progress (e.g., verify an SGTR), and
- verify unit conditions for termination of SI during secondary unit HELBs outside containment.

Operator action is based on the control room indication of SG level. The RCS response during a design basis small break LOCA depends on the break size. For a certain range of break sizes, the boiler condenser mode of heat transfer is necessary to remove decay heat. Extended startup range level is a Type A variable because the operator must manually raise and control SG level to establish boiler condenser heat transfer. Operator action is initiated on a loss of subcooled margin. Feedwater flow is increased until the indicated extended startup range level reaches the boiler condenser setpoint. This function is an alternate mean with EFW Flow. DCD_16-1769/282

The PAM function of Steam Generator Water Level Wide Range and Emergency Feedwater Flow is to monitor heat removal capability of the Steam Generators. Since during accident or shutdown conditions, SG water level is directly attributed to emergency feedwater flow, either provides an indication of SG heat removal capability. Thus the SG Water Level Wide Range and EFW Flow can be defined as equivalent parameters to monitor the heat removal capability of the secondary. Thus, the SG Water Level and EFW Flow of same loop are pair PAM functions credited for compliance with the single failure criteria. Therefore, only one of each channel of SG Water Level and EFW Flow are required in each loop, since with a failure of either channel adequate heat removal capability can still be monitored.

12, 13, 14, 15. Core Exit Temperature

Core Exit Temperature is provided for verification and long term surveillance of core cooling.

Twenty six core exit thermocouples are provided for measuring core cooling as the post accident monitors. These thermocouples are arranged in two safety trains and a train consists of thirteen thermocouples. These thermocouples in each train are distributed at

BASES

ACTIONS (Continued)

Required Action C.2 is modified by a Note that indicates C.2 is only required to be performed when the Emergency Feedwater Pit Level is inoperable.]

D.1

Condition D applies when the Required Action and associated Completion Time of Condition C is not met. Required Action D.1 requires entering the appropriate Condition referenced in Table 3.3.3-1 for the channel immediately. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met the Required Action of Condition C, and the associated Completion Time has expired, Condition D is entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1 and E.2

If the Required Action and associated Completion Time of Condition C is not met and Table 3.3.3-1 directs entry into Condition E, the unit must be brought to a MODE where the requirements of this LCO do not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and MODE 4 within 12 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

F.1

At this unit, alternate means of monitoring Reactor Vessel Water Level and Containment High Area Radiation have been developed and tested. ~~Also, alternate means of the RCS Hot Leg Temperature (Wide Range) and RCS Cold Leg Temperature (Wide Range) have developed and tested. Also, alternate means of Steam Generator Water Level (Wide Range) and Emergency Feedwater Flow have been developed and tested.~~ These alternate means may be temporarily installed if the normal PAM channel cannot be restored to ~~P~~OPERABEL status within the allotted time. If these alternate means are used, the Required Action is not to shut down the unit but rather to follow the directions of Specification 5.6.5, in the Administrative Control section of the TS. The report provided to the NRC should discuss the alternate means used, describe the degree to which the alternate means are equivalent to the installed PAM channels,

DCD_16-1784/192

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.10.4 (continued)

The CRE is considered habitable when the radiological dose to CRE occupants calculated in the licensing basis analyses of DBA consequences is no more than 5 rem TEDE and the CRE occupants are protected from hazardous chemicals and smoke. This SR verifies that the unfiltered air inleakage into the CRE is no greater than the flow rate assumed in the licensing basis analyses of DBA consequences. When unfiltered air inleakage is greater than the assumed flow rate, Condition C must be entered Required Action C.3 allows time to restore the CRE boundary to OPERABLE status provided mitigating actions can ensure that the CRE remains within the licensing basis habitability limits for the occupants following an accident. Compensatory measures are discussed in Regulatory Guide 1.196, Section C.2.7.3, (Ref. 4) which endorses, with exceptions, NEI 99-03, Section 8.4 and Appendix F (Ref. 5). These compensatory measures may also be used as mitigating actions as required by Required Action C.2. Temporary analytical methods may also be used as compensatory measures to restore OPERABILITY (Ref. 6). Options for restoring the CRE boundary to OPERABLE status include changing the licensing basis DBA consequence analysis, repairing the CRE boundary, or a combination of these actions. Depending upon the nature of the problem and the corrective action, a full scope inleakage test may not be necessary to establish that the CRE boundary has been restored to OPERABLE status.

SR 3.7.10.5

This SR verifies that the heat removal capability ~~of the system~~ all potential operating configuration of two trains of 50% capacity MCRATCS air handling units is sufficient to remove the heat load assumed in the safety analyses in the control room. This SR consists of a combination of testing and calculations. [The 24 month Frequency is appropriate since significant degradation of the MCRATCS is slow and is not expected over this time period. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

BASES

SURVEILLANCE REQUIREMENTS (continued)

contaminating the entire volume of fuel oil in the storage tanks. These tests are to be conducted prior to adding the new fuel to the storage tank(s), but in no case is the time between receipt of new fuel and conducting the tests to exceed 31 days. The tests, limits, and applicable ASTM Standards are as follows:

a. Sample the new fuel oil in accordance with ASTM D4057-06 (Ref. 6),

b. Verify in accordance with the tests specified in ASTM D975-07b (Ref. 6) that the sample has an absolute specific gravity at 60/60°F of ≥ 0.83 and ≤ 0.89 or an API gravity at 60°F of ≥ 27° and ≤ 39° when tested in accordance with ASTM D1298-99 (Reapproved 2005) (Ref. 6), a kinematic viscosity at 40°C of ≥ 1.9 centistokes and ≤ 4.1 centistokes, and a flash point of ≥ 125°F, and

c. Verify that the new fuel oil has a clear and bright appearance with proper color when tested in accordance with ASTM D4176-04[E1] or a water and sediment content within limits when tested in accordance with ASTM D2709-96(Reapproved 2006)(Ref. 6).

Failure to meet any of the above limits is cause for rejecting the new fuel oil, but does not represent a failure to meet the LCO concern since the fuel oil is not added to the storage tanks.

Within 31 days following the initial new fuel oil sample, the fuel oil is analyzed to establish that the other properties specified in Table 1 of ASTM D975-07b (Ref. 7) are met for new fuel oil when tested in accordance with ASTM D975-07b (Ref. 6), except that the analysis for sulfur may be performed in accordance with ASTM D1552-03, ASTM D2622-07, or ASTM D4294-03 (Ref. 6). The 31 day period is acceptable because the fuel oil properties of interest, even if they were not within stated limits, would not have an immediate effect on GTG operation. This Surveillance ensures the availability of high quality fuel oil for the GTGs.

Fuel oil degradation during long term storage shows up as an increase in particulate, due mostly to oxidation. The presence of particulate does not mean the fuel oil will not burn properly in a gas turbine engine. The particulate can cause fouling of filters and fuel oil injection equipment, however, which can cause engine failure.

Particulate concentrations should be determined in accordance with ASTM D5452-06 (Ref. 6). This method involves a gravimetric determination of total particulate concentration in the fuel oil and has a limit of 10 mg/l. It is acceptable to obtain a field sample for subsequent laboratory testing in lieu of field testing.

BASES

REFERENCES

1. Subsection 9.5.4.
2. Regulatory Guide 1.137. Rev.1, October 1979.
3. ANSI N195-1976, Appendix B.
4. Chapter 6.
5. Chapter 15.
6. ASTM Standards: D4057-06; D975-07b; D1298-99 (Reapproved 2005); ~~D4176-04[E1];~~ D2709-96 (Reapproved 2006); D1552-03; D2622-07; D4294-03; D5452-06.
7. ASTM Standards, D975-07b, Table 1.

Chapter 19

US-APWR DCD Revision 2 Chapter 19 Tracking Report Revision 1 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ item ,table with column/row, or figure)	Description of Change
19.1-108	19.1.6.1 Bullet of "Indications of temperature"	RAI#443_19-397 and RAI#479_19-402 Changed "As for inaccurate hot leg temperature measurement after loss of decay heat removal, reactor coolant hot leg temperature instruments are located in the flow path during RHR operation, so this parameter can be accurately indicated." to "Two types of instruments are provided in US-APWR design to measure RV temperature. The first one is core exit thermocouples located inside the RV. The second is resistance temperature detectors in the reactor coolant hot leg. In the event of loss of RHR flow, the core exit thermocouples can continue to measure RV temperature." (The latter description is described in RAI 19-402)
19.1-108	19.1.6.1 Bullet of "Indications of water"	RAI#479_19-403 Inserted the following sentence after first paragraph. "In addition to the narrow range … to prevent delay in response."
19.1-118	19.1.6.1 Last paragraph in section 19.6.1	RAI#479_19-404 Incorporated items(i) and (j) to reflect RAI.
19.1-952	Table 19.1-119 (sheet 5)	RAI#423 19-375 Inserted new key insights and assumptions regarding emergency feedwater system.

Loss of SFP cooling is also progress the phenomena and has sufficient time to recovery because of large coolant inventory in the pool. Furthermore, both events have not been risk significant in previous PRA studies. Therefore, both events are excluded as an initiating event for LPSD PRA.

Indications of temperature and water level are provided to detect unfavorable events that occur during shutdown. Indications are listed below.

- Indications of temperature

Two types of instruments are provided in US-APWR design to measure RV temperature. The first one is core exit thermocouples located inside the RV. The second is resistance temperature detectors in the reactor coolant hot leg. In the event of loss of RHR flow, the core exit thermocouples can continue to measure RV temperature.~~As for inaccurate hot leg temperature measurement after loss of decay heat removal, reactor coolant hot leg temperature instruments are located in the flow path during RHR operation, so this parameter can be accurately indicated.~~

- Indications of water

Three types of instruments are provided in US-APWR design to measure RCS water level for shutdown. The first one is narrow range water level instrument, the second one is mid range water level and the third one is wide range water level. Narrow range and mid range water level instruments that refer pressure at the bottom of cross over leg and pressurizer gas phase are provided to measure RCS water level during midloop operation.

In addition to the narrow range and middle range mid-loop water level sensors, a temporary water level sensor that refer pressure at the bottom of cross over leg and reactor vessel top vent is provided when the reactor coolant system (RCS) is vented at a high elevation. This sensor will satisfy the following specifications.

- Water level can be read outside the containment vessel (CV) in order to be effective during events which involve harsh environment in the CV
- Tygon tubing monometer will not be used
- Instrumentation piping diameter will be sufficient enough to prevent delay in response

Freeze plug may not be used for US-APWR because the isolation valves are installed considering maintenance and CCWS has been separated individual trains. Therefore, the freeze plug failure is excluded from the potential initiator.

The methods for data analysis and common cause analysis are the same as for Level 1 internal events PRA at power. The details of data analysis and CCF analysis are given in Subsection 19.1.4.1.1.

materials fall into the sump because the debris interceptor is installed on the sump of US-APWR. (see Chapter 6, Subsection 6.2.2) Therefore, potential plugging of the suction strainers due to debris is excluded from the PRA modeling.

i. During plant shutdown, the operability of I&C systems used for mitigation functions such as RHR, charging injection, RWSAT replenishment by refueling water recirculation pump are frequently checked through maintenance activities and evolution of plant operating states. Local I&C equipments of these components as well as the safety logic system can be checked and the I&C hardware are considered to be reliable during plant shutdown. Local I&C equipments of the safety injection pumps, which is a mitigation function during plant shutdown, may not be operated or tested during plant shutdown. However, the DAS can be used to initiated safety injection when the I&C systems have failed, and therefore, signals to actuate safety injection pumps are also reliable. Manual operation of the safety injection pumps through the DAS is available during plant shutdown.

j. Restoration of I&C equipments can be performed within a short period of time by exchanging the faulted card.

19.1.6.2 Results from the Low-Power and Shutdown Operations PRA

Table 19.1-86 shows a summary of system unavailability of frontline systems. Table 19.1-87 shows a summary of system unavailability of support systems. LPSD initiating event frequencies are shown in Table 19.1-88.

Detailed accident sequence quantification was performed only for POS 8-1 and the results are shown in Table 19.1-89. The LPSD CDF for POS 8-1 is 6.0E-08/RY. The dominant accident sequences for POS 8-1 are given in Table 19.1-90. The top 50 component level failure combinations (cutsets) associated with these sequences is shown in Table 19.1-91.

The top seven accident sequences contribute 92 percent toward the Level 1 LPSD CDF in POS 8-1. These dominant sequences are as follows:

- LOOP initiating event, with success of the power supplying by the class 1E gas turbine generators and failure of mitigation systems such as RHRS, which contributes 27 percent of the CDF
- LOCA initiating event, with success of isolation and failures of RCS injection, which contributes 27 percent of the CDF
- LOCS initiating event, with failure of injection to RCS using alternate component cooling, which contributes 12 percent of the CDF
- LOOP initiating event, with failure of the power supplying by all of ac power, which contributes 9.5 percent of the CDF

Table 19.1-119 Key Insights and Assumptions (Sheet 5 of 2324)

Key Insights and Assumptions	Dispositions
- The motor-operated EFW isolation valves and EFW control valves are provided in each EFW pump discharge line to close automatically to terminate the flow to the affected SG.	10.4.9.2
- The common suction line from each EFW pit is connected by a tie line with two normally closed manual valves. When the two EFW pumps taking suction from the same pit are not available (OLM of one EFW pump and the single failure of other EFW pump), the tie line connections to EFW pits need to be established.	10.4.9.2
- The demineralized water storage tank provides a backup source for EFWS. The manual valves from the demineralized water storage tank to the EFW pumps are normally closed.	
- To cope with common cause failure of EFW pit water level sensors, a non-safety water level sensor diverse from the safety related water level sensors are installed in each EFW pit. Low water level in the EFW pit can be detected by these non-safety sensors. Accordingly, the operator can recognize the low water level in the EFW pit during EFW pump operation with high reliability.	
10. Reactor Coolant System High Point Vents	
- Safety depressurization valves (SDVs) are provided at top head of the pressurizer in order to cool the reactor core by feed and bleed operation when loss of heat removal from steam generator occurs.	5.4.12.2
- RCS depressurization system dedicated for severe accident is provided to prevent high pressure melt ejection. The location of release point from the valve is in containment dome area.	5.4.12.2
11. Main Steam Supply System MSIVs are installed in each of the main steam lines to (1) limit uncontrolled steam release from one steam generator in the event of a steam line break, and to (2) isolate the faulted SG in the event of SGTR.	10.3
12. Component Cooling Water System	
- The CCWS consists of two independent subsystems. One subsystem consists of trains A & B, and the other subsystem consists of trains C & D, for a total of four trains.	9.2.2.2
- The CCWS is designed to withstand leakage in one train without loss of the system's safety function.	9.2.2.1.1

Tier 1

US-APWR DCD Tier1 Section 2.2 Revision 2 to Revision 3 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	Description of Change
2.2-6	2.2.2.2, second paragraph	Replaced “into four areas” with “into two areas” in the first sentence. RAI 488, 14.03.11-40
2.2-6	2.2.2.2, third paragraph	Deleted the following sentence from the paragraph: The two trains of four emergency feedwater pump rooms are isolated by concrete walls and water tight doors. RAI 488, 14.03.11-40

US-APWR DCD Tier1 Section 2.3 Revision 2 to Revision 3 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ item, table with column/row, or figure)	Description of Change
2.3-8	Table 2.3-2, ITAAC #1.b	Replaced Class 1 piping systems with Class 1 PSC in the DC, ITA, and AC column text. RAI 499, 14.03.03-23
2.3-8	Table 2.3-2, ITAAC #3	Deleted “risk-significant” from ITA and AC column text. Deleted ITAAC #3.ii and renumbered from “3.i” to “3” in the ITA and AC column text. RAI 499, 14.03.03-23
2.3-9	Table 2.3-2, ITAAC #4	Replaced with the design ITAAC of pipe break hazard analysis. RAI 459, 03.06.02-39
2.3-9	Table 2.3-2, ITAAC #5	Added new ITAAC to perform the reconciliation analysis of the high energy piping. RAI 459, 03.06.02-39

US-APWR DCD Tier1 Section 2.4 Revision 2 to Revision 3 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
2.4-104	Table 2.4.7-1, ITAAC #1.iv	Replaced "reference to Subsection 2.7.6.6" with "description of test and/or analysis of the containment radiation particulate monitor" in the ITA and AC column text. RAI 478, 05.02.05-11
2.4-104	Table 2.4.7-1, ITAAC #2	Deleted the line of ITAAC #2. RAI 478, 05.02.05-11

US-APWR DCD Tier1 Section 2.7 Revision 2 to Revision 3 Change List

Page	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	Description of Change
2.7-83	Table 2.7.1.11-5, ITAAC #12	Replaced ".. to the any of the two SGs .." with ".. to any two of the four SGs" in the AC column text. RAI 503, 14.03.04-42

US-APWR DCD Tier1 Section 2.8 Revision 2 to Revision 3 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/ item, table with column/row, or figure)	Description of Change
2.8-2	Table 2.8-1, ITAAC #1.a	Deleted the reference to Table 2.2-4 ITAAC item 1 in the ITA and AC column text. Changed to “concrete wall and floor thicknesses” in the AC column text. RAI 508, 14.03.07-50
2.8-2	Table 2.8-1, ITAAC #2	Changed to “concrete wall and floor thicknesses” in the AC column text. RAI 508, 14.03.07-50

US-APWR DCD Tier1 Section 2.11 Revision 2 to Revision 3 Change List

Page	**Location** (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	Description of Change
2.11-14	Table 2.11.2-1	Changed the instruments tag numbers “PT-2390” and “PT-2391” to “PT-371” and “PT-372” to be consistent with Tier 1 Figure 2.11.2-1. RAI 488, 14.03.11-42

2.2.2 Protection Against Hazards

2.2.2.1 External Flooding

Protection against external flooding is provided to preserve the safe shutdown capability. The main components protected against external flooding are listed in Table 2.2-3. The external walls that are below flood level are adequate thickness to protect against water seepage, and penetrations in the external walls below flood level are provided with flood protection features. Construction joints in the exterior walls and base mats are provided with water stops to prevent seepage of ground water. Additional protection is provided using a waterproofing system applied to below-grade surfaces.

2.2.2.2 Internal Flooding

Protection against internal flooding is provided to preserve the safe shutdown capability. The main components protected against internal flooding are listed in Table 2.2-3.

Elevation -26 ft, 4 in. in radiological controlled area (RCA) of the R/B is divided into two~~four~~ areas, by concrete walls and water-tight doors. A water-tight door is provided in each CS/RHR pump room and SIS pump room. And also water-tight doors are provided in doorways between A/B and R/B.

Elevation -26 ft, 4 in. in the non-radiological controlled area (NRCA) of the R/B is divided into two areas by concrete walls and water-tight doors installed in the corridor. ~~The two trains of four emergency feedwater pump rooms are isolated by concrete walls and water-tight doors.~~ Water-tight doors are provided in doorways at ground level between the T/B and the R/B.

2.2.2.3 Fire Barriers

Redundant safe shutdown components and associated electrical divisions outside the containment and the control room complex are separated by 3-hour rated fire barriers to preserve the capability to safely shut down the plant following a fire. The main components protected against fires are listed in Table 2.2-3. The 3-hour rated fire barriers are placed as required by the fire hazard analysis (FHA). All penetrations and openings through the fire barriers are protected with 3-hour rated components (i.e. fire doors in door openings, fire dampers in ventilation duct openings, and penetration seals).

2.2.2.4 Site Parameters

Section 2.1 contains specific site parameter requirements necessary to meet the engineering and design needs for construction and operation of the US-APWR standard plant. Site bounding parameters, and subsequent engineering design, are chosen to allow construction of the US-APWR within 75% to 80% of the landmass of the conterminous U.S. and includes all possible sites under current consideration. The design of the US-APWR standard plant and the site parameters are robust to meet most conditions expected to be encountered in all possible sites.

Table 2.3-2 Piping Systems and Components Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 1 of 2)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a The ASME Code Section III, Class 1 piping systems and components (PSC) are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads.	1.a An inspection of the stress report for the ASME Code, Section III, Class 1 PSC will be performed.	1.a The stress report(s) exist and conclude that the design of the ASME Code Section III Class 1 PSC comply with the requirements of the ASME Code Section III.
1.b The usage factors for ASME Code Section III Class 1 ~~piping systems~~PSC are evaluated for both air and reactor coolant environments.	1.b An analysis of the ASME Code, Section III, Class 1 ~~piping systems~~PSC will be performed.	1.b Report(s) exist and conclude that the usage factors for ASME Code Section III Class 1 ~~piping systems~~PSC are evaluated for air and reactor coolant environments.
2. RCPB and MSS piping systems are designed in accordance with the LBB method.	2. A LBB analysis using the LBB method will be performed for each RCPB and MSS piping system.	2. The results of the LBB analysis conclude that the stress values conform to the LBB acceptance criteria using the LBB assumptions.
3. The ASME Code Section III, Class 2 and 3 piping systems and components (PSC) are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads.	3.~~i~~ An inspection of the stress report for the ~~risk-significant~~ ASME Code, Section III, Class 2 and 3 PSC will be performed.	3.~~i~~ The stress report(s) exist and conclude that the design of the ~~risk-significant~~ ASME Code Section III Class 2 and 3 PSC comply with the requirements of ASME Code Section III.
	~~3.ii An inspection of the stress report for low risk ASME Code Section III, Class 2 and 3 PSC will be performed.~~	~~3.ii The stress report(s) exist and conclude that the design of low risk ASME Code Section III Class 2 and 3 PSC comply with the requirements of ASME Code Section III.~~

Table 2.3-2 Piping Systems and Components Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 2)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. Safety-related SSCs are protected against or qualified to withstand the dynamic and environmental effects associated with analyses of postulated failures in high-energy piping and moderate-energy piping systems.~~Safety-related SSCs have adequate high-energy pipe break mitigation features.~~	4.i Dynamic effect analysis will be performed for the high-energy piping system. The analysis includes the evaluation of pipe whip and jet impingement.~~A pipe break analysis of the as-built high-energy line will be performed.~~	4.i Report(s) exist and conclude that~~The reconciliation of the as-built configuration of high-energy pipe lines concludes that,~~ for each postulated piping failure, the reactor can be shut down safely and maintained in a safe, cold shutdown condition without offsite power. ~~For postulated pipe breaks, the~~ The report confirms whether (A) piping stresses in the containment penetration area are within allowable stress limits, (B) pipe whip restraints and jet shield designs can mitigate pipe break loads, and (C) loads on safety-related SSCs are within design load limits~~and (D) SSCs are protected or qualified to withstand the environmental effects of postulated failures~~.
	4.ii Environmental effect analysis will be performed for the high-energy piping and moderate-energy piping systems. The analysis includes the evaluation for spray wetting, flooding, environmental conditions, as appropriate.	4.ii Report(s) exist and conclude that for each postulated piping failure, the reactor can be shut down safely and maintained in a safe, cold shutdown condition without offsite power. The report confirms whether SSCs are protected or qualified to withstand the environmental effects of postulated failures.
5. Safety-related SSCs are reconciled with the as-designed high-energy pipe break mitigation features.	5. A reconciliation analysis of the as-built high-energy piping using as-designed pipe break hazard analysis report and as-built information will be performed.	5. Report(s) exist and conclude that the high-energy pipe break mitigation features are installed in the as-built plant as described in the design and reconciliation analysis.

Table 2.4.7-1 Reactor Coolant Pressure Boundary Leakage Detection System Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Reactor coolant pressure boundary leakage detection methods provide the nonsafety-related function of detecting leaks from the reactor coolant system.	1.i Inspection will be performed for retrievability of the displays of the following channels in the MCR. ・Containment sump level channels LMS-LT-093A,B ・Standpipe level channel LMS-LT-092	1.i Nonsafety-related displays of the following channels can be retrieved in the MCR. ・Containment sump level channels LMS-LT-093A,B ・Standpipe level channel LMS-LT-092
	1.ii Testing will be performed by adding water to the sump and observing display of sump level.	1.ii A report exists and concludes sump level channels LMS-LT-093A,B can detect level change due to adding water, which corresponds to required sensitivity, response time and set point.
	1.iii Testing will be performed by adding water to the standpipe and observing display of standpipe level.	1.iii A report exists and concludes standpipe level channel LMS-LT-092 can detect level change due to adding water, which corresponds to required sensitivity, response time and set point.
	1.iv Tests and/or analyses of the containment radiation particulate monitor RMS-RE-040 will be performed.See Tier1 Material sections: Section 2.7.6.6 for the containment radiation particulate monitor RMS-RE-040	1.iv A report exists and concludes containment radiation particulate monitor RMS-RE-040 can detect radiation level, which corresponds to required sensitivity, response time and set point.See Tier1 Material sections: Section 2.7.6.6 for the containment radiation particulate monitor RMS-RE-040
2. The functional arrangement of the reactor coolant pressure boundary leakage detection monitors is as described in Subsection 2.7.6.6 Design Description.	2. An inspection of the as-built RCPB leakage detection monitors will be performed.	2. The as-built RCPB leakage detection monitors conform to the functional arrangement as described in the Design Description of this Subsection 2.7.6.6.

Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 6 of 7)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9.a The motor-operated valves and check valves, identified in Table 2.7.1.11-2, perform an active safety function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valve changes position as indicated in Table 2.7.1.11-2 under design conditions.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii Each as-built motor-operated valve changes position as indicated in Table 2.7.1.11-2 under pre-operational test conditions.
	9.a.iii Tests of the as-built check valves with active safety functions identified in Table 2.7.1.2-2 will be performed under pre-operational test pressure, temperature, and fluid flow conditions.	9.a.iii Each as-built check valve changes position as indicated in Table 2.7.1.11-2.
9.b After loss of motive power, the remotely operated valves, identified in Table 2.7.1.11-2, assume the indicated loss of motive power position.	9.b. Tests of the as-built valves will be performed under the conditions of loss of motive power.	9.b Upon loss of motive power, each as-built remotely operated valve identified in Table 2.7.1.11-2 assumes the indicated loss of motive power position.
10. MCR alarms and displays of the parameters identified in Table 2.7.1.11-4 can be retrieved in the MCR.	10. Inspections will be performed for retrievability of the EFWS parameters in the as-built MCR.	10. MCR alarms and displays identified in Table 2.7.1.11-4 can be retrieved in the as-built MCR.
11. RSC alarms, displays and controls are identified in Table 2.7.1.11-4.	11. Inspections of the as-built RSC alarms, displays and controls will be performed.	11. Alarms, displays and controls exist on the as-built RSC as identified in Table 2.7.1.11-4.
12. Each EFW pump delivers at least the minimum flow required for removal of core decay heat using the SGs against a SG pressure up to the set pressure of the first stage of main steam safety valve plus 3 percent.	12 A test of each as-built EFW pump will be performed to determine system flow vs. SG pressure under preoperational condition. Analyses will be performed to convert the test results to the design conditions.	12 From the result of analyses, any two of the as-built EFW pumps deliver at least 705 gpm to ~~the~~ any two of the fourtwo SGs against a SG pressure up to the set pressure of the first stage of main steam safety valve plus 3 percent.
13. Each EFW pit has a volume to permit plant cooldown from hot standby to hot shutdown condition (residual heat removal system initiation temperature) following the most limiting design basis event.	13. Inspections will be performed to verify the as-built EFW pits include sufficient volume of water.	13. The water volume of the each as-built EFW pit is greater than or equal to 204,850 gallons.

Table 2.8-1 Radiation Protection
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a Shielding walls and floors listed in Table 2.2-2 are provided to maintain the maximum radiation levels specified in Table 2.8-2.	1.a Inspections of the as-built shielding walls and floors thicknesses will be performed. ~~Refer to Table 2.2-4 ITAAC Item 1.~~	1.a The as-built shielding walls and floors listed in Table 2.2-2 are consistent with the designed concrete wall and floor thicknesses. ~~Refer to Table 2.2-4 ITAAC Item 1.~~
1.b Shielding walls and floors in the auxiliary building are provided to maintain the maximum radiation levels specified in Table 2.8-2.	1.b Inspections of the as-built shielding walls and floors thicknesses will be performed.	1.b The as-built shielding walls and floors in the auxiliary building are consistent with the designed concrete wall and floor thicknesses.
2. Area radiation and airborne radioactivity monitoring systems are provided to monitor radioactivity concentrations.	2. Refer to Table 2.7.6.13-3.	2. Refer to Table 2.7.6.13-3.
3. Ventilation flow for the radioactive controlled area is provided to control the concentrations of airborne radioactivity specified in 10 CFR 20 Appendix B.	3. Tests of the as-built containment purge system and auxiliary building HVAC system will be performed.	3. The as-built containment purge system and auxiliary building HVAC provide ventilation flow to control the concentrations of airborne radioactivity specified in 10 CFR 20 Appendix B.

Table 2.8-2 Radiation Zone Designations

Zone	Dose Rate
I	≤0.25 mrem/h
II	≤1.0 mrem/h
III	≤2.5 mrem/h
IV	≤15.0 mrem/h
V	≤100.0 mrem/h
VI	≤1.0 rem/h
VII	≤10.0 rem/h
VIII	≤100.0 rem/h
IX	≤500.0 rad/h
X	>500.0 rad/h

Table 2.11.2-1 Containment Isolation System Equipment Characteristics (Sheet 4 of 10)

System Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/ Qual. For Harsh Envir.	Safety-Related Display	PSMS Control	Active Safety Function	Loss of Motive Power Position
CVVS	VCS-AOV-307	2	Yes	Yes	Yes/No	Yes	Containment Purge Isolation	Transfer Closed	Closed
CVVS	VCS-AOV-305	2	Yes	Yes	Yes/Yes	Yes	Containment Purge Isolation	Transfer Closed	Closed
CVVS	VCS-AOV-304	2	Yes	Yes	Yes/No	Yes	Containment Purge Isolation	Transfer Closed	Closed
CVVS	VCS-AOV-356	2	Yes	Yes	Yes/Yes	Yes	Containment Purge Isolation	Transfer Closed	Closed
CVVS	VCS-AOV-357	2	Yes	Yes	Yes/No	Yes	Containment Purge Isolation	Transfer Closed	Closed
CVVS	VCS-AOV-355	2	Yes	Yes	Yes/Yes	Yes	Containment Purge Isolation	Transfer Closed	Closed
CVVS	VCS-AOV-354	2	Yes	Yes	Yes/No	Yes	Containment Purge Isolation	Transfer Closed	Closed
CVVS~~CWS~~	VCS-PT-371~~2390~~,372~~2391~~	-	Yes	-	No/No	No	-	-	-
VWS	VWS-MOV-407	2	Yes	Yes	Yes/No	Yes	Containment Isolation Phase A	Transfer Closed	As Is