Table 3.3.2-15
Auxiliary Systems –
Emergency Diesel Generators—Lube Oil System –
Summary of Aging Management Evaluation

Table 3.3.2-15 : Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
3	Filter housing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
4	Filter housing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
5	Filter housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
6	Flexible hose	Pressure boundary	Elastomers	Lubricating oil	None	None	N/A	N/A	G
7	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Hardening and loss of strength	External Surfaces Monitoring (B.2.15)	VII.F4-6 (A-17)	3.3.1-11	E
9	Flexible hose	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-17 (AP-59)	3.3.1-33	A
10	Flexible hose	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-17 (AP-59)	3.3.1-33	A
11	Flexible hose	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
12	Heat exchanger (channel)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
13	Heat exchanger (channel)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A
14	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	N/A	N/A	G
15	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	N/A	N/A	G
16	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	G

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	G
18	Heat exchanger (shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
19	Heat exchanger (shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A
20	Heat exchanger (shell)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A
21	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
22	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
23	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-2 (AP-80)	3.3.1-52	A

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
24	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	H
25	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	H
26	Heat exchanger (tube/core and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
27	Heat exchanger (tube/core and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
28	Heat exchanger (tube/core and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-2 (AP-80)	3.3.1-52	A
29	Heat exchanger (tube/core and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	H

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
30	Heat exchanger (tube/core and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	H
31	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
32	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
33	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	C
34	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	C
35	Heater housing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
36	Heater housing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A
37	Heater housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
38	Orifice	Pressure boundary and Flow restriction	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
39	Orifice	Pressure boundary and Flow restriction	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
40	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
41	Piping	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	A
42	Piping	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	A
43	Piping	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
44	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
45	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
46	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
47	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
48	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
49	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
50	Pump casing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
51	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled	None	None	VII.J-8 (AP-14)	3.3.1-93	A, 304

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
52	Sight glass	Pressure boundary	Glass	Lubricating oil	None	None	VII.J-10 (AP-15)	3.3.1-93	A
53	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
54	Strainer body	Pressure boundary	Aluminum	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	N/A	N/A	G
55	Strainer body	Pressure boundary	Aluminum	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	N/A	N/A	G
56	Strainer body	Pressure boundary	Aluminum	Air - indoor uncontrolled-EXT	None	None	VII.J-1 (AP-36)	3.3.1-95	A
57	Strainer body	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
58	Strainer body	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
59	Strainer body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
60	Strainer body	Pressure boundary	Steel	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
61	Strainer body	Pressure boundary	Steel	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
62	Strainer element	Filtration	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-17 (AP-59)	3.3.1-33	A
63	Strainer element	Filtration	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-17 (AP-59)	3.3.1-33	A
64	Tank	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
65	Tank	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
66	Tank	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
67	Tank	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
68	Tubing	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	A

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
69	Tubing	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	A
70	Tubing	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
71	Tubing	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-17 (AP-59)	3.3.1-33	A
72	Tubing	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-17 (AP-59)	3.3.1-33	A
73	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
74	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
75	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	A
76	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	A

Table 3.3.2-15 (continued): Emergency Diesel Generators—Lube Oil System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
77	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
78	Valve body	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-17 (AP-59)	3.3.1-33	A
79	Valve body	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-17 (AP-59)	3.3.1-33	A
80	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
81	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
82	Valve body	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
83	Valve body	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
84	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-16
Auxiliary Systems –
Emergency Diesel Generators—Water Cooling System –
Summary of Aging Management Evaluation

Table 3.3.2-16 : Emergency Diesel Generators—Water Cooling System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
3	Flexible hose	Pressure boundary	Elastomers	Closed cycle cooling water	None	None	N/A	N/A	G
4	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
5	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Hardening and loss of strength	External Surfaces Monitoring (B.2.15)	VII.F4-6 (A-17)	3.3.1-11	E
6	Flexible hose	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Flexible hose	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
8	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-8 (A-50)	3.3.1-85	D
9	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
10	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A
11	Heat exchanger (channel)	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-5 (A-64)	3.3.1-77	A
12	Heat exchanger (channel)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A
13	Heat exchanger (shell)	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
14	Heat exchanger (shell)	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Heat exchanger (shell)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A
16	Heat exchanger (shell)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
17	Heat exchanger (shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A
18	Heat exchanger (shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
19	Heat exchanger (shell)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A
20	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-3 (A-65)	3.3.1-82	A
21	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Raw water	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.32)	VII.C1-6 (A-72)	3.3.1-83	A

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
22	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
23	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Closed cycle cooling water-EXT	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-2 (AP-80)	3.3.1-52	A
24	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
25	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
26	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-2 (AP-80)	3.3.1-52	A
27	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	H

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	H
29	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.H2-18 (AP-55)	3.3.1-80	C
30	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.32)	VII.H2-6 (AP-61)	3.3.1-83	A
31	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
32	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-3 (AP-63)	3.3.1-52	A
33	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-3 (A-65)	3.3.1-82	A

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
34	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-4 (A-66)	3.3.1-84	B
35	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
36	Heat exchanger (tubesheet)	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
37	Heater housing	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
38	Heater housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-58	A
39	Orifice	Pressure boundary and Flow restriction	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
40	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
41	Piping	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
42	Piping	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-8 (AP-12)	3.3.1-51	A
43	Piping	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	B
44	Piping	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
45	Piping	Pressure Boundary	Polymer	Closed cycle cooling water	None	None	N/A	N/A	F
46	Piping	Pressure Boundary	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	F
47	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
48	Piping	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
49	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
50	Pump casing	Pressure boundary	Cast austenitic stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
51	Pump casing	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
52	Pump casing	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
53	Pump casing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
54	Sight glass	Pressure boundary	Polymer	Air - indoor uncontrolled	None	None	N/A	N/A	F

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
55	Sight glass	Pressure boundary	Polymer	Closed cycle cooling water	None	None	N/A	N/A	F
56	Sight glass	Pressure boundary	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	F
57	Tank	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
58	Tank	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
59	Tank	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
60	Tubing	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-8 (AP-12)	3.3.1-51	A
61	Tubing	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	B

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Tubing	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
63	Tubing	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
64	Tubing	Pressure boundary	Stainless steel	Closed cycle cooling water >60°C (>140°F)	Cracking	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-11 (AP-60)	3.3.1-46	A
65	Tubing	Pressure boundary	Stainless steel	Closed cycle cooling water >60°C (>140°F)	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
66	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
67	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
68	Valve body	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-8 (AP-12)	3.3.1-51	A

Table 3.3.2-16 (continued): Emergency Diesel Generators—Water Cooling System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
69	Valve body	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	B
70	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
71	Valve body	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
72	Valve body	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-8 (A-50)	3.3.1-85	B
73	Valve body	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
74	Valve body	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
75	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-17
Auxiliary Systems –
Emergency Response Facility Substation System (Common) –
Summary of Aging Management Evaluation

Table 3.3.2-17 : Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
2	Bolting	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-1 (AP-28)	3.3.1-43	A
3	Expansion joint	Pressure boundary	Elastomers	Air - indoor uncontrolled	Cracking	External Surfaces Monitoring (B.2.15)	VII.F4-6 (A-17)	3.3.1-11	H, 303
4	Expansion joint	Pressure boundary	Elastomers	Air - indoor uncontrolled	Hardening and loss of strength	External Surfaces Monitoring (B.2.15)	VII.F4-6 (A-17)	3.3.1-11	E, 303
5	Expansion joint	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
6	Expansion joint	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Hardening and loss of strength	External Surfaces Monitoring (B.2.15)	VII.F4-6 (A-17)	3.3.1-11	E

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Expansion joint	Pressure boundary	Stainless steel	Closed cycle cooling water >60°C (>140°F)	Cracking	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-11 (AP-60)	3.3.1-46	A
8	Expansion joint	Pressure boundary	Stainless steel	Closed cycle cooling water >60°C (>140°F)	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
9	Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-1 (AP-33)	3.3.1-06	E
10	Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H
11	Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Expansion joint	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
13	Expansion joint	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
14	Expansion joint	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
15	Expansion joint	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
16	Expansion joint	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
17	Expansion joint	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
18	Filter housing	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
19	Filter housing	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
20	Filter housing	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
21	Filter housing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
22	Filter housing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
23	Filter housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
24	Filter housing	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
25	Flexible hose	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
26	Flexible hose	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
27	Flexible hose	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
28	Flexible hose	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
29	Flexible hose	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
30	Heat exchanger (channel)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
31	Heat exchanger (channel)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
32	Heat exchanger (fin)	Heat transfer	Aluminum	Air - outdoor-EXT	Reduction of heat transfer	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
33	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	N/A	N/A	G
34	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	N/A	N/A	G
35	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	G

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
36	Heat exchanger (fin)	Heat transfer	Aluminum	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	G
37	Heat exchanger (header)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
38	Heat exchanger (header)	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-4 (AP-40)	3.3.1-58	A
39	Heat exchanger (shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
40	Heat exchanger (shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A
41	Heat exchanger (shell)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
42	Heat exchanger (tube and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
43	Heat exchanger (tube and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
44	Heat exchanger (tube and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-2 (AP-80)	3.3.1-52	A
45	Heat exchanger (tube and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	C
46	Heat exchanger (tube and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	C
47	Heat exchanger (tube and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	H
48	Heat exchanger (tube and tubesheet)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	H
49	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
50	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
51	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-2 (AP-80)	3.3.1-52	A
52	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Air - outdoor-EXT	Reduction of heat transfer	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
53	Heater housing	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
54	Heater housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
55	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
56	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	A
57	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
58	Orifice	Pressure boundary and Flow restriction	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
59	Orifice	Pressure boundary and Flow restriction	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
60	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
61	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
62	Piping	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
63	Piping	Pressure boundary	Steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H
64	Piping	Pressure boundary	Steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
65	Piping	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
66	Piping	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
67	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
68	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
69	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
70	Piping	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
71	Piping	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.H1-9 (A-01)	3.3.1-19	A
72	Piping (fitting)	Pressure boundary	Stainless steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-6 (AP-54)	3.3.1-32	B
73	Piping (fitting)	Pressure boundary	Stainless steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-6 (AP-54)	3.3.1-32	A
74	Piping (fitting)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
75	Piping (geoFlex fuel oil lines)	Pressure boundary	Polymer	Fuel oil	None	None	N/A	N/A	F
76	Piping (geoFlex fuel oil lines)	Pressure boundary	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	F

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
77	Piping (geoFlex fuel oil lines)	Pressure boundary	Polymer	Soil-EXT	None	None	N/A	N/A	F
78	Pump casing	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
79	Pump casing	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
80	Pump casing	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
81	Pump casing	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
82	Pump casing	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
83	Pump casing	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
84	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
85	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
86	Pump casing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
87	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled	None	None	VII.J-8 (AP-14)	3.3.1-93	A, 304
88	Sight glass	Pressure boundary	Glass	Closed cycle cooling water	None	None	N/A	N/A	G
89	Sight glass	Pressure boundary	Glass	Lubricating oil	None	None	VII.J-10 (AP-15)	3.3.1-93	A
90	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
91	Silencer	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
92	Silencer	Pressure boundary	Steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
93	Silencer	Pressure boundary	Steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
94	Silencer	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
95	Silencer	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
96	Strainer body	Pressure boundary	Aluminum	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	N/A	N/A	G
97	Strainer body	Pressure boundary	Aluminum	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	N/A	N/A	G
98	Strainer body	Pressure boundary	Aluminum	Air - indoor uncontrolled-EXT	None	None	VII.J-1 (AP-36)	3.3.1-95	A
99	Strainer body	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
100	Strainer body	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
101	Strainer body	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
102	Strainer body	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
103	Strainer body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
104	Strainer element	Filtration	Stainless steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-6 (AP-54)	3.3.1-32	B
105	Strainer element	Filtration	Stainless steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-6 (AP-54)	3.3.1-32	A
106	Strainer element	Filtration	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-17 (AP-59)	3.3.1-33	A
107	Strainer element	Filtration	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-17 (AP-59)	3.3.1-33	A
108	Tank	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
109	Tank	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
110	Tank	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
111	Tank	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
112	Tank	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
113	Tank (fiberglass)	Pressure boundary	Glass	Air - indoor uncontrolled	None	None	VII.J-8 (AP-14)	3.3.1-93	A, 304
114	Tank (fiberglass)	Pressure boundary	Glass	Fuel oil	None	None	VII.J-9 (AP-49)	3.3.1-93	A
115	Tank (fiberglass)	Pressure boundary	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
116	Tubing	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
117	Tubing	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
118	Tubing	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
119	Tubing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
120	Tubing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
121	Tubing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
122	Turbocharger housing	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
123	Turbocharger housing	Pressure boundary	Steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H
124	Turbocharger housing	Pressure boundary	Steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
125	Turbocharger housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
126	Valve body	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-8 (AP-12)	3.3.1-51	A
127	Valve body	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	B
128	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	Fuel Oil Chemistry (B.2.20)	N/A	N/A	H
129	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	One-Time Inspection (B.2.30)	N/A	N/A	H
130	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-3 (AP-44)	3.3.1-32	A
131	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-3 (AP-44)	3.3.1-32	B

Table 3.3.2-17 (continued): Emergency Response Facility Substation System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
132	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	A
133	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	A
134	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
135	Valve body	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
136	Valve body	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
137	Valve body	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
138	Valve body	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
139	Valve body	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
140	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-18
Auxiliary Systems –
Fire Protection System –
Summary of Aging Management Evaluation

Table 3.3.2-18 : Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
2	Bolting	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
3	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-1 (AP-28)	3.3.1-43	A
5	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
6	Bolting	Pressure boundary	Steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.D-1 (A-103)	3.3.1-44	A
7	Bolting	Pressure boundary	Steel	Raw water-EXT	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	C

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.G-25 (A-01)	3.3.1-19	C
9	Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-1 (AP-33)	3.3.1-06	E
10	Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H
11	Expansion joint	Pressure boundary	Stainless steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
12	Expansion joint	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
13	Flame arrestor (RCP oil collection)	Flame suppressio n	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
14	Flame arrestor (RCP oil collection)	Flame suppression	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
15	Flame arrestor (RCP oil collection)	Flame suppression	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
16	Flexible hose (halon)	Pressure boundary	Polymer	Gas	None	None	N/A	N/A	G
17	Flexible hose (halon)	Pressure boundary	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	G
18	Flexible hose (pump oil cooler)	Pressure boundary	Stainless steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-19 (A-55)	3.3.1-69	A
19	Flexible hose (pump oil cooler)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
20	Flexible hose (RCP oil collection)	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.G-18 (AP-59)	3.3.1-33	A
21	Flexible hose (RCP oil collection)	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.G-18 (AP-59)	3.3.1-33	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
22	Flexible hose (RCP oil collection)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
23	Flexible hose (RCP oil collection)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
24	Heat exchanger (jacket water - channel)	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	C
25	Heat exchanger (jacket water - channel)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.G-5 (AP-41)	3.3.1-59	A
26	Heat exchanger (jacket water - shell)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.A3-3 (A-63)	3.3.1-48	A
27	Heat exchanger (jacket water - shell)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.G-5 (AP-41)	3.3.1-59	A
28	Heat exchanger (jacket water - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-12 (A-45)	3.3.1-70	C

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Heat exchanger (jacket water - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-4 (A-66)	3.3.1-84	B
30	Heat exchanger (jacket water - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Raw water	Reduction of heat transfer	Fire Water System (B.2.17)	VII.C1-6 (A-72)	3.3.1-83	E, 318
31	Heat exchanger (jacket water - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
32	Heat exchanger (jacket water - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.E1-2 (AP-34)	3.3.1-51	A
33	Heat exchanger (jacket water - tubesheet)	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	C
34	Heat exchanger (jacket water - tubesheet)	Pressure boundary	Steel	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.A3-3 (A-63)	3.3.1-48	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Heat exchanger (oil cooler - housing)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.G-11 (AP-47)	3.3.1-26	C
36	Heat exchanger (oil cooler - housing)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.G-11 (AP-47)	3.3.1-26	C
37	Heat exchanger (oil cooler - housing)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
38	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-12 (A-45)	3.3.1-70	C
39	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-4 (A-66)	3.3.1-84	B
40	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Raw water	Reduction of heat transfer	Fire Water System (B.2.17)	VII.C1-6 (A-72)	3.3.1-83	E, 318

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
41	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.G-11 (AP-47)	3.3.1-26	C
42	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VII.G-11 (AP-47)	3.3.1-26	C
43	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	H
44	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	H
45	Hose rack (CO_2)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Hose rack (CO_2)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-8 (A-77)	3.3.1-58	E, 319
47	Hose rack (water)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
48	Hose rack (water)	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-12 (A-45)	3.3.1-70	A
49	Hose rack (water)	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-13 (A-47)	3.3.1-84	B
50	Hose rack (water)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
51	Hose rack (water)	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
52	Nozzle (CO_2)	Direct flow	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
53	Nozzle (CO_2)	Direct flow	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
54	Nozzle (halon)	Direct flow	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
55	Nozzle (halon)	Direct flow	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
56	Nozzle (water)	Direct flow	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
57	Nozzle (water)	Direct flow	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
58	Nozzle (water)	Direct flow	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
59	Orifice	Pressure boundary and Flow restriction	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
60	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
61	Orifice	Pressure boundary and Flow restriction	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
62	Piping	Leakage boundary (spatial)	Copper alloy <15% Zn	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-12 (A-45)	3.3.1-70	A
63	Piping	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
64	Piping	Leakage boundary (spatial)	Steel	Fuel oil	Loss of material	Fire Protection (B.2.16)	VII.G-21 (A-28)	3.3.1-64	B
65	Piping	Leakage boundary (spatial)	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.G-21 (A-28)	3.3.1-64	B
66	Piping	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
67	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
68	Piping	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
69	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
70	Piping	Pressure boundary	Steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H
71	Piping	Pressure boundary	Steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
72	Piping	Pressure boundary	Steel	Dried air	None	None	VII.J-22 (AP-4)	3.3.1-98	A
73	Piping	Pressure boundary	Steel	Fuel oil	Loss of material	Fire Protection (B.2.16)	VII.G-21 (A-28)	3.3.1-64	B
74	Piping	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.G-21 (A-28)	3.3.1-64	B

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
75	Piping	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
76	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
77	Piping	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
78	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
79	Piping (buried)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
80	Piping (buried)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-14 (A-51)	3.3.1-85	B
81	Piping (buried)	Pressure boundary	Gray cast iron	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.G-25 (A-01)	3.3.1-19	A
82	Piping (buried)	Pressure boundary	Gray cast iron	Soil-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-15 (A-02)	3.3.1-85	B
83	Piping (buried)	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
84	Piping (buried)	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.G-25 (A-01)	3.3.1-19	A
85	Piping (CO_2 fittings)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
86	Piping (CO_2 fittings)	Pressure boundary	Copper alloy >15% Zn	Gas	None	None	VII.J-4 (AP-9)	3.3.1-97	A
87	Piping (CO_2 fittings)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
88	Piping (CO_2)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
89	Piping (CO_2)	Pressure boundary	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A
90	Piping (CO_2)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-8 (A-77)	3.3.1-58	E, 319

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
91	Piping (CO_2)	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-9 (A-78)	3.3.1-58	E, 319
92	Piping (CO_2)	Pressure boundary	Steel	Condensation -EXT	Loss of material	Fire Protection (B.2.16)	VII.I-11 (A-81)	3.3.1-58	E, 319
93	Piping (drained/ vented)	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
94	Piping (drained/ vented)	Leakage boundary (spatial)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
95	Piping (drained/ vented)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
96	Piping (drained/ vented)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
97	Piping (drained/ vented)	Pressure boundary	Galvanized steel	Air - indoor uncontrolled	None	None	VII.J-6 (AP-13)	3.3.1-92	A, 304
98	Piping (drained/ vented)	Pressure boundary	Galvanized steel	Air - indoor uncontrolled-EXT	None	None	VII.J-6 (AP-13)	3.3.1-92	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
99	Piping (drained/ vented)	Pressure boundary	Galvanized steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
100	Piping (drained/ vented)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
101	Piping (drained/ vented)	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
102	Piping (halon fittings)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
103	Piping (halon fittings)	Pressure boundary	Copper alloy >15% Zn	Gas	None	None	VII.J-4 (AP-9)	3.3.1-97	A
104	Piping (halon fittings)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
105	Piping (halon)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
106	Piping (halon)	Pressure boundary	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A
107	Piping (halon)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-8 (A-77)	3.3.1-58	E, 319
108	Piping (RCP oil collection)	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.G-18 (AP-59)	3.3.1-33	A
109	Piping (RCP oil collection)	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.G-18 (AP-59)	3.3.1-33	A
110	Piping (RCP oil collection)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
111	Piping (RCP oil collection)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
112	Piping (RCP oil collection)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
113	Piping (RCP oil collection)	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.G-26 (A-83)	3.3.1-15	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
114	Piping (RCP oil collection)	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.G-26 (A-83)	3.3.1-15	A
115	Piping (RCP oil collection)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
116	Piping (RCP oil collection)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
117	Pump casing	Pressure boundary	Gray cast iron	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
118	Pump casing	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-14 (A-51)	3.3.1-85	B
119	Pump casing	Pressure boundary	Gray cast iron	Raw water-EXT	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
120	Pump casing	Pressure boundary	Gray cast iron	Raw water-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-14 (A-51)	3.3.1-85	B
121	Pump casing (riser column)	Pressure boundary	Steel	Condensation	Loss of material	Fire Water System (B.2.17)	VII.D-2 (A-26)	3.3.1-53	E, 318
122	Pump casing (riser column)	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
123	Pump casing (riser column)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
124	Pump casing (riser column)	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
125	Pump casing (riser column)	Pressure boundary	Steel	Raw water-EXT	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
126	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled	None	None	VII.J-8 (AP-14)	3.3.1-93	A, 304
127	Sight glass	Pressure boundary	Glass	Condensation	None	None	N/A	N/A	G
128	Sight glass	Pressure boundary	Glass	Raw water	None	None	VII.J-11 (AP-50)	3.3.1-93	A
129	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
130	Silencer (diesel fire pump exhaust)	Pressure boundary	Steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
131	Silencer (diesel fire pump exhaust)	Pressure boundary	Steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
132	Silencer (diesel fire pump exhaust)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
133	Strainer body	Pressure boundary	Copper alloy >15% Zn	Dried air	None	None	VII.J-3 (AP-8)	3.3.1-98	A
134	Strainer body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
135	Strainer body	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
136	Strainer body	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-14 (A-51)	3.3.1-85	B
137	Strainer body	Pressure boundary	Gray cast iron	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
138	Strainer body	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
139	Strainer body	Pressure boundary	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
140	Strainer body	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
141	Strainer body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
142	Strainer body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
143	Tank (CO_2)	Pressure boundary	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A
144	Tank (CO_2)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-8 (A-77)	3.3.1-58	E, 319
145	Tank (CO_2)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
146	Tank (fuel oil)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
147	Tank (fuel oil)	Pressure boundary	Steel	Fuel oil	Loss of material	Fire Protection (B.2.16)	VII.G-21 (A-28)	3.3.1-64	B
148	Tank (fuel oil)	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.G-21 (A-28)	3.3.1-64	B
149	Tank (fuel oil)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
150	Tank (halon)	Pressure boundary	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A
151	Tank (halon)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-8 (A-77)	3.3.1-58	E, 319
152	Tank (hydropneumatic)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
153	Tank (hydropneumatic)	Pressure boundary	Steel	Condensation	Loss of material	Fire Water System (B.2.17)	VII.D-2 (A-26)	3.3.1-53	E, 318

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
154	Tank (hydropneumatic)	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
155	Tank (hydropneumatic)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
156	Tank (RCP oil collection)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
157	Tank (RCP oil collection)	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.G-27 (A-82)	3.3.1-16	A
158	Tank (RCP oil collection)	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.G-27 (A-82)	3.3.1-16	A
159	Tank (RCP oil collection)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
160	Tank (RCP oil collection)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
161	Tank (retarding chamber)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
162	Tank (retarding chamber)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
163	Tank (retarding chamber)	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
164	Tank (retarding chamber)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
165	Tank (retarding chamber)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
166	Tank (retarding chamber)	Pressure boundary	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
167	Tubing	Pressure boundary	Copper alloy <15% Zn	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-12 (A-45)	3.3.1-70	A
168	Tubing	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
169	Tubing (CO_2 / halon)	Pressure boundary	Copper alloy <15% Zn	Gas	None	None	VII.J-4 (AP-9)	3.3.1-97	A
170	Tubing (CO_2 / halon)	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
171	Valve body (buried)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
172	Valve body (buried)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-14 (A-51)	3.3.1-85	B
173	Valve body (buried)	Pressure boundary	Gray cast iron	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.G-25 (A-01)	3.3.1-19	A
174	Valve body (buried)	Pressure boundary	Gray cast iron	Soil-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-15 (A-02)	3.3.1-85	B
175	Valve body (CO_2 / halon)	Pressure boundary	Aluminum	Air - indoor uncontrolled	None	None	V.F-2 (EP-3)	3.2.1-50	A
176	Valve body (CO_2 / halon)	Pressure boundary	Aluminum	Gas	None	None	VII.J-2 (AP-37)	3.3.1-97	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
177	Valve body (CO_2 / halon)	Pressure boundary	Aluminum	Air - indoor uncontrolled-EXT	None	None	VII.J-1 (AP-36)	3.3.1-95	A
178	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
179	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy <15% Zn	Gas	None	None	VII.J-4 (AP-9)	3.3.1-97	A
180	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
181	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
182	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
183	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy >15% Zn	Gas	None	None	VII.J-4 (AP-9)	3.3.1-97	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
184	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
185	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy >15% Zn	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-14 (A-46)	3.3.1-25	E
186	Valve body (CO_2 / halon)	Pressure boundary	Copper alloy >15% Zn	Condensation -EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G
187	Valve body (CO_2 / halon)	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
188	Valve body (CO_2 / halon)	Pressure boundary	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
189	Valve body (CO_2 / halon)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
190	Valve body (CO_2 / halon)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
191	Valve body (CO_2 / halon)	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	Fire Protection (B.2.16)	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
192	Valve body (CO_2 / halon)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
193	Valve body (CO_2 / halon)	Pressure boundary	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A
194	Valve body (CO_2 / halon)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-8 (A-77)	3.3.1-58	E, 319
195	Valve body (CO_2 / halon)	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Fire Protection (B.2.16)	VII.I-9 (A-78)	3.3.1-58	E, 319
196	Valve body (CO_2 / halon)	Pressure boundary	Steel	Condensation -EXT	Loss of material	Fire Protection (B.2.16)	VII.I-11 (A-81)	3.3.1-58	E, 319
197	Valve body (fuel oil)	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.G-21 (A-28)	3.3.1-64	B
198	Valve body (fuel oil)	Pressure boundary	Steel	Fuel oil	Loss of material	Fire Protection (B.2.16)	VII.G-21 (A-28)	3.3.1-64	B
199	Valve body (fuel oil)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
200	Valve body (hydrant)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
201	Valve body (hydrant)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
202	Valve body (hydrant)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-14 (A-51)	3.3.1-85	B
203	Valve body (hydrant)	Pressure boundary	Gray cast iron	Air - outdoor-EXT	Loss of material	Fire Water System (B.2.17)	VII.I-9 (A-78)	3.3.1-58	E, 318
204	Valve body (hydrant)	Pressure boundary	Gray cast iron	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.G-25 (A-01)	3.3.1-19	A
205	Valve body (hydrant)	Pressure boundary	Gray cast iron	Soil-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-15 (A-02)	3.3.1-85	B
206	Valve body (RCP oil collection)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
207	Valve body (RCP oil collection)	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.G-26 (A-83)	3.3.1-15	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
208	Valve body (RCP oil collection)	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.G-26 (A-83)	3.3.1-15	A
209	Valve body (RCP oil collection)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
210	Valve body (RCP oil collection)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
211	Valve body (water system)	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
212	Valve body (water system)	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
213	Valve body (water system)	Leakage boundary (spatial)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
214	Valve body (water system)	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
215	Valve body (water system)	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
216	Valve body (water system)	Leakage boundary (spatial)	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
217	Valve body (water system)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
218	Valve body (water system)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
219	Valve body (water system)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
220	Valve body (water system)	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
221	Valve body (water system)	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
222	Valve body (water system)	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
223	Valve body (water system)	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
224	Valve body (water system)	Pressure boundary	Copper alloy <15% Zn	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-12 (A-45)	3.3.1-70	A
225	Valve body (water system)	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
226	Valve body (water system)	Pressure boundary	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
227	Valve body (water system)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
228	Valve body (water system)	Pressure boundary	Copper alloy >15% Zn	Dried air	None	None	VII.J-3 (AP-8)	3.3.1-98	A
229	Valve body (water system)	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-13 (A-47)	3.3.1-84	B

Table 3.3.2-18 (continued): Fire Protection System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
230	Valve body (water system)	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-12 (A-45)	3.3.1-70	A
231	Valve body (water system)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
232	Valve body (water system)	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
233	Valve body (water system)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
234	Valve body (water system)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
235	Valve body (water system)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.G-14 (A-51)	3.3.1-85	B
236	Valve body (water system)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
237	Valve body (water system)	Pressure boundary	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-18 (continued): Fire Protection System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
238	Valve body (water system)	Pressure boundary	Stainless steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-19 (A-55)	3.3.1-69	A
239	Valve body (water system)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
240	Valve body (water system)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
241	Valve body (water system)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Fire Water System (B.2.17)	V.A-19 (E-29)	3.2.1-32	E, 318
242	Valve body (water system)	Pressure boundary	Steel	Raw water	Loss of material	Fire Water System (B.2.17)	VII.G-24 (A-33)	3.3.1-68	A
243	Valve body (water system)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
244	Valve body (water system)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-19
Auxiliary Systems –
Fuel Pool Cooling and Purification System –
Summary of Aging Management Evaluation

Table 3.3.2-19 : Fuel Pool Cooling and Purification System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
6	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
7	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
9	Demineralizer	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
10	Demineralizer	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
11	Demineralizer	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
12	Expansion joint	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
13	Expansion joint	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
14	Expansion joint	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
15	Expansion joint	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Expansion joint	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
17	Expansion joint	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
18	Filter housing	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
19	Filter housing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
20	Filter housing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
21	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A, 302
22	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
23	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
24	Flexible hose	Pressure boundary	Nickel alloy	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A, 302
25	Flexible hose	Pressure boundary	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
26	Flexible hose	Pressure boundary	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
27	Heat exchanger (head)	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	C
28	Heat exchanger (head)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
29	Heat exchanger (head)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
30	Heat exchanger (shell)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.A3-3 (A-63)	3.3.1-48	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
31	Heat exchanger (shell)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
32	Heat exchanger (shell)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.A3-2 (A-79)	3.3.1-89	A
33	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	C
34	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Treated borated water	Reduction of heat transfer	Water Chemistry (B.2.42)	N/A	N/A	G
35	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Treated borated water	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	G
36	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-3 (AP-63)	3.3.1-52	A
38	Orifice	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
39	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
40	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
41	Orifice	Pressure boundary and Flow restriction	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
42	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
43	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
44	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
45	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E, 307
46	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
47	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
48	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
49	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
50	Piping	Pressure boundary	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E, 307
51	Piping	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
52	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
53	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
54	Pump casing (cooling)	Pressure boundary	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
55	Pump casing (cooling)	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
56	Pump casing (cooling)	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
57	Pump casing (Unit 1 purification)	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
58	Pump casing (Unit 1 purification)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
59	Pump casing (Unit 1 purification)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
60	Pump casing (Unit 2 ACU drain)	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
61	Pump casing (Unit 2 ACU drain)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
62	Pump casing (Unit 2 ACU drain)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.A3-2 (A-79)	3.3.1-89	A
63	Pump casing (Unit 2 purification)	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
64	Pump casing (Unit 2 purification)	Leakage boundary (spatial)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
65	Pump casing (Unit 2 purification)	Leakage boundary (spatial)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
66	Strainer body	Leakage boundary (spatial)	Cast austenitic stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E, 307
67	Strainer body	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
68	Strainer body	Leakage boundary (spatial)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
69	Strainer body	Leakage boundary (spatial)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
70	Strainer body	Pressure boundary	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
71	Strainer body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
72	Strainer body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
73	Tank	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E, 307
74	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
75	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
76	Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
77	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
78	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
79	Tubing	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
80	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
81	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
82	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
83	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E, 307
84	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
85	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
86	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
87	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
88	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
89	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
90	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-19 (continued): Fuel Pool Cooling and Purification System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
91	Valve body	Pressure boundary	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E, 307
92	Valve body	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A3-8 (AP-79)	3.3.1-91	A
93	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
94	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-20
Auxiliary Systems –
Gaseous Waste Disposal System –
Summary of Aging Management Evaluation

Table 3.3.2-20 : Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-20 (continued): Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.F2-1 (A-09)	3.3.1-27	E
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
5	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
6	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.D-1 (A-103)	3.3.1-44	A
7	Filter housing	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
8	Filter housing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
9	Filter housing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
10	Filter housing	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
11	Filter housing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
12	Filter housing	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
13	Heat exchanger (shell / header)	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
14	Heat exchanger (shell / header)	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
15	Heat exchanger (shell / header)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
16	Heat exchanger (shell / header)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
17	Heat exchanger (shell / header)	Leakage boundary (spatial)	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-20 (continued): Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
18	Heat exchanger (shell / header)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F2-9 (A-63)	3.3.1-48	A
19	Heat exchanger (shell / header)	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	C
20	Heat exchanger (shell / header)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
21	Heat exchanger (shell / header)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
22	Heat exchanger (shell / header)	Leakage boundary (spatial)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
23	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
24	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
25	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
26	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
27	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
28	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
29	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
30	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
31	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
32	Sight glass	Leakage boundary (spatial)	Glass	Condensation	None	None	N/A	N/A	G

Table 3.3.2-20 (continued): Gaseous Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
33	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
34	Sight glass	Leakage boundary (spatial)	Glass	Air with borated water leakage-EXT	None	None	N/A	N/A	G
35	Strainer body	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
36	Strainer body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
37	Strainer body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
38	Tank	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-20 (continued): Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
39	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
40	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
41	Trap body	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
42	Trap body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
43	Trap body	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
44	Trap body	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
45	Trap body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
46	Trap body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
47	Tubing	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
48	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
49	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
50	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
51	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
52	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
53	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
54	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
55	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-20 (continued): Gaseous Waste Disposal System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
56	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-21
Auxiliary Systems –
Liquid Waste Disposal System –
Summary of Aging Management Evaluation

Table 3.3.2-21 : Liquid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
3	Bolting	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Demineralizer	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316

Table 3.3.2-21 (continued): Liquid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
6	Demineralizer	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
7	Demineralizer	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
8	Filter housing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
9	Filter housing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
10	Filter housing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
11	Filter housing	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316

Table 3.3.2-21 (continued): Liquid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Filter housing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
13	Filter housing	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
14	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-13 (AP-53)	3.3.1-78	E, 316
15	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
16	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
17	Flexible hose	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
18	Flexible hose	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Flexible hose	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
20	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
21	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
22	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
23	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
24	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316

Table 3.3.2-21 (continued): Liquid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
25	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-18 (A-35)	3.3.1-17	C, 305
26	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-18 (A-35)	3.3.1-17	C, 305
27	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
28	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
29	Heater housing	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
30	Heater housing	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316
31	Heater housing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
32	Heater housing	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
33	Orifice	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
34	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
35	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
36	Piping	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
37	Piping	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
38	Piping	Leakage boundary (spatial)	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
39	Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
40	Piping	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
41	Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
42	Piping	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
43	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
44	Piping	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
45	Piping	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316
46	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
47	Piping	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
48	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-10 (A-47)	3.3.1-84	B
49	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-9 (A-44)	3.3.1-81	E, 316
50	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
51	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
52	Pump casing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
53	Pump casing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
54	Pump casing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
55	Pump casing	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
56	Pump casing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
57	Pump casing	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
58	Strainer body	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
59	Strainer body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
60	Strainer body	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
61	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
62	Tank	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
63	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
64	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
65	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
66	Tank	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316
67	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
68	Tank	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
69	Tubing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
70	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
71	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
72	Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
73	Valve body	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
74	Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-21 (continued): Liquid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
75	Valve body	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
76	Valve body	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
77	Valve body	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316
78	Valve body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
79	Valve body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-22
Auxiliary Systems –
Post-Accident Sample System –
Summary of Aging Management Evaluation

Table 3.3.2-22 : Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
6	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
7	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
9	Drip pan	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
10	Drip pan	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
11	Drip pan	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
12	Drip pan	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
13	Heat exchanger (shell and cover)	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
14	Heat exchanger (shell and cover)	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	C

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Heat exchanger (shell and cover)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
16	Heat exchanger (shell and cover)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
17	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
18	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
19	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
20	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-22 (continued): Post-Accident Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
21	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
22	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
23	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
24	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
25	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
26	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305

Table 3.3.2-22 (continued): Post-Accident Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
27	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
28	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
29	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
30	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
31	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
32	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
33	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
34	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-22 (continued): Post-Accident Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
35	Pump casing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
36	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
37	Pump casing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
38	Pump casing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
39	Sample capsule	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
40	Sample capsule	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
41	Sample capsule	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-22 (continued): Post-Accident Sample System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Sample panel (housing)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
43	Sample panel (housing)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
44	Sample panel (housing)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
45	Sample panel (housing)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
46	Sample panel (housing)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
47	Sample panel (housing)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-22 (continued): Post-Accident Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
48	Strainer body	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
49	Strainer body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
50	Strainer body	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
51	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
52	Tank	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
53	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
54	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
55	Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
56	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
57	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
58	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
59	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
60	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
61	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
63	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
64	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
65	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
66	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
67	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-22 (continued): Post-Accident Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
68	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
69	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
70	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
71	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-23
Auxiliary Systems –
Post-Design Basis Accident Hydrogen Control System –
Summary of Aging Management Evaluation

Table 3.3.2-23 : Post-Design Basis Accident Hydrogen Control System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
3	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Bolting	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
6	Bolting	Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Bolting	Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
8	Bolting	Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
9	Expansion joint	Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
10	Expansion joint	Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
11	Expansion joint	Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
12	Fan housing	Structural integrity (attached)	Gray cast iron	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
13	Fan housing	Structural integrity (attached)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
14	Fan housing	Structural integrity (attached)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
15	Filter housing	Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
16	Filter housing	Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
17	Filter housing	Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
18	Flexible hose	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
19	Flexible hose	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
20	Flexible hose	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
21	Orifice	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
22	Orifice	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
23	Orifice	Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
24	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
25	Piping	Pressure boundary	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
26	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
27	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
29	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
30	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
31	Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
32	Piping	Structural integrity (attached)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
33	Piping	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
34	Piping	Structural integrity (attached)	Stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Piping	Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
36	Piping	Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
37	Piping	Structural integrity (attached)	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
38	Piping	Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
39	Pump casing	Pressure boundary	Aluminum	Air - indoor uncontrolled	None	None	V.F-2 (EP-3)	3.2.1-50	A
40	Pump casing	Pressure boundary	Aluminum	Air - indoor uncontrolled-EXT	None	None	VII.J-1 (AP-36)	3.3.1-95	A
41	Pump casing	Pressure boundary	Aluminum	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.E1-10 (AP-1)	3.3.1-88	A

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Pump casing	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
43	Pump casing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
44	Pump casing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
45	Rupture disc	Pressure boundary	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
46	Rupture disc	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 301
47	Rupture disc	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
48	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
49	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
50	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
51	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
52	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
53	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
54	Valve body	Pressure boundary	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
55	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
56	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
57	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
58	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
59	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
60	Valve body	Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
61	Valve body	Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
62	Valve body	Structural integrity (attached)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-23 (continued): Post-Design Basis Accident Hydrogen Control System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
63	Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
64	Valve body	Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
65	Valve body	Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-24
Auxiliary Systems –
Primary Component and Neutron Shield Tank Cooling Water System –
Summary of Aging Management Evaluation

Table 3.3.2-24 : Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
6	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
7	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
9	Expansion joint	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
10	Expansion joint	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
11	Expansion joint	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
12	Expansion joint	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
13	Expansion joint	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
14	Expansion joint	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A, 302
16	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
17	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
18	Flexible hose	Pressure boundary	Nickel alloy	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A, 302
19	Flexible hose	Pressure boundary	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
20	Flexible hose	Pressure boundary	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
21	Flexible hose	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
22	Flexible hose	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
23	Flexible hose	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
24	Heat exchanger (component cooling channel)	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-5 (A-64)	3.3.1-77	A
25	Heat exchanger (component cooling channel)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
26	Heat exchanger (component cooling channel)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
27	Heat exchanger (component cooling shell)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
28	Heat exchanger (component cooling shell)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Heat exchanger (component cooling shell)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
30	Heat exchanger (component cooling tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C
31	Heat exchanger (component cooling tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.32)	VII.C1-7 (AP-61)	3.3.1-83	A
32	Heat exchanger (component cooling tube)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
33	Heat exchanger (component cooling tube)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-3 (AP-63)	3.3.1-52	A
34	Heat exchanger (component cooling tubesheet)	Pressure boundary	Steel with stainless steel cladding	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Heat exchanger (component cooling tubesheet)	Pressure boundary	Steel with stainless steel cladding	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
36	Heat exchanger (Containment penetration cooler)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
37	Heat exchanger (Containment penetration cooler)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
38	Heat exchanger (Containment penetration cooler)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
39	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
40	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-3 (AP-63)	3.3.1-52	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	*NUREG-1801* Volume 2 Item	Table 1 Item	Notes
41	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
42	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
43	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
44	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Steel	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-13 (AP-77)	3.3.1-52	A
45	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
46	Heat exchanger (Containment penetration cooler)	Pressure boundary and Heat transfer	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
47	Heat exchanger (neutron shield tk shell/channel)	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
48	Heat exchanger (neutron shield tk shell/channel)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
49	Heat exchanger (neutron shield tk shell/channel)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
50	Heat exchanger (neutron shield tk tube/tubesheet)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
51	Heat exchanger (neutron shield tk tube/tubesheet)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-3 (AP-63)	3.3.1-52	A
52	Heat exchanger (neutron shield tk tube/tubesheet)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
53	Heat exchanger (neutron shield tk tube/tubesheet)	Pressure boundary and Heat transfer	Stainless steel	Closed cycle cooling water-EXT	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-3 (AP-63)	3.3.1-52	A
54	Heat exchanger (RCP oil cooler channel)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
55	Heat exchanger (RCP oil cooler channel)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
56	Heat exchanger (RCP oil cooler channel)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
57	Heat exchanger (RCP oil cooler shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
58	Heat exchanger (RCP oil cooler shell)	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A
59	Heat exchanger (RCP oil cooler shell)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
60	Heat exchanger (RCP oil cooler shell)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
61	Heat exchanger (RCP oil cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
62	Heat exchanger (RCP oil cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-12 (AP-80)	3.3.1-52	A
63	Heat exchanger (RCP oil cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.C2-5 (AP-47)	3.3.1-26	C
64	Heat exchanger (RCP oil cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VII.C2-5 (AP-47)	3.3.1-26	C
65	Heat exchanger (RCP oil cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	H

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
66	Heat exchanger (RCP oil cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	H
67	Heat exchanger (RCP stator cooler header)	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
68	Heat exchanger (RCP stator cooler header)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
69	Heat exchanger (RCP stator cooler header)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
70	Heat exchanger (RCP stator cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-8 (AP-34)	3.3.1-51	A
71	Heat exchanger (RCP stator cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.F3-12 (AP-80)	3.3.1-52	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
72	Heat exchanger (RCP stator cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	Reduction of heat transfer	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
73	Heat exchanger (RCP stator cooler tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	C
74	Orifice	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
75	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
76	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
77	Orifice	Pressure boundary and Flow restriction	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
78	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
79	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
80	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
81	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
82	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
83	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
84	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
85	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
86	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
87	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
88	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
89	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
90	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
91	Piping	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
92	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
93	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
94	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
95	Piping	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
96	Piping	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
97	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
98	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
99	Pump casing	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
100	Pump casing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
101	Pump casing	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
102	Sight glass	Leakage boundary (spatial)	Glass	Closed cycle cooling water	None	None	N/A	N/A	G
103	Sight glass	Leakage boundary (spatial)	Glass	Condensation	None	None	N/A	N/A	G
104	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
105	Sight glass	Leakage boundary (spatial)	Glass	Air with borated water leakage-EXT	None	None	N/A	N/A	G

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
106	Strainer body	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
107	Strainer body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
108	Strainer body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
109	Tank	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
110	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
111	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
112	Tank	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
113	Tank	Pressure boundary	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
114	Tank	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
115	Tank	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
116	Tank	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
117	Tank	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
118	Tank	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
119	Tank	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
120	Tubing	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
121	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
122	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
123	Tubing	Pressure boundary	Copper alloy <15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-4 (AP-12)	3.3.1-51	A
124	Tubing	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
125	Tubing	Pressure boundary	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
126	Tubing	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
127	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
128	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
129	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
130	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
131	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
132	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
133	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
134	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
135	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
136	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
137	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
138	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
139	Valve body	Pressure boundary	Cast austenitic stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
140	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
141	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
142	Valve body	Pressure boundary	Copper alloy <15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-4 (AP-12)	3.3.1-51	A
143	Valve body	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
144	Valve body	Pressure boundary	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
145	Valve body	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-4 (AP-12)	3.3.1-51	A
146	Valve body	Pressure boundary	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-6 (AP-43)	3.3.1-84	B
147	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
148	Valve body	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
149	Valve body	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
150	Valve body	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-8 (A-50)	3.3.1-85	B
151	Valve body	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
152	Valve body	Pressure boundary	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
153	Valve body	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
154	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-24 (continued): Primary Component and Neutron Shield Tank Cooling Water System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
155	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
156	Valve body	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
157	Valve body	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
158	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
159	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-25
Auxiliary Systems –
Radiation Monitoring System –
Summary of Aging Management Evaluation

Table 3.3.2-25 : Radiation Monitoring System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
3	Bolting	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
6	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
8	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
9	Filter housing	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
10	Filter housing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
11	Filter housing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
12	Heat exchanger (channel)	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
13	Heat exchanger (channel)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
14	Heat exchanger (channel)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Heat exchanger (channel)	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C
16	Heat exchanger (channel)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
17	Heat exchanger (channel)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
18	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
19	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
20	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305
21	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
22	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
23	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
24	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
25	Heat exchanger (shell)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
26	Heat exchanger (shell)	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C
27	Heat exchanger (shell)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
28	Heat exchanger (shell)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-25 (continued): Radiation Monitoring System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C
30	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.32)	VII.C1-7 (AP-61)	3.3.1-83	A
31	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C
32	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Raw water-EXT	Reduction of heat transfer	Open-Cycle Cooling Water System (B.2.32)	VII.C1-7 (AP-61)	3.3.1-83	A
33	Heat exchanger (tubesheet)	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C
34	Heat exchanger (tubesheet)	Pressure boundary	Stainless steel	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C
35	Isokinetic nozzle	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
36	Isokinetic nozzle	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
37	Isokinetic nozzle	Pressure boundary	Stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G, 309
38	Isokinetic nozzle	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
39	Piping	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
40	Piping	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
41	Piping	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
42	Piping	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
43	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
44	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305
45	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
46	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
47	Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
48	Piping	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
49	Piping	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
50	Piping	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
51	Piping	Pressure boundary	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
52	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
53	Piping	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
54	Piping	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
55	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
56	Piping	Pressure boundary	Stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G, 309
57	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
58	Pump casing	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A

Table 3.3.2-25 (continued): Radiation Monitoring System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
59	Pump casing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
60	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
61	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
62	Pump casing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
63	Pump casing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
64	Pump casing	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
65	Pump casing	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
66	Pump casing	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
67	Pump casing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
68	Pump casing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
69	Radiation monitor	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
70	Radiation monitor	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
71	Radiation monitor	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
72	Radiation monitor	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
73	Radiation monitor	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
74	Radiation monitor	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
75	Radiation monitor	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
76	Radiation monitor	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
77	Radiation monitor	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
78	Radiation monitor	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	V.D1-30 (EP-41)	3.2.1-49	A
79	Radiation monitor	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
80	Radiation monitor	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
81	Tubing	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A

Table 3.3.2-25 (continued): Radiation Monitoring System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
82	Tubing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
83	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
84	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
85	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
86	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
87	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
88	Tubing	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
89	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-25 (continued): Radiation Monitoring System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
90	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
91	Valve body	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
92	Valve body	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
93	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
94	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
95	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305
96	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305

Table 3.3.2-25 (continued): Radiation Monitoring System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
97	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
98	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
99	Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
100	Valve body	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
101	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
102	Valve body	Pressure boundary	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	A
103	Valve body	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
104	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-25 (continued): Radiation Monitoring System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
105	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-26
Auxiliary Systems –
Reactor Plant Sample System –
Summary of Aging Management Evaluation

Table 3.3.2-26 : Reactor Plant Sample System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
5	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
6	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.D-1 (A-103)	3.3.1-44	A
7	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
8	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
9	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
10	Demineralizer	Leakage boundary (spatial)	Polymer	Treated water	None	None	N/A	N/A	F
11	Demineralizer	Leakage boundary (spatial)	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	F

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Demineralizer	Leakage boundary (spatial)	Polymer	Air with borated water leakage-EXT	None	None	N/A	N/A	F
13	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled	None	None	VII.J-14 (AP-16)	3.3.1-94	A, 304
14	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A, 302
15	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A, 302
16	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A, 302
17	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A, 302
18	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 302, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 302, 305
20	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E3-14 (A-62)	3.3.1-02	C, 302, 305
21	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 302, 305
22	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 302, 305
23	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
24	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
25	Flexible hose	Pressure boundary	Nickel alloy	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A, 302

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
26	Flexible hose	Pressure boundary	Nickel alloy	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A, 302
27	Flexible hose	Pressure boundary	Nickel alloy	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A, 302
28	Flexible hose	Pressure boundary	Nickel alloy	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A, 302
29	Flexible hose	Pressure boundary	Nickel alloy	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 302, 305
30	Flexible hose	Pressure boundary	Nickel alloy	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 302, 305
31	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 302, 305
32	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 302, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
33	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E3-14 (A-62)	3.3.1-02	C, 302, 305
34	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 302, 305
35	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 302, 305
36	Flexible hose	Pressure boundary	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
37	Flexible hose	Pressure boundary	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
38	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-10 (A-52)	3.3.1-50	C
39	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	C

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
40	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	C
41	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305
42	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305
43	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
44	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
45	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
46	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
47	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
48	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Gas-EXT	None	None	VII.J-19 (AP-22)	3.3.1-97	C
49	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
50	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
51	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
52	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
53	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
54	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
55	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
56	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A
57	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
58	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
59	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
60	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305
61	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
62	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E3-14 (A-62)	3.3.1-02	C, 305
63	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
64	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
65	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
66	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
67	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
68	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-18 (A-35)	3.3.1-17	C, 305
69	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-18 (A-35)	3.3.1-17	C, 305
70	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
71	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
72	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
73	Piping	Pressure boundary	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
74	Piping	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
75	Piping	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
76	Piping	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A
77	Piping	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
78	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305
79	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305
80	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E3-14 (A-62)	3.3.1-02	C, 305
81	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
82	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
83	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
84	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
85	Pump casing	Leakage boundary (spatial)	Gray cast iron	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
86	Pump casing	Leakage boundary (spatial)	Gray cast iron	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-8 (A-50)	3.3.1-85	B
87	Pump casing	Leakage boundary (spatial)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
88	Pump casing	Leakage boundary (spatial)	Gray cast iron	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
89	Pump casing	Leakage boundary (spatial)	Gray cast iron	Condensation -EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
90	Sample sink	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
91	Sample sink	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
92	Sample sink	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
93	Sample sink	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
94	Sample sink	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
95	Sample sink	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
96	Sight glass	Leakage boundary (spatial)	Glass	Treated borated water	None	None	VII.J-12 (AP-52)	3.3.1-93	A

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
97	Sight glass	Leakage boundary (spatial)	Glass	Treated water	None	None	VII.J-13 (AP-51)	3.3.1-93	A
98	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
99	Sight glass	Leakage boundary (spatial)	Glass	Air with borated water leakage-EXT	None	None	N/A	N/A	G
100	Tank	Leakage boundary (spatial)	Polymer	Treated water	None	None	N/A	N/A	F
101	Tank	Leakage boundary (spatial)	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	F
102	Tank	Leakage boundary (spatial)	Polymer	Air with borated water leakage-EXT	None	None	N/A	N/A	F
103	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
104	Tank	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
105	Tank	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
106	Tank	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
107	Tank	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
108	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
109	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
110	Tubing	Leakage boundary (spatial)	Polymer	Treated borated water	None	None	N/A	N/A	F

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
111	Tubing	Leakage boundary (spatial)	Polymer	Treated water	None	None	N/A	N/A	F
112	Tubing	Leakage boundary (spatial)	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	F
113	Tubing	Leakage boundary (spatial)	Polymer	Air with borated water leakage-EXT	None	None	N/A	N/A	F
114	Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
115	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
116	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
117	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
118	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
119	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-4 (AP-12)	3.3.1-51	A
120	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-6 (AP-43)	3.3.1-84	B
121	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
122	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-14 (A-46)	3.3.1-25	E
123	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Condensation -EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	H
124	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
125	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
126	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
127	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
128	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A
129	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
130	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
131	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
132	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305
133	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
134	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E3-14 (A-62)	3.3.1-02	C, 305
135	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
136	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
137	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
138	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
139	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
140	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-18 (A-35)	3.3.1-17	C, 305
141	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-18 (A-35)	3.3.1-17	C, 305
142	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
143	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
144	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
145	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
146	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >250°C (>482°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
147	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >250°C (>482°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A
148	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >250°C (>482°F)	Loss of fracture toughness	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (B.2.41)	V.D1-16 (E-47)	3.2.1-47	A
149	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >250°C (>482°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
150	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A
151	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A

Table 3.3.2-26 (continued): Reactor Plant Sample System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
152	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
153	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
154	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
155	Valve body	Pressure boundary	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
156	Valve body	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
157	Valve body	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A
158	Valve body	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
159	Valve body	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
160	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E4-15 (A-61)	3.3.1-38	E, 305
161	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E4-15 (A-61)	3.3.1-38	E, 305
162	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E3-14 (A-62)	3.3.1-02	C, 305
163	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
164	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
165	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-26 (continued): Reactor Plant Sample System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
166	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
167	Valve body (bonnet)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
168	Valve body (bonnet)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-27
Auxiliary Systems –
Reactor Plant Vents and Drains System –
Summary of Aging Management Evaluation

Table 3.3.2-27 : Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	VII.E1-18 (A-34)	3.3.1-02	C
5	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
6	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
7	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
8	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
9	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
10	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
11	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A, 302

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
12	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-13 (AP-53)	3.3.1-78	E, 316
13	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A, 302
14	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
15	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
16	Heat exchanger (cover)	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-5 (A-84)	3.3.1-08	A
17	Heat exchanger (cover)	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VII.E1-5 (A-84)	3.3.1-08	E

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
18	Heat exchanger (cover)	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	C
19	Heat exchanger (cover)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
20	Heat exchanger (cover)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
21	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-1 (A-63)	3.3.1-48	A
22	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
23	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
24	Orifice	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
25	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
26	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
27	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
28	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
29	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
30	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
31	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
32	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
33	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
34	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
35	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
36	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A
37	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
38	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
39	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
40	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
41	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Concrete-EXT	None	None	VII.J-17 (AP-19)	3.3.1-96	A
42	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
43	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
44	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
45	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
46	Piping	Pressure boundary	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
47	Piping	Pressure boundary	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
48	Piping	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
49	Piping	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A
50	Piping	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
51	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
52	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
53	Piping	Pressure boundary	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A
54	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
55	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
56	Pump casing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
57	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
58	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A
59	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
60	Pump casing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
61	Pump casing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Pump casing	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-19 (A-38)	3.3.1-76	E, 316
63	Pump casing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
64	Pump casing	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
65	Strainer body	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
66	Strainer body	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
67	Strainer body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
68	Strainer body	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
69	Tank	Leakage boundary (spatial)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
70	Tank	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
71	Tank	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
72	Tank	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A
73	Tank	Leakage boundary (spatial)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
74	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
75	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
76	Trap body	Leakage boundary (spatial)	Gray cast iron	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
77	Trap body	Leakage boundary (spatial)	Gray cast iron	Condensation	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G
78	Trap body	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
79	Trap body	Leakage boundary (spatial)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
80	Tubing	Leakage boundary (spatial)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
81	Tubing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
82	Tubing	Leakage boundary (spatial)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
83	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
84	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
85	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
86	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
87	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
88	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
89	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
90	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
91	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
92	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	VII.E1-16 (A-57)	3.3.1-02	A
93	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
94	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
95	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
96	Valve body	Pressure boundary	Cast austenitic stainless steel	Gas	None	None	VII.J-19 (AP-22)	3.3.1-97	A
97	Valve body	Pressure boundary	Cast austenitic stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
98	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
99	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
100	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
101	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
102	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
103	Valve body	Pressure boundary	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
104	Valve body	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
105	Valve body	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VII.E1-20 (AP-82)	3.3.1-90	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
106	Valve body	Pressure boundary	Stainless steel	Treated borated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VII.E1-17 (AP-79)	3.3.1-91	A
107	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
108	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
109	Valve body	Pressure boundary	Steel	Gas	None	None	VII.J-23 (AP-6)	3.3.1-97	A
110	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
111	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
112	Valve body (RV outlet plenum)	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
113	Valve body (RV outlet plenum)	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
114	Valve body (RV outlet plenum)	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-27 (continued): Reactor Plant Vents and Drains System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
115	Valve body (RV outlet plenum)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
116	Valve body (RV outlet plenum)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
117	Valve body (RV outlet plenum)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-28
Auxiliary Systems –
River Water System (Unit 1 only) –
Summary of Aging Management Evaluation

Table 3.3.2-28 : River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.F2-1 (A-09)	3.3.1-27	E
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
5	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
6	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.D-1 (A-103)	3.3.1-44	A
7	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
8	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
9	Bolting	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.F2-1 (A-09)	3.3.1-27	E
10	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
11	Bolting	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-1 (AP-28)	3.3.1-43	A
12	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
13	Bolting	Pressure boundary	Steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.D-1 (A-103)	3.3.1-44	A
14	Condenser (ACU tubesheet cladding and tube)	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	C, 308
15	Condenser (ACU tubesheet cladding and tube)	Pressure boundary	Stainless steel	Gas-EXT	None	None	VII.J-19 (AP-22)	3.3.1-97	C, 308
16	Condenser (ACU waterbox/cover)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	D, 308
17	Condenser (ACU waterbox/cover)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-5 (A-64)	3.3.1-77	A, 308
18	Condenser (ACU waterbox/cover)	Pressure boundary	Gray cast iron	Condensation -EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G, 308
19	Condenser (ACU waterbox/cover)	Pressure boundary	Gray cast iron	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A, 308

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
20	Expansion joint	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
21	Expansion joint	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
22	Expansion joint	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
23	Expansion joint	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
24	Expansion joint	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
25	Expansion joint	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
26	Expansion joint	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
27	Expansion joint	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Orifice	Pressure boundary and Flow restriction	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
29	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
30	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
31	Orifice	Pressure boundary and Flow restriction	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
32	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
33	Orifice	Pressure boundary and Flow restriction	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
35	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
36	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
38	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
39	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	*NUREG-1801* Volume 2 Item	Table 1 Item	Notes
40	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
41	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
42	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
43	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
44	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
45	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
47	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
48	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.C1-18 (A-01)	3.3.1-19	A
49	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
50	Piping	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
51	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
52	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
53	Piping	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
54	Piping	Pressure boundary	Stainless steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.C1-16 (AP-56)	3.3.1-29	E
55	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
56	Piping	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
57	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
58	Piping	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
59	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
60	Piping	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
61	Piping	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.C1-18 (A-01)	3.3.1-19	A
62	Piping (Spent Fuel Pool makeup)	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A2-1 (AP-79)	3.3.1-91	A
63	Piping (Spent Fuel Pool makeup)	Pressure boundary	Stainless steel	Treated borated water-EXT	Loss of material	Water Chemistry (B.2.42)	VII.A2-1 (AP-79)	3.3.1-91	A
64	Pump casing	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
65	Pump casing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
66	Pump casing	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
67	Pump casing	Leakage boundary (spatial)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
68	Pump casing	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
69	Pump casing	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
70	Pump casing	Pressure boundary	Steel	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
71	Pump casing (idle / drained)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
72	Pump casing (idle / drained)	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
73	Pump casing (idle / drained)	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
74	Pump casing (idle / drained)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
75	Pump casing (idle / drained)	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
76	Pump casing (idle / drained)	Pressure boundary	Steel	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
77	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
78	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
79	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
80	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
81	Sight glass	Leakage boundary (spatial)	Glass	Raw water	None	None	VII.J-11 (AP-50)	3.3.1-93	A
82	Sight glass	Leakage boundary (spatial)	Glass	Condensation -EXT	None	None	N/A	N/A	G
83	Sight glass	Pressure boundary	Glass	Raw water	None	None	VII.J-11 (AP-50)	3.3.1-93	A
84	Sight glass	Pressure boundary	Glass	Condensation -EXT	None	None	N/A	N/A	G
85	Strainer body	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
86	Strainer body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	***NUREG-*1801 Volume 2 Item**	**Table 1 Item**	**Notes**
87	Strainer body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
88	Strainer body	Pressure boundary	Cast austenitic stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
89	Strainer body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
90	Strainer body	Pressure boundary	Cast austenitic stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
91	Strainer body	Pressure boundary	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
92	Strainer body	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
93	Strainer body	Pressure boundary	Gray cast iron	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
94	Strainer body	Pressure boundary	Gray cast iron	Condensation -EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G
95	Strainer body	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
96	Strainer body	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
97	Strainer body	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
98	Strainer body	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
99	Strainer element	Filtration	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
100	Tank	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
101	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
102	Tank	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
103	Tubing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
104	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
105	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
106	Tubing	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
107	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
108	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
109	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
110	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
111	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
112	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
113	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
114	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
115	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
116	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
117	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
118	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
119	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
120	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
121	Valve body	Pressure boundary	Cast austenitic stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
122	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
123	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
124	Valve body	Pressure boundary	Cast austenitic stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
125	Valve body	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-10 (A-47)	3.3.1-84	B
126	Valve body	Pressure boundary	Copper alloy >15% Zn	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-9 (A-44)	3.3.1-81	A
127	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
128	Valve body	Pressure boundary	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
129	Valve body	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
130	Valve body	Pressure boundary	Gray cast iron	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
131	Valve body	Pressure boundary	Gray cast iron	Condensation -EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G
132	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
133	Valve body	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
134	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
135	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
136	Valve body	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-28 (continued): River Water System (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
137	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
138	Valve body	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
139	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
140	Valve body	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
141	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
142	Valve body	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-29
Auxiliary Systems –
Security Diesel Generator System (Common) –
Summary of Aging Management Evaluation

Table 3.3.2-29 : Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
2	Bolting	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-1 (AP-28)	3.3.1-43	A
3	Bolting	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.H1-9 (A-01)	3.3.1-19	C
4	Filter housing	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
5	Filter housing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
6	Filter housing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Filter housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
8	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H, 303
9	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled	Hardening and loss of strength	External Surfaces Monitoring (B.2.15)	VII.F4-6 (A-17)	3.3.1-11	E, 303
10	Flexible hose	Pressure boundary	Elastomers	Closed cycle cooling water	None	None	N/A	N/A	G
11	Flexible hose	Pressure boundary	Elastomers	Fuel oil	None	None	N/A	N/A	G
12	Flexible hose	Pressure boundary	Elastomers	Lubricating oil	None	None	N/A	N/A	G
13	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
14	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Hardening and loss of strength	External Surfaces Monitoring (B.2.15)	VII.F4-6 (A-17)	3.3.1-11	E

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Flexible hose	Pressure boundary	Stainless steel	Diesel exhaust	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-1 (AP-33)	3.3.1-06	E
16	Flexible hose	Pressure boundary	Stainless steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H
17	Flexible hose	Pressure boundary	Stainless steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
18	Flexible hose	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
19	Flexible hose	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
20	Flexible hose	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
21	Flexible hose	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
22	Heat exchanger (oil cooler - channel)	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
23	Heat exchanger (oil cooler - channel)	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A
24	Heat exchanger (oil cooler - channel)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
25	Heat exchanger (oil cooler - shell)	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F4-8 (A-63)	3.3.1-48	A
26	Heat exchanger (oil cooler - shell)	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-8 (A-50)	3.3.1-85	D
27	Heat exchanger (oil cooler - shell)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
28	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	C

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	C
30	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	N/A	N/A	H
31	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Lubricating oil	Reduction of heat transfer	One-Time Inspection (B.2.30)	N/A	N/A	H
32	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F1-8 (AP-34)	3.3.1-51	A
33	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.H2-12 (AP-43)	3.3.1-84	D
34	Heat exchanger (oil cooler - tube)	Pressure boundary and Heat transfer	Copper alloy >15% Zn	Closed cycle cooling water-EXT	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-2 (AP-80)	3.3.1-52	A

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
35	Heat exchanger (oil cooler - tubesheet)	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-5 (AP-39)	3.3.1-21	A
36	Heat exchanger (oil cooler - tubesheet)	Pressure boundary	Gray cast iron	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-5 (AP-39)	3.3.1-21	A
37	Heat exchanger (oil cooler - tubesheet)	Pressure boundary	Gray cast iron	Closed cycle cooling water-EXT	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F4-8 (A-63)	3.3.1-48	A
38	Heat exchanger (oil cooler - tubesheet)	Pressure boundary	Gray cast iron	Closed cycle cooling water-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-8 (A-50)	3.3.1-85	D
39	Heat exchanger (radiator)	Pressure boundary and Heat transfer	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F4-8 (A-63)	3.3.1-48	A
40	Heat exchanger (radiator)	Pressure boundary and Heat transfer	Steel	Closed cycle cooling water	Reduction of heat transfer	Closed-Cycle Cooling Water System (B.2.9)	VII.F4-9 (AP-77)	3.3.1-52	A
41	Heat exchanger (radiator)	Pressure boundary and Heat transfer	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.H2-3 (AP-41)	3.3.1-59	A

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Heat exchanger (radiator)	Pressure boundary and Heat transfer	Steel	Air - indoor uncontrolled-EXT	Reduction of heat transfer	External Surfaces Monitoring (B.2.15)	N/A	N/A	H, 313
43	Heater housing	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.F4-8 (A-63)	3.3.1-48	A
44	Heater housing	Pressure boundary	Gray cast iron	Closed cycle cooling water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-8 (A-50)	3.3.1-85	D
45	Heater housing	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
46	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Fuel oil	Cracking	Fuel Oil Chemistry (B.2.20)	N/A	N/A	H
47	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Fuel oil	Cracking	One-Time Inspection (B.2.30)	N/A	N/A	H

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
48	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H2-9 (AP-44)	3.3.1-32	B
49	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-9 (AP-44)	3.3.1-32	A
50	Orifice	Pressure boundary and Flow restriction	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
51	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
52	Piping	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
53	Piping	Pressure boundary	Steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
54	Piping	Pressure boundary	Steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
55	Piping	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
56	Piping	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
57	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
58	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
59	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
60	Piping	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
61	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 303

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	Fuel Oil Chemistry (B.2.20)	N/A	N/A	H
63	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	One-Time Inspection (B.2.30)	N/A	N/A	H
64	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H2-9 (AP-44)	3.3.1-32	B
65	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-9 (AP-44)	3.3.1-32	A
66	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-10 (AP-47)	3.3.1-26	A
67	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-10 (AP-47)	3.3.1-26	A
68	Piping (fittings)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
69	Piping (geoFlex fuel oil lines)	Pressure boundary	Polymer	Air - indoor uncontrolled	None	None	N/A	N/A	F

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
70	Piping (geoFlex fuel oil lines)	Pressure boundary	Polymer	Fuel oil	None	None	N/A	N/A	F
71	Piping (geoFlex fuel oil lines)	Pressure boundary	Polymer	Soil-EXT	None	None	N/A	N/A	F
72	Pump casing	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	Fuel Oil Chemistry (B.2.20)	N/A	N/A	H
73	Pump casing	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	One-Time Inspection (B.2.30)	N/A	N/A	H
74	Pump casing	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H2-9 (AP-44)	3.3.1-32	B
75	Pump casing	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-9 (AP-44)	3.3.1-32	A
76	Pump casing	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
77	Pump casing	Pressure boundary	Gray cast iron	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
78	Pump casing	Pressure boundary	Gray cast iron	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
79	Pump casing	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
80	Pump casing	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
81	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
82	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
83	Pump casing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
84	Tank	Pressure boundary	Aluminum	Air - indoor uncontrolled	None	None	V.F-2 (EP-3)	3.2.1-50	A
85	Tank	Pressure boundary	Aluminum	Air - indoor uncontrolled-EXT	None	None	VII.J-1 (AP-36)	3.3.1-95	A

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
86	Tank	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
87	Tank	Pressure boundary	Steel	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
88	Tank	Pressure boundary	Steel	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
89	Tank	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VII.H2-20 (AP-30)	3.3.1-14	A
90	Tank	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-20 (AP-30)	3.3.1-14	A
91	Tank	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
92	Tank	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.H1-9 (A-01)	3.3.1-19	A

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
93	Turbocharger housing (compressor)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
94	Turbocharger housing (compressor)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
95	Turbocharger housing (turbine)	Pressure boundary	Steel	Diesel exhaust	Cumulative fatigue damage	TLAA	N/A	N/A	H
96	Turbocharger housing (turbine)	Pressure boundary	Steel	Diesel exhaust	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.H2-2 (A-27)	3.3.1-18	E
97	Turbocharger housing (turbine)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
98	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 303

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
99	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	Fuel Oil Chemistry (B.2.20)	N/A	N/A	H
100	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Cracking	One-Time Inspection (B.2.30)	N/A	N/A	H
101	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H2-9 (AP-44)	3.3.1-32	B
102	Valve body	Pressure boundary	Copper alloy >15% Zn	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H2-9 (AP-44)	3.3.1-32	A
103	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
104	Valve body	Pressure boundary	Gray cast iron	Fuel oil	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B
105	Valve body	Pressure boundary	Gray cast iron	Fuel oil	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A
106	Valve body	Pressure boundary	Gray cast iron	Fuel oil-EXT	Loss of material	Fuel Oil Chemistry (B.2.20)	VII.H1-10 (A-30)	3.3.1-20	B, 306
107	Valve body	Pressure boundary	Gray cast iron	Fuel oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VII.H1-10 (A-30)	3.3.1-20	A, 306

Table 3.3.2-29 (continued): Security Diesel Generator System (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
108	Valve body	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.H2-23 (A-25)	3.3.1-47	A
109	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-30
Auxiliary Systems –
Service Water System (Unit 2 only) –
Summary of Aging Management Evaluation

Table 3.3.2-30 : Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.F2-1 (A-09)	3.3.1-27	E
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
5	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-1 (AP-28)	3.3.1-43	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
6	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
7	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.D-1 (A-103)	3.3.1-44	A
8	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
9	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
10	Bolting	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
11	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
12	Bolting	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-1 (AP-28)	3.3.1-43	A
13	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
14	Bolting	Pressure boundary	Steel	Condensation -EXT	Loss of material	Bolting Integrity (B.2.6)	VII.D-1 (A-103)	3.3.1-44	A
15	Expansion joint	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
16	Expansion joint	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
17	Expansion joint	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
18	Expansion joint	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
19	Flexible hose	Pressure boundary	Nickel alloy	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-13 (AP-53)	3.3.1-78	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
20	Flexible hose	Pressure boundary	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VII.J-14 (AP-16)	3.3.1-94	A
21	Flexible hose	Pressure boundary	Nickel alloy	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	G
22	Flexible hose	Pressure boundary	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 302
23	Flexible hose	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
24	Flexible hose	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
25	Flexible hose	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
26	Orifice	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
27	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
29	Orifice	Leakage boundary (spatial)	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
30	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
31	Orifice	Pressure boundary and Flow restriction	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
32	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
33	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Orifice	Pressure boundary and Flow restriction	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
35	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
36	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
37	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
38	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Gray cast iron	Air - outdoor-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G
39	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
40	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
41	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
42	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
43	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
44	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
45	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
46	Piping	Pressure boundary	Nickel alloy	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-13 (AP-53)	3.3.1-78	A
47	Piping	Pressure boundary	Nickel alloy	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	G
48	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
49	Piping	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
50	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
51	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
52	Piping	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
53	Piping	Pressure boundary	Stainless steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.C1-16 (AP-56)	3.3.1-29	E
54	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
55	Piping	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
56	Piping	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
57	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
58	Piping	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
59	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
60	Piping	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
61	Piping	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VII.C1-18 (A-01)	3.3.1-19	A
62	Piping (Spent Fuel Pool makeup)	Pressure boundary	Stainless steel	Treated borated water	Loss of material	Water Chemistry (B.2.42)	VII.A2-1 (AP-79)	3.3.1-91	A
63	Piping (Spent Fuel Pool makeup)	Pressure boundary	Stainless steel	Treated borated water-EXT	Loss of material	Water Chemistry (B.2.42)	VII.A2-1 (AP-79)	3.3.1-91	A
64	Pump casing	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
65	Pump casing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
66	Pump casing	Pressure boundary	Cast austenitic stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
67	Pump casing	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
68	Pump casing	Pressure boundary	Cast austenitic stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
69	Pump casing	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
70	Pump casing	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
71	Pump casing	Pressure boundary	Steel	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
72	Pump casing (idle / drained)	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
73	Pump casing (idle / drained)	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.G-23 (A-23)	3.3.1-71	A
74	Pump casing (idle / drained)	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
75	Pump casing (idle / drained)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
76	Pump casing (idle / drained)	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
77	Pump casing (idle / drained)	Pressure boundary	Steel	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
78	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
79	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
80	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water-EXT	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
81	Pump casing (submerged bowl)	Pressure boundary	Gray cast iron	Raw water-EXT	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C1-11 (A-51)	3.3.1-85	B
82	Sight glass	Pressure boundary	Glass	Raw water	None	None	VII.J-11 (AP-50)	3.3.1-93	A
83	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
84	Strainer body	Pressure boundary	Cast austenitic stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
85	Strainer body	Pressure boundary	Cast austenitic stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
86	Strainer body	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
87	Strainer body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
88	Strainer body	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
89	Strainer element	Filtration	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
90	Tank	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
91	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
92	Tubing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
93	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
94	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
95	Tubing	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
96	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
97	Tubing	Pressure boundary	Stainless steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	G
98	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
99	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
100	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
101	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	G

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
102	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
103	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
104	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
105	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
106	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A
107	Valve body	Pressure boundary	Cast austenitic stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
108	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
109	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	G
110	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
111	Valve body	Pressure boundary	Cast austenitic stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E
112	Valve body	Pressure boundary	Stainless steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-15 (A-54)	3.3.1-79	A
113	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
114	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
115	Valve body	Pressure boundary	Stainless steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-30 (continued): Service Water System (Unit 2 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
116	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
117	Valve body	Pressure boundary	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VII.C2-14 (A-25)	3.3.1-47	A
118	Valve body	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VII.C1-19 (A-38)	3.3.1-76	A
119	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
120	Valve body	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
121	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
122	Valve body	Pressure boundary	Steel	Condensation -EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-31
Auxiliary Systems –
Solid Waste Disposal System –
Summary of Aging Management Evaluation

Table 3.3.2-31 : Solid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
6	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-31 (continued): Solid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Filter housing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
8	Filter housing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
9	Filter housing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
10	Filter housing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
11	Filter housing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
12	Flexible hose	Leakage boundary (spatial)	Elastomers	Air - indoor uncontrolled	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H, 303
13	Flexible hose	Leakage boundary (spatial)	Elastomers	Air - indoor uncontrolled	Hardening and Loss of strength	External Surfaces Monitoring (B.2.15)	VII.F2-7 (A-17)	3.3.1-11	E, 303

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Flexible hose	Leakage boundary (spatial)	Elastomers	Air - indoor uncontrolled-EXT	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
15	Flexible hose	Leakage boundary (spatial)	Elastomers	Air - indoor uncontrolled-EXT	Hardening and Loss of strength	External Surfaces Monitoring (B.2.15)	VII.F2-7 (A-17)	3.3.1-11	E
16	Flexible hose	Leakage boundary (spatial)	Elastomers	Air with borated water leakage-EXT	None	None	N/A	N/A	G
17	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
18	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
19	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
20	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
21	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
22	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
23	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
24	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
25	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
26	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
27	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-31 (continued): Solid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Piping (fitting)	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
29	Piping (fitting)	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
30	Piping (fitting)	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
31	Piping (fitting)	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
32	Piping (fitting)	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A
33	Piping (fitting)	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
34	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305

Table 3.3.2-31 (continued): Solid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
36	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
37	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
38	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-18 (A-35)	3.3.1-17	C, 305
39	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VII.C2-9 (AP-31)	3.3.1-85	B
40	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-18 (A-35)	3.3.1-17	C, 305
41	Pump casing	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
42	Pump casing	Leakage boundary (spatial)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
43	Pump casing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
44	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
45	Pump casing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
46	Pump casing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
47	Pump casing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
48	Sight glass	Leakage boundary (spatial)	Glass	Treated water	None	None	VII.J-13 (AP-51)	3.3.1-93	A

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
49	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VII.J-8 (AP-14)	3.3.1-93	A
50	Sight glass	Leakage boundary (spatial)	Glass	Air with borated water leakage-EXT	None	None	N/A	N/A	G
51	Tank	Leakage boundary (spatial)	Polymer	Air - indoor uncontrolled	None	None	N/A	N/A	F
52	Tank	Leakage boundary (spatial)	Polymer	Treated water	None	None	N/A	N/A	F
53	Tank	Leakage boundary (spatial)	Polymer	Air - indoor uncontrolled-EXT	None	None	N/A	N/A	F
54	Tank	Leakage boundary (spatial)	Polymer	Air with borated water leakage-EXT	None	None	N/A	N/A	F
55	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-31 (continued): Solid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
56	Tank	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316
57	Tank	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
58	Tank	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
59	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
60	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
61	Tubing	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316

Table 3.3.2-31 (continued): Solid Waste Disposal System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
63	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
64	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
65	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
66	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
67	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
68	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
69	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
70	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
71	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
72	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 316

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
73	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
74	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
75	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
76	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
77	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
78	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
79	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
80	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-31 (continued): Solid Waste Disposal System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
81	Valve body	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VII.E3-15 (A-58)	3.3.1-24	C, 305
82	Valve body	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VII.E3-15 (A-58)	3.3.1-24	C, 305
83	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
84	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-32
Auxiliary Systems –
Supplementary Leak Collection and Release System –
Summary of Aging Management Evaluation

Table 3.3.2-32 : Supplementary Leak Collection and Release System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A
5	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-4 (AP-27)	3.3.1-43	A
6	Bolting	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VII.I-1 (AP-28)	3.3.1-43	A
7	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-2 (A-102)	3.3.1-89	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Damper housing	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
9	Damper housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A
10	Damper housing	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
11	Damper housing	Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
12	Damper housing	Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A
13	Damper housing	Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
14	Duct	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
15	Duct	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A
16	Duct	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.I-9 (A-78)	3.3.1-58	A
17	Duct	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
18	Duct	Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
19	Duct	Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
20	Duct	Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
21	Fan housing	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
22	Fan housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A
23	Fan housing	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
24	Filter housing	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
25	Filter housing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
26	Filter housing	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
27	Flexible connection	Pressure boundary	Elastomers	Air - indoor uncontrolled	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H, 303
28	Flexible connection	Pressure boundary	Elastomers	Air - indoor uncontrolled	Hardening and Loss of strength	External Surfaces Monitoring (B.2.15)	VII.F2-7 (A-17)	3.3.1-11	E, 303
29	Flexible connection	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	H
30	Flexible connection	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Hardening and Loss of strength	External Surfaces Monitoring (B.2.15)	VII.F2-7 (A-17)	3.3.1-11	E
31	Flexible connection	Pressure boundary	Elastomers	Air with borated water leakage-EXT	None	None	N/A	N/A	G
32	Flow straightener	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
33	Flow straightener	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Flow straightener	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
35	Heater housing	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
36	Heater housing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
37	Heater housing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
38	Isokinetic nozzle	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
39	Isokinetic nozzle	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
40	Isokinetic nozzle	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
41	Moisture separator	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
42	Moisture separator	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
43	Moisture separator	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
44	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
45	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
46	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
47	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
48	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
49	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A
50	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
51	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
52	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
53	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
54	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
55	Piping	Pressure boundary	Steel	Dried air	None	None	VII.J-22 (AP-4)	3.3.1-98	A
56	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A
57	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A
58	Tank	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
59	Tank	Leakage boundary (spatial)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.C1-15 (A-54)	3.3.1-79	E, 317
60	Tank	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
61	Tank	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
62	Tank (seal bladder accumulator)	Pressure boundary	Steel	Dried air	None	None	VII.J-22 (AP-4)	3.3.1-98	A
63	Tank (seal bladder accumulator)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A
64	Tank (seal bladder accumulator)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
65	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.F2-1 (A-09)	3.3.1-27	E
66	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
67	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
68	Valve body	Pressure boundary	Aluminum	Dried air	None	None	V.F-2 (EP-3)	3.2.1-50	A, 314

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
69	Valve body	Pressure boundary	Aluminum	Air - indoor uncontrolled-EXT	None	None	VII.J-1 (AP-36)	3.3.1-95	A
70	Valve body	Pressure boundary	Aluminum	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.E1-10 (AP-1)	3.3.1-88	A
71	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
72	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
73	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
74	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 304
75	Valve body	Pressure boundary	Copper alloy >15% Zn	Dried air	None	None	VII.J-3 (AP-8)	3.3.1-98	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
76	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
77	Valve body	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
78	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VII.J-15 (AP-17)	3.3.1-94	A, 304
79	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VII.J-15 (AP-17)	3.3.1-94	A
80	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
81	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
82	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VII.F2-2 (A-10)	3.3.1-56	A

Table 3.3.2-32 (continued): Supplementary Leak Collection and Release System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
83	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-10 (A-79)	3.3.1-89	A

Notes for Table 3.3.2-1 through 3.3.2-32

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP has some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP has some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 (Chapter VII) for this component.

G. Environment not in NUREG-1801 (Chapter VII) for this component and material.

H. Aging effect not in NUREG-1801 (Chapter VII) for this component, material and environment combination.

I. Aging effect in NUREG-1801 (Chapter VII) for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801 (Chapter VII).

Plant-specific notes

301. This row addresses both the downstream face and the external flange of the rupture disc.

302. For the purpose of NUREG-1801 comparison, the aging effect is also applicable to nickel alloy in this environment.

303. This external monitoring program is capable of managing the internal aging effects, since the same effects will be observable externally, and observation of the surface during physical manipulation will reveal both cracking and hardening/loss of strength.

304. For the purpose of NUREG-1801 comparison, this external environment NUREG-1801 row is also applicable to the internal surface for this material.

305. For the purpose of NUREG-1801 comparison, this row for a BWR system is also applicable to PWR systems with treated (unborated) water.
306. The security diesel generator fuel oil tank suction line foot valve is a gray cast iron valve that is immersed in fuel oil. Thus, fuel oil is the internal and external environment.
307. These items represent piping and piping components that are associated with the Fuel Building ACU drain system and are exposed to condensation formed from the dehumidification of Fuel Building air.
308. Items are applicable to a nonsafety-related air conditioning unit that is not credited except as part of the River Water boundary.
309. Isokinetic nozzles and associated sample piping for ventilation vent effluent monitors are located outside (on a roof). NUREG-1801 does not address stainless steel in an outdoor air environment.
310. Assumes aluminum alloy contains greater than 12% Zn and/or 6% Mg.
311. For the purpose of NUREG-1801 comparison of aging effects for glass, air is considered to be equivalent to dried air.
312. Loss of material due to galvanic corrosion is only applicable to components in contact with stainless steel.
313. Reduction of heat transfer by fins due to buildup of particulate on external surfaces.
314. For comparison of aging evaluations, this NUREG-1801 row for air-indoor uncontrolled is considered to be applicable to dried air.
315. This raw water environment is associated with filtered water from the Water Treatment System. The Open Cycle Cooling Water System program is not applicable to this environment.
316. This raw water environment is associated with aerated drains from sumps. The Open Cycle Cooling Water System program is not applicable to this environment.
317. This raw water environment is associated with aerated condensation drains from ventilation systems. The Open Cycle Cooling Water System program is not applicable to this environment.
318. These components are associated with the Fire Water System and are managed by the Fire Water System program.
319. These components are associated with the CO_2 / Halon subsystems and are managed by the Fire Protection System program.

320. This raw water environment is associated with condensed or separated water from portions of the system with undried air, or with the Unit 2 Containment instrument air compressor seal water fluid. The Open Cycle Cooling Water System program is not applicable to this environment.

321. This environment is associated with undried portions of the system which are expected to be potentially wetted. Aging effects are managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

322. This raw water environment is associated with Domestic Water. The Open Cycle Cooling Water System program is not applicable to this environment.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEMS

3.4.1 INTRODUCTION

This section provides the results of the aging management reviews for components in the Steam and Power Conversion Systems that are subject to aging management review. The following listed systems are addressed in this chapter. A link to the associated system description section in Chapter 2 is also provided.

- Auxiliary Feedwater System (Section 3.4.2.1.1) / (Section 2.3.4.1)
- Auxiliary Steam System (Section 3.4.2.1.2) / (Section 2.3.4.2)
- Building Services Hot Water Heating System (Section 3.4.2.1.3) / (Section 2.3.4.3)
- Condensate System (Unit 1 only) (Section 3.4.2.1.4) / (Section 2.3.4.4)
- Glycol Heating System (Unit 1 only) (Section 3.4.2.1.5) / (Section 2.3.4.5)
- Main Feedwater System (Section 3.4.2.1.6) / (Section 2.3.4.6)
- Main Steam System (Section 3.4.2.1.7) / (Section 2.3.4.7)
- Main Turbine and Condenser System (Section 3.4.2.1.8) / (Section 2.3.4.8)
- Steam Generator Blowdown System (Section 3.4.2.1.9) / (Section 2.3.4.9)
- Water Treatment System (Section 3.4.2.1.10) / (Section 2.3.4.10)

Table 3.4.1, *Summary of Aging Management Evaluations in Chapter VIII of NUREG-1801 for Steam and Power Conversion Systems*, provides the summary of the programs evaluated in NUREG-1801 [Reference 1.3-5] for the Steam and Power Conversion System component group. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.4.2 RESULTS

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for the Steam and Power Conversion Systems.

- Table 3.4.2-1 Auxiliary Feedwater System – Summary of Aging Management Evaluation

- Table 3.4.2-2 Auxiliary Steam System – Summary of Aging Management Evaluation
- Table 3.4.2-3 Building Services Hot Water Heating System – Summary of Aging Management Evaluation
- Table 3.4.2-4 Condensate System (Unit 1 only) – Summary of Aging Management Evaluation
- Table 3.4.2-5 Glycol Heating System (Unit 1 only) – Summary of Aging Management Evaluation
- Table 3.4.2-6 Main Feedwater System – Summary of Aging Management Evaluation
- Table 3.4.2-7 Main Steam System – Summary of Aging Management Evaluation
- Table 3.4.2-8 Main Turbine and Condenser System – Summary of Aging Management Evaluation
- Table 3.4.2-9 Steam Generator Blowdown System – Summary of Aging Management Evaluation
- Table 3.4.2-10 Water Treatment System – Summary of Aging Management Evaluation

3.4.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the Steam and Power Conversion Systems. Programs are described in Appendix B. Further details are provided in the system tables.

3.4.2.1.1 Auxiliary Feedwater System

Materials

Auxiliary Feedwater System components are constructed of the following materials.

- Cast austenitic stainless steel
- Copper alloy <15% Zn
- Copper alloy >15% Zn
- Elastomers
- Glass
- Gray cast iron
- High strength steel
- Nickel alloy
- Stainless steel
- Steel

Environment

Auxiliary Feedwater System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air with borated water leakage
- Air with steam or water leakage
- Condensation
- Lubricating oil
- Raw water
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Auxiliary Feedwater System require management.

- Cracking
- Cumulative fatigue damage
- Hardening and loss of strength

- Loss of material
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the effects of aging on Auxiliary Feedwater System components.

- Bolting Integrity (Section B.2.6)
- Boric Acid Corrosion (Section B.2.7)
- Buried Piping and Tanks Inspection (Section B.2.8)
- External Surfaces Monitoring (Section B.2.15)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- Lubricating Oil Analysis (Section B.2.24)
- One-Time Inspection (Section B.2.30)
- Open-Cycle Cooling Water System (Section B.2.32)
- Selective Leaching of Materials Inspection (Section B.2.36)
- Water Chemistry (Section B.2.42)

3.4.2.1.2 Auxiliary Steam System

Materials

Auxiliary Steam System components are constructed of the following materials.

- Glass
- Gray cast iron
- Nickel alloy
- Stainless steel
- Steel

Environment

Auxiliary Steam System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air with borated water leakage
- Closed cycle cooling water

- Condensation
- Treated water
- Treated water >60°C (>140°F)

Aging Effects Requiring Management

The following aging effects associated with the Auxiliary Steam System require management.

- Cracking
- Cumulative fatigue damage
- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Auxiliary Steam System components.

- Bolting Integrity (Section B.2.6)
- Boric Acid Corrosion (Section B.2.7)
- Closed-Cycle Cooling Water System (Section B.2.9)
- External Surfaces Monitoring (Section B.2.15)
- Flow-Accelerated Corrosion (Section B.2.18)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- One-Time Inspection (Section B.2.30)
- Selective Leaching of Materials Inspection (Section B.2.36)
- Water Chemistry (Section B.2.42)

3.4.2.1.3 Building Services Hot Water Heating System

Materials

Building Services Hot Water Heating System components are constructed of the following materials.

- Copper alloy <15% Zn
- Copper alloy >15% Zn
- Glass

- Gray cast iron
- Stainless steel
- Steel

Environment

Building Services Hot Water Heating System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air with borated water leakage
- Gas
- Treated water
- Treated water >60°C (>140°F)

Aging Effects Requiring Management

The following aging effects associated with the Building Services Hot Water Heating System require management.

- Cracking
- Cumulative fatigue damage
- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Building Services Hot Water Heating System components.

- Bolting Integrity (Section B.2.6)
- Boric Acid Corrosion (Section B.2.7)
- External Surfaces Monitoring (Section B.2.15)
- Flow-Accelerated Corrosion (Section B.2.18)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- One-Time Inspection (Section B.2.30)
- Selective Leaching of Materials Inspection (Section B.2.36)
- Water Chemistry (Section B.2.42)

3.4.2.1.4 Condensate System (Unit 1 only)

Materials

Condensate System components are constructed of the following materials.

- Aluminum
- Cast austenitic stainless steel
- Gray cast Iron
- Stainless steel
- Steel

Environment

Condensate System components are exposed to the following environments.

- Air - indoor uncontrolled
- Air - outdoor
- Condensation
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effect associated with the Condensate System requires management.

- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Condensate System components.

- Bolting Integrity (Section B.2.6)
- Buried Piping and Tanks Inspection (Section B.2.8)
- External Surfaces Monitoring (Section B.2.15)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- One-Time Inspection (Section B.2.30)
- Selective Leaching of Materials Inspection (Section B.2.36)
- Water Chemistry (Section B.2.42)

3.4.2.1.5 Glycol Heating System (Unit 1 only)

Materials

Glycol Heating System components are constructed of the following materials.

- Copper alloy <15% Zn
- Copper alloy >15% Zn
- Glass
- Gray cast iron
- Stainless steel
- Steel

Environment

Glycol Heating System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air with borated water leakage
- Gas
- Treated water
- Treated water >60°C (>140°F)

Aging Effects Requiring Management

The following aging effects associated with the Glycol Heating System require management.

- Cracking
- Cumulative fatigue damage
- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Glycol Heating System components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Flow-Accelerated Corrosion

- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Selective Leaching of Materials Inspection
- Water Chemistry

3.4.2.1.6 Main Feedwater System

Materials

Main Feedwater System components are constructed of the following materials.

- Nickel alloy
- Stainless steel
- Steel

Environment

Main Feedwater System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air-outdoor
- Air with borated water leakage
- Treated water
- Treated water >60°C (>140°F)

Aging Effects Requiring Management

The following aging effects associated with the Main Feedwater System require management.

- Cracking
- Cumulative fatigue damage
- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Main Feedwater System components.

- Bolting Integrity (Section B.2.6)

- Boric Acid Corrosion (Section B.2.7)
- External Surfaces Monitoring (Section B.2.15)
- Flow-Accelerated Corrosion (Section B.2.18)
- One-Time Inspection (Section B.2.30)
- Water Chemistry (Section B.2.42)

3.4.2.1.7 Main Steam System

Materials

Main Steam System components are constructed of the following materials.

- Cast austenitic stainless steel
- Nickel alloy
- Stainless steel
- Steel

Environment

Main Steam System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air-outdoor
- Air with borated water leakage
- Treated water
- Treated water >60°C (>140°F)
- Treated water >250°C (>482°F)

Aging Effects Requiring Management

The following aging effects associated with the Main Steam System require management.

- Cracking
- Cumulative fatigue damage
- Loss of Fracture Toughness
- Loss of Material

Aging Management Programs

The following aging management programs manage the effects of aging on Main Steam System components.

- Bolting Integrity (Section B.2.6)
- Boric Acid Corrosion (Section B.2.7)
- External Surfaces Monitoring (Section B.2.15)
- Flow-Accelerated Corrosion (Section B.2.18)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- One-Time Inspection (Section B.2.30)
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (Section B.2.41)
- Water Chemistry (Section B.2.42)

3.4.2.1.8 Main Turbine and Condenser System

Materials

Main Turbine and Condenser System components are constructed of the following materials.

- Gray cast iron
- Stainless steel
- Steel

Environment

Main Turbine and Condenser System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air with borated water leakage
- Condensation

Aging Effects Requiring Management

The following aging effect associated with the Main Turbine and Condenser System requires management.

- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Main Turbine and Condenser System components.

- Bolting Integrity (Section B.2.6)
- Boric Acid Corrosion (Section B.2.7)
- External Surfaces Monitoring (Section B.2.15)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- Selective Leaching of Materials Inspection (Section B.2.36)

3.4.2.1.9 Steam Generator Blowdown System

Materials

Steam Generator Blowdown System components are constructed of the following materials.

- Cast austenitic stainless steel
- Nickel alloy
- Stainless steel
- Steel

Environment

Steam Generator Blowdown System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air with borated water leakage
- Closed cycle cooling water
- Condensation

- Treated water
- Treated water >250°C (>482°F)
- Treated water >60°C (>140°F)

Aging Effects Requiring Management

The following aging effects associated with the Steam Generator Blowdown System require management.

- Cracking
- Cumulative fatigue damage
- Loss of fracture toughness
- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Steam Generator Blowdown System components.

- Bolting Integrity (Section B.2.6)
- Boric Acid Corrosion (Section B.2.7)
- Closed-Cycle Cooling Water System (Section B.2.9)
- External Surfaces Monitoring (Section B.2.15)
- Flow-Accelerated Corrosion (Section B.2.18)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- One-Time Inspection (Section B.2.30)
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (Section B.2.41)
- Water Chemistry (Section B.2.42)

3.4.2.1.10 Water Treatment System

Materials

Water Treatment System components are constructed of the following materials.

- Copper alloy <15% Zn
- Copper alloy >15% Zn

- Glass
- Stainless steel
- Steel

Environment

Water Treatment System components are exposed to the following environments.

- Air-indoor uncontrolled
- Air-outdoor
- Air with borated water leakage
- Condensation
- Raw water
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effect associated with the Water Treatment System requires management.

- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on Water Treatment System components.

- Bolting Integrity (Section B.2.6)
- Boric Acid Corrosion (Section B.2.7)
- Buried Piping and Tanks Inspection (Section B.2.8)
- External Surfaces Monitoring (Section B.2.15)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B.2.22)
- One-Time Inspection (Section B.2.30)
- Selective Leaching of Materials Inspection (Section B.2.36)
- Water Chemistry (Section B.2.42)

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.4.2.2 of NUREG-1800 [Reference 1.3-4] discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.4.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3 [Reference 1.3-3]. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4.3.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

3.4.2.2.2.1 Steel Piping and Components Exposed to Treated Water and Steam

Loss of material due to general, pitting, and crevice corrosion could occur for steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water and for steel piping, piping components, and piping elements exposed to steam.

The BVPS steel piping, piping components, or piping elements in-scope for license renewal that are exposed to steam are compared to NUREG-1801 rows for Treated water. No components were compared to NUREG-1801 rows for the Steam environment, therefore Item 3.4.1-02 is not applicable. BVPS manages steel and gray cast iron components exposed to treated water with a combination of the Water Chemistry Program (Section B.2.42) and the One-Time Inspection Program (Section B.2.30). The steam-driven auxiliary feedwater pump turbine casing is also aligned to this item.

The Water Chemistry Program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking and loss of material aging effects. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.2.2 Steel Piping Components Exposed to Lubricating Oil

Loss of material due to general, pitting and crevice corrosion could occur for steel piping, piping components, and piping elements exposed to lubricating oil.

BVPS manages piping components exposed to lubricating oil with a combination of the Lubricating Oil Analysis Program (Section B.2.24) and the One-Time Inspection Program (Section B.2.30).

The Lubricating Oil Analysis Program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material, cracking or reduction of heat transfer. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.3 Loss of Material Due to General, Pitting, and Crevice, and Microbiologically-Influenced Corrosion (MIC), and Fouling

Loss of material due to general, pitting, crevice, and MIC, and fouling could occur in steel piping, piping components, and piping elements exposed to raw water.

Steel piping and tank in the Water Treatment System contain filtered river water, which is evaluated as raw water for aging comparisons. Aging of these components is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (Section B.2.22).

Portions of the Auxiliary Feedwater System within the scope of license renewal that are exposed to raw water are managed by the Open Cycle Cooling water System Program (Section B.2.32). Refer to Table 3.4.1, Item 3.4.1-31.

3.4.2.2.4 Reduction of Heat Transfer Due to Fouling

3.4.2.2.4.1 Heat Exchanger Tubes Exposed to Treated Water

Reduction of heat transfer due to fouling could occur for heat exchanger tubes exposed to treated water.

BVPS manages heat exchanger components exposed to treated water with a combination of the Water Chemistry Program (Section B.2.42) and the One-Time Inspection Program (Section B.2.30). The Water Chemistry Program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking and loss of material aging effects. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.4.2 Heat Exchanger Tubes Exposed to Lubricating Oil

Reduction of heat transfer due to fouling could occur for heat exchanger tubes exposed to lubricating oil.

BVPS manages Steam and Power Conversion System heat exchanger components exposed to lubricating oil with a combination of the Lubricating Oil Analysis Program (Section B.2.24) and the One-Time Inspection Program (Section B.2.30). The Lubricating Oil Analysis Program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material, cracking or reduction of heat transfer. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.5 Loss of Material Due to General, Pitting, Crevice and Microbiologically-Influenced Corrosion

3.4.2.2.5.1 Steel Piping Components and Tanks Exposed to Soil

Loss of material due to general, pitting and crevice corrosion, and MIC could occur in steel (with or without coating or wrapping) piping, piping components, piping elements and tanks exposed to soil.

Buried piping in the Auxiliary Feedwater System is managed by the Buried Piping and Tanks Inspection Program (Section B.2.8). The program includes preventive measures to mitigate corrosion (e.g., coatings and wrappings required by design), and inspections to manage the effects of corrosion on the pressure-retaining capability of buried steel and stainless steel components. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components will be inspected when excavated during maintenance or a planned inspection.

The exterior of the bottom of the Primary Plant Demineralized Water Storage Tank is protected by construction or treatment methods intended to preclude water from the tank bottom, and the tank is located within a concrete structure.

These features are expected to exclude air and water from the bottom of the tank. However, verification of the absence of air and water is impractical, and the tank was evaluated as if it may be exposed to air and water. The tank is mounted on a concrete slab. While the tank is not in contact with soil, the environment is presented as "Soil," as this environment approximates the potentially wetted concrete–steel interface. Loss of material for this component will be managed by the One-Time Inspection Program (Section B.2.30). The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.5.2 Steel Heat Exchanger Components Exposed to Lubricating Oil

Loss of material due to general, pitting and crevice corrosion, and MIC could occur in steel heat exchanger components exposed to lubricating oil.

The Auxiliary Feedwater System heat exchanger components are fabricated from copper alloys, stainless steel and gray cast iron. Only the stainless steel and copper alloy heat exchanger components are exposed to lubricating oil. See Further Evaluation for Section 3.4.2.2.4.1 and Section 3.4.2.2.4.2. Therefore, this item is not applicable to BVPS.

3.4.2.2.6 Cracking Due to Stress Corrosion Cracking (SCC)

Cracking due to SCC could occur in stainless steel piping, piping components, and piping elements, tanks, and heat exchanger components exposed to steam or treated water greater than 140°F, and for stainless steel piping, piping components, and piping elements exposed to steam.

The BVPS stainless steel components that are exposed to steam and are in-scope for license renewal were compared to NUREG-1801 rows for Treated water >140°F. No components were compared to NUREG-1801 rows for the Steam environment, therefore item 3.4.1-13 is not applicable. BVPS manages stainless steel piping components exposed to treated water with a combination of the Water Chemistry Program (Section B.2.42) together with the One-Time Inspection Program (Section B.2.30). The steam-driven auxiliary feedwater pump turbine is also aligned to this item. The aging effect is also applicable to nickel alloy in treated water environments exceeding 500°F. The Water Chemistry Program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking and loss of material aging effects. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.7 Loss of Material Due to Pitting and Crevice Corrosion

3.4.2.2.7.1 Stainless Steel, Aluminum, and Copper Alloy Components Exposed to Treated Water

Loss of material due to pitting and crevice corrosion could occur for stainless steel, aluminum, and copper alloy piping, piping components and piping elements and for stainless steel tanks and heat exchanger components exposed to treated water.

BVPS manages loss of material for piping components, heat exchangers and tanks exposed to treated water with a combination of the Water Chemistry Program (Section B.2.42) together with the One-Time Inspection Program (Section B.2.30). The steam-driven auxiliary feedwater pump turbine is also aligned to this item. The Water Chemistry Program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking and loss of material aging effects. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

Heat exchangers in the Building Services Hot Water Heating System also align to this row.

3.4.2.2.7.2 Stainless Steel Piping Components Exposed to Soil

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil.

Buried stainless steel piping in the Condensate and Water Treatment Systems is managed by the Buried Piping and Tanks Inspection Program (Section B.2.8). The program includes preventive measures to mitigate corrosion (e.g., coatings and wrappings required by design), and inspections to manage the effects of corrosion on the pressure-retaining capability of buried steel and stainless steel components. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components will be inspected when excavated during maintenance or a planned inspection.

The demineralized water storage tanks used to supply the Unit 1 dedicated auxiliary feedwater pump and the Unit 2 auxiliary feedwater pumps are supported on concrete pads. Provisions are made to exclude water from the exterior of the tank bottom surfaces by means of an oil sand bedding, and the safety-related Unit 2 tank is housed within a concrete structure. While the tanks are not in contact with soil, the environment is presented as "Soil," as this environment approximates the potentially wetted concrete and oil sand / stainless steel interface. Loss of material for these components will be managed by the One-Time Inspection Program (Section B.2.30). The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring, or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.7.3 Copper Alloy Piping Components Exposed to Lubricating Oil

Loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to lubricating oil.

BVPS manages Auxiliary Feedwater System copper alloy piping and heat exchanger components exposed to lubricating oil with a combination of the Lubricating Oil Analysis Program (Section B.2.24) and the One-Time Inspection Program (Section B.2.30). The Lubricating Oil Analysis Program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material, cracking or reduction of heat transfer. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.8 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

Loss of material due to pitting, crevice, and MIC could occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil.

BVPS manages Auxiliary Feedwater System stainless steel piping and heat exchanger components exposed to lubricating oil with a combination of the Lubricating Oil Analysis Program (Section B.2.24) and the One-Time Inspection Program (Section B.2.30). The Lubricating Oil Analysis Program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material, cracking or reduction of heat transfer. The One-Time Inspection Program provides an inspection that either verifies that unacceptable degradation is not occurring or triggers additional actions that assure the intended function of affected components will be maintained during the period of extended operation.

3.4.2.2.9 Loss of Material Due to General, Pitting, and Crevice, and Galvanic Corrosion

Loss of material due to general, pitting, crevice, and galvanic corrosion can occur for steel heat exchanger components exposed to treated water.

NUREG-1800 Table 3.4-1 does not contain a pointer to Further Evaluation Section 3.4.2.2.9. However, item 3.4.1-05 (BWR only item) Further Evaluation column points to NUREG-1800, Section 3.4.2.2.2.9, which is assumed to be a link to this Section (3.4.2.2.9). BVPS Condensate System heat exchanger components exposed to treated water are not within the scope of license renewal, and the NUREG-1801 row that aligns to this Further Evaluation item is specific to BWRs. Therefore, this item is not applicable to BVPS.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-related Components

See Appendix B, Section B.1.3, for discussion of BVPS quality assurance procedures and administrative controls for aging management programs.

3.4.2.3 Time-Limited Aging Analyses

The following Time-Limited Aging Analyses (TLAAs) are associated with Steam and Power Conversion System components. The section of the application that contains the TLAA review results is indicated in parentheses.

1. Cumulative Fatigue Damage (Section 4.3, Metal Fatigue)

3.4.3 CONCLUSION

The Steam and Power Conversion Systems components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Steam and Power Conversion Systems components/commodities will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1
Summary of Aging Management Evaluations in Chapter VIII of NUREG-1801 for Steam and Power Conversion Systems

Table 3.4.1 : Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-01	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801, with additional components. Fatigue of metal components is addressed as a TLAA in Section 4.3. Further evaluation is documented in Section 3.4.2.2.1.
3.4.1-02	Steel piping, piping components, and piping elements exposed to steam	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. No BVPS AMR line items roll up to this item. BVPS evaluated steam environments as treated water. See Item 3.4.1-03. Further evaluation is documented in Section 3.4.2.2.2.1.
3.4.1-03	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. BVPS manages the aging effect with a combination of the Water Chemistry (B.2.42) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.2.1.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-04	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801, with additional components. BVPS manages the aging effect with a combination of the Water Chemistry (B.2.42) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.2.1.
3.4.1-05	BWR only—not used				
3.4.1-06	Steel and stainless steel tanks exposed to treated water	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. BVPS manages the aging effect with a combination of the Water Chemistry (B.2.42) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.7.1.
3.4.1-07	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. BVPS manages the aging effect with a combination of the Lubricating Oil Analysis (B.2.24) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.2.2.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-08	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Plant specific	Yes, plant specific	Consistent with NUREG-1801. BVPS manages the aging effect with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22) Program. Further evaluation is documented in Section 3.4.2.2.3.
3.4.1-09	Stainless steel and copper alloy heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. BVPS manages the aging effect with a combination of the Water Chemistry (B.2.42) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.4.1.
3.4.1-10	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. BVPS manages the aging effect with a combination of the Lubricating Oil Analysis (B.2.24) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.4.2.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-11	Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Consistent with NUREG-1801, with a different program assigned for one component. BVPS manages the aging effect for piping with the Buried Piping and Tanks Inspection (B.2.8) Program. However, the external bottom surface of a tank mounted on a concrete pad was evaluated with a soil environment to address the potential for loss of material. BVPS will manage the aging effect for this tank with the One-Time Inspection (B.2.30) Program. Further evaluation is documented in Section 3.4.2.2.5.1.
3.4.1-12	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. No BVPS AMR line items roll up to this item. Further evaluation is documented in Section 3.4.2.2.5.2.
3.4.1-13	BWR only—not used				

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-14	Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801, with additional components. BVPS manages the aging effect with a combination of the Water Chemistry (B.2.42) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.6.
3.4.1-15	Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801, with heat exchangers added. BVPS manages the aging effect with a combination of the Water Chemistry (B.2.42) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.7.1.
3.4.1-16	Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801, with additional components. BVPS manages the aging effect with a combination of the Water Chemistry (B.2.42) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.7.1.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-17	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	Consistent with NUREG-1801. BVPS manages the aging effect with either the Buried Piping and Tanks Inspection (B.2.8) or One-Time Inspection (B.2.30) Program. Further evaluation is documented in Section 3.4.2.2.7.2.
3.4.1-18	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801, with heat exchangers included. BVPS manages the aging effect with a combination of the Lubricating Oil Analysis (B.2.24) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.7.3.
3.4.1-19	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. BVPS manages the aging effect with a combination of the Lubricating Oil Analysis (B.2.24) and One-Time Inspection (B.2.30) Programs. Further evaluation is documented in Section 3.4.2.2.8.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-20	Steel tanks exposed to air - outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable. No BVPS AMR line items roll up to this item.
3.4.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Consistent with NUREG-1801. BVPS manages the aging effect with the Bolting Integrity (B.2.6) Program.
3.4.1-22	Steel bolting and closure bolting exposed to air with steam or water leakage, air - outdoor (external), or air - indoor uncontrolled (external);	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801, with exception of loss of preload aging effect. BVPS did not identify loss of preload as an aging effect for closure bolting. However, BVPS assigned the Bolting Integrity (B.2.6) Program to manage aging of in-scope bolting. The Bolting Integrity Program is consistent with NUREG-1801.
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable. No BVPS AMR line items roll up to this item.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-24	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. BVPS manages the aging effect with the Closed-Cycle Cooling Water System (B.2.9) Program.
3.4.1-25	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. BVPS manages the aging effect by the Closed-Cycle Cooling Water System (B.2.9) Program.
3.4.1-26	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. No BVPS AMR line items roll up to this item.
3.4.1-27	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable. No BVPS AMR line items roll up to this item.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-28	Steel external surfaces exposed to air - indoor uncontrolled (external), condensation (external), or air outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801, with a different program for one component type. BVPS manages the aging effect with the External Surfaces Monitoring (B.2.15) Program. For heating coil headers, the external surfaces may be within the ductwork; BVPS manages the aging effect for these components with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22) Program.
3.4.1-29	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801, with heat exchangers included. BVPS manages the aging effect with the Flow-Accelerated Corrosion (B.2.18) Program.
3.4.1-30	Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Consistent with NUREG-1801. BVPS manages the aging effect with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22) Program.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for a different component type (valves). BVPS manages the aging effect with the Open-Cycle Cooling Water System (B.2.32) Program.
3.4.1-32	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, with a different AMP assigned. BVPS manages the aging effect with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22) Program. The affected components are exposed to filtered river water in the Water Treating System, which is unrelated to open-cycle cooling water.
3.4.1-33	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. No BVPS AMR line items roll up to this item.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-34	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable. No BVPS AMR line items roll up to this item.
3.4.1-35	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801, with additional components and AMP exceptions. BVPS manages the aging effect for susceptible components by the Selective Leaching of Materials Inspection (B.2.36) Program. Heat exchanger components are included.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-36	Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801, with additional components and AMP exceptions. Components, including heat exchanger components, in the Building Services Hot Water Heating system and Glycol Heating System have been aligned to this item based on material, environment, aging effect, and program assignment. BVPS manages the aging effect for susceptible components using the Selective Leaching of Materials Inspection (B.2.36) Program.
3.4.1-37	Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Not applicable. No BVPS AMR line items roll up to this item.
3.4.1-38	Steel bolting and external surfaces exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801. BVPS manages the aging effect with the Boric Acid Corrosion (B.2.7) Program.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-39	Stainless steel piping, piping components, and piping elements exposed to steam	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable. No BVPS AMR line items roll up to this item.
3.4.1-40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Air-indoor uncontrolled (External) is considered equivalent to an internal environment of Air-indoor uncontrolled for aging comparison. Glass in air is considered equivalent to glass in gas for aging comparison. Water Treatment System tanks fabricated of fiberglass, a glass composition, are evaluated relative to aging effects as glass.
3.4.1-41	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Note that components from Auxiliary Systems have been aligned to this item number. Air-indoor uncontrolled (External) is considered equivalent to an internal environment of Air-indoor uncontrolled for aging comparison.

Table 3.4.1 (continued): Steam and Power Conversion Systems, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-42	Steel piping, piping components, and piping elements exposed to air - indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. No BVPS AMR line items roll up to this item.
3.4.1-43	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. No BVPS AMR line items roll up to this item.
3.4.1-44	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801, with additional components.

Table 3.4.2-1
Steam and Power Conversion Systems – Auxiliary Feedwater System – Summary of Aging Management Evaluation

Table 3.4.2-1 : Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
5	Bolting	Pressure boundary	High-strength steel	Air with steam or water leakage-EXT	Cracking	Bolting Integrity (B.2.6)	VIII.H-3 (S-03)	3.4.1-21	A
6	Bolting	Pressure boundary	High-strength steel	Air with steam or water leakage-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-6 (S-02)	3.4.1-22	A
7	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
9	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
10	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
11	Flexible hose	Pressure boundary	Elastomers	Lubricating oil	None	None	N/A	N/A	G
12	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Cracking	External Surfaces Monitoring (B.2.15)	N/A	N/A	G
13	Flexible hose	Pressure boundary	Elastomers	Air - indoor uncontrolled-EXT	Hardening and Loss of strength	External Surfaces Monitoring (B.2.15)	N/A	N/A	G
14	Flexible hose	Pressure boundary	Elastomers	Air with borated water leakage-EXT	None	None	N/A	N/A	G
15	Flexible hose	Pressure boundary	Nickel alloy	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Flexible hose	Pressure boundary	Nickel alloy	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A
17	Flexible hose	Pressure boundary	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VIII.I-9 (SP-11)	3.4.1-41	A
18	Flexible hose	Pressure boundary	Nickel alloy	Air with borated water leakage-EXT	None	None	N/A	N/A	G
19	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A
20	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.G-26 (SP-27)	3.4.1-36	D
21	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
22	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
23	Heat exchanger (channel)	Pressure boundary	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
24	Heat exchanger (channel)	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	C

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
25	Heat exchanger (channel)	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	C
26	Heat exchanger (channel)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
27	Heat exchanger (channel)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
28	Heat exchanger (shell)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-19 (SP-32)	3.4.1-18	C
29	Heat exchanger (shell)	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-19 (SP-32)	3.4.1-18	C
30	Heat exchanger (shell)	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
31	Heat exchanger (shell)	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	C
32	Heat exchanger (shell)	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-3 (S-20)	3.4.1-19	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
33	Heat exchanger (shell)	Pressure boundary	Stainless steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-3 (S-20)	3.4.1-19	A
34	Heat exchanger (shell)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
35	Heat exchanger (shell)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
36	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-15 (SP-61)	3.4.1-15	C
37	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-15 (SP-61)	3.4.1-15	C
38	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Treated water	Reduction of heat transfer	One-Time Inspection (B.2.30)	VIII.G-10 (SP-58)	3.4.1-09	A
39	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Treated water	Reduction of heat transfer	Water Chemistry (B.2.42)	VIII.G-10 (SP-58)	3.4.1-09	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
40	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-19 (SP-32)	3.4.1-18	C
41	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.G-19 (SP-32)	3.4.1-18	C
42	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	VIII.G-8 (SP-53)	3.4.1-10	A
43	Heat exchanger (tube)	Pressure boundary and Heat transfer	Copper alloy <15% Zn	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	VIII.G-8 (SP-53)	3.4.1-10	A
44	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	C
45	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	C

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Treated water	Reduction of heat transfer	One-Time Inspection (B.2.30)	VIII.F-10 (SP-40)	3.4.1-09	A
47	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Treated water	Reduction of heat transfer	Water Chemistry (B.2.42)	VIII.F-10 (SP-40)	3.4.1-09	A
48	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-3 (S-20)	3.4.1-19	A
49	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.G-3 (S-20)	3.4.1-19	A
50	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Lubricating oil-EXT	Reduction of heat transfer	Lubricating Oil Analysis (B.2.24)	VIII.G-12 (SP-62)	3.4.1-10	A
51	Heat exchanger (tube)	Pressure boundary and Heat transfer	Stainless steel	Lubricating oil-EXT	Reduction of heat transfer	One-Time Inspection (B.2.30)	VIII.G-12 (SP-62)	3.4.1-10	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
52	Orifice	Pressure boundary and Flow restriction	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A
53	Orifice	Pressure boundary and Flow restriction	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A
54	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
55	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
56	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A
57	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
58	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
59	Orifice	Pressure boundary and Flow restriction	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
60	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A
61	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
63	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
64	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
65	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A
66	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
67	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
68	Piping	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 402

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
69	Piping	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-19 (SP-32)	3.4.1-18	A
70	Piping	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-19 (SP-32)	3.4.1-18	A
71	Piping	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
72	Piping	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
73	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A
74	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A
75	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
76	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
77	Piping	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.G-34 (SP-60)	3.4.1-30	A
78	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-35 (SP-25)	3.4.1-07	A
79	Piping	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-35 (SP-25)	3.4.1-07	A
80	Piping	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A
81	Piping	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A
82	Piping	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A
83	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
84	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
85	Piping	Pressure boundary	Steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VIII.G-1 (S-01)	3.4.1-01	A
86	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A
87	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A
88	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
89	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
90	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-35 (SP-25)	3.4.1-07	A
91	Pump casing	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-35 (SP-25)	3.4.1-07	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
92	Pump casing	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A
93	Pump casing	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A
94	Pump casing	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
95	Pump casing	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
96	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled	None	None	VIII.I-5 (SP-9)	3.4.1-40	A, 402
97	Sight glass	Pressure boundary	Glass	Lubricating oil	None	None	VIII.I-6 (SP-10)	3.4.1-40	A
98	Sight glass	Pressure boundary	Glass	Air - indoor uncontrolled-EXT	None	None	VIII.I-5 (SP-9)	3.4.1-40	A
99	Sight glass	Pressure boundary	Glass	Air with borated water leakage-EXT	None	None	N/A	N/A	G
100	Strainer body	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
101	Strainer body	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A
102	Strainer body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
103	Strainer body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
104	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A
105	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A
106	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
107	Tank	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
108	Tank	Pressure boundary	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G
109	Tank	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-40 (S-13)	3.4.1-06	A
110	Tank	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-40 (S-13)	3.4.1-06	A
111	Tank	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
112	Tank	Pressure boundary	Stainless steel	Soil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.G-31 (SP-37)	3.4.1-17	E, 410
113	Tank	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-35 (SP-25)	3.4.1-07	A
114	Tank	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-35 (SP-25)	3.4.1-07	A
115	Tank	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A
116	Tank	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
117	Tank	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
118	Tank	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
119	Tank	Pressure boundary	Steel	Soil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.G-1 (S-01)	3.4.1-11	E, 410
120	Tubing	Pressure boundary	Copper alloy <15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-19 (SP-32)	3.4.1-18	A, 401
121	Tubing	Pressure boundary	Copper alloy <15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-19 (SP-32)	3.4.1-18	A, 401
122	Tubing	Pressure boundary	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
123	Tubing	Pressure boundary	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	N/A	N/A	G
124	Tubing	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
125	Tubing	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A
126	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
127	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
128	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A
129	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
130	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
131	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
132	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
133	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A
134	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
135	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
136	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
137	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A
138	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
139	Valve body	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
140	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-19 (SP-32)	3.4.1-18	A
141	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-19 (SP-32)	3.4.1-18	A
142	Valve body	Pressure boundary	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
143	Valve body	Pressure boundary	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
144	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-19 (SP-32)	3.4.1-18	A
145	Valve body	Pressure boundary	Copper alloy >15% Zn	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.G-19 (SP-32)	3.4.1-18	A
146	Valve body	Pressure boundary	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G
147	Valve body	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-32 (SP-16)	3.4.1-16	A
148	Valve body	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-32 (SP-16)	3.4.1-16	A
149	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
150	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
151	Valve body	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.G-34 (SP-60)	3.4.1-30	A
152	Valve body	Pressure boundary	Steel	Lubricating oil	Loss of material	One-Time Inspection (B.2.30)	VIII.G-35 (SP-25)	3.4.1-07	A
153	Valve body	Pressure boundary	Steel	Lubricating oil	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-35 (SP-25)	3.4.1-07	A
154	Valve body	Pressure boundary	Steel	Raw water	Loss of material	Open-Cycle Cooling Water System (B.2.32)	VIII.G-7 (S-24)	3.4.1-31	C
155	Valve body	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.G-38 (S-10)	3.4.1-04	A
156	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.G-38 (S-10)	3.4.1-04	A
157	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
158	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-1 (continued): Auxiliary Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
159	Valve body	Pressure boundary	Steel	Lubricating oil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.G-35 (SP-25)	3.4.1-07	A
160	Valve body	Pressure boundary	Steel	Lubricating oil-EXT	Loss of material	Lubricating Oil Analysis (B.2.24)	VIII.G-35 (SP-25)	3.4.1-07	A

Table 3.4.2-2
Steam and Power Conversion Systems –
Auxiliary Steam System –
Summary of Aging Management Evaluation

Table 3.4.2-2 : Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A

Table 3.4.2-2 (continued): Auxiliary Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
4	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
5	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
6	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	C
7	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
8	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water	Cumulative fatigue damage	TLAA	N/A	N/A	H
10	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A, 407
11	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A, 407
12	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A, 407
13	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 407
14	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VIII.E-2 (S-25)	3.4.1-25	A
15	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	C

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	C
17	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.E-36 (S-22)	3.4.1-16	A
18	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.E-36 (S-22)	3.4.1-16	A
19	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
20	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
21	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VIII.E-5 (S-23)	3.4.1-24	A
22	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A

Table 3.4.2-2 (continued): Auxiliary Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
23	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	C
24	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
25	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
26	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
27	Orifice	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A
28	Orifice	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A
29	Orifice	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-2 (continued): Auxiliary Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
30	Orifice	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A
31	Orifice	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
32	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
33	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
34	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
35	Piping	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
36	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
37	Piping	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
38	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
39	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
40	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
41	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
42	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
43	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
44	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
45	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
46	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	B
47	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
48	Pump casing	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-2 (continued): Auxiliary Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
49	Pump casing	Leakage boundary (spatial)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
50	Pump casing	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
51	Pump casing	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
52	Pump casing	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
53	Pump casing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
54	Pump casing	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
55	Sight glass	Leakage boundary (spatial)	Glass	Treated water	None	None	VIII.I-8 (SP-35)	3.4.1-40	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
56	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VIII.I-5 (SP-9)	3.4.1-40	A
57	Sight glass	Leakage boundary (spatial)	Glass	Air with borated water leakage-EXT	None	None	N/A	N/A	G
58	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
59	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
60	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
61	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
62	Strainer body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
63	Strainer body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
64	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
65	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
66	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
67	Tank	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
68	Trap body	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
69	Trap body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
70	Trap body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
71	Trap body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
72	Trap body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
73	Trap body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
74	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A
75	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A
76	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-2 (continued): Auxiliary Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
77	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A
78	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
79	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
80	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
81	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
82	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A
83	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
84	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
85	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
86	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
87	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
88	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
89	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
90	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A

Table 3.4.2-2 (continued): Auxiliary Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
91	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
92	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
93	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
94	Valve body	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
95	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A

Table 3.4.2-2 (continued): Auxiliary Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
96	Valve body	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
97	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
98	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
99	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-3
Steam and Power Conversion Systems – Building Services Hot Water Heating System – Summary of Aging Management Evaluation

Table 3.4.2-3 : Building Services Hot Water Heating System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
2	Bolting	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
3	Bolting	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
4	Bolting	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
5	Bolting	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
6	Bolting	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	C
8	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	C
9	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	C
10	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	C
11	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
12	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A
13	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	C

Table 3.4.2-3 (continued): Building Services Hot Water Heating System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
15	Heat exchanger (shell / channel)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
16	Heating coil	Leakage boundary (spatial)	Copper alloy <15% Zn	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.A-5 (SP-61)	3.4.1-15	C
17	Heating coil	Leakage boundary (spatial)	Copper alloy <15% Zn	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.A-5 (SP-61)	3.4.1-15	C
18	Heating coil	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	C
19	Heating coil	Leakage boundary (spatial)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
20	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Cracking	One-Time Inspection (B.2.30)	N/A	N/A	H

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
21	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Cracking	Water Chemistry (B.2.42)	N/A	N/A	H
22	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.A-5 (SP-61)	3.4.1-15	C
23	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-21 (SP-55)	3.4.1-35	D
24	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.A-5 (SP-61)	3.4.1-15	C
25	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	C
26	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	C
27	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	C

Table 3.4.2-3 (continued): Building Services Hot Water Heating System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A
29	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
30	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	D
31	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
32	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.H-7 (S-29)	3.4.1-28	E, 413
33	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
34	Heating coil (header)	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	C

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Heating coil (header)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	C
36	Heating coil (header)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
37	Heating coil (header)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A
38	Heating coil (header)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
39	Heating coil (header)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.H-7 (S-29)	3.4.1-28	E, 413
40	Heating coil (header)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
41	Orifice	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
43	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
44	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
45	Orifice	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
46	Orifice	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
47	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
48	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
49	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
50	Piping	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A
51	Piping	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
52	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
53	Piping	Leakage boundary (spatial)	Steel	Gas	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
54	Piping	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A
55	Piping	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
56	Piping	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
57	Piping	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
58	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
59	Piping	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
60	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
61	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
62	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	B

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
63	Pump casing	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
64	Pump casing	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
65	Sight glass	Leakage boundary (spatial)	Glass	Gas	None	None	VIII.I-4 (SP-33)	3.4.1-40	A, 409
66	Sight glass	Leakage boundary (spatial)	Glass	Treated water	None	None	VIII.I-8 (SP-35)	3.4.1-40	A
67	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VIII.I-5 (SP-9)	3.4.1-40	A
68	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A
69	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
70	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
71	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
72	Strainer body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
73	Strainer body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
74	Tank	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-40 (S-13)	3.4.1-06	A
75	Tank	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	D
76	Tank	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-40 (S-13)	3.4.1-06	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
77	Tank	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
78	Tank	Leakage boundary (spatial)	Steel	Gas	None	None	VIII.I-15 (SP-4)	3.4.1-44	C
79	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
80	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
81	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
82	Trap body	Leakage boundary (spatial)	Gray cast iron	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A
83	Trap body	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
84	Trap body	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
85	Trap body	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	B
86	Trap body	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
87	Trap body	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
88	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.A-5 (SP-61)	3.4.1-15	A
89	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.A-5 (SP-61)	3.4.1-15	A
90	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
91	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
92	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
93	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
94	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A
95	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
96	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
97	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
98	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
99	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
100	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
101	Valve body	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A
102	Valve body	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
103	Valve body	Leakage boundary (spatial)	Steel	Gas	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
104	Valve body	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A

Table 3.4.2-3 (continued): Building Services Hot Water Heating System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
105	Valve body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
106	Valve body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
107	Valve body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
108	Valve body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
109	Valve body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-4
Steam and Power Conversion Systems – Condensate System – Summary of Aging Management Evaluation

Table 3.4.2-4 : Condensate System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
2	Bolting	Pressure boundary	Stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G
3	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
4	Bolting	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-1 (S-32)	3.4.1-22	A
5	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-29 (SP-16)	3.4.1-16	A
6	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-29 (SP-16)	3.4.1-16	A
7	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-4 (continued): Condensate System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Piping	Pressure boundary	Stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G
9	Piping	Pressure boundary	Stainless steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VIII.E-28 (SP-37)	3.4.1-17	E
10	Tank	Pressure boundary	Aluminum	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G
11	Tank	Pressure boundary	Aluminum	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-15 (SP-24)	3.4.1-15	A
12	Tank	Pressure boundary	Aluminum	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-15 (SP-24)	3.4.1-15	A
13	Tank	Pressure boundary	Aluminum	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	H, 405
14	Tank	Pressure boundary	Aluminum	Soil-EXT	Loss of material	One-Time Inspection (B.2.30)	N/A	N/A	G

Table 3.4.2-4 (continued): Condensate System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Tank	Pressure boundary	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G
16	Tank	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-40 (S-13)	3.4.1-06	A
17	Tank	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-40 (S-13)	3.4.1-06	A
18	Tank	Pressure boundary	Stainless steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	G, 404
19	Tank	Pressure boundary	Stainless steel	Soil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.E-28 (SP-37)	3.4.1-17	E
20	Valve Body	Pressure boundary	Cast austenitic stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-29 (SP-16)	3.4.1-16	A
21	Valve Body	Pressure boundary	Cast austenitic stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-29 (SP-16)	3.4.1-16	A

Table 3.4.2-4 (continued): Condensate System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
22	Valve Body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
23	Valve Body	Pressure boundary	Cast austenitic stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G
24	Valve Body	Pressure boundary	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
25	Valve Body	Pressure boundary	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	B
26	Valve Body	Pressure boundary	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
27	Valve Body	Pressure boundary	Gray cast iron	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-8 (S-41)	3.4.1-28	A

Table 3.4.2-5
Steam and Power Conversion Systems – Glycol Heating System (Unit 1 only) – Summary of Aging Management Evaluation

Table 3.4.2-5 : Glycol Heating System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
2	Bolting	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
3	Bolting	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
4	Heat exchanger (channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
5	Heat exchanger (channel)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A
6	Heat exchanger (channel)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A
8	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	C
9	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
10	Heat exchanger (shell)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
11	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-21 (SP-55)	3.4.1-35	D
12	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-15 (SP-61)	3.4.1-15	C
13	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-15 (SP-61)	3.4.1-15	C

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
14	Heating coil	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	C
15	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-37 (S-19)	3.4.1-03	A
16	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	D
17	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-37 (S-19)	3.4.1-03	A
18	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
19	Heating coil (header)	Leakage boundary (spatial)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
20	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
21	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
22	Orifice	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
23	Orifice	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
24	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
25	Piping	Leakage boundary (spatial)	Steel	Gas	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
26	Piping	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A
27	Piping	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Piping	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
29	Piping	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
30	Piping	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
31	Piping	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
32	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-15 (SP-61)	3.4.1-15	A
33	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-21 (SP-55)	3.4.1-35	B
34	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-15 (SP-61)	3.4.1-15	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Pump casing	Leakage boundary (spatial)	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
36	Pump casing	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
37	Pump casing	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
38	Pump casing	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
39	Sight glass	Leakage boundary (spatial)	Glass	Gas	None	None	VIII.I-4 (SP-33)	3.4.1-40	A, 409
40	Sight glass	Leakage boundary (spatial)	Glass	Treated water	None	None	VIII.I-8 (SP-35)	3.4.1-40	A
41	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VIII.I-5 (SP-9)	3.4.1-40	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
42	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A
43	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
44	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
45	Strainer body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
46	Strainer body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
47	Strainer body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
48	Tank	Leakage boundary (spatial)	Steel	Gas	None	None	VIII.I-15 (SP-4)	3.4.1-44	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
49	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A
50	Tank	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
51	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
52	Tank (fitting)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-40 (S-13)	3.4.1-06	A
53	Tank (fitting)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-40 (S-13)	3.4.1-06	A
54	Tank (fitting)	Leakage boundary (spatial)	Gray cast iron	Treated water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-23 (SP-27)	3.4.1-36	B
55	Tank (fitting)	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
56	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.A-5 (SP-61)	3.4.1-15	A
57	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.A-5 (SP-61)	3.4.1-15	A
58	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
59	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
60	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
61	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
62	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
63	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
64	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
65	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
66	Valve body	Leakage boundary (spatial)	Steel	Gas	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
67	Valve body	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.G-37 (S-11)	3.4.1-01	A
68	Valve body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.E-35 (S-16)	3.4.1-29	A
69	Valve body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-34 (S-10)	3.4.1-04	A

Table 3.4.2-5 (continued): Glycol Heating System (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
70	Valve body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-34 (S-10)	3.4.1-04	A
71	Valve body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
72	Valve body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-6
Steam and Power Conversion Systems – Main Feedwater System – Summary of Aging Management Evaluation

Table 3.4.2-6 : Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
5	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
6	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
7	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
8	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
9	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
10	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
11	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
12	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
13	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water	Cumulative fatigue damage	TLAA	N/A	N/A	H
14	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A, 407
15	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A, 407
16	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VIII.I-9 (SP-11)	3.4.1-41	A
17	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 407
18	Flexible hose	Pressure boundary	Nickel alloy	Treated water	Cumulative fatigue damage	TLAA	N/A	N/A	H
19	Flexible hose	Pressure boundary	Nickel alloy	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A, 407

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
20	Flexible hose	Pressure boundary	Nickel alloy	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A, 407
21	Flexible hose	Pressure boundary	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VIII.I-9 (SP-11)	3.4.1-41	A
22	Flexible hose	Pressure boundary	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 407
23	Orifice	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
24	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-8 (S-10)	3.4.1-04	A
25	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-8 (S-10)	3.4.1-04	A
26	Orifice	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
27	Orifice	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Orifice	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
29	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
30	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
31	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-8 (S-10)	3.4.1-04	A
32	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-8 (S-10)	3.4.1-04	A
33	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
35	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
36	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
37	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A
38	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
39	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
40	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
41	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
42	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
43	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-8 (S-10)	3.4.1-04	A
44	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-8 (S-10)	3.4.1-04	A
45	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
46	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
47	Piping	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
48	Piping	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
49	Piping	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-8 (S-10)	3.4.1-04	A
50	Piping	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-8 (S-10)	3.4.1-04	A
51	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
52	Piping	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-8 (S-41)	3.4.1-28	A
53	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
54	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
55	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
56	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
57	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
58	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A
59	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
60	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-6 (continued): Main Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
61	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
62	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
63	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
64	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
65	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A
66	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
67	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
68	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
69	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
70	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-6 (continued): Main Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
71	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
72	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A
73	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-6 (continued): Main Feedwater System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
74	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
75	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
76	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A

Table 3.4.2-6 (continued): Main Feedwater System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
77	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-8 (S-10)	3.4.1-04	A
78	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-8 (S-10)	3.4.1-04	A
79	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
80	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
81	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.D1-5 (SP-17)	3.4.1-14	A
82	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.D1-5 (SP-17)	3.4.1-14	A
83	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
84	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-4 (SP-16)	3.4.1-16	A
85	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.D1-4 (SP-16)	3.4.1-16	A

Table 3.4.2-6 (continued): Main Feedwater System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
86	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
87	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
88	Valve body	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
89	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
90	Valve body	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.D1-8 (S-10)	3.4.1-04	A
91	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.D1-8 (S-10)	3.4.1-04	A
92	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
93	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-7
Steam and Power Conversion Systems –
Main Steam System –
Summary of Aging Management Evaluation

Table 3.4.2-7 : Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
4	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Cumulative fatigue damage	TLAA	N/A	N/A	H
5	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
6	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A, 407
7	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A, 407
8	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
9	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A, 407
10	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A, 407
11	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VIII.I-9 (SP-11)	3.4.1-41	A
12	Flexible hose	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	N/A	N/A	G
13	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A, 407
14	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A, 407
15	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A, 407
17	Flexible hose	Pressure boundary	Nickel alloy	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A, 407
18	Flexible hose	Pressure boundary	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VIII.I-9 (SP-11)	3.4.1-41	A
19	Flexible hose	Pressure boundary	Nickel alloy	Air with borated water leakage-EXT	None	None	N/A	N/A	G
20	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled	None	None	VIII.I-10 (SP-12)	3.4.1-41	A, 402
21	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
22	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
23	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled	None	None	VIII.I-10 (SP-12)	3.4.1-41	A, 402
24	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
25	Orifice	Pressure boundary and Flow restriction	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
26	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
27	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
28	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Orifice	Pressure boundary and Flow restriction	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
30	Orifice	Pressure boundary and Flow restriction	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
31	Orifice	Pressure boundary and Flow restriction	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
32	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
33	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
34	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
35	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
36	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
37	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
38	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
39	Piping	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
40	Piping	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
41	Piping	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
42	Piping	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
43	Piping	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
44	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
45	Piping	Pressure boundary	Steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-8 (S-41)	3.4.1-28	A
46	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
47	Trap body	Leakage boundary (spatial)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
48	Trap body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
49	Trap body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
50	Trap body	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
51	Trap body	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
52	Trap body	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
53	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
54	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A
55	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
56	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A
57	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
58	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
59	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
60	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
61	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A
62	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
63	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A
64	Tubing	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
65	Tubing	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
66	Tubing	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
67	Turbine casing (aux feed)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	C

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
68	Turbine casing (aux feed)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	C
69	Turbine casing (aux feed)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of fracture toughness	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (B.2.41)	V.D2-20 (E-11)	3.2.1-20	C, 403
70	Turbine casing (aux feed)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	C
71	Turbine casing (aux feed)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	C
72	Turbine casing (aux feed)	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C

Table 3.4.2-7 (continued): Main Steam System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
73	Turbine casing (aux feed)	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
74	Turbine casing (aux feed)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	C
75	Turbine casing (aux feed)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	C
76	Turbine casing (aux feed)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	C
77	Turbine casing (aux feed)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	C
78	Turbine casing (aux feed)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
79	Turbine casing (aux feed)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
80	Turbine casing (aux feed)	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
81	Turbine casing (aux feed)	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	C
82	Turbine casing (aux feed)	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	C
83	Turbine casing (aux feed)	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
84	Turbine casing (aux feed)	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
85	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VIII.I-10 (SP-12)	3.4.1-41	A, 402

Table 3.4.2-7 (continued): Main Steam System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
86	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A
87	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A
88	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
89	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
90	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A
91	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
92	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
93	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
94	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A

Table 3.4.2-7 (continued): Main Steam System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
95	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
96	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
97	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
98	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
99	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
100	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A
101	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
102	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
103	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of fracture toughness	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (B.2.41)	V.D2-20 (E-11)	3.2.1-20	C, 403
104	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
105	Valve body	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A
106	Valve body	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
107	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled	None	None	VIII.I-10 (SP-12)	3.4.1-41	A, 402

Table 3.4.2-7 (continued): Main Steam System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
108	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.B1-5 (SP-17)	3.4.1-14	A
109	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.B1-5 (SP-17)	3.4.1-14	A
110	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
111	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-4 (SP-16)	3.4.1-16	A
112	Valve body	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.B1-4 (SP-16)	3.4.1-16	A
113	Valve body	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
114	Valve body	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-7 (continued): Main Steam System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
115	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
116	Valve body	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.B1-10 (S-08)	3.4.1-01	A
117	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.D1-9 (S-16)	3.4.1-29	A
118	Valve body	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.B1-11 (S-10)	3.4.1-04	A
119	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.B1-11 (S-10)	3.4.1-04	A
120	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
121	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-8
Steam and Power Conversion Systems – Main Turbine and Condenser System – Summary of Aging Management Evaluation

Table 3.4.2-8 : Main Turbine and Condenser System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.4.2-8 (continued): Main Turbine and Condenser System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
5	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
6	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A

Table 3.4.2-8 (continued): Main Turbine and Condenser System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
7	Moisture separator	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A
8	Moisture separator	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
9	Moisture separator	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
10	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G

Table 3.4.2-8 (continued): Main Turbine and Condenser System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
11	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
12	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
13	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A

Table 3.4.2-8 (continued): Main Turbine and Condenser System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
15	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
16	Piping	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A
17	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-8 (continued): Main Turbine and Condenser System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
19	Trap body	Leakage boundary (spatial)	Gray cast iron	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A
20	Trap body	Leakage boundary (spatial)	Gray cast iron	Condensation	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	N/A	N/A	G
21	Trap body	Leakage boundary (spatial)	Gray cast iron	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
22	Trap body	Leakage boundary (spatial)	Gray cast iron	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-8 (continued): Main Turbine and Condenser System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
23	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G
24	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
25	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-8 (continued): Main Turbine and Condenser System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
26	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A
27	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
28	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-8 (continued): Main Turbine and Condenser System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Valve body	Pressure boundary	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A
30	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
31	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-9
Steam and Power Conversion Systems – Steam Generator Blowdown System – Summary of Aging Management Evaluation

Table 3.4.2-9 : Steam Generator Blowdown System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
5	Bolting	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
6	Bolting	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
7	Bolting	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Bolting	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
9	Filter housing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
10	Filter housing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
11	Filter housing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
12	Filter housing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
13	Flexible hose (Unit 2 only)	Leakage boundary (spatial)	Nickel alloy	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A, 407
14	Flexible hose (Unit 2 only)	Leakage boundary (spatial)	Nickel alloy	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A, 407

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Flexible hose (Unit 2 only)	Leakage boundary (spatial)	Nickel alloy	Air - indoor uncontrolled-EXT	None	None	VIII.I-9 (SP-11)	3.4.1-41	A
16	Flexible hose (Unit 2 only)	Leakage boundary (spatial)	Nickel alloy	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A, 407
17	Heat exchanger (Unit 1 drain cooler - channel)	Leakage boundary (spatial)	Steel	Closed cycle cooling water	Loss of material	Closed-Cycle Cooling Water System (B.2.9)	VIII.F-4 (S-23)	3.4.1-24	A
18	Heat exchanger (Unit 1 drain cooler - channel)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
19	Heat exchanger (Unit 1 drain cooler - channel)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
20	Heat exchanger (Unit 1 drain cooler - shell)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-28 (S-19)	3.4.1-03	A
21	Heat exchanger (Unit 1 drain cooler - shell)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-28 (S-19)	3.4.1-03	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
22	Heat exchanger (Unit 1 drain cooler - shell)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
23	Heat exchanger (Unit 1 drain cooler - shell)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
24	Heat exchanger (Unit 1 reboiler)	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A
25	Heat exchanger (Unit 1 reboiler)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-28 (S-19)	3.4.1-03	A
26	Heat exchanger (Unit 1 reboiler)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-28 (S-19)	3.4.1-03	A
27	Heat exchanger (Unit 1 reboiler)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
28	Heat exchanger (Unit 1 reboiler)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Orifice	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
30	Orifice	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
31	Orifice	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
32	Orifice	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
33	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VIII.I-10 (SP-12)	3.4.1-41	A, 402

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
34	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
35	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
36	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
37	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
38	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
39	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
40	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-25 (S-10)	3.4.1-04	A
41	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.F-26 (S-16)	3.4.1-29	A
42	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-25 (S-10)	3.4.1-04	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
43	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
44	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
45	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.F-24 (SP-17)	3.4.1-14	A
46	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.F-24 (SP-17)	3.4.1-14	A
47	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
48	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
49	Piping	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
50	Piping	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
51	Piping	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
52	Piping	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
53	Piping	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.F-26 (S-16)	3.4.1-29	A
54	Piping	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-25 (S-10)	3.4.1-04	A
55	Piping	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-25 (S-10)	3.4.1-04	A
56	Piping	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
57	Piping	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
58	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
59	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
60	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
61	Pump casing	Leakage boundary (spatial)	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
62	Tank (Unit 1 only)	Leakage boundary (spatial)	Steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.B1-7 (SP-60)	3.4.1-30	A
63	Tank (Unit 1 only)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-25 (S-10)	3.4.1-04	A
64	Tank (Unit 1 only)	Leakage boundary (spatial)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-25 (S-10)	3.4.1-04	A
65	Tank (Unit 1 only)	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
66	Tank (Unit 1 only)	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
67	Tank (Unit 2 only)	Leakage boundary (spatial)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.D-4 (AP-81)	3.3.1-54	E, 411

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
68	Tank (Unit 2 only)	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
69	Tank (Unit 2 only)	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
70	Tank (Unit 2 only)	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
71	Tank (Unit 2 only)	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
72	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
73	Tubing	Leakage boundary (spatial)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
74	Tubing	Leakage boundary (spatial)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
75	Tubing	Leakage boundary (spatial)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
76	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
77	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
78	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.F-24 (SP-17)	3.4.1-14	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
79	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.F-24 (SP-17)	3.4.1-14	A
80	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
81	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
82	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
83	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
84	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
85	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
86	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.F-26 (S-16)	3.4.1-29	A
87	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-25 (S-10)	3.4.1-04	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
88	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-25 (S-10)	3.4.1-04	A
89	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
90	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
91	Valve body	Pressure boundary	Steel	Treated water	Cumulative fatigue damage	TLAA	VIII.D1-7 (S-11)	3.4.1-01	A
92	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Flow-Accelerated Corrosion (B.2.18)	VIII.F-26 (S-16)	3.4.1-29	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
93	Valve body	Pressure boundary	Steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.F-25 (S-10)	3.4.1-04	A
94	Valve body	Pressure boundary	Steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.F-25 (S-10)	3.4.1-04	A
95	Valve body	Pressure boundary	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
96	Valve body	Pressure boundary	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
97	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cracking	One-Time Inspection (B.2.30)	VIII.F-24 (SP-17)	3.4.1-14	A
98	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cracking	Water Chemistry (B.2.42)	VIII.F-24 (SP-17)	3.4.1-14	A
99	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H

Table 3.4.2-9 (continued): Steam Generator Blowdown System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
100	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of fracture toughness	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (B.2.41)	V.D2-20 (E-11)	3.2.1-20	C, 403, 406
101	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
102	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Treated water >250°C (>482°F)	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
103	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
104	Valve body (Unit 2 only)	Pressure boundary	Cast austenitic stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A
105	Valve body (Unit 2 only)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	One-Time Inspection (B.2.30)	VIII.F-24 (SP-17)	3.4.1-14	A

Table 3.4.2-9 (continued): Steam Generator Blowdown System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
106	Valve body (Unit 2 only)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cracking	Water Chemistry (B.2.42)	VIII.F-24 (SP-17)	3.4.1-14	A
107	Valve body (Unit 2 only)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Cumulative fatigue damage	TLAA	N/A	N/A	H
108	Valve body (Unit 2 only)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	One-Time Inspection (B.2.30)	VIII.F-23 (SP-16)	3.4.1-16	A
109	Valve body (Unit 2 only)	Pressure boundary	Stainless steel	Treated water >60°C (>140°F)	Loss of material	Water Chemistry (B.2.42)	VIII.F-23 (SP-16)	3.4.1-16	A
110	Valve body (Unit 2 only)	Pressure boundary	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
111	Valve body (Unit 2 only)	Pressure boundary	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-10
Steam and Power Conversion Systems – Water Treatment System – Summary of Aging Management Evaluation

Table 3.4.2-10 : Water Treatment System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	C
2	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	C

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
4	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	C
5	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	Bolting Integrity (B.2.6)	VIII.H-4 (S-34)	3.4.1-22	A

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
6	Bolting	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-2 (S-40)	3.4.1-38	A
7	Bolting	Pressure boundary	Stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G
8	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Air - indoor uncontrolled	None	None	VIII.I-2 (SP-6)	3.4.1-41	A, 402
9	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.E-18 (SP-31)	3.4.1-32	E, 412

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
10	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
11	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
12	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled	None	None	VIII.I-10 (SP-12)	3.4.1-41	A, 402

Table 3.4.2-10 (continued): Water Treatment System									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
13	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G
14	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.G-30 (SP-36)	3.4.1-32	E, 412
15	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-29 (SP-16)	3.4.1-16	A

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
16	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-29 (SP-16)	3.4.1-16	A
17	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
18	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	V.A-19 (E-29)	3.2.1-32	A
20	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.G-36 (S-12)	3.4.1-08	E
21	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
22	Piping	Leakage boundary (spatial) and/or Structural integrity (attached)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A
23	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-29 (SP-16)	3.4.1-16	A
24	Piping	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-29 (SP-16)	3.4.1-16	A
25	Piping	Pressure boundary	Stainless steel	Air - outdoor-EXT	None	None	N/A	N/A	G
26	Piping	Pressure boundary	Stainless steel	Soil-EXT	Loss of material	Buried Piping and Tanks Inspection (B.2.8)	VIII.G-31 (SP-37)	3.4.1-17	E
27	Sight glass	Leakage boundary (spatial)	Glass	Condensation	None	None	N/A	N/A	G
28	Sight glass	Leakage boundary (spatial)	Glass	Treated water	None	None	VIII.I-8 (SP-35)	3.4.1-40	A

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Sight glass	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VIII.I-5 (SP-9)	3.4.1-40	A
30	Tank	Leakage boundary (spatial)	Glass	Condensation	None	None	N/A	N/A	G, 408
31	Tank	Leakage boundary (spatial)	Glass	Treated water	None	None	VIII.I-8 (SP-35)	3.4.1-40	A, 408
32	Tank	Leakage boundary (spatial)	Glass	Air - indoor uncontrolled-EXT	None	None	VIII.I-5 (SP-9)	3.4.1-40	A, 408
33	Tank	Leakage boundary (spatial)	Steel	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.G-36 (S-12)	3.4.1-08	E
34	Tank	Leakage boundary (spatial)	Steel	Air - indoor uncontrolled-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	VIII.H-7 (S-29)	3.4.1-28	A
35	Tank	Leakage boundary (spatial)	Steel	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VIII.H-9 (S-30)	3.4.1-38	A

Table 3.4.2-10 (continued): Water Treatment System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
36	Tank	Pressure boundary	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VII.D-4 (AP-81)	3.3.1-54	E, 411
37	Tank	Pressure boundary	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-40 (S-13)	3.4.1-06	A
38	Tank	Pressure boundary	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-40 (S-13)	3.4.1-06	A
39	Tank	Pressure boundary	Stainless steel	Air - outdoor-EXT	Loss of material	External Surfaces Monitoring (B.2.15)	N/A	N/A	G, 404
40	Tank	Pressure boundary	Stainless steel	Soil-EXT	Loss of material	One-Time Inspection (B.2.30)	VIII.G-31 (SP-37)	3.4.1-17	E, 410
41	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.E-18 (SP-31)	3.4.1-32	E, 412
42	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.4.2-10 (continued): Water Treatment System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
43	Tubing	Leakage boundary (spatial)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A
44	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.E-18 (SP-31)	3.4.1-32	E, 412
45	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
46	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy <15% Zn	Air with borated water leakage-EXT	None	None	VII.J-5 (AP-11)	3.3.1-99	A

Table 3.4.2-10 (continued): Water Treatment System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
47	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Raw water	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	VIII.E-18 (SP-31)	3.4.1-32	E, 412
48	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Raw water	Loss of material	Selective Leaching of Materials Inspection (B.2.36)	VIII.E-20 (SP-30)	3.4.1-35	B
49	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Air - indoor uncontrolled-EXT	None	None	VIII.I-2 (SP-6)	3.4.1-41	A

Table 3.4.2-10 (continued): Water Treatment System

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
50	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Copper alloy >15% Zn	Air with borated water leakage-EXT	Loss of material	Boric Acid Corrosion (B.2.7)	VII.I-12 (AP-66)	3.3.1-88	A
51	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Condensation	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.22)	N/A	N/A	G
52	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	One-Time Inspection (B.2.30)	VIII.E-29 (SP-16)	3.4.1-16	A

Table 3.4.2-10 (continued): Water Treatment System									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
53	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Treated water	Loss of material	Water Chemistry (B.2.42)	VIII.E-29 (SP-16)	3.4.1-16	A
54	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air - indoor uncontrolled-EXT	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
55	Valve body	Leakage boundary (spatial) and/or Structural integrity (attached)	Stainless steel	Air with borated water leakage-EXT	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Notes for Table 3.4.2-1 through 3.4.2-10

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP has some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP has some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 (Chapter VIII) for this component.

G. Environment not in NUREG-1801 (Chapter VIII) for this component and material.

H. Aging effect not in NUREG-1801 (Chapter VIII) for this component, material and environment combination.

I. Aging effect in NUREG-1801 (Chapter VIII) for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801 (Chapter VIII).

Plant-specific notes

401. Loss of material is due to galvanic corrosion and is only applicable to components in contact with stainless steel.

402. For the purpose of NUREG-1801 comparison, this external environment NUREG-1801 row is also applicable to the internal surface for this material.

403. For the purpose of NUREG-1801 comparison, this row for a BWR system is also applicable to PWR systems with treated (unborated) water.

404. This AMP applies only at the base of the tank, where water pooling can result in a concentration of contaminants.

405. This AMP applies only at the base of the tank, where water pooling can result in a concentration of contaminants, and at the tank aluminum-to-stainless steel transition welds, where galvanic corrosion can occur.
406. Applies to twelve (12) valve bodies fabricated of CASS that are in the Unit 2 Steam Generator Blowdown System pressure boundary.
407. For the purpose of NUREG-1801 comparison, the aging effect is also applicable to nickel alloy in this environment.
408. The tank is fabricated of fiberglass, which is a glass composition, and, relative to aging effects, is evaluated as glass.
409. For NUREG-1801 comparison, “glass in air” is considered equivalent to “glass in gas”.
410. Environment is listed as soil as an approximation, but is actually the interface with a concrete pad. The tanks are not buried.
411. This condensation environment represents the wetted surface of the air space in a tank, and is not associated with the Compressed Air System.
412. This raw water environment is associated with filtered water from the Water Treatment System. The Open Cycle Cooling Water System program is not applicable to this environment.
413. The external surface of these components is within ventilation equipment housings and is not normally visible.

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3.5 AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

3.5.1 INTRODUCTION

This section provides the results of the aging management review for structural components and commodities that are subject to aging management review. The following listed structures are addressed in this chapter. A link to the associated structure description section in Chapter 2 is also provided.

- Alternate Intake Structure (Common) (Section 3.5.2.1.1) / (Section 2.4.1)
- Auxiliary Building (Section 3.5.2.1.2) / (Section 2.4.2)
- Boric Acid Tank Building (Unit 1 only) (Section 3.5.2.1.3) / (Section 2.4.3)
- Cable Tunnel (Section 3.5.2.1.4) / (Section 2.4.4)
- Chemical Addition Building (Unit 1 only) (Section 3.5.2.1.5) / (Section 2.4.5)
- Condensate Polishing Building (Unit 2 only) (Section 3.5.2.1.6) / (Section 2.4.6)
- Control Building (Unit 2 only) (Section 3.5.2.1.7) / (Section 2.4.7)
- Decontamination Building (Section 3.5.2.1.8) / (Section 2.4.8)
- Diesel Generator Building (Section 3.5.2.1.9) / (Section 2.4.9)
- Emergency Outfall Structure (Unit 2 only) (Section 3.5.2.1.10) / (Section 2.4.10)
- Emergency Response Facility Diesel Generator Building (Common) (Section 3.5.2.1.11) / (Section 2.4.11)
- Emergency Response Facility Substation Building (Common) (Section 3.5.2.1.12) (Section 2.4.12)
- Equipment Hatch Platform (Section 3.5.2.1.13) / (Section 2.4.13)
- Fuel Building (Section 3.5.2.1.14) / (Section 2.4.14)
- Gaseous Waste Storage Vault (Section 3.5.2.1.15) / (Section 2.4.15)
- Guard House (Common) (Section 3.5.2.1.16) / (Section 2.4.16)
- Intake Structure (Common) (Section 3.5.2.1.17) / (Section 2.4.17)
- Main Steam and Cable Vault (Section 3.5.2.1.18) / (Section 2.4.18)
- Pipe Tunnel (Section 3.5.2.1.19) / (Section 2.4.19)
- Primary Demineralized Water Storage Tank Pad and Enclosure (Section 3.5.2.1.20) / (Section 2.4.20)
- Primary Water Storage Building (Unit 1 only) (Section 3.5.2.1.21) / (Section 2.4.21)

- Reactor Containment Building (Section 3.5.2.1.22) / (Section 2.4.22)
- Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings (Section 3.5.2.1.23) / (Section 2.4.23)
- Relay Building (Common) (Section 3.5.2.1.24) / (Section 2.4.24)
- Safeguards Building (Section 3.5.2.1.25) / (Section 2.4.25)
- Service Building (Section 3.5.2.1.26) / (Section 2.4.26)
- Solid Waste Building (Unit 1 only) (Section 3.5.2.1.27) / (Section 2.4.27)
- South Office and Shops Building (Common) (Section 3.5.2.1.28) / (Section 2.4.28)
- Steam Generator Drain Tank Structure (Unit 1 only) (Section 3.5.2.1.29) / (Section 2.4.29)
- Switchyard (Common) (Section 3.5.2.1.30) / (Section 2.4.30)
- Turbine Building (Section 3.5.2.1.31) / (Section 2.4.31)
- Valve Pit (Section 3.5.2.1.32) / (Section 2.4.32)
- Waste Handling Building (Unit 2 only) (Section 3.5.2.1.33) / (Section 2.4.33)
- Water Treatment Building (Unit 1 only) (Section 3.5.2.1.34) / (Section 2.4.34)
- Yard Structures (Section 3.5.2.1.35) / (Section 2.4.35)
- Bulk Structural Commodities (Section 3.5.2.1.36) / (Section 2.4.36)

Table 3.5.1, *Summary of Aging Management Evaluations in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports*, provides the summary of the programs evaluated in NUREG-1801 [Reference 1.3-5] for structures and component supports. Hyperlinks are provided to the program evaluations in Appendix B.

3.5.2 RESULTS

The following tables summarize the results of aging management reviews and the NUREG-1801 comparison for structures and component supports.

- Table 3.5.2-1 Alternate Intake Structure (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-2 Auxiliary Building – Summary of Aging Management Evaluation
- Table 3.5.2-3 Boric Acid Tank Building (Unit 1 only) – Summary of Aging Management Evaluation

- Table 3.5.2-4 Cable Tunnel – Summary of Aging Management Evaluation
- Table 3.5.2-5 Chemical Addition Building (Unit 1 only) – Summary of Aging Management Evaluation
- Table 3.5.2-6 Condensate Polishing Building (Unit 2 only) – Summary of Aging Management Evaluation
- Table 3.5.2-7 Control Building (Unit 2 only) – Summary of Aging Management Evaluation
- Table 3.5.2-8 Decontamination Building – Summary of Aging Management Evaluation
- Table 3.5.2-9 Diesel Generator Building – Summary of Aging Management Evaluation
- Table 3.5.2-10 Emergency Outfall (Unit 2 only) – Summary of Aging Management Evaluation
- Table 3.5.2-11 Emergency Response Facility Diesel Generator Building (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-12 Emergency Response Facility Substation Building (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-13 Equipment Hatch Platform – Summary of Aging Management Evaluation
- Table 3.5.2-14 Fuel Building – Summary of Aging Management Evaluation
- Table 3.5.2-15 Gaseous Waste Storage Vault – Summary of Aging Management Evaluation
- Table 3.5.2-16 Guard House (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-17 Intake Structure (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-18 Main Steam and Cable Vault – Summary of Aging Management Evaluation

- Table 3.5.2-19 Pipe Tunnel – Summary of Aging Management Evaluation
- Table 3.5.2-20 Primary Demineralized Water Storage Tank Pad and Enclosure – Summary of Aging Management Evaluation
- Table 3.5.2-21 Primary Water Storage Building (Unit 1 only) – Summary of Aging Management Evaluation
- Table 3.5.2-22 Reactor Containment Building – Summary of Aging Management Evaluation
- Table 3.5.2-23 Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings – Summary of Aging Management Evaluation
- Table 3.5.2-24 Relay Building (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-25 Safeguards Building – Summary of Aging Management Evaluation
- Table 3.5.2-26 Service Building – Summary of Aging Management Evaluation
- Table 3.5.2-27 Solid Waste Building (Unit 1 only) – Summary of Aging Management Evaluation
- Table 3.5.2-28 South Office and Shops Building (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-29 Steam Generator Drain Tank Structure (Unit 1 only) – Summary of Aging Management Evaluation
- Table 3.5.2-30 Switchyard (Common) – Summary of Aging Management Evaluation
- Table 3.5.2-31 Turbine Building – Summary of Aging Management Evaluation
- Table 3.5.2-32 Valve Pit – Summary of Aging Management Evaluation
- Table 3.5.2-33 Waste Handling Building (Unit 2 only) – Summary of Aging Management Evaluation

- Table 3.5.2-34 Water Treatment Building (Unit 1 only) – Summary of Aging Management Evaluation
- Table 3.5.2-35 Yard Structures – Summary of Aging Management Evaluation
- Table 3.5.2-36 Bulk Structural Commodities – Summary of Aging Management Evaluation

3.5.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for structures and component supports subject to aging management review. Programs are described in Appendix B. Further details are provided in the structure and commodities tables.

3.5.2.1.1 Alternate Intake Structure (Common)

Materials

Alternate Intake Structure components subject to aging management review are constructed of the following materials.

- Alloy steel
- Carbon steel
- Concrete
- Galvanized steel

Environment

Alternate Intake Structure components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to raw water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Alternate Intake Structure components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Alternate Intake Structure components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.2 Auxiliary Building

Materials

Auxiliary Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel
- Stainless steel

Environment

Auxiliary Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Auxiliary Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Auxiliary Building components.

- Boric Acid Corrosion (Section B.2.7)
- Fire Protection (Section B.2.16)
- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.3 Boric Acid Tank Building (Unit 1 only)

Materials

Boric Acid Tank Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Boric Acid Tank Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Boric Acid Tank Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Boric Acid Tank Building components.

- Boric Acid Corrosion (Section B.2.7)
- Structures Monitoring (Section B.2.39)

3.5.2.1.4 Cable Tunnel

Materials

Cable Tunnel components subject to aging management review are constructed of the following material.

- Concrete

Environment

Cable Tunnel components subject to aging management review are exposed to the following environments.

- Below grade
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Cable Tunnel components require management.

- None

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Cable Tunnel components. [See Note 501 for explanation of program assignments.]

- Fire Protection (Section B.2.16)
- Structures Monitoring (Section B.2.39)

3.5.2.1.5 Chemical Addition Building (Unit 1 only)

Materials

Chemical Addition Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Chemical Addition Building components subject to aging management review are exposed to the following environments.

- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Chemical Addition Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Chemical Addition Building components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.6 Condensate Polishing Building (Unit 2 only)

Materials

Condensate Polishing Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Condensate Polishing Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Condensate Polishing Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Condensate Polishing Building components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.7 Control Building (Unit 2 only)

Materials

Control Building components subject to aging management review are constructed of the following materials.

- Carbon steel

- Concrete
- Concrete block
- Galvanized steel

Environment

Control Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Control Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Control Building components.

- Fire Protection (Section B.2.16)
- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.8 Decontamination Building

Materials

Decontamination Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Decontamination Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Decontamination Building components require management.

- Cracking (Unit 2 only)
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Decontamination Building components.

- Boric Acid Corrosion (Section B.2.7)
- Structures Monitoring (Section B.2.39)

3.5.2.1.9 Diesel Generator Building

Materials

Diesel Generator Building components subject to aging management review are constructed of the following material.

- Concrete

Environment

Diesel Generator Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Diesel Generator Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Diesel Generator Building components.

- Fire Protection (Section B.2.16)
- Structures Monitoring (Section B.2.39)

3.5.2.1.10 Emergency Outfall Structure (Unit 2 only)

Materials

Emergency Outfall Structure components subject to aging management review are constructed of the following material.

- Concrete

Environment

Emergency Outfall Structure components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to raw water
- Exposed to weather

Aging Effects Requiring Management

The following aging effects associated with Emergency Outfall Structure components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Emergency Outfall Structure components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.11 Emergency Response Facility Diesel Generator Building (Common)

Materials

Emergency Response Facility Diesel Generator Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete

Environment

Emergency Response Facility Diesel Generator Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Emergency Response Facility Diesel Generator Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Emergency Response Facility Diesel Generator Building components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.12 Emergency Response Facility Substation Building (Common)

Materials

Emergency Response Facility Substation Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel

Environment

Emergency Response Facility Substation Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Emergency Response Facility Substation Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Emergency Response Facility Substation Building components.

- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.13 Equipment Hatch Platform

Materials

Equipment Hatch Platform components subject to aging management review are constructed of the following material.

- Concrete

Environment

Equipment Hatch Platform components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Equipment Hatch Platform components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Equipment Hatch Platform components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.14 Fuel Building

Materials

Fuel Building components subject to aging management review are constructed of the following materials.

- Boral (Unit 1 only)
- Carbon steel
- Concrete

- Concrete block (Unit 1 only)
- Galvanized steel
- Stainless steel

Environment

Fuel Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to treated water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Fuel Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Fuel Building components.

- Boric Acid Corrosion (Section B.2.7)
- Fire Protection (Section B.2.16)
- Masonry Wall (Section B.2.25) (Unit 1 only)
- Structures Monitoring (Section B.2.39)
- Water Chemistry (Section B.2.42)

3.5.2.1.15 Gaseous Waste Storage Vault

Materials

Gaseous Waste Storage Vault components subject to aging management review are constructed of the following materials.

- Carbon steel (Unit 2 only)

- Concrete
- Galvanized steel (Unit 1 only)

Environment

Gaseous Waste Storage Vault components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Gaseous Waste Storage Vault components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Gaseous Waste Storage Vault components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.16 Guard House (Common)

Materials

Guard House components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel

Environment

Guard House components subject to aging management review are exposed to the following environments.

- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Guard House components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Guard House components.

- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.17 Intake Structure (Common)

Materials

Intake Structure components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel
- Stainless steel

Environment

Intake Structure components subject to aging management review are exposed to the following environments.

- Below grade

- Exposed to raw water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Intake Structure components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Intake Structure components.

- Fire Protection (Section B.2.16)
- Structures Monitoring (Section B.2.39)

3.5.2.1.18 Main Steam and Cable Vault

Materials

Main Steam and Cable Vault components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel (Unit 2 only)
- Stainless steel (Unit 2 only)

Environment

Main Steam and Cable Vault components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Main Steam and Cable Vault components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Main Steam and Cable Vault components.

- Boric Acid Corrosion (Section B.2.7)
- Fire Protection (Section B.2.16)
- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.19 Pipe Tunnel

Materials

Pipe Tunnel components subject to aging management review are constructed of the following material.

- Concrete

Environment

Pipe Tunnel components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather (Unit 1 only)
- Protected from weather (Unit 2 only)

Aging Effects Requiring Management

The following aging effects associated with Pipe Tunnel components require management.

- Cracking (Unit 1 only)
- Loss of material (Unit 1 only)

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Pipe Tunnel components.

- Fire Protection (Section B.2.16) (Unit 1 only)
- Structures Monitoring (Section B.2.39)

3.5.2.1.20 Primary Demineralized Water Storage Tank Pad and Enclosure

Materials

Primary Demineralized Water Storage Tank Pad and Enclosure components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Primary Demineralized Water Storage Tank Pad and Enclosure components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Primary Demineralized Water Storage Tank Pad and Enclosure components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Primary Demineralized Water Storage Tank Pad and Enclosure components.

- Fire Protection (Section B.2.16) (Unit 1 only)
- Structures Monitoring (Section B.2.39)

3.5.2.1.21 Primary Water Storage Building (Unit 1 only)

Materials

Primary Water Storage Building components subject to aging management review are constructed of the following material.

- Concrete

Environment

Primary Water Storage Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Primary Water Storage Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Primary Water Storage Building components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.22 Reactor Containment Building

Materials

Reactor Containment Building components subject to aging management review are constructed of the following materials.

- Alloy steel
- Carbon steel
- Concrete
- Elastomer
- Galvanized steel (Unit 1 only)
- Lead
- Lubrite®
- Stainless steel

Environment

Reactor Containment Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to treated water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Reactor Containment Building components require management.

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of sealing

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Reactor Containment Building components.

- 10 CFR Part 50, Appendix J (Section B.2.1)

- ASME Section XI, Subsection IWE (Section B.2.3)
- ASME Section XI, Subsection IWF (Section B.2.4)
- ASME Section XI, Subsection IWL (Section B.2.5)
- Boric Acid Corrosion (Section B.2.7)
- Structures Monitoring (Section B.2.39)
- Water Chemistry (Section B.2.42)

3.5.2.1.23 Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings

Materials

Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete

Environment

Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather

Aging Effects Requiring Management

The following aging effects associated with Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings components.

- Fire Protection (Section B.2.16) (Unit 1 only)
- Structures Monitoring (Section B.2.39)

3.5.2.1.24 Relay Building (Common)

Materials

Relay Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel

Environment

Relay Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Relay Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Relay Building components.

- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.25 Safeguards Building

Materials

Safeguards Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete

Environment

Safeguards Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Safeguards Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Safeguards Building components.

- Fire Protection (Section B.2.16)
- Structures Monitoring (Section B.2.39)

3.5.2.1.26 Service Building

Materials

Service Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel
- Stainless steel (Unit 2 only)

Environment

Service Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Service Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Service Building components.

- Boric Acid Corrosion (Section B.2.7) (Unit 2 only)
- Fire Protection (Section B.2.16)
- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.27 Solid Waste Building (Unit 1 only)

Materials

Solid Waste Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Solid Waste Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Solid Waste Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Solid Waste Building components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.28 South Office and Shops Building (Common)

Materials

South Office and Shops Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete

Environment

South Office and Shops Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with South Office and Shops Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on South Office and Shops Building components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.29 Steam Generator Drain Tank Structure (Unit 1 only)

Materials

Steam Generator Drain Tank Structure components subject to aging management review are constructed of the following material.

- Concrete

Environment

Steam Generator Drain Tank Structure components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Steam Generator Drain Tank Structure components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Steam Generator Drain Tank Structure components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.30 Switchyard (Common)

Materials

Switchyard components subject to aging management review are constructed of the following materials.

- Alloy steel
- Concrete
- Wood

Environment

Switchyard components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather

Aging Effects Requiring Management

The following aging effects associated with Switchyard components require management.

- Change in material properties
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Switchyard components.

- Electrical Wooden Poles/Structures Inspection (Unit 2 only) (Section B.2.13)
- Structures Monitoring (Section B.2.39)

3.5.2.1.31 Turbine Building

Materials

Turbine Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel

Environment

Turbine Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Turbine Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Turbine Building components.

- Masonry Wall (Section B.2.25)
- Structures Monitoring (Section B.2.39)

3.5.2.1.32 Valve Pit

Materials

Valve Pit components subject to aging management review are constructed of the following materials.

- Carbon steel (Unit 2 only)
- Concrete

Environment

Valve Pit components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to raw water
- Exposed to weather (Unit 2 only)
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Valve Pit components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Valve Pit components.

- Fire Protection (Section B.2.16) (Unit 2 only)
- Structures Monitoring (Section B.2.39)

3.5.2.1.33 Waste Handling Building (Unit 2 only)

Materials

Waste Handling Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Waste Handling Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Waste Handling Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Waste Handling Building components.

- Boric Acid Corrosion (Section B.2.7)
- Structures Monitoring (Section B.2.39)

3.5.2.1.34 Water Treatment Building (Unit 1 only)

Materials

Water Treatment Building components subject to aging management review are constructed of the following materials.

- Carbon steel
- Concrete
- Galvanized steel

Environment

Water Treatment Building components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Water Treatment Building components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Water Treatment Building components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.35 Yard Structures

Materials

Yard Structures components subject to aging management review are constructed of the following materials.

- Aluminum

- Carbon steel
- Concrete

Environment

Yard Structures components subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather

Aging Effects Requiring Management

The following aging effects associated with Yard Structures components require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management program is credited for managing the effects of aging on Yard Structures components.

- Structures Monitoring (Section B.2.39)

3.5.2.1.36 Bulk Structural Commodities

Bulk Structural Commodities consist of the following six categories of structural components, organized by materials of construction:

- Steel and Other Metals (Section 3.5.2.1.36.1)
- Concrete (Section 3.5.2.1.36.2)
- Elastomers (Section 3.5.2.1.36.3)
- Fire Barriers (Section 3.5.2.1.36.4)
- Miscellaneous Materials (PVC and non-metallic insulation) (Section 3.5.2.1.36.5)
- Threaded Fasteners (Section 3.5.2.1.36.6)

3.5.2.1.36.1 Steel and Other Metals

Materials

Bulk Structural Commodities (Steel and Other Metals) subject to aging management review are constructed of the following materials.

- Aluminum
- Carbon steel
- Copper
- Galvanized steel
- Stainless steel

Environment

Bulk Structural Commodities (Steel and Other Metals) subject to aging management review are exposed to the following environments.

- Exposed to raw water
- Exposed to treated water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Bulk Structural Commodities (Steel and Other Metals) require management.

- Cracking
- Cumulative fatigue damage
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Bulk Structural Commodities (Steel and Other Metals).

- ASME Section XI, Subsection IWF (Section B.2.4)
- Boric Acid Corrosion (Section B.2.7)
- Fire Protection (Section B.2.16)
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Section B.2.23)

- Structures Monitoring (Section B.2.39)
- Water Chemistry (Section B.2.42)

3.5.2.1.36.2 Concrete

Materials

Bulk Structural Commodities (Concrete) subject to aging management review are constructed of the following material.

- Concrete

Environment

Bulk Structural Commodities (Concrete) subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to raw water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Bulk Structural Commodities (Concrete) require management.

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Bulk Structural Commodities (Concrete).

- Fire Protection (Section B.2.16)
- Structures Monitoring (Section B.2.39)

3.5.2.1.36.3 Elastomers

Materials

Bulk Structural Commodities (Elastomers) subject to aging management review are constructed of the following materials.

- Elastomer
- Elastomer (non-rubber)
- Elastomer / Built-up roofing
- Rubber

Environment

Bulk Structural Commodities (Elastomers) subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to treated water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Bulk Structural Commodities (Elastomers) require management.

- Change in material properties
- Cracking

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Bulk Structural Commodities (Elastomers).

- 10 CFR Part 50, Appendix J (Section B.2.1)
- ASME Section XI, Subsection IWE (Section B.2.3)
- Structures Monitoring (Section B.2.39)

3.5.2.1.36.4 Fire Barriers

Materials

Bulk Structural Commodities (Fire Barriers) subject to aging management review are constructed of the following materials.

- Cafcote / Johns-Manville 375 or 460 / Marinite pyrocrete / Superkote cement and similar materials
- Concrete / concrete block / cellular concrete / grout
- Fiberboard / foamglas / gypsum board / siltemp blanket / thermolag panels (and similar materials)
- Flame-mastic / silicone elastomer

Environment

Bulk Structural Commodities (Fire Barriers) subject to aging management review are exposed to the following environments.

- Below grade
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Bulk Structural Commodities (Fire Barriers) require management.

- Change in material properties
- Cracking
- Delamination
- Loss of material
- Separation

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Bulk Structural Commodities (Fire Barriers).

- Fire Protection (Section B.2.16)
- Structures Monitoring (Section B.2.39)

3.5.2.1.36.5 Miscellaneous Materials (PVC and non-metallic insulation)

Materials

Bulk Structural Commodities (Miscellaneous Materials) subject to aging management review are constructed of the following materials.

- Calcium silicate and similar materials
- Fiberglass

Environment

Bulk Structural Commodities (Miscellaneous Materials) subject to aging management review are exposed to the following environment.

- Protected from weather

Aging Effects Requiring Management

The following aging effects associated with Bulk Structural Commodities (Miscellaneous Materials) require management.

- None

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Bulk Structural Commodities (Miscellaneous Materials).

- None

3.5.2.1.36.6 Threaded Fasteners

Materials

Bulk Structural Commodities (Threaded Fasteners) subject to aging management review are constructed of the following materials.

- Alloy steel
- Carbon steel
- Galvanized steel
- Stainless steel

Environment

Bulk Structural Commodities (Threaded Fasteners) subject to aging management review are exposed to the following environments.

- Exposed to raw water
- Exposed to treated water
- Exposed to weather
- Protected from weather

Aging Effects Requiring Management

The following aging effect associated with Bulk Structural Commodities (Threaded Fasteners) requires management.

- Loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on Bulk Structural Commodities (Threaded Fasteners).

- ASME Section XI, Subsection IWF (Section B.2.4)
- Boric Acid Corrosion (Section B.2.7)
- Structures Monitoring (Section B.2.39)
- Water Chemistry (Section B.2.42)

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.5.2.2 of NUREG-1800 [Reference 1.3-4] discusses these aging effects and other issues that require further evaluation. The following sections, numbered in accordance with the corresponding discussions in NUREG-1800, explain the BVPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

NUREG-1800 states in Section 3.5.2.2.1.1:

Increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel could occur in inaccessible areas of PWR and BWR concrete and steel containments.

BVPS did not align any AMR rows to this item. The aging effects addressed by NUREG-1801 rows associated with this item are discussed in the following paragraphs:

Aggressive Chemical Attack

Loss of material and change in material properties due to aggressive chemicals are not aging effects requiring management for concrete components below grade since BVPS groundwater chemistry is non-aggressive based on samples taken in January 2007. The samples were tested and show the groundwater from two different wells to have a pH range of 6.83 to 7.12, which are well above the recommended minimum pH of 5.5. These tests also show that chloride solutions range from 18.9 ppm to 208 ppm, and sulfate solutions from 177 ppm to 187 ppm. These results compare favorably to the recommended limits for chloride solutions of < 500 ppm and sulfate solutions of < 1500 ppm. In addition, the foundation bottoms for the Equipment Hatch Platform and Reactor Containment Building are above the ground water table; therefore, below grade concrete components are not normally in contact with groundwater.

Quality concrete was also utilized in the construction of BVPS structures. The concrete specifications for BVPS concrete were designed in accordance with ACI 318 [Reference 3.0-6] and constructed in accordance with ACI 301 [Reference 3.0-7] using materials conforming to ACI and ASTM standards. Aggregate soundness was stringently controlled, which resulted in assured concrete durability. Concrete constructed with these criteria has low permeability and is effectively protected against sulfate and chloride attack.

Corrosion of Embedded Steel

Loss of material due to corrosion of embedded steel and steel reinforcement is not an aging effect requiring management for concrete components below grade because the concrete is not exposed to an aggressive environment and good concrete design and construction practices are sufficient to preclude embedded steel and steel reinforcement corrosion in the absence of other aging mechanisms.

BVPS is not near enough to a salt water environment such that rain or leakage would have the potential to concentrate contaminants and provide an aggressive environment. There is an increased possibility of exposure to sulfate and chloride attack (e.g., acid rain) due to industry in the area. However, rainwater results in exposure for only intermittent periods of time and therefore its aggressiveness is considered non-significant.

With respect to monitoring inaccessible areas, the below-grade portions of Containment Building concrete are partially surrounded by backfill. The below-grade concrete surfaces for the Containment Buildings are enclosed by other safety-related structures, and cannot be examined unless the concrete of the surrounding structures is removed. However, examination of representative portions of other safety-related concrete buildings in the same below-grade environment will be performed when backfill is removed. This approach is considered equivalent to examining the Containment concrete. If the below-grade Containment concrete is exposed, it will be examined directly.

In addition, the Structures Monitoring Program (Section B.2.39) is used to ensure that groundwater is monitored on a periodic basis.

3.5.2.2.1.2 Cracks and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking and Differential Settlement Due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program

NUREG-1800 states in Section 3.5.2.2.1.2:

> *Cracks and distortion due to increased stress levels from settlement could occur in PWR and BWR concrete and steel containments. Also, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in all types of PWR and BWR containments.*

BVPS did not align any AMR rows to this item. The aging effects addressed by NUREG-1801 rows associated with this item are described in the following paragraphs:

Cracking and Distortion Due to Increased Stress Levels from Settlement

Cracking due to settlement is not an aging effect requiring management for concrete components below grade because the total and differential settlements experienced by the subject structures since plant construction (i.e., over 20 - 30 years) are within permissible and anticipated limits. Based on settlement markers determined to be stable over a period of several decades, the Unit 1 Settlement Monitoring Program was terminated circa 1995. For Unit 2, the Settlement Monitoring Program (Section B.2.37) is an existing plant-specific program that monitors settlement in the reinforced concrete walls of structures that are subject to aging management to ensure that settlement is not approaching limits. These effects are managed by using surveys to observe changes in elevations of settlement markers located on monitored structures. Changes in elevations are then evaluated by comparing the elevations with previously recorded elevations for the same settlement markers.

The program monitors all safety-related structures following construction until the settlement of a particular structure has been determined to be stable. Although settlement data has not yet stabilized for a few structures (which continue to be monitored), no building locations have settled to unacceptable levels. No settlement has manifested itself via cracked walls or cracked foundations of structures that are subject to aging management. The Settlement Monitoring Program (Unit 2 only) is a BVPS plant-specific program that is credited with management of a TLAA associated with piping stresses at penetrations into structures whose settlement has not stopped. See the TLAA discussion on this topic in Section 4.7.5.

Settlement and Porous Concrete Subfoundation

Although there is a 4-inch porous concrete sub-foundation beneath the Reactor Containment Building foundation mat, because the sub-foundation is above the groundwater table, a de-watering system is not used, and settlement was found acceptable, erosion of cement from the porous concrete layer (i.e., loss of material) is not an aging effect requiring management.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature

NUREG-1800 states in Section 3.5.2.2.1.3:

> *Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR concrete and steel*

containments. The implementation of 10 CFR 50.55a and ASME Section XI, Subsection IWL would not be able to identify the reduction of strength and modulus of concrete due to elevated temperature. Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period, i.e., general area temperature greater than 66°C (150°F) and local area temperature greater than 93°C (200°F).

Change in Concrete Material Properties due to Elevated Temperature

Not applicable. BVPS has no dome, wall, basemat, ring girder, buttresses, Containment, or annulus concrete exposed to temperatures above 150°F for general areas, or 200°F for local areas. High energy line penetrations have been designed to dissipate the heat from these process pipes, and insulation has been installed to further limit the exposure of the concrete.

Loss of material, cracking and change in material properties due to elevated temperature are not aging effects requiring management for concrete components protected from weather because the ambient air temperatures within the Equipment Hatch Platform and Reactor Containment Building are maintained below the 150°F threshold for these aging effects to be applicable. Piping contained in the Reactor Containment Building is not in direct contact with concrete. For cold penetrations, piping is welded to a plate flange which is anchored to the Containment wall. Hot penetrations are equipped with cooling units which keep the temperature of concrete below 150°F. Subsequently, localized hot spots on concrete are not expected from exposure to adjacent piping.

3.5.2.2.1.4 Loss of Material Due to General, Pitting and Crevice Corrosion

NUREG-1800 states in Section 3.5.2.2.1.4:

> *Loss of material due to general, pitting and crevice corrosion could occur in steel elements of accessible and inaccessible areas for all types of PWR and BWR containments.*

Reinforced concrete structures at BVPS were designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. The mixes were designed with entrained air content between 4% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. Cracking in the concrete or degradation of the moisture barrier that could potentially provide a pathway for water to reach inaccessible portions of the steel Containment liner is not expected due to the design and procedural controls described above.

Procedural controls will ensure that borated water spills are not common, and when detected are cleaned up in a timely manner. Therefore, further evaluation for corrosion in inaccessible areas of the steel Containment liner is not required.

Aging effects for the Containment liner, liner anchors, and integral attachments are managed by the ASME Section XI, Subsection IWE (Section B.2.3) and 10 CFR Part 50 Appendix J (Section B.2.1) Programs. Additionally, the corrosion of the liner test channels is a TLAA that is addressed in Section 4.6.2.

Loss of material due to corrosion is not significant for inaccessible areas (embedded Containment steel liner) based on meeting the conditions specified as follows:

1. Concrete meeting ACI 318 was used for interior and exterior concrete (in contact with the embedded steel liner). ACI was used as guidance for concrete mix proportions in producing high density, low permeability concrete.
2. The Containment Building is monitored for penetrating cracks by the ASME Section XI, Subsection IWL Program (Section B.2.5).
3. The moisture barrier is monitored for aging effects by the ASME Section XI, Subsection IWE Program (Section B.2.3).
4. Borated water spills and water ponding on the Containment Building floor are not common, and are cleaned up promptly when identified. The design of the Containment floor provides for collection of water in a sump area that is maintained pumped down.

During Unit 1's 17th refueling outage (in 2006), a section of the Containment was removed to support the steam generator and reactor vessel head replacement projects. During removal of the Containment wall, a section of the steel liner was found with pitting corrosion on the side contacting the concrete. The probable cause was identified as corrosion of the liner that occurred during construction where the liner was exposed to oxygen and water.

3.5.2.2.1.5 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

NUREG-1800 states in Section 3.5.2.2.1.5:

> *Loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for PWR prestressed concrete containments and BWR Mark II prestressed concrete containments is a Time-Limited Aging Analysis (TLAA) as defined in 10 CFR 54.3.*

The BVPS Containment Building Structure is constructed of reinforced concrete. There are no prestressed tendons associated with the Containment Building Structure design. Therefore, the aging effect, loss of prestress, is not applicable to the BVPS Containment Structure.

3.5.2.2.1.6 Cumulative Fatigue Damage

NUREG-1800 states in Section 3.5.2.2.1.6:

> *If included in the current licensing basis, fatigue analyses of suppression pool steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers are TLAAs as defined in 10 CFR 54.3.*

For the Containment Structure, fatigue is a TLAA for the bellows expansion joints associated with the Containment Spray River Water supply and with the fuel transfer tube. Additionally, Containment liner penetrations such as the equipment hatches at both units and the mechanical piping penetrations at Unit 2 include fatigue evaluations. The evaluation of these TLAAs is provided in Section 4.6.3.

While ASME Section III was used as a guide in the selection of design stresses used in the analysis of Unit 1 penetrations, no specific fatigue analysis was performed for the Unit 1 piping penetrations. As such, there is no TLAA associated with the Unit 1 piping penetrations.

Also, the NUREG-1801 BWR components, i.e., suppression pool shell and unbraced downcomers, are not applicable to the BVPS Containment.

3.5.2.2.1.7 Cracking Due to Stress Corrosion Cracking (SCC)

NUREG-1800 states in Section 3.5.2.2.1.7:

> *Cracking due to stress corrosion cracking of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds could occur in all types of PWR and BWR containments. Cracking due to SCC could also occur in stainless steel vent line bellows for BWR containments.*

To be susceptible to SCC, stainless steel must be subjected to both high temperature (>140°F) and an aggressive chemical environment. Cracking due to SCC is not an applicable effect for the stainless steel penetration sleeves and bellows because these stainless steel components are not subject to an aggressive chemical environment.

3.5.2.2.1.8 Cracking Due to Cyclic Loading

NUREG-1800 states in Section 3.5.2.2.1.8:

> *Cracking due to cyclic loading of suppression pool steel and stainless steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) could occur for all types of PWR and BWR containments and BWR vent header, vent line bellows and downcomers.*

BVPS did not align any AMR rows to this item. Cumulative fatigue damage is a TLAA and is discussed in Section 3.5.2.2.1.6.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) Due to Freeze–Thaw

NUREG-1800 states in Section 3.5.2.2.1.9:

> *Loss of material (scaling, cracking, and spalling) due to freeze-thaw could occur in PWR and BWR concrete containments.*

Loss of material and cracking due to freeze–thaw for concrete exposed to weather are considered aging effects requiring management.

Cracking and loss of material due to freeze thaw is managed by the ASME Section XI, Subsection IWL Program (Section B.2.5) for the portion of the Containment cylinder wall and dome that is exposed to an outdoor environment. The only part of the Containment Building subject to freeze–thaw is the accessible cylinder wall and dome that extends above or beyond the Auxiliary Building and the Fuel Handling Building. Inaccessible concrete areas of the above-grade portions of the Containment Buildings surrounded by an indoor environment and are not subject to moderate weathering conditions resulting in freeze–thaw.

3.5.2.2.1.10 Cracking Due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability, Due to Leaching of Calcium Hydroxide

NUREG-1800 states in Section 3.5.2.2.1.10:

> *Cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide could occur in concrete elements of PWR and BWR concrete and steel containments.*

Reaction with Aggregates

Cracking due to reaction with aggregates is not an aging effect requiring management for concrete components exposed to weather because the BVPS specifications require that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM C227, *Potential Alkali Reactivity of Cement - Aggregate Combinations* [Reference 3.0-8], and ASTM C289, *Potential Reactivity of Aggregate* [Reference 3.0-9]. The aggregates used are therefore not reactive with reinforced concrete. In addition, the BVPS specifications for concrete prohibits the use of calcium chloride in the concrete mix design.

Leaching of Calcium Hydroxide

Change in material properties due to leaching of calcium hydroxide is not an aging effect requiring management for concrete components below grade because concrete with low permeability (i.e., dense concrete with suitable cement content and well cured) is utilized in BVPS structures. Referring to the BVPS concrete specifications, BVPS concrete is designed in accordance with ACI 318 and constructed in accordance with ACI 301 using materials conforming to ACI and ASTM standards.

3.5.2.2.2 Safety-related and Other Structures and Component Supports

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

NUREG-1800 states in Section 3.5.2.2.2.1:

The GALL Report recommends further evaluation of certain structure/aging effect combinations if they are not covered by the structures monitoring program. This includes (1) cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for Groups 1-5, 7, 9 structures; (2) increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, 9 structures; (3) loss of material due to corrosion for Groups 1-5, 7, 8 structures; (4) loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, 7-9 structures; (5) cracking due to expansion and reaction with aggregates for Groups 1-5, 7-9 structures; (6) cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures; and (7) reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation for Groups 1-3, 5-9 structures. The GALL Report recommends further evaluation only for structure/aging effect combinations that are not within the structures monitoring program.

For structures outside the Containment Building, applicable aging effects are managed by the Structures Monitoring Program (Section B.2.39).

1. Corrosion of Embedded Steel

   Cracking, loss of bond, and loss of material due to corrosion of embedded steel and steel reinforcement is not an aging effect requiring management for concrete components below grade, protected from weather or exposed to weather because the concrete is not exposed to an aggressive environment and good concrete design and construction practices are sufficient to preclude embedded steel and steel reinforcement corrosion in the absence of other aging mechanisms.

2. Aggressive Chemical Attack

   Increase in porosity and permeability, cracking, loss of material and change in material properties due to aggressive chemicals are not aging effects requiring management for concrete components and structures below grade, protected from weather or exposed to weather since proper drainage and slope design limits the duration that concrete is exposed to rain water. Referring to the BVPS concrete specifications, concrete is designed in accordance with

ACI 318 and constructed in accordance with ACI 301 using materials conforming to ACI and ASTM standards. Concrete constructed with these criteria has low permeability and is effectively protected against sulfate and chloride attack.

3. Loss of Material due to Corrosion

   Loss of material due to corrosion for structural steel components is managed by the Structures Monitoring Program (Section B.2.39). Additionally, loss of material of steel components that provide a fire barrier is also managed by the Fire Protection Program (Section B.2.16). The Fire Protection Program provides inspections of indoor surfaces of these components that ensure the fire barrier function is maintained.

4. Freeze–Thaw

   BVPS is located in an area in which weathering conditions are considered severe (weathering index >500 day-inch/year), and, based on operating experience, loss of material and cracking due to freeze–thaw for concrete exposed to weather are considered aging effects requiring management. The aging effect is managed by the Structures Monitoring Program (Section B.2.39).

5. Reaction With Aggregates

   Cracking due to expansion and reaction with aggregates is not an aging effect requiring management for concrete components because the BVPS specifications require that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM C227, *Potential Alkali Reactivity of Cement - Aggregate Combinations*, and ASTM C289, *Potential Reactivity of Aggregate*. The aggregates used are therefore not reactive with reinforced concrete. In addition, the BVPS specifications for concrete prohibits the use of calcium chloride in the concrete mix design.

6. Settlement

   Cracking and distortion due to settlement is not an aging effect requiring management for concrete components below grade because the total and differential settlements experienced by the subject structures since plant construction (i.e., over 20 - 30 years) are within permissible and anticipated limits. Based on settlement markers determined to be stable over a period of several decades, the Unit 1 Settlement Monitoring Program was terminated circa 1995. For Unit 2, the Settlement Monitoring Program (Section B.2.39) is an existing plant-specific program that monitors settlement in the reinforced concrete walls of structures that are subject to aging management to ensure that settlement is not approaching limits. These effects are managed by using surveys to observe changes in elevations of settlement markers located on monitored structures. Changes in elevations are then evaluated by comparing the elevations with previously recorded elevations for the same settlement markers.

The program monitors all safety-related structures following construction until the settlement of a particular structure has been determined to be stable. Although settlement data has not yet stabilized for a few structures (which continue to be monitored), no building locations have settled to unacceptable levels. No settlement has manifested itself via cracked walls or cracked foundations of structures that are subject to aging management. The Settlement Monitoring Program (Unit 2 only) (Section B.2.39) is a BVPS plant-specific program that is credited with management of a TLAA associated with piping stresses at penetrations into structures whose settlement has not stopped. See the TLAA discussion on this topic in Section 4.7.5.

7. Porous Concrete Subfoundations

   BVPS only has porous concrete subfoundations under the Containment structures; these structures are discussed in Section 3.5.2.2.1.2.

Lock-up due to Wear

(Additional Information also for Items 3.5.1-30 and 3.5.1-56.)

NUREG-1800 states in Section 3.5.2.2.2.1:

> *Lock up due to wear could occur for Lubrite® radial beam seats in BWR drywell, RPV support shoes for PWR with nozzle supports, steam generator supports, and other sliding support bearings and sliding support surfaces. The GALL Report recommends further*

evaluation only for structure/aging effect combinations that are not within the ISI (IWF) or structures monitoring program.

Slide Bearing Plates - Also includes the Reactor Vessel sliding foot assemblies and sliding restraints associated with Main Steam and Feedwater piping. The Reactor Vessel sliding foot assemblies consist of a lubricated ball and sliding block. The foot assemblies were fabricated from American Iron and Steel Institute (AISI) 4330 forgings. Sliding restraints for Main Steam and Feedwater piping consists of sliding plates.

Lubrite® is used in association with the Reactor Vessel sliding foot assemblies and the steam generator and reactor coolant pump supports. Lubrite® is the trade name for a low friction lubricant material used in applications where relative motion (sliding) is desired. The Lubrite® proprietary lubricant is a custom compound mixture of metals, metal oxides, minerals and other lubricating materials combined with a lubricating binder. Lubrite® material resists deformation, has a low coefficient of friction, resists softening at elevated temperatures, absorbs grit and abrasive particles, is not susceptible to corrosion, withstands high intensities of radiation, and will not score or mar. Additionally, Lubrite® products are solid, permanent, completely self lubricating, and require no maintenance for the design life of the product. The Lubrite® lubricants used in nuclear applications are designed for the environments to which they are exposed. There are no known aging effects that would lead to a loss of intended function, and, therefore, no aging effects requiring management for Lubrite® plates. The ASME Section XI, Subsection IWF Program (Section B.2.4) will perform inspections to confirm the absence of aging effects for these components.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

1. Freeze–Thaw

   NUREG-1800 states in Section 3.5.2.2.2.2, Item 1:

   Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

   For structures outside the Containment in scope of license renewal and subject to freeze–thaw, the concrete design varied depending on the safety classification of the structure. Safety-related structures were designed with Class 1 concrete; others, with Non-Class 1 concrete.

BVPS Class 1 concrete was constructed to ACI 301 and 211.1-70 for Unit 1 and Unit 2, respectively, for concrete mix designs. Non-Class 1 concrete was designed to the requirements of ACI 318, ACI 301, and plant specifications. Subsequent inspections have not indicated any degradation due to freeze–thaw for either Class 1 or Non-Class 1 concrete. Nevertheless, examination of inaccessible Non-Class 1 concrete used for the structures in scope for license renewal will be performed when excavated for any reason.

NUREG-1801 does not list *exposed to raw water environment* for this component type. BVPS operating experience has shown cases of water accumulating in Valve Pits and manholes. Therefore, aging mechanisms pertaining to raw water environments are also applicable to the Unit 1 Valve Pit, the Unit 2 Valve Pit adjacent to the Safeguards Building, and duct line manholes.

Aging of exterior surfaces of concrete and concrete fire barriers exposed to weather, exposed to raw water, or below grade is managed by the Structures Monitoring Program (Section B.2.39). Their interior surfaces are managed by the Structures Monitoring Program (Section B.2.39) and the Fire Protection Program (Section B.2.16), similar to interior concrete fire barriers protected from weather.

2. Reaction with Aggregates

NUREG-1800 states in Section 3.5.2.2.2.2, Item 2:

Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures.

This aging effect is not applicable at BVPS. The concrete in inaccessible areas was constructed to ACI 301 and 211.1-70 for Unit 1 and Unit 2, respectively, for concrete mix designs. These structures are not susceptible to concrete cracking due to expansion due to reaction with aggregates; the concrete aggregates were selected per ASTM C33, which uses ASTM C227 and ASTM C295. The aggregates used are not reactive.

Non-Class 1 concrete used the same non-reactive aggregates as Class 1 concrete and was designed to the requirements of ACI 318, ACI 301, and plant specifications. Subsequent inspections have not indicated any degradation due to reaction with aggregates. However, examination of inaccessible Non-Class 1 concrete used in the construction of the structures in scope for license renewal will be performed via the Structures Monitoring Program (Section B.2.39) when excavated for any reason.

3. Increased Stress Levels from Settlement and Erosion of Porous Concrete

NUREG-1800 states in Section 3.5.2.2.2.2, Item 3:

Cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

This aging effect is not applicable at BVPS. However, the Structures Monitoring Program (Section B.2.39) is used to monitor for potential cracks and distortion.

The Containment Building foundation is supported on a porous concrete subfoundation, but the subfoundation is located above the normal groundwater level and not subject to erosion. BVPS does not have a dewatering system.

Structures outside the Containment Building also do not rely on a dewatering system for control of settlement. None of the BVPS structures, outside of the Containments, in the scope of license renewal have porous subfoundations.

4. Aggressive Chemical Attack and Corrosion of Embedded Steel

NUREG-1800 states in Section 3.5.2.2.2.2, Item 4:

Increase in porosity and permeability, cracking, loss of material *(spalling, scaling) due to aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.*

The Structures Monitoring Program (Section B.2.39) is used to manage the aging effects for accessible concrete. Groundwater chemistry is non-aggressive. Exposed portions of below-grade concrete will be examined when excavated for any reason. Periodic monitoring of groundwater chemistry will be performed.

Aggressive Chemical Attack

Loss of material and change in material properties due to aggressive chemicals are not aging effects requiring management for concrete components below grade since BVPS groundwater chemistry is non-aggressive. In addition, the foundation for the Reactor Containment Building is above the ground water table. By comparison, the foundation for the Equipment Hatch Platform is also above the ground water table. Therefore, below-grade concrete components are not normally in contact with groundwater. Quality concrete was also utilized in the construction of BVPS structures. Referring to the concrete specifications for BVPS, concrete is designed in accordance with ACI 318 and constructed in accordance with ACI 301 using materials conforming to ACI and ASTM standards. Aggregate soundness was stringently controlled, which resulted in assured concrete durability. Concrete constructed with these criteria has low permeability and is effectively protected against sulfate and chloride attack.

Corrosion of Embedded Steel

Loss of material due to corrosion of embedded steel and steel reinforcement is not an aging effect requiring management for concrete components below grade because the concrete is not exposed to an aggressive environment and good concrete design and construction practices are sufficient to preclude embedded steel and steel reinforcement corrosion in the absence of other aging mechanisms.

5. Leaching of Calcium Hydroxide

   NUREG-1800 states in Section 3.5.2.2.2.2, Item 5:

   Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

   Change in material properties due to leaching of calcium hydroxide is not an aging effect requiring management for concrete components below grade because concrete with low permeability (i.e., dense concrete with suitable cement content and well cured) is utilized in Unit 1 structures. BVPS concrete is designed in accordance with ACI 318 and constructed in accordance with ACI 301 using materials conforming to ACI and ASTM standards.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature

NUREG-1800 states in Section 3.5.2.2.2.3:

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR Group 1-5 concrete structures. For any concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A of ACI 349-85 specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150°F except for local areas, which are allowed to have increased temperatures not to exceed 200°F. The GALL Report recommends further evaluation of a plant-specific program if any portion of the safety-related and other concrete structures exceeds specified temperature limits, i.e., general area temperature greater than 66°C (150°F) and local area temperature greater than 93°C (200°F).

Elevated Temperatures

The NUREG-1801 item regarding concrete degradation from elevated temperatures is not applicable, because neither the Containment Internals nor the concrete structural components for other structures exceed the specified temperature limits. Ambient temperatures in all locations are well below these limits. Hot piping penetrations are provided with cooling systems to ensure concrete temperature remains below threshold.

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

1. Aggressive Chemical Attack and Corrosion of Embedded Steel

   NUREG-1800 states in Section 3.5.2.2.2.4, Item 1:

   Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel could occur in below-grade inaccessible concrete areas of Group 6 structures.

   This aging effect is not applicable at BVPS. However, the Structures Monitoring Program (Section B.2.39) is used to manage the aging effects for the Intake Structure (Common), the Alternate Intake Structure (Common), and the Emergency Outfall Structure (Unit 2 only). Exposed portions of below-grade concrete will be examined when excavated for any reason. Periodic monitoring of groundwater chemistry will be performed.

   Aggressive Chemical Attack

   Loss of material and change in material properties due to aggressive chemicals are not aging effects requiring management for concrete components below grade since BVPS groundwater and river water chemistry is non-aggressive. Quality concrete was also used in the construction of BVPS structures. Referring to the concrete specifications for BVPS, concrete is designed in accordance with ACI 318 and constructed in accordance with ACI 301 using materials conforming to ACI and ASTM standards. Aggregate soundness was stringently controlled, which resulted in assured concrete durability. Concrete constructed with these criteria has low permeability and is effectively protected against sulfate and chloride attack.

   Corrosion of Embedded Steel

   Loss of material due to corrosion of embedded steel and steel reinforcement is not an aging effect requiring management for concrete components below grade because the concrete is not exposed to an aggressive environment and good concrete design and construction practices are sufficient to preclude embedded steel and steel reinforcement corrosion in the absence of other aging mechanisms.

2. Freeze–Thaw

NUREG-1800 states in Section 3.5.2.2.2.4, Item 2:

Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures.

The Structures Monitoring Program (Section B.2.39) manages this aging effect for concrete exposed to weather in the Intake, Alternate Intake, and Unit 2 Emergency Outfall Structures.

The NUREG-1801 item for freeze–thaw does not list "exposed to raw water" environment for water-control structures. Freeze–thaw may be possible near the water line and/or at the water–concrete contact surface. This environment is both exposed to weather and exposed to raw water; therefore, environment is considered a match. The Structures Monitoring Program (Section B.2.39) is used to manage the aging effects for these components in the Intake, the Alternate Intake, and the Unit 2 Emergency Outfall Structures.

See also Section 3.5.2.2.2.2, Item 1, *Freeze–Thaw*.

3. Reaction with Aggregates and Leaching of Calcium Hydroxide

NUREG-1800 states in Section 3.5.2.2.2.4, Item 3:

Cracking due to expansion and reaction with aggregates and increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide could occur in below-grade inaccessible reinforced concrete areas of Group 6 structures.

This aging effect is not applicable at BVPS. However, the Structures Monitoring Program (Section B.2.39) is used to manage aging effects for the Intake, the Alternate Intake, and the

Emergency Outfall Structures.

Reaction with Aggregates

Cracking due to reaction with aggregates is not an aging effect requiring management for concrete components exposed to raw water because BVPS specifications require that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM C227, *Potential Alkali Reactivity of Cement - Aggregate Combinations*, and ASTM C289, *Potential Reactivity of Aggregate*. The aggregates used are therefore not reactive with reinforced concrete. In addition, BVPS specifications for concrete prohibit the use of calcium chloride in the concrete mix design.

Leaching of Calcium Hydroxide

Change in material properties due to leaching of calcium hydroxide is not an aging effect requiring management for concrete components exposed to raw water because concrete with low permeability (i.e., dense concrete with suitable cement content and well cured) is utilized in BVPS structures. BVPS concrete is designed in accordance with ACI 318 and constructed in accordance with ACI 301 using materials conforming to ACI and ASTM standards.

3.5.2.2.2.5 Cracking Due to Stress Corrosion Cracking and Loss of Material Due to Pitting and Crevice Corrosion

NUREG-1800 states in Section 3.5.2.2.2.5:

> *Cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion could occur for Group 7 and 8 stainless steel tank liners exposed to standing water.*

Not applicable. BVPS has no in-scope stainless steel tank liners exposed to standing water so the applicable NUREG-1801 lines were not used.

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

NUREG-1800 states in Section 3.5.2.2.2.6:

The GALL Report recommends further evaluation of certain component support/aging effect combinations if they are not covered by the structures monitoring program. This includes (1) loss of material due to general and pitting corrosion, for Groups B2-B5 supports; (2) reduction in concrete anchor capacity due to degradation of the surrounding concrete, for Groups B1-B5 supports; and (3) reduction/loss of isolation function due to degradation of vibration isolation elements, for Group B4 supports. Further evaluation is necessary only for structure/aging effect combinations not covered by the structures monitoring program.

All components that align to this subsection are managed by the Structures Monitoring Program (Section B.2.39).

Building concrete is inspected per Structures Monitoring Program, therefore no further evaluation is required.

The following supports and other listed items are inspected using the guidance and criteria of the Structures Monitoring Program, therefore no further evaluation is required:

- HVAC duct supports;
- Instrument tubing and supports;
- Non-ASME mechanical equipment supports;
- Non-ASME supports
- Electrical panels, raceways, and enclosures; and,
- Vibration isolation elements (springs).

3.5.2.2.2.7 Cumulative Fatigue Damage Due to Cyclic Loading

NUREG-1800 states in Section 3.5.2.2.2.7:

Fatigue of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports is a TLAA as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c).

Analyses of fatigue in component support members, anchor bolts, and welds for Group B1.1, B1.2, and B1.3 component supports (for ASME Class 1, 2, and 3 piping and components, and for Class MC containment components) are TLAAs as defined in 10 CFR 54.3 [Reference 1.3-3] only if a CLB fatigue analysis exists. TLAAs are evaluated in accordance with 10 CFR 54.21(c). There are no fatigue analyses in the CLB applicable to component supports; therefore, cumulative fatigue damage of component supports is not a TLAA as defined in 10 CFR 54.3.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-related Components

See Appendix B, Section B.1.3, for discussion of BVPS quality assurance procedures and administrative controls for aging management programs.

3.5.2.3 Time-Limited Aging Analyses

The following Time-Limited Aging Analyses (TLAAs) are associated with Containments, Structures, and Component Support components. The section of the application that contains the TLAA review results is indicated in parentheses.

1. *Containment Liner Fatigue* (Section 4.6.1)
2. *Containment Liner Leak Test Channel Corrosion Allowance* (Section 4.6.2)
3. *Containment Liner Penetration Fatigue* (Section 4.6.3)
4. *Settlement of Structures* (Unit 2 only) (Section 4.7.5)
5. *Crane Load Cycles* (Section 4.7.6)

An evaluation of time-limited aging analyses is required by 10 CFR 54.21. The results of the time-limited aging analyses are contained in Section 4.0.

3.5.3 CONCLUSION

The Containments, Structures, and Component Support components/commodities having aging effects requiring management have been evaluated, and aging management programs have been selected to manage the aging effects. A description of the aging management programs is provided in Appendix B, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, the effects of aging will be adequately managed so that there is reasonable assurance that the intended functions of Containments, Structures, and Component Support components/ commodities will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.5.1
Summary of Aging Management Evaluations in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports

Table 3.5.1 : Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
PWR Concrete (Reinforced and Prestressed) and Steel Containment BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment					
3.5.1-01	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable)	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if the environment is aggressive	Not applicable. Aging of concrete Containment elements exposed to weather is addressed in Item 3.5.1-14. Further evaluation is documented in Section 3.5.2.2.1.1.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-02	Concrete elements; All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. Cracking due to settlement is not an aging effect requiring management for concrete components below grade because the total and differential settlements experienced by the subject structures are within permissible and anticipated limits. Further evaluation is documented in Section 3.5.2.2.1.2.
3.5.1-03	Concrete elements: foundation, sub-foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. The Containment sub-foundation is above the groundwater table, so erosion is not an applicable aging effect, and settlement has remained within limits. Further evaluation is documented in Section 3.5.2.2.1.2.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-04	Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Reduction of strength and modulus of concrete due to elevated temperature	Plant-specific	Yes, plant-specific if temperature limits are exceeded	Not applicable. Concrete temperatures do not exceed threshold levels for these effects. Further evaluation is documented in Section 3.5.2.2.1.3.
3.5.1-05	BWR only—not used				
3.5.1-06	Steel elements: steel liner, liner anchors, integral attachments	Loss of material due to general, pitting and crevice corrosion	ISI (IWE), and 10 CFR Part 50, Appendix J.	Yes, if corrosion is significant for inaccessible areas	Consistent with NUREG-1801, with an AMP exception. BVPS manages the aging effects with the ASME Section XI, Subsection IWE (Section B.2.3) and 10 CFR Part 50, Appendix J (Section B.2.1) Programs. Additionally, a TLAA exists for corrosion of the liner test channels (Section 4.6.2). Further evaluation is documented in Section 3.5.2.2.1.4.
3.5.1-07	Prestressed containment tendons	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. This item applies to prestressed concrete containments. BVPS has steel-lined reinforced concrete Containments.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-08	BWR only—not used				
3.5.1-09	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801, with additional components. This item is a TLAA. Further evaluation is documented in Section 3.5.2.2.1.6.
3.5.1-10	Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds.	Yes, detection of aging effects is to be evaluated	Not applicable. These components are not exposed to an aggressive environment that would support stress corrosion cracking. Further evaluation is documented in Section 3.5.2.2.1.7.
3.5.1-11	BWR only—not used				
3.5.1-12	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Not applicable. Cumulative fatigue damage is a TLAA for some components as identified in Item 3.5.1-09. Further evaluation is documented in Section 3.5.2.2.1.8.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-13	BWR only—not used				
3.5.1-14	Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801. BVPS manages the aging effect with the ASME Section XI, Subsection IWL (Section B.2.5) Program. Further evaluation is documented in Section 3.5.2.2.1.9.
3.5.1-15	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable).	Increase in porosity, permeability due to leaching of calcium hydroxide; cracking due to expansion and reaction with aggregate	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. These effects are not expected to be significant due to the quality of concrete used in construction. However, accessible areas of Containments are managed by the ASME Section XI, Subsection IWL (Section B.2.5) Program. Further evaluation is documented in Section 3.5.2.2.1.10.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-16	Seals, gaskets, and moisture barriers	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801, with an AMP exception. The ASME Section XI, Subsection IWE (Section B.2.3) and 10 CFR Part 50, Appendix J (Section B.2.1) Programs are used to manage loss of sealant and leakage through Containment due to deterioration of seals and gaskets. The ASME Section XI, Subsection IWE (Section B.2.3) Program alone is used to manage loss of seal and leakage of the moisture barrier at the Containment liner to concrete floor slab interface.
3.5.1-17	Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and Plant Technical Specifications	No	Not applicable. Aging of these components was aligned to Item 3.5.1-18, and they are managed by the ASME Section XI, Subsection IWE (Section B.2.3) and 10 CFR Part 50, Appendix J (Section B.2.1) Programs.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-18	Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J.	No	Consistent with NUREG-1801, with an AMP exception. BVPS manages the aging effect with the ASME Section XI, Subsection IWE (Section B.2.3) and 10 CFR Part 50, Appendix J (Section B.2.1) Programs.
3.5.1-19	BWR only—not used				
3.5.1-20	BWR only—not used				
3.5.1-21	BWR only—not used				
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	Not applicable. This item applies to prestressed concrete containments. BVPS has steel-lined reinforced concrete Containments.
Safety-Related and Other Structures; and Component Supports					
3.5.1-23	All Groups except Group 6: interior and above grade exterior concrete	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Not applicable. Concrete aging is addressed by Item 3.5.1-26. Additionally, the Structures Monitoring (Section B.2.39) Program verifies the absence of aging effects for concrete that is not exposed to weather. Further evaluation is documented in Section 3.5.2.2.2.1.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-24	All Groups except Group 6: interior and above grade exterior concrete	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Not applicable. Concrete aging is addressed by Item 3.5.1-26. Additionally, the Structures Monitoring (Section B.2.39) Program verifies the absence of aging effects for concrete that is not exposed to weather. Further evaluation is documented in Section 3.5.2.2.2.1.
3.5.1-25	All Groups except Group 6: steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801, with an additional program credited. BVPS manages the aging effect with the Structures Monitoring (Section B.2.39) Program. Additionally, indoor surfaces of steel fire barriers are also managed with the Fire Protection (Section B.2.16) Program. Protective coatings are not relied upon to manage the effects of aging. Further evaluation is documented in Section 3.5.2.2.2.1.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-26	All Groups except Group 6: accessible and inaccessible concrete: foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, if not within the scope of the applicant's structures monitoring program or for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801. The Structures Monitoring (Section B.2.39) Program is used to manage aging effects for accessible concrete. Further evaluation is documented in Section 3.5.2.2.2.2.1.
3.5.1-27	All Groups except Group 6: accessible and inaccessible interior/exterior concrete	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if not within the scope of the applicant's structures monitoring program or concrete was not constructed as stated for inaccessible areas	Not applicable. Concrete aging is addressed by Item 3.5.1-26. Additionally, the Structures Monitoring (Section B.2.39) Program verifies the absence of aging effects for concrete that is not exposed to weather. Further evaluation is documented in Section 3.5.2.2.2.2.2.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-28	Groups 1-3, 5-9: All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. The Structures Monitoring (Section B.2.39) Program is used to monitor cracks and distortion. Further evaluation is documented in Section 3.5.2.2.2.1 and Section 3.5.2.2.2.2.3.
3.5.1-29	Groups 1-3, 5-9: foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. This aging effect is not applicable to BVPS structures in the scope of license renewal, as there are no structures other than the Containments that have a porous concrete foundation. BVPS does not have a dewatering system. Further evaluation is documented in Section 3.5.2.2.2.1 and Section 3.5.2.2.2.2.3.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-30	Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports	Lock-up due to wear	ISI (IWF) or Structures Monitoring Program	Yes, if not within the scope of ISI or structures monitoring program	Not applicable. Refer to Item 3.5.1-53 and Item 3.5.1-56 for aging management programs applicable to the RPV and Steam Generator supports. Further evaluation is documented in Section 3.5.2.2.2.2.1.
3.5.1-31	Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; Cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel	Structures Monitoring Program; Examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if environment is aggressive	Not applicable. Concrete aging is addressed by Item 3.5.1-26. Additionally, the Structures Monitoring (Section B.2.39) Program verifies the absence of aging effects for concrete that is not exposed to weather. Groundwater chemistry is non-aggressive. Further evaluation is documented in Section 3.5.2.2.2.2.4.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-32	Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations	Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide	Structures Monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. Concrete aging is addressed by Item 3.5.1-26. Additionally, the Structures Monitoring (Section B.2.39) Program verifies the absence of aging effects for concrete that is not exposed to weather. Further evaluation is documented in Section 3.5.2.2.2.2.5.
3.5.1-33	Groups 1-5: concrete	Reduction of strength and modulus of concrete due to elevated temperature	Plant-specific	Yes, plant-specific if temperature limits are exceeded	Not applicable. This aging effect is not applicable to concrete in BVPS structures since temperature limits are not exceeded. Further evaluation is documented in Section 3.5.2.2.2.3.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-34	Group 6: Concrete; all	Cracking, loss of bond, loss of material due to corrosion of embedded steel; increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack	Inspection of Water-Control Structures Assoc with Nuclear Power Plants and for inaccessible concrete, exam of rep. samples of below-grade concrete, and periodic monitoring of groundwater, if environment is non-aggressive. Plant specific if environment is aggressive.	Yes, plant-specific if environment is aggressive	Not applicable. Concrete aging is addressed by Item 3.5.1-26. Additionally, the Structures Monitoring (Section B.2.39) Program verifies the absence of aging effects for concrete that is not exposed to weather. BVPS did not credit the RG 1.127 program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, for managing aging. However, the Structures Monitoring (Section B.2.39) Program includes the elements of the RG 1.127 program necessary for BVPS structures. The groundwater and river water environments are nonaggressive. Further evaluation is documented in Section 3.5.2.2.2.4.1.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-35	Group 6: exterior above and below grade concrete foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures Associated with Nuclear Power Plants. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/ yr) (NUREG-1557).	Yes, for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801, with a different program assigned. BVPS manages the aging effects with the Structures Monitoring (Section B.2.39) Program for the Intake Structure, the Alternate Intake Structure, and the Emergency Outfall Structure. BVPS did not credit the RG 1.127 program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, for managing aging. However, the Structures Monitoring (Section B.2.39) Program includes the elements of the RG 1.127 program necessary for BVPS structures. Further evaluation is documented in Section 3.5.2.2.2.4.2.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-36	Group 6: all accessible/ inaccessible reinforced concrete	Cracking due to expansion/ reaction with aggregates	Accessible areas: Inspection of Water-Control Structures Associated with Nuclear Power Plants. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. Concrete aging for structures in raw water is addressed by Items 3.3.1-66, 3.5.1-26, 3.5.1-35, and 3.5.1-45. BVPS did not credit the RG 1.127 program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, for managing aging. Further evaluation is documented in Section 3.5.2.2.2.4.3.
3.5.1-37	Group 6: exterior above and below grade reinforced concrete foundation interior slab	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	For accessible areas, Inspection of Water-Control Structures Associated with Nuclear Power Plants. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. Concrete aging for structures in raw water is addressed by Items 3.3.1-66, 3.5.1-26, 3.5.1-35, and 3.5.1-45. BVPS did not credit the RG 1.127 program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, for managing aging. Further evaluation is documented in Section 3.5.2.2.2.4.3.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-38	Groups 7, 8: Tank liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Plant-specific	Yes, plant specific	Not applicable. BVPS has no in-scope stainless steel tank liners exposed to standing water. Further evaluation is documented in Section 3.5.2.2.2.5.
3.5.1-39	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801, with additional components. BVPS manages the aging effect with the Structures Monitoring (Section B.2.39) Program. Further evaluation is documented in Section 3.5.2.2.2.6.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-40	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801, with additional programs included for some components. BVPS manages the aging effect with the Structures Monitoring (Section B.2.39) Program. The ASME Section XI, Subsection IWL (Section B.2.5) Program is also assigned for Containment foundations, and the Fire Protection (Section B.2.16) Program is assigned to manage components that perform a fire barrier function. Further evaluation is documented in Section 3.5.2.2.2.6.
3.5.1-41	Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Not applicable. Vibration isolators (springs) are considered piece-parts of the concrete equipment pads, and are managed by the Structures Monitoring (Section B.2.39) Program. Further evaluation is documented in Section 3.5.2.2.2.6.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-42	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. A fatigue analysis does not exist in the current licensing basis for the applicable supports. Therefore, no TLAA evaluation is necessary as specified in NUREG-1801. Further evaluation is documented in Section 3.5.2.2.2.7.
3.5.1-43	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Consistent with NUREG-1801, with an additional program assigned for some components. BVPS manages the aging effect with the Masonry Wall (Section B.2.25) Program. In addition, the Fire Protection (Section B.2.16) Program is utilized to examine specific Masonry Walls identified as fire barriers.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-44	Group 6 elastomer seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Consistent with NUREG-1801, with different components. The Structures Monitoring (Section B.2.39) Program is used to manage the aging effect for elastomer components in all structure groups, not just group 6. NUREG-1801 lists loss of sealing as the aging effect for elastomers. Loss of sealing is not considered an aging effect, but rather a consequence of elastomer degradation. This effect may be caused by cracking and/or change in material properties for elastomeric material.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-45	Group 6: exterior above and below grade concrete foundation; interior slab	Loss of material due to abrasion, cavitation	Inspection of Water-Control Structures Associated with Nuclear Power Plants	No	Consistent with NUREG-1801, with a different program assignment. BVPS manages the aging effect with the Structures Monitoring (Section B.2.39) Program. BVPS did not credit the RG 1.127 program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, for managing aging. However, the Structures Monitoring (Section B.2.39) Program includes the elements of the RG 1.127 program necessary for BVPS structures.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-46	Group 5: Fuel pool liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No	Consistent with NUREG-1801 for loss of material aging effect. Cracking due to SCC is not an applicable effect for this item, because, to be susceptible to SCC, stainless steel must be subjected to both high temperature (>140°F) and an aggressive chemical environment. The stainless steel liner temperature is maintained < 140°F. Loss of material is managed by the Water Chemistry (Section B.2.42) Program. Additionally, installed instrumentation provides control room annunciation of spent fuel pool leakage collected by leak chase channels, and water level is maintained in accordance with existing Technical Specification commitments. Components in the Reactor Containment refueling cavity are also aligned to this row.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-47	Group 6: all metal structural members	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures Associated with Nuclear Power Plants. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	Consistent with NUREG-1801, with a different program assignment. BVPS manages the aging effects by the use of the Structures Monitoring (Section B.2.39) Program. Additionally, the ASME Section XI, Subsection IWF (Section B.2.4) Program is used to manage support components that are exposed to raw water. BVPS did not credit the RG 1.127 program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, for managing aging. However, the Structures Monitoring (Section B.2.39) Program includes the elements of the RG 1.127 program necessary for BVPS structures. BVPS operating experience has shown cases of water accumulating in manholes. Therefore, aging mechanisms pertaining to raw water environments are also applicable to manholes.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-48	Group 6: earthen water control structures - dams, embankments, reservoirs, channels, canals, and ponds	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, Seepage	Inspection of Water-Control Structures Associated with Nuclear Power Plants	No	Not applicable. BVPS has no earthen water control structures.
3.5.1-49	Support members; welds; bolted connections; support anchorage to building structure	Loss of material/ general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	No	Consistent with this NUREG-1801 BWR row, with the corresponding PWR programs assigned, and with an AMP exception. BVPS manages the aging effect with the Water Chemistry (Section B.2.42) and the ASME Section XI, Subsection IWF (Section B.2.4) Programs.
3.5.1-50	Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801, with an additional program for some components. BVPS manages the aging effect with the Structures Monitoring (Section B.2.39) Program. Additionally, aging effects for component and piping supports are managed by the ASME Section XI, Subsection IWF (Section B.2.4) Program.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-51	Group B1.1: high strength low-alloy bolts	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	No	Not applicable. High strength structural bolting is in interior, sheltered environments and is not susceptible to wetting. Industry reported failures of high strength bolts did not occur in bolts less than 1.25-inch diameter. No high strength structural bolts greater than 1-inch diameter have been identified in outdoor air or raw water environments. Therefore, cracking is not expected and does not require management. Loss of material for steel bolting is addressed by Item 3.5.1-39.
3.5.1-52	Groups B2, and B4: sliding support bearings and sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	No	Not applicable. BVPS did not identify aging effects for Lubrite® sliding support surfaces. However, the absence of aging effects will be verified with the ASME Section XI, Subsection IWF (Section B.2.4) Program.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-53	Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ISI (IWF)	No	Consistent with NUREG-1801, with an AMP exception. BVPS manages the aging effect with the ASME Section XI, Subsection IWF (Section B.2.4) Program.
3.5.1-54	Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops;	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Not applicable. BVPS addressed aging of these component types in Item 3.5.1-53, managed by the ASME Section XI, Subsection IWF (Section B.2.4) Program.
3.5.1-55	Steel, galvanized steel, and aluminum support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801, with additional components. BVPS manages the aging effect with the Boric Acid Corrosion (Section B.2.7) Program.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1

Item Number	Component/ Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-56	Groups B1.1, B1.2, and B1.3: Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Not applicable. No aging effect is expected for this material and environment combination. However, these components will be inspected by the ASME Section XI, Subsection IWF (Section B.2.4) Program to confirm the absence of aging effects during the period of extended operation. Lubrite® bearing plates are associated with the Reactor Vessel sliding foot assemblies and the steam generator and reactor coolant pump supports.
3.5.1-57	Groups B1.1, B1.2, and B1.3: Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	No	Not applicable. BVPS has not identified non-metallic vibration isolator elements in Class 1 applications.

Table 3.5.1 (continued): Containments, Structures, and Component Supports, NUREG-1801 Volume 1					
Item Number	**Component/ Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-58	Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801, with additional components.
3.5.1-59	Stainless steel support members; welds; bolted connections; support anchorage to building structure	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Although not support members, additional components, such as, expansion bellows, structural steel, tube tracks, electrical and instrument panels and enclosures, sump liners and screen assemblies, missile shields, shield panels, and flood, pressure, and specialty doors, are aligned with this line item based on use of the same material and environment.

Table 3.5.2-1
Containments, Structures, and Component Supports – Alternate Intake Structure (Common) – Summary of Aging Management Evaluation

Table 3.5.2-1 : Alternate Intake Structure (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Metal siding	EN, SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Roof decking	SNS	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Screen guides	SNS	Alloy Steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 518
4	Steel piling (sheet piling, H-piles)	HS, SCW, SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Steel piling (sheet piling, H-piles)	HS, SCW, SNS	Carbon steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 518
6	Structural steel: beams, columns, plates and trusses	SNS	Carbon steel	Protected from Weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
7	Trash racks	SNS	Carbon steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 518

Table 3.5.2-1 (continued): Alternate Intake Structure (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Traveling screen casing and associated framing	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
9	Ventilation hoods and framing	SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
10	Exterior walls (above grade)	SNS	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
11	Exterior walls (below grade)	HS, SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
12	Floor slabs	SNS	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B1.2-1 (T-29)	3.5.1-40	A
13	Foundation mat	HS, SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
14	Foundation mat	HS, SNS	Concrete	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-7 (T-20)	3.5.1-45	E, 518
15	Pipe chamber	SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
16	Pipe chamber	SNS	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
17	Pipe enclosure	SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-1 (continued): Alternate Intake Structure (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
18	Sump pit	SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-2
Containments, Structures, and Component Supports – Auxiliary Building – Summary of Aging Management Evaluation

Table 3.5.2-2 : Auxiliary Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Metal siding	EN, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Roof decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C
3	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
4	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-2 (continued): Auxiliary Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
7	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
8	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
9	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
10	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
11	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
12	Foundation mat (includes sump pit)	EN, FB, FLB, SHD, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
13	Interior walls	EN, FB, FLB, MB, SHD, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-2 (continued): Auxiliary Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Interior walls	EN, FB, FLB, MB, SHD, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A
15	Interior walls	EN, FB, FLB, MB, SHD, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A3-11 (T-12)	3.5.1-43	E, 529
16	Pipe trench to Containment (including sump pit)	EN, FB, MB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
17	Pipe trench to Fuel Building	EN, FB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
Unit 2									
18	Metal siding	EN, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
19	Missile Shields	MB	Stainless steel	Protected from weather	None	None	III.B5-6 (TP-4)	3.5.1-59	C
20	Roof decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C

Table 3.5.2-2 (continued): Auxiliary Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
21	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
22	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
23	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
24	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
25	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
26	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
27	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-2 (continued): Auxiliary Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
29	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
30	Foundation mat (includes sump pit)	EN, FB, FLB, SHD, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
31	Interior walls	EN, FB, FLB, MB, SHD, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
32	Interior walls	FB, FLB, MB, SHD, SNS, SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A
33	Interior walls	FB, FLB, MB, SHD, SNS, SRE	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A3-11 (T-12)	3.5.1-43	E, 529
34	Roof slab	FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-2 (continued): Auxiliary Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
35	Roof slab	FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
36	Roof slab	FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-3
Containments, Structures, and Component Supports – Boric Acid Tank Building (Unit 1 only) – Summary of Aging Management Evaluation

Table 3.5.2-3 : Boric Acid Tank Building (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Roof decking	SNS	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C
2	Structural steel: beams, columns, plates and trusses	SNS	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
3	Structural steel: beams, columns, plates and trusses	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
4	Exterior walls (above grade)	SNS	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
5	Foundation mat (includes sump pit)	SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Roof slab	SNS	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-4
Containments, Structures, and Component Supports – Cable Tunnel – Summary of Aging Management Evaluation

Table 3.5.2-4 : Cable Tunnel									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Unit 1									
1	Ceiling slabs	EN, MB, FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
2	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
3	Floor slabs	FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
4	Interior walls	FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-4 (continued): Cable Tunnel									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 2									
5	Ceiling slabs	EN, MB, FB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
6	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
7	Foundation mat	FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
8	Interior walls	FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-5
Containments, Structures, and Component Supports – Chemical Addition Building (Unit 1 only) – Summary of Aging Management Evaluation

Table 3.5.2-5 : Chemical Addition Building (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Metal siding	EN, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Metal Siding	EN, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Roof decking	EN, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
4	Structural steel: beams, columns, plates and trusses	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Foundation mat (includes sump pit)	EN, FLB, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A

Table 3.5.2-6
Containments, Structures, and Component Supports – Condensate Polishing Building (Unit 2 only) – Summary of Aging Management Evaluation

Table 3.5.2-6 : Condensate Polishing Building (Unit 2 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Roof decking	SNS, SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
2	Structural steel: beams, columns, plates and trusses	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Exterior walls (above grade)	SNS, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
4	Exterior walls (below grade)	SNS, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Floor slabs	SNS, SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Foundation (includes sump pit)	SNS, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
7	Interior walls	SNS, SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-6 (continued): Condensate Polishing Building (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Roof slab	SNS, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-7
Containments, Structures, and Component Supports – Control Building (Unit 2 only) – Summary of Aging Management Evaluation

Table 3.5.2-7 : Control Building (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Control room ceiling	SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A1-12 (T-11)	3.5.1-25	A
2	Metal siding	EN, SNS, SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A1-12 (T-11)	3.5.1-25	A
3	Structural steel: beams, columns, plates and trusses	EN, SNS, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A1-12 (T-11)	3.5.1-25	A
4	Roof decking	EN, SNS, SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
5	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6 (T-01)	3.5.1-26	A
7	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508

Table 3.5.2-7 (continued): Control Building (Unit 2 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
9	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
10	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
11	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
12	Foundation mat (includes sump pit)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
13	Interior walls	EN, FB, MB, SHD, SPB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
14	Interior walls	FB, MB, SHD, SPB, SNS, SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A1-11 (T-12)	3.5.1-43	A

Table 3.5.2-7 (continued): Control Building (Unit 2 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Interior walls	FB, MB, SHD, SPB, SNS, SRE	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A1-11 (T-12)	3.5.1-43	E, 529
16	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6 (T-01)	3.5.1-26	A
17	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
18	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-8
Containments, Structures, and Component Supports – Decontamination Building – Summary of Aging Management Evaluation

Table 3.5.2-8 : Decontamination Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Unit 1									
1	Metal siding	SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Roof decking	SNS	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C
3	Structural steel: beams, columns, plates and trusses	SNS	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
4	Structural steel: beams, columns, plates and trusses	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Foundation (includes sump pit)	SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Table 3.5.2-8 (continued): Decontamination Building									
Unit 2									
6	Roof decking	SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C
7	Structural steel: beams, columns, plates and trusses	SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
8	Structural steel: beams, columns, plates and trusses	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
9	Exterior walls (above grade)	MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
10	Foundation (includes sump pit)	SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
11	Interior walls	SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
12	Roof slab	MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-9
Containments, Structures, and Component Supports – Diesel Generator Building – Summary of Aging Management Evaluation

Table 3.5.2-9 : Diesel Generator Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
2	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
3	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
4	Foundation	EN, FB, FLB, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
5	Foundation	EN, FB, FLB, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511

Table 3.5.2-9 (continued): Diesel Generator Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
6	Interior walls	EN, FB, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
7	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
8	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
9	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
10	Slab covers (includes buried trench)	MB	Concrete	Below Grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
Unit 2									
11	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
12	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508

Table 3.5.2-9 (continued): Diesel Generator Building									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
13	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
14	Floor slabs	FB, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
15	Floor slabs	FB, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
16	Foundation	EN, FB, FLB, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
17	Interior walls	EN, FB, MB, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
18	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
19	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508

Table 3.5.2-9 (continued): Diesel Generator Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
20	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
21	Tank embedment	FLB, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-10
Containments, Structures, and Component Supports –
Emergency Outfall Structure (Unit 2 only) –
Summary of Aging Management Evaluation

Table 3.5.2-10 : Emergency Outfall Structure (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Foundation mat	FLB, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
2	Overflow weir wall and chamber walls	FLB, MB, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A, 509
3	Exterior walls (below grade)	FLB, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
4	Roof slab	MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-11
Containments, Structures, and Component Supports – Emergency Response Facility Diesel Generator Building (Common) – Summary of Aging Management Evaluation

Table 3.5.2-11 : Emergency Response Facility Diesel Generator Building (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Metal siding and roofing	SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Structural steel: beams, columns, plates and trusses	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Floor slabs	SRE	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
4	Foundation	FLB, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Foundation for ERF diesel generator cooler (radiator)	SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
6	Pipe trench	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
7	Fuel tank vault walls	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-11 (continued): Emergency Response Facility Diesel Generator Building (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Fuel tank vault roof	SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-12
Containments, Structures, and Component Supports – Emergency Response Facility Substation Building (Common) – Summary of Aging Management Evaluation

Table 3.5.2-12 : Emergency Response Facility Substation Building (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Battery racks	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Floor and roof decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Metal siding	SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
4	Structural steel: beams, columns, plates and trusses	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Structural steel: beams, columns, plates and trusses	SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	A
6	Floor slabs	SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
7	Foundation	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-12 (continued): Emergency Response Facility Substation Building (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Exterior walls (above grade)	SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A, 520
9	Exterior walls (below grade)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
10	Interior walls	SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
11	Interior walls	SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A

Table 3.5.2-13
Containments, Structures, and Component Supports – Equipment Hatch Platform – Summary of Aging Management Evaluation

Table 3.5.2-13 : Equipment Hatch Platform									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Beams and columns	SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
2	Exterior walls (above grade)	EN, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
3	Foundation	SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
4	Interior walls	MB, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Roof slab	EN, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
Unit 2									
6	Exterior walls (above grade)	EN, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
7	Floor slabs	SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-13 (continued): Equipment Hatch Platform

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Foundation	SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
9	Interior walls	MB, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
10	Roof slab	EN, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-14
Containments, Structures, and Component Supports – Fuel Building – Summary of Aging Management Evaluation

Table 3.5.2-14 : Fuel Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Metal siding	EN, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A5-12 (T-11)	3.5.1-25	A
2	New fuel storage racks	EN, SNS, SSR	Stainless steel	Protected from weather	None	None	III.B1.2-8 (TP-4)	3.5.1-59	C
3	Roof decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C
4	Spent fuel pool weir gates	SNS, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 504, 513, 514
5	Fuel transfer tube gate	SNS, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 504, 513, 514
6	Spent fuel pool liner	SPB, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 504, 513

Table 3.5.2-14 (continued): Fuel Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Spent fuel storage racks	EN, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	V.A-27 (EP-41)	3.2.1-49	C
8	Structural steel: beams, columns, plates and trusses	SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
9	Structural steel: beams, columns, plates and trusses	SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A5-12 (T-11)	3.5.1-25	A
10	Exterior walls (above grade)	EN, FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A5-6 (T-01)	3.5.1-26	A
11	Exterior walls (above grade)	EN, FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
12	Exterior walls (above grade)	EN, FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
13	Exterior walls (below grade)	EN, FB, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-14 (continued): Fuel Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
14	Foundation (includes sump pit)	EN, FB, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
15	Interior walls	FB, SNS, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A5-11 (T-12)	3.5.1-43	A
16	Interior walls	FB, SNS, SSR	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A5-11 (T-12)	3.5.1-43	E, 529
17	Spent fuel pool	MB, SHD, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501, 508
18	Spent fuel rack neutron absorbers	SHD, SSR	Boral	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	VII.A2-5 (A-88)	3.3.1-13	E, 515
Unit 2									
19	New fuel storage racks	EN, SNS, SSR	Stainless steel	Protected from weather	None	None	III.B1.2-8 (TP-4)	3.5.1-59	C
20	Roof decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C
21	Spent fuel pool weir gates	SNS, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 504, 513, 514

Table 3.5.2-14 (continued): Fuel Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
22	Fuel transfer tube gate	SNS, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 504, 513, 514
23	Spent fuel pool liner	SPB, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 504, 513
24	Spent fuel storage racks	EN, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	V.A-27 (EP-41)	3.2.1-49	C
25	Structural steel: beams, columns, plates and trusses	SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
26	Structural steel: beams, columns, plates and trusses	SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A5-12 (T-11)	3.5.1-25	A
27	Exterior walls (above grade)	EN, FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A5-6 (T-01)	3.5.1-26	A
28	Exterior walls (above grade)	EN, FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
29	Exterior walls (above grade)	EN, FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-14 (continued): Fuel Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
30	Exterior walls (below grade)	EN, FB, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
31	Foundation (includes sump pit)	EN, FB, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
32	Interior walls	FB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
33	Roof slab	FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
34	Roof slab	FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
35	Roof slab	FB, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
36	Spent fuel pool	MB, SHD, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501, 508

Table 3.5.2-15
Containments, Structures, and Component Supports – Gaseous Waste Storage Vault – Summary of Aging Management Evaluation

Table 3.5.2-15 : Gaseous Waste Storage Vault									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Blowout panels	PR, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
2	Exterior walls (below grade)	EN, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
3	Foundation	EN, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
4	Interior walls	EN, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Roof slab	EN, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
Unit 2									
6	Structural steel: beams, columns, plates and trusses	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A

Table 3.5.2-15 (continued): Gaseous Waste Storage Vault

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Foundation (includes sump pit)	SNS, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
8	Exterior walls (above grade)	SNS, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
9	Exterior walls (below grade)	SNS, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
10	Interior walls	SNS, SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
11	Roof slab	SNS, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-16
Containments, Structures, and Component Supports – Guard House (Common) – Summary of Aging Management Evaluation

Table 3.5.2-16 : Guard House

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Battery racks	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
2	Floor and roof decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Structural steel: beams, columns, plates and trusses	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
4	Exterior walls (above grade)	SRE	Concrete block	Exposed to weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A
5	Floor slabs	SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Foundation	SRE	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
7	Interior walls	SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A

Table 3.5.2-17
Containments, Structures, and Component Supports – Intake Structure (Common) – Summary of Aging Management Evaluation

Table 3.5.2-17 : Intake Structure (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Metal siding	SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Roof decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Screen guides	EN, SRE, SSR	Stainless steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	VII.C3-7 (A-53)	3.3.1-78	E, 530
4	Structural steel: beams, columns, plates and trusses	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Trash racks	SNS, SRE, SSR	Carbon steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 518
6	Traveling screen casing and associated framing	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
7	Valve stuffing box floor penetrations	FLB	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C

Table 3.5.2-17 (continued): Intake Structure (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Vent hoods and framing	FLB, SRE, SSR	Carbon steel	Exposed to Weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
9	Vent hoods and framing	FLB, SRE, SSR	Galvanized steel	Exposed to Weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
10	Exterior walls (above grade)	EN, FB, FLB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
11	Exterior walls (above grade)	EN, FB, FLB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
12	Exterior walls (below grade)	EN, FLB, HS, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
13	Floor slabs	EN, FB, FLB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
14	Floor slabs	EN, FB, FLB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511

Table 3.5.2-17 (continued): Intake Structure (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
15	Foundation mat	EN, FLB, HS, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
16	Foundation mat	EN, FLB, HS, SNS, SRE, SSR	Concrete	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-7 (T-20)	3.5.1-45	E, 518
17	Interior walls	EN, FB, FLB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
18	Interior walls	EN, FB, FLB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
19	Line anchors	EN, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
20	Pump intake chamber walls	EN, HS, SCW, SNS, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A, 509
21	Pump intake chamber walls	EN, HS, SCW, SNS, SRE, SSR	Concrete	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-7 (T-20)	3.5.1-45	E, 518

Table 3.5.2-17 (continued): Intake Structure (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
22	Roof slab	EN, FB, MB, SSR, SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501
23	Sump pits	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
24	Ventilation air intake stacks	EN, FLB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-18
Containments, Structures, and Component Supports – Main Steam and Cable Vault – Summary of Aging Management Evaluation

Table 3.5.2-18 : Main Steam and Cable Vault									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Structural steel: beams, columns, plates and trusses	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
2	Structural steel: beams, columns, plates and trusses	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
4	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
5	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-18 (continued): Main Steam and Cable Vault									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
6	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
7	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
8	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
9	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
10	Foundation	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
11	Interior walls	EN, FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
12	Interior walls	EN, FB, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A

Table 3.5.2-18 (continued): Main Steam and Cable Vault

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
13	Interior walls	EN, FB, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A3-11 (T-12)	3.5.1-43	E, 529
14	Pipe chase/ tunnel (El. 722 ft.-6 in.)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
15	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
16	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
17	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
18	Sump pit	SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
Unit 2									
19	Missile shields	MB	Stainless steel	Protected from weather	None	None	III.B5-6 (TP-4)	3.5.1-59	C
20	Roof Decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C

Table 3.5.2-18 (continued): Main Steam and Cable Vault									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
21	Structural steel: beams, columns, plates and trusses	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
22	Structural steel: beams, columns, plates and trusses	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
23	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
24	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
25	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
26	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
27	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-18 (continued): Main Steam and Cable Vault

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
28	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
29	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
30	Foundation (includes sump pit)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
31	Interior walls	EN, FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
32	Interior walls	FB, MB, SNS, SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A
33	Interior walls	FB, MB, SNS, SRE	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A3-11 (T-12)	3.5.1-43	E, 529
34	Pipe Tunnel/ Trench, (El. 718 ft. - 6 in.)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-18 (continued): Main Steam and Cable Vault

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
36	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
37	Roof slab	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-19
Containments, Structures, and Component Supports – Pipe Tunnel – Summary of Aging Management Evaluation

Table 3.5.2-19 : Pipe Tunnel									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Exterior walls (below grade)	EN, FB, FLB, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
2	Foundation (includes sump pit)	EN, FB, FLB, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
3	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
4	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
5	Roof slab	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-19 (continued): Pipe Tunnel

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Unit 2									
6	Exterior walls (below grade)	EN, FLB, SNS, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
7	Foundation	EN, FLB, SNS, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
8	Interior walls	SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
9	Ceiling slabs	EN, MB, SNS, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-20
Containments, Structures, and Component Supports – Primary Demineralized Water Storage Tank Pad and Enclosure – Summary of Aging Management Evaluation

Table 3.5.2-20 : Primary Demineralized Water Storage Tank Pad and Enclosure

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Unit 1									
1	Piles	SRE	Carbon steel	Below Grade	None	None	N/A	N/A	G, 512
2	Roof decking	EN, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Structural steel: beams, columns, plates and trusses	SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
4	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
5	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
6	Exterior walls (above grade)	EN, FB, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-20 (continued): Primary Demineralized Water Storage Tank Pad and Enclosure									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
7	Foundation (auxiliary demineralized water storage tank pad)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
8	Foundation (turbine plant demineralized water storage tank pad)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
9	Foundation (primary demineralized water storage tank pad, including valve pit)	SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
10	Roof slab	EN, FB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
11	Roof slab	EN, FB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
12	Roof slab	EN, FB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-20 (continued): Primary Demineralized Water Storage Tank Pad and Enclosure									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Unit 2									
13	Roof decking	EN, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
14	Structural steel: beams, columns, plates and trusses	SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
15	Exterior walls (above grade)	EN, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
16	Foundation (demineralized water storage tank pad, including sump pit)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
17	Foundation (primary demineralized water storage tank pad, including sump pit)	SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
18	Roof slab	EN, MB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-21
Containments, Structures, and Component Supports – Primary Water Storage Building (Unit 1 only) – Summary of Aging Management Evaluation

Table 3.5.2-21 : Primary Water Storage Building (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Exterior walls (above grade)	MB, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
2	Exterior walls (below grade)	FLB, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
3	Floor slabs	SRE	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
4	Foundation (includes sump pit)	FLB, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Interior walls	SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39),	N/A	N/A	I, 501
6	Roof slab	MB, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-22
Containments, Structures, and Component Supports – Reactor Containment Building – Summary of Aging Management Evaluation

Table 3.5.2-22 : Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Unit 1									
1	Containment liner	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A1-11 (C-09)	3.5.1-06	A
2	Containment liner	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A1-11 (C-09)	3.5.1-06	B
3	Containment liner	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	TLAA	II.A1-11 (C-09)	3.5.1-06	E, 502
4	Containment liner and liner penetrations	EN, SPB, SSR	Carbon steel	Protected from weather	Cumulative fatigue damage	TLAA	II.A3-4 (C-13)	3.5.1-09	C
5	Control rod drive shield	MB, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.2-11 (T-25)	3.5.1-55	C
6	Control rod drive shield	MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A4-5 (T-11)	3.5.1-25	A

Table 3.5.2-22 (continued): Reactor Containment Building									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Control rod drive supports	MB, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	A
8	Control rod drive supports	MB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	B
9	Equipment hatch and emergency air lock	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A3-6 (C-16)	3.5.1-18	A
10	Equipment hatch and emergency air lock	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A3-6 (C-16)	3.5.1-18	B
11	Fuel transfer canal liner	SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
12	Fuel transfer tube	SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
13	Fuel transfer tube expansion bellows	SSR	Stainless steel	Protected from weather	None	None	III.B1.2-8 (TP-4)	3.5.1-59	C

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Fuel transfer tube expansion bellows	SSR	Stainless steel	Protected from weather	Cumulative fatigue damage	TLAA	II.A3-4 (C-13)	3.5.1-09	A
15	Neutron shield tank	SHD, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	C, 507
16	Neutron shield tank	SHD, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	D, 507
17	Neutron shield tank shielding	SHD	Lead	Protected from weather	None	None	N/A	N/A	F, 505
18	Penetrations (electrical and mechanical)	SPB, SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	C
19	Penetrations (electrical and mechanical)	SPB, SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A3-1 (C-12)	3.5.1-18	A
20	Penetrations (electrical and mechanical)	SPB, SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A3-1 (C-12)	3.5.1-18	B

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
21	Penetrations (electrical and mechanical)	SPB, SSR	Stainless steel	Protected from weather	None	10 CFR Part 50, Appendix J (B.2.1), ASME Section XI, Subsection IWE (B.2.3)	II.A3-2 (C-15)	3.5.1-10	I, 501
22	Penetration bellows	SPB, SSR	Stainless steel	Protected from weather	Cumulative fatigue damage	TLAA	II.A3-4 (C-13)	3.5.1-09	A
23	Penetration bellows	SPB, SSR	Stainless steel	Protected from weather	None	10 CFR Part 50, Appendix J (B.2.1), ASME Section XI, Subsection IWE (B.2.3)	II.A3-2 (C-15)	3.5.1-10	I, 501
24	Personnel air lock	SPB, SSR	Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A3-6 (C-16)	3.5.1-18	A
25	Personnel air lock	SPB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A3-6 (C-16)	3.5.1-18	B
26	Pressurizer supports and safety valve restraints	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	A

Table 3.5.2-22 (continued): Reactor Containment Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
27	Pressurizer supports and safety valve restraints	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	B
28	Radiation shield panels	SHD	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	C
29	Radiation shield panels	SHD	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	C
30	Radiation shield panels	SHD	Stainless steel	Protected from weather	None	None	III.B5-6 (TP-4)	3.5.1-59	C
31	Reactor cavity water seal	FLB, SSR	Stainless steel	Protected from weather	None	None	III.B1.1-10 (TP-4)	3.5.1-59	C
32	Reactor cavity water seal	FLB, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
33	Reactor internals storage stand	SSR	Stainless steel	Protected from weather	None	None	III.B1.1-10 (TP-4)	3.5.1-59	C
34	Recirculation spray cooler shield	HLBS, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	C

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
35	Recirculation spray cooler shield	HLBS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A4-5 (T-11)	3.5.1-25	A
36	Recirculation spray cooler support	HLBS, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	A
37	Recirculation spray cooler support	HLBS, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	B
38	Refueling cavity cofferdam	SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
39	Refueling cavity liner	SPB, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
40	Steam generator and reactor coolant pump supports	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	A
41	Steam generator and reactor coolant pump supports	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	B

Table 3.5.2-22 (continued): Reactor Containment Building									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
42	Structural steel: beams, columns, plates and trusses	SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
43	Structural steel: beams, columns, plates and trusses	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A4-5 (T-11)	3.5.1-25	A
44	Sump screen assembly and liner	SSR	Stainless steel	Protected from weather	None	None	III.B5-6 (TP-4)	3.5.1-59	C
45	Vortex baffles	SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C, 517
46	Vortex baffles	SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
47	Vortex baffles	SSR	Stainless steel	Protected from weather	None	None	III.B5-5 (TP-5)	3.5.1-59	C
48	Concrete framing	SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
49	Crane wall	MB, SHD, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-22 (continued): Reactor Containment Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
50	Dome	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	ASME Section XI, Subsection IWL (B.2.5)	II.A1-2 (C-01)	3.5.1-14	A
51	Dome	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6 (T-01)	3.5.1-26	A
52	Drain trenches	DF	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
53	Exterior walls (above grade)	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	ASME Section XI, Subsection IWL (B.2.5)	II.A1-2 (C-01)	3.5.1-14	A
54	Exterior walls (above grade)	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6 (T-01)	3.5.1-26	A
55	Exterior walls (below grade)	EN, FLB, SRE, SSR	Concrete	Below grade	None	ASME Section XI, Subsection IWL (B.2.5), Structures Monitoring (B.2.39)	N/A	N/A	I, 501
56	Foundation	EN, FLB, MB, SRE, SSR	Concrete	Protected from weather	Cracking	ASME Section XI, Subsection IWL (B.2.5)	III.B4-1 (T-29)	3.5.1-40	E, 506

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
57	Foundation	EN, FLB, MB, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A, 506
58	Fuel transfer canal	SHD, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
59	Instrument pits (including sump pits)	FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
60	Interior walls	MB, SHD, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
61	Moisture barrier (caulk)	EN	Elastomer	Protected from weather	Loss of sealing	ASME Section XI, Subsection IWE (B.2.3)	II.A3-7 (C-18)	3.5.1-16	B, 525
62	Neutron shields	SHD	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
63	Refueling cavity	MB, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
64	Sump	SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
65	Slide bearing plates	SSR	Lubrite®	Protected from weather	None	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-5 (T-32)	3.5.1-56	I, 501

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Unit 2									
66	Blowout panels	PR	Stainless steel	Protected from weather	None	None	III.B1.1-10 (TP-4)	3.5.1-59	C
67	Containment liner	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A1-11 (C-09)	3.5.1-06	A
68	Containment liner	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A1-11 (C-09)	3.5.1-06	B
69	Containment liner	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	TLAA	II.A1-11 (C-09)	3.5.1-06	E, 502
70	Containment liner and liner penetrations	EN, SPB, SSR	Carbon steel	Protected from weather	Cumulative fatigue damage	TLAA	II.A3-4 (C-13)	3.5.1-09	C
71	Control rod drive shield	MB, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.2-11 (T-25)	3.5.1-55	C
72	Control rod drive shield	MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A4-5 (T-11)	3.5.1-25	A
73	Control rod drive supports	MB, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	A

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
74	Control rod drive supports	MB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	B
75	Equipment hatch and emergency air lock	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A3-6 (C-16)	3.5.1-18	A
76	Equipment hatch and emergency air lock	EN, SPB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A3-6 (C-16)	3.5.1-18	B
77	Fuel transfer canal liner	SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
78	Fuel transfer tube	SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
79	Fuel transfer tube expansion bellows	SSR	Stainless steel	Protected from weather	None	None	III.B1.2-8 (TP-4)	3.5.1-59	C
80	Fuel transfer tube expansion bellows	SSR	Stainless steel	Protected from weather	Cumulative fatigue damage	TLAA	II.A3-4 (C-13)	3.5.1-09	A
81	Missile shields	MB	Stainless steel	Protected from weather	None	None	III.B1.2-8 (TP-4)	3.5.1-59	C

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
82	Neutron shield (supplementary)	SHD	Stainless steel	Protected from weather	None	None	III.B1.1-10 (TP-4)	3.5.1-59	C
83	Neutron shield tank	SHD, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	C, 507
84	Neutron shield tank	SHD, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	D, 507
85	Neutron shield tank shielding	SHD	Lead	Protected from weather	None	None	N/A	N/A	F, 505
86	Penetrations (electrical and mechanical)	SPB, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	C
87	Penetrations (electrical and mechanical)	SPB, SSR	Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A3-1 (C-12)	3.5.1-18	A
88	Penetrations (electrical and mechanical)	SPB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A3-1 (C-12)	3.5.1-18	B

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
89	Penetrations (electrical and mechanical)	SPB, SSR	Stainless steel	Protected from weather	None	10 CFR Part 50, Appendix J (B.2.1), ASME Section XI, Subsection IWE (B.2.3)	II.A3-2 (C-15)	3.5.1-10	I, 501
90	Personnel air lock	SPB, SSR	Carbon steel	Protected from weather	Loss of material	10 CFR Part 50, Appendix J (B.2.1)	II.A3-6 (C-16)	3.5.1-18	A
91	Personnel air lock	SPB, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWE (B.2.3)	II.A3-6 (C-16)	3.5.1-18	B
92	Pressurizer supports and safety valve restraints	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	A
93	Pressurizer supports and safety valve restraints	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	B
94	Reactor cavity water seal	FLB, SSR	Stainless steel	Protected from weather	None	None	III.B1.1-10 (TP-4)	3.5.1-59	C
95	Reactor cavity water seal	FLB, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
96	Reactor internals storage stand	SSR	Stainless steel	Protected from weather	None	None	III.B1.1-10 (TP-4)	3.5.1-59	C
97	Refueling cavity liner	SPB, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.A5-13 (T-14)	3.5.1-46	I, 503, 504
98	Steam generator and reactor coolant pump supports	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14 (T-25)	3.5.1-55	A
99	Steam generator and reactor coolant pump supports	SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 (T-24)	3.5.1-53	B
100	Structural steel: beams, columns, plates and trusses	SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
101	Structural steel: beams, columns, plates and trusses	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A4-5 (T-11)	3.5.1-25	A

Table 3.5.2-22 (continued): Reactor Containment Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
102	Sump screen assembly and liner	SSR	Stainless steel	Protected from weather	None	None	III.B5-6 (TP-4)	3.5.1-59	C
103	Concrete framing	SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
104	Crane wall	MB, SHD, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
105	Dome	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	ASME Section XI, Subsection IWL (B.2.5)	II.A1-2 (C-01)	3.5.1-14	A
106	Dome	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6 (T-01)	3.5.1-26	A
107	Drain trenches	DF	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
108	Exterior walls (above grade)	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	ASME Section XI, Subsection IWL (B.2.5)	II.A1-2 (C-01)	3.5.1-14	A
109	Exterior walls (above grade)	EN, MB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6 (T-01)	3.5.1-26	A

Table 3.5.2-22 (continued): Reactor Containment Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
110	Exterior walls (below grade)	EN, FLB, SRE, SSR	Concrete	Below grade	None	ASME Section XI, Subsection IWL (B.2.5), Structures Monitoring (B.2.39)	N/A	N/A	I, 501
111	Foundation	EN, FLB, MB, SRE, SSR	Concrete	Protected from weather	Cracking	ASME Section XI, Subsection IWL (B.2.5)	III.B4-1 (T-29)	3.5.1-40	E, 506
112	Foundation	EN, FLB, MB, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A, 506
113	Fuel transfer canal	SHD, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
114	Instrument pits (including sump pits)	FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
115	Interior walls	MB, SHD, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
116	Missile shields	MB	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
117	Moisture barrier (caulk)	EN	Elastomer	Protected from weather	Loss of sealing	ASME Section XI, Subsection IWE (B.2.3)	II.A3-7 (C-18)	3.5.1-16	B, 525

Table 3.5.2-22 (continued): Reactor Containment Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
118	Refueling cavity	MB, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
119	Sump	SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
120	Slide bearing plates	SSR	Lubrite®	Protected from weather	None	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-5 (T-32)	3.5.1-56	I, 501

Table 3.5.2-23
Containments, Structures, and Component Supports – Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings – Summary of Aging Management Evaluation

Table 3.5.2-23 : Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Tank skirt	SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	C
2	Foundation (tank pad)	SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
3	Shield wall	EN, FB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
4	Shield wall	EN, FB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
5	Shield wall	EN, FB, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
Unit 2									
6	Tank Skirt	SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	C

Table 3.5.2-23 (continued): Refueling Water Storage Tank and Chemical Addition Tank Pad and Surroundings

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Foundation (tank pad, including sump pit)	SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
8	Shield wall	EN, SHD, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-24
Containments, Structures, and Component Supports – Relay Building (Common) – Summary of Aging Management Evaluation

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Conduit envelope / duct bank	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
2	Roof beams	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Roof decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
4	Roof relief vents	SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Roof relief vents	SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	A
6	Steel lintels	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
7	Exterior walls (above grade)	SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
8	Floor slabs	SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-24 (continued): Relay Building (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
9	Foundation	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
10	Interior walls	SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A
11	Roof slab	SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-25
Containments, Structures, and Component Supports – Safeguards Building – Summary of Aging Management Evaluation

Table 3.5.2-25 : Safeguards Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Pump casements	EN, FLB	Carbon Steel	Below Grade	None	None	N/A	N/A	G, 526
2	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
3	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
4	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
5	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
6	Floor slabs (including baffles)	FB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A

Table 3.5.2-25 (continued): Safeguards Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Floor slabs (including baffles)	FB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
8	Foundation mat (includes sump pit)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
9	Interior walls	EN, FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
10	Roof slab	EN, FB, MB, SSR, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
11	Roof slab	EN, FB, MB, SSR, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
12	Roof slab	EN, FB, MB, SSR, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
13	Roof slab (Valve Pit)	EN, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-25 (continued): Safeguards Building									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Vent ducts	EN, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
Unit 2									
15	Pump casements	EN, FLB	Carbon Steel	Below Grade	None	None	N/A	N/A	G, 526
16	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
17	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
18	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
19	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
20	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
21	Floor slabs	FB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A

Table 3.5.2-25 (continued): Safeguards Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
22	Floor slabs	FB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
23	Foundation mat (includes sump pit)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
24	Interior walls	EN, FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
25	Roof slab	EN, FB, MB, SSR, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
26	Roof slab	EN, FB, MB, SSR, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
27	Roof slab	EN, FB, MB, SSR, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
28	Roof slab (Valve Pit)	EN, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-26
Containments, Structures, and Component Supports – Service Building – Summary of Aging Management Evaluation

Table 3.5.2-26 : Service Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Control room ceiling	SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A1-12 (T-11)	3.5.1-25	A
2	Floor and roof decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Metal siding	EN, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A1-12 (T-11)	3.5.1-25	A
4	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A1-12 (T-11)	3.5.1-25	A
5	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A1-12 (T-11)	3.5.1-25	A
6	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-26 (continued): Service Building									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
7	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
8	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
9	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
10	Exterior walls (below grade)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
11	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
12	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
13	Foundation mat (includes sump pit)	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-26 (continued): Service Building									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
14	Interior walls	EN, FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
15	Interior walls	EN, FB, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A1-11 (T-12)	3.5.1-43	A
16	Interior walls	EN, FB, SNS, SRE, SSR	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A1-11 (T-12)	3.5.1-43	E, 529
17	Main control room envelope	EN, FB, MB, SHD, SPB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
18	Pipe chase (northwest corner)	EN, FB, HLBS, MB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
Unit 2									
19	Blowout panel	PR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C
20	Metal siding	EN, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A

Table 3.5.2-26 (continued): Service Building

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
21	Roof decking	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C
22	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
23	Structural steel: beams, columns, plates and trusses	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
24	Beams and columns	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
25	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
26	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
27	Exterior walls (above grade)	EN, FB, MB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-26 (continued): Service Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
28	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
29	Floor slabs	FB, MB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Fire Protection (B.2.16)	III.B4-1 (T-29)	3.5.1-40	E, 511
30	Foundation mat	EN, FB, FLB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
31	Interior walls	EN, FB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
32	Interior walls	FB, SNS, SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A
33	Interior walls	FB, SNS, SRE	Concrete block	Protected from weather	Cracking	Fire Protection (B.2.16)	III.A3-11 (T-12)	3.5.1-43	E, 529
34	Pipe and vent chases	EN, FB, HLBS, MB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508

Table 3.5.2-27
Containments, Structures, and Component Supports – Solid Waste Building (Unit 1 only) – Summary of Aging Management Evaluation

Table 3.5.2-27 : Solid Waste Building (Unit 1 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Roof decking	EN, SNS, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
2	Shield plates	EN, SNS, SSR,	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Structural steel: beams, columns, plates and trusses	SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
4	Exterior walls (above grade)	EN, MB, SNS, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
5	Exterior walls (below grade)	EN, FLB, SNS, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Foundation (at grade)	EN, SNS, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
7	Foundation (includes sump pit)	EN, FLB, SNS, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-27 (continued): Solid Waste Building (Unit 1 only)									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Interior walls	EN, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
9	Platform at elevation 770 ft. - 6 in.	SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
10	Roof slab	EN, SNS, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-28
Containments, Structures, and Component Supports – South Office and Shops Building (Common) – Summary of Aging Management Evaluation

Table 3.5.2-28 : South Office and Shops Building (Common)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Metal siding and roofing	SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Structural steel: beams, columns, plates and trusses	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Foundation	SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
4	Roof slab	SNS	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-29
Containments, Structures, and Component Supports – Steam Generator Drain Tank Structure (Unit 1 only) – Summary of Aging Management Evaluation

Table 3.5.2-29 : Steam Generator Drain Tank Structure (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Exterior walls (above grade)	SNS	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A7-5 (T-01)	3.5.1-26	A
2	Foundation	SNS	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
3	Interior walls	SNS	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
4	Roof slab	SNS	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A7-5 (T-01)	3.5.1-26	A

Table 3.5.2-30
Containments, Structures, and Component Supports – Switchyard (Common) – Summary of Aging Management Evaluation

Table 3.5.2-30 : Switchyard (Common)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Transmission towers	SRE	Alloy steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Transmission tower foundations	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
3	Transmission poles	SRE	Wood	Exposed to weather	Loss of material, Change in material properties	Electrical Wooden Poles/Structures Inspection (Unit 2 only) (B.2.13)	N/A	N/A	J
4	Transmission poles	SRE	Wood	Below grade	Loss of material, Change in material properties	Electrical Wooden Poles/Structures Inspection (Unit 2 only) (B.2.13)	N/A	N/A	J

Table 3.5.2-31
Containments, Structures, and Component Supports – Turbine Building – Summary of Aging Management Evaluation

Table 3.5.2-31 : Turbine Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Floor decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
2	Metal siding	SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
3	Roof decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
4	Structural steel: beams, columns, plates and trusses	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
5	Exterior walls (below grade)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Foundation (includes sump pit)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
7	Floor slabs	SRE	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A

Table 3.5.2-31 (continued): Turbine Building									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
8	Interior walls	SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
9	Interior walls	SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A
Unit 2									
10	Floor decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
11	Metal siding	SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
12	Roof decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
13	Structural steel: beams, columns, plates and trusses	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
14	Foundation (includes sump pit)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
15	Floor slabs	SRE	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
16	Interior walls	SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-31 (continued): Turbine Building									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
17	Interior walls	SRE	Concrete block	Protected from weather	Cracking	Masonry Wall (B.2.25)	III.A3-11 (T-12)	3.5.1-43	A

Table 3.5.2-32
Containments, Structures, and Component Supports – Valve Pit – Summary of Aging Management Evaluation

Table 3.5.2-32 : Valve Pit									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Unit 1									
1	Foundation mat	EN, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
2	Exterior walls (below grade)	EN, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
3	Exterior walls (below grade)	EN, FLB, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A, 509, 510
4	Interior walls	EN, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Roof slab	EN, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
Unit 2									
6	Ceiling plates	EN, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A

Table 3.5.2-32 (continued): Valve Pit									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
7	Foundation mat (includes sump pit)	EN, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
8	Exterior walls (above grade)	MB	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
9	Exterior walls (below grade)	EN, FB, FLB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508
10	Exterior walls (below grade)	EN, FB, FLB, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A, 509, 510
11	Removable slab covers	EN, MB, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
12	Roof slab	EN, MB, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-33
Containments, Structures, and Component Supports – Waste Handling Building (Unit 2 only) – Summary of Aging Management Evaluation

Table 3.5.2-33 : Waste Handling Building (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
1	Metal siding	SNS, SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Roof decking	SNS, SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Structural steel: beams, columns, plates and trusses	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
4	Structural steel: beams, columns, plates and trusses	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A
5	Exterior walls (above grade)	SNS, SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A
6	Exterior walls (below grade)	SNS, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
7	Floor slabs	SNS, SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-33 (continued): Waste Handling Building (Unit 2 only)									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
8	Foundation (includes sump pit)	SNS, SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
9	Interior walls	SNS, SRE	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-34
Containments, Structures, and Component Supports – Water Treatment Building (Unit 1 only) – Summary of Aging Management Evaluation

Table 3.5.2-34 : Water Treatment Building (Unit 1 only)

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Metal siding	SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
2	Roof decking	SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
3	Structural steel: beams, columns, plates and trusses	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.A3-12 (T-11)	3.5.1-25	A
4	Exterior walls (below grade)	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Foundation	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
6	Floor slabs	SRE	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A

Table 3.5.2-35
Containments, Structures, and Component Supports – Yard Structures – Summary of Aging Management Evaluation

Table 3.5.2-35 : Yard Structures

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
1	Lighting poles	SRE	Aluminum	Exposed to weather	Cracking	Structures Monitoring (B.2.39)	N/A	N/A	H
2	Lighting poles	SRE	Aluminum	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
3	Lighting poles	SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	C
4	Lighting pole and transformer foundations	SRE	Concrete	Below grade	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501
5	Lighting pole and transformer foundations	SRE	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A

Table 3.5.2-36
Containments, Structures, and Component Supports – Bulk Structural Commodities – Summary of Aging Management Evaluation

Table 3.5.2-36 : Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Steel and Other Metals									
1	Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11, III.B3-8, III.B4-11, III.B5-8 (T-25)	3.5.1-55	A, 517
2	Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B3-7, III.B4-10, III.B5-7 (T-30)	3.5.1-39	A

Table 3.5.2-36 (continued): Bulk Structural Commodities

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
3	Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8, III.B3-5, III.B4-8, III.B5-5 (TP-5) III.B2-9, III.B3-6, III.B4-9, III.B5-6 (TP-4)	3.5.1-59	A
4	Anchorage / embedments	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
5	Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
6	Anchorage / embedments	SNS, SRE, SSR	Galvanized steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 519
7	Cable trays and conduits	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
8	Cable trays and conduits	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	C
9	Cable trays and conduits	EN, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
10	Cable trays and conduits	EN, SNS, SRE, SSR	Galvanized steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 519
11	Cable tray and conduit supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	A, 517
12	Cable tray and conduit supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
13	Cable tray and conduit supports	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	A
14	Cable tray and conduit supports	SNS, SRE, SSR	Galvanized steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 519
15	Cable trays and conduits	EN, SNS, SRE, SSR	Aluminum	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	VII.G-8 (AP-83)	3.3.1-62	E, 519
16	Cable trays and conduits	EN, SNS, SRE, SSR	Aluminum	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
17	Cable trays and conduits	EN, SNS, SRE, SSR	Aluminum	Protected from weather	None	None	III.B2-4 (TP-8)	3.5.1-58	C
18	Cable trays and conduits	EN, SNS, SRE, SSR	Aluminum	Exposed to weather	Cracking	Structures Monitoring (B.2.39)	N/A	N/A	H
19	Cable trays and conduits	EN, SNS, SRE, SSR	Aluminum	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
20	Cable trays and conduits	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	C, 517

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
21	Cable trays and conduits	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
22	Cable trays and conduits	EN, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
23	Cable trays and conduits	EN, SNS, SRE, SSR	Carbon steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 519
24	Cable tray and conduit supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	A, 517
25	Cable tray and conduit supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	A
26	Cable tray and conduit supports	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	A
27	Cable tray and conduit supports	SNS, SRE, SSR	Carbon steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 519
28	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13, III.B1.2-10 (T-24)	3.5.1-53	B

Table 3.5.2-36 (continued): Bulk Structural Commodities

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
29	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14, III.B1.2-11 (T-25)	3.5.1-55	A, 517
30	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-8, III.B1.2-6 (TP-3)	3.5.1-55	A, 517
31	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B1.1-7, III.B1.2-5 (TP-11)	3.5.1-58	A
32	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B1.1-9, III.B1.2-7 (TP-5) III.B1.1-10, III.B1.2-8 (TP-4)	3.5.1-59	A
33	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13, III.B1.2-10 (T-24)	3.5.1-53	B

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Table 3.5.2-36 (continued): Bulk Structural Commodities									
34	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13, III.B1.2-10 (T-24)	3.5.1-53	B
35	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	E, 531
36	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Carbon steel	Exposed to raw water	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.A6-11 (T-21)	3.5.1-47	E, 528
37	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Galvanized steel	Exposed to raw water	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.A6-11 (T-21)	3.5.1-47	E, 528
38	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Stainless steel	Exposed to raw water	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	VII.C3-7 (A-53)	3.3.1-78	E, 528

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
39	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Stainless steel	Exposed to treated water	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-11 (TP-10)	3.5.1-49	D, 521
40	Component and piping supports (ASME class 1, 2 and 3)	SNS, SRE, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.B1.1-11 (TP-10)	3.5.1-49	C, 521
41	Crane girders and rails	SNS, SRE, SSR	Carbon steel	Protected from weather	Cumulative fatigue damage	TLAA	VII.B-2 (A-06)	3.3.1-01	A
42	Crane girders and rails	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-8 (T-25)	3.5.1-55	A, 517
43	Crane girders and rails	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.23)	VII.B-3 (A-07)	3.3.1-73	A
44	Crane girders and rails	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	A, 517
45	Crane girders and rails	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
46	Crane girders and rails	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B5-5 (TP-5)	3.5.1-59	A
47	Damper framing (in-wall)	FB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	C, 517
48	Damper framing (in-wall)	FB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Fire Protection (B.2.16)	III.A3-12 (T-11)	3.5.1-25	E, 511
49	Damper framing (in-wall)	FB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
50	Damper framing (in-wall)	FB, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
51	Damper framing (in-wall)	FB, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Fire Protection (B.2.16)	III.A3-12 (T-11)	3.5.1-25	E, 511
52	Damper framing (in-wall)	FB, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	C
53	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B3-8 (T-25)	3.5.1-55	C, 517
54	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B3-7 (T-30)	3.5.1-39	C

Table 3.5.2-36 (continued): Bulk Structural Commodities

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
55	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B3-4 (TP-3)	3.5.1-55	C, 517
56	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B3-3 (TP-11)	3.5.1-58	C
57	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B3-5 (TP-5)	3.5.1-59	C
58	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B3-7 (T-30)	3.5.1-39	C
59	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
60	Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Table 3.5.2-36 (continued): Bulk Structural Commodities									
61	Equipment component supports	SNS, SRE, SSR	Aluminum	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6, III.B3-4, III.B4-6, III.B5-4 (TP-3)	3.5.1-55	A, 517
62	Equipment component supports	SNS, SRE, SSR	Aluminum	Protected from weather	None	None	III.B2-4, III.B3-2, III.B4-4, III.B5-2 (TP-8)	3.5.1-58	A
63	Equipment component supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11, III.B3-8, III.B4-11, III.B5-8 (T-25)	3.5.1-55	A, 517
64	Equipment component supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B3-7, III.B4-10, III.B5-7 (T-30)	3.5.1-39	A
65	Equipment component supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6, III.B3-4, III.B4-6, III.B5-4 (TP-3)	3.5.1-55	A, 517

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
66	Equipment component supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5, III.B3-3, III.B4-5, III.B5-3 (TP-11)	3.5.1-58	A
67	Equipment component supports	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8, III.B3-5, III.B4-8, III.B5-5	3.5.1-59	A
68	Equipment component supports	SNS, SRE, SSR	Aluminum	Exposed to weather	Cracking	Structures Monitoring (B.2.39)	N/A	N/A	H
69	Equipment component supports	SNS, SRE, SSR	Aluminum	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
70	Equipment component supports	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B3-7, III.B4-10, III.B5-7 (T-30)	3.5.1-39	A
71	Equipment component supports	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
72	Equipment component supports	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
73	Fire doors	FB, FLB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-11 (T-25)	3.5.1-55	C, 517
74	Fire doors	FB, FLB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Fire Protection (B.2.16)	VII.G-3 (A-21)	3.3.1-63	B
75	Fire doors	FB, FLB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
76	Fire doors	FB, FLB, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Fire Protection (B.2.16)	VII.G-4 (A-22)	3.3.1-63	B
77	Fire doors	FB, FLB, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
78	Flexible conduit	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
79	Flexible conduit	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	C, 517

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
80	Flexible conduit	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
81	Flexible conduit	SNS, SRE, SSR	Copper	Protected from weather	None	None	V.F-3 (EP-10)	3.2.1-53	C
82	Flexible conduit	SNS, SRE, SSR	Stainless Steel	Protected from weather	None	None	III.B2-8 (TP-5)	3.5.1-59	C
83	Flexible conduit	SNS, SRE, SSR	Stainless Steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
84	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Aluminum	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-6 (TP-3)	3.5.1-55	C, 517
85	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Aluminum	Protected from weather	None	None	III.B4-4 (TP-8)	3.5.1-58	C
86	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-11 (T-25)	3.5.1-55	C, 517
87	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
88	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B4-8 (TP-5)	3.5.1-59	C

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
89	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Aluminum	Exposed to weather	Cracking	Structures Monitoring (B.2.39)	N/A	N/A	H
90	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Aluminum	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C
91	Flood, pressure and specialty doors	FLB, MB, SPB, SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C
92	Floor plates	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-11 (T-25)	3.5.1-55	C, 517
93	Floor plates	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
94	Floor plates	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-6 (TP-3)	3.5.1-55	C, 517
95	Floor plates	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B4-5 (TP-11)	3.5.1-58	C
96	Floor plates	EN, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
97	Floor plates	EN, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
98	Framing for floor and wall sections	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-11 (T-25)	3.5.1-55	C, 517
99	Framing for floor and wall sections	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
100	Framing for floor and wall sections	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-6 (TP-3)	3.5.1-55	C, 517
101	Framing for floor and wall sections	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B4-5 (TP-11)	3.5.1-58	C
102	Framing for floor and wall sections	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
103	Framing for floor and wall sections	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C
104	Grating, ladders, platforms and stairs	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C, 517
105	Grating, ladders, platforms and stairs	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	C
106	Grating, ladders, platforms and stairs	SNS, SRE	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C, 517

Table 3.5.2-36 (continued): Bulk Structural Commodities

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
107	Grating, ladders, platforms and stairs	SNS, SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	C
108	Grating, ladders, platforms and stairs	SNS, SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	C
109	Grating, ladders, platforms and stairs	SNS, SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C
110	Grating, ladder, platform and stair supports	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	A, 517
111	Grating, ladder, platform and stair supports	SNS, SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	A
112	Grating, ladder, platform and stair supports	SNS, SRE	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	A, 517
113	Grating, ladder, platform and stair supports	SNS, SRE	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
114	Grating, ladder, platform and stair supports	SNS, SRE	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	A
115	Grating, ladder, platform and stair supports	SNS, SRE	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C
116	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-11 (T-25)	3.5.1-55	C, 517
117	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Fire Protection (B.2.16)	III.A3-12 (T-11)	3.5.1-25	E, 511
118	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
119	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B4-6 (TP-3)	3.5.1-55	C, 517

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
120	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Fire Protection (B.2.16)	III.A3-12 (T-11)	3.5.1-25	E, 511
121	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B4-5 (TP-11)	3.5.1-58	C
122	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Fire Protection (B.2.16)	III.A3-12 (T-11)	3.5.1-25	E, 511
123	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
124	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Fire Protection (B.2.16)	III.A3-12 (T-11)	3.5.1-25	E, 511
125	Hatches (hatch covers)	EN, FB, FLB, MB, SPB, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C

Table 3.5.2-36 (continued): Bulk Structural Commodities

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
126	HELB barriers	HLBS, PW, SNS, SSR	Aluminum	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C, 517
127	HELB barriers	HLBS, PW, SNS, SSR	Aluminum	Protected from weather	None	None	III.B5-2 (TP-8)	3.5.1-58	C
128	HELB barriers	HLBS, PW, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B5-4 (TP-3)	3.5.1-55	C, 517
129	HELB barriers	HLBS, PW, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B5-7 (T-30)	3.5.1-39	C
130	HELB barriers	HLBS, PW, SNS, SSR	Stainless steel	Protected from weather	None	None	III.B5-5 (TP-5)	3.5.1-59	C
131	HVAC duct supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	A, 517
132	HVAC duct supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	A
133	HVAC duct supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	A, 517
134	HVAC duct supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
135	Instrument racks and frames	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B3-8 (T-25)	3.5.1-55	C, 517
136	Instrument racks and frames	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B3-7 (T-30)	3.5.1-39	C

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
137	Instrument racks and frames	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B3-4 (TP-3)	3.5.1-55	C, 517
138	Instrument racks and frames	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B3-3 (TP-11)	3.5.1-58	C
139	Instrument racks and frames	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B3-7 (T-30)	3.5.1-39	C
140	Instrument racks and frames	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
141	Louvers and vents	RP, SNS, SRE, SSR	Aluminum	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
142	Louvers and vents	RP, SNS, SRE, SSR	Aluminum	Protected from weather	None	None	III.B2-4 (TP-8)	3.5.1-58	C
143	Louvers and vents	RP, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	C, 517
144	Louvers and vents	RP, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
145	Louvers and vents	RP, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
146	Louvers and vents	RP, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	C
147	Louvers and vents	RP, SNS, SRE, SSR	Aluminum	Exposed to weather	Cracking	Structures Monitoring (B.2.39)	N/A	N/A	H

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
148	Louvers and vents	RP, SNS, SRE, SSR	Aluminum	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
149	Louvers and vents	RP, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
150	Louvers and vents	RP, SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
151	Penetrations (electrical and mechanical, non Containment pressure boundary)	EN, FLB, SPB, SNS, SRE, SSR	Aluminum	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
152	Penetrations (electrical and mechanical, non Containment pressure boundary)	EN, FLB, SPB, SNS, SRE, SSR	Aluminum	Protected from weather	None	None	III.B2-4 (TP-8)	3.5.1-58	C
153	Penetrations (electrical and mechanical, non Containment pressure boundary)	EN, FLB, SPB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	C, 517

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
154	Penetrations (electrical and mechanical, non Containment pressure boundary)	EN, FLB, SPB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
155	Penetrations (electrical and mechanical, non Containment pressure boundary)	EN, FLB, SPB, SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
156	Penetrations (electrical and mechanical, non Containment pressure boundary)	EN, FLB, SPB, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	C
157	Penetrations (electrical and mechanical, non Containment pressure boundary)	EN, FLB, SPB, SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8 (TP-5)	3.5.1-59	C

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
158	Pipe supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11, III.B4-11 (T-25)	3.5.1-55	A, 517
159	Pipe supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B4-10 (T-30)	3.5.1-39	A
160	Pipe supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6, III.B4-6 (TP-3)	3.5.1-55	A, 517
161	Pipe supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5, III.B4-5 (TP-11)	3.5.1-58	A
162	Pipe supports	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8, III.B4-8 (TP-5)	3.5.1-59	A
163	Pipe supports	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B4-10 (T-30)	3.5.1-39	A
164	Pipe supports	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
165	Pipe supports	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
166	Shake space / expansion joint covers	EN, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-10 (T-30)	3.5.1-39	C
167	Shake space / expansion joint covers	EN, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B4-7 (TP-6)	3.5.1-50	C
168	Sump liners	EN, SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B5-5 (TP-5)	3.5.1-59	C
169	Thermal insulation (metallic)	SNS, SRE, SSR	Aluminum	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
170	Thermal insulation (metallic)	SNS, SRE, SSR	Aluminum	Protected from weather	None	None	III.B2-4 (TP-8)	3.5.1-58	C
171	Thermal insulation (metallic)	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8 (TP-5)	3.5.1-59	C
172	Thermal insulation (metallic)	SNS, SRE, SSR	Aluminum	Exposed to weather	Cracking	Structures Monitoring (B.2.39)	N/A	N/A	H

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
173	Thermal insulation (metallic)	SNS, SRE, SSR	Aluminum	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
174	Thermal insulation (metallic)	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	C
175	Tube tracks	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	C, 517
176	Tube tracks	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
177	Tube tracks	SNS, SRE, SSR	Copper	Protected from weather	None	None	V.F-3 (EP-10)	3.2.1-53	C
178	Tube tracks	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	C, 517
179	Tube tracks	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	C
180	Tube tracks	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8 (TP-5)	3.5.1-59	C
181	Tube tracks	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
182	Tube tracks	SNS, SRE, SSR	Copper	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	N/A	N/A	G

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
183	Tube tracks	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
184	Tube tracks	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
185	Tube track and instrument line supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11 (T-25)	3.5.1-55	A, 517
186	Tube track and instrument line supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	A
187	Tube track and instrument line supports	SNS, SRE, SSR	Copper	Protected from weather	None	None	V.F-3 (EP-10)	3.2.1-53	C
188	Tube track and instrument line supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6 (TP-3)	3.5.1-55	A, 517
189	Tube track and instrument line supports	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
190	Tube track and instrument line supports	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8 (TP-5)	3.5.1-59	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
191	Tube track and instrument line supports	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	A
192	Tube track and instrument line supports	SNS, SRE, SSR	Copper	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	N/A	N/A	G
193	Tube track and instrument line supports	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	A
194	Tube track and instrument line supports	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	A
195	Vent panels	PR, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10 (T-30)	3.5.1-39	C
196	Vent panels	PR, SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 (TP-6)	3.5.1-50	C
Concrete									
197	Duct lines and manholes	EN, FB, SNS, SRE, SSR	Concrete	Below grade	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501, 508, 522

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
198	Duct lines and manholes	EN, FB, SNS, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A3-6 (T-01)	3.5.1-26	A, 509, 510, 522
199	Duct lines and manholes	EN, FB, SNS, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508, 509, 510, 522
200	Duct lines and manholes	EN, FB, SNS, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A, 509, 510, 522
201	Equipment pads	FLB, SNS, SRE, SSR	Concrete	Protected from weather	Cracking	Structures Monitoring (B.2.39)	III.B4-1 (T-29)	3.5.1-40	A
202	Equipment pads	FLB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6, III.A3-6, III.A5-6 (T-01)	3.5.1-26	A
203	Equipment pads	FLB, SNS, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A6-5 (T-15)	3.5.1-35	E, 518
204	Flood curbs	FLB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39)	N/A	N/A	I, 501

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
205	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring (B.2.39), Fire Protection (B.2.16)	N/A	N/A	I, 501
206	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A1-6, III.A3-6, III.A5-6 (T-01)	3.5.1-26	A
207	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A6-5 (T-15)	3.5.1-35	E, 518
208	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
209	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
210	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	III.A6-5 (T-15)	3.5.1-35	E, 509, 518
211	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508, 509
212	Hatches	EN, FB, FLB, MB, SHD, SNS, SPB, SRE, SSR	Concrete	Exposed to raw water	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A, 509
Elastomers									
213	Building pressure boundary seals and sealants	SNS, SPB, SSR	Elastomer	Protected from weather	Cracking and Change in material properties	Structures Monitoring (B.2.39)	III.A6-12 (TP-7)	3.5.1-44	C, 516
214	Compressible joints and seals	EXP, FLB, SNS, SPB	Elastomer	Protected from weather	Cracking and Change in material properties	10 CFR Part 50, Appendix J (B.2.1)	II.A3-7 (C-18)	3.5.1-16	A, 516

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
215	Compressible joints and seals	EXP, FLB, SNS, SPB	Elastomer	Protected from weather	Cracking and Change in material properties	ASME Section XI, Subsection IWE (B.2.3)	II.A3-7 (C-18)	3.5.1-16	B, 516
216	Compressible joints and seals	EXP, FLB, SNS, SPB	Elastomer	Protected from weather	Cracking and Change in material properties	Structures Monitoring (B.2.39)	III.A6-12 (TP-7)	3.5.1-44	C, 516
217	Compressible joints and seals	EXP, FLB, SNS, SPB	Elastomer (non-rubber)	Exposed to weather	Cracking and Change in material properties	Structures Monitoring (B.2.39)	III.A6-12 (TP-7)	3.5.1-44	C, 516
218	Compressible joints and seals	EXP, FLB, SNS, SPB	Rubber	Exposed to weather	Cracking and Change in material properties	Structures Monitoring (B.2.39)	III.A6-12 (TP-7)	3.5.1-44	C, 516
219	Compressible joints and seals	EXP, FLB, SNS, SPB	Elastomer	Exposed to treated water	Cracking and Change in material properties	Structures Monitoring (B.2.39)	III.A6-12 (TP-7)	3.5.1-44	C, 516
220	Roof membrane	FLB, SNS	Elastomer / Built-up roofing	Exposed to weather	Cracking and Change in material properties	Structures Monitoring (B.2.39)	III.A6-12 (TP-7)	3.5.1-44	C, 516
221	Waterproofing membrane	FLB, SNS	Elastomer	Below grade	None	None	N/A	N/A	J, 527
222	Waterstops	FLB	Elastomer	Below grade	None	None	N/A	N/A	J, 527

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
Fire Barriers									
223	Fire barriers	FB, SNS, SRE, SSR	Concrete / Concrete block / Cellular concrete / Grout	Protected from weather	None	Fire Protection (B.2.16)	N/A	N/A	I, 501
224	Fire barriers	FB, SNS, SRE, SSR	Concrete / Concrete block / Cellular concrete / Grout	Exposed to weather	Loss of material, Cracking	Structures Monitoring (B.2.39)	VII.G-30 (A-92)	3.3.1-66	A
225	Fire barriers	FB, SNS, SRE, SSR	Concrete / Concrete block / Cellular concrete / Grout	Exposed to weather	Loss of material, Cracking	Fire Protection (B.2.16)	VII.G-30 (A-92)	3.3.1-66	B, 508
226	Fire barriers	FB, SNS, SRE, SSR	Concrete / Concrete block / Cellular concrete / Grout	Below grade	None	Fire Protection (B.2.16)	N/A	N/A	I, 501

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
227	Fireproofing	FB, SNS	Cafcote / Johns-Manville 375 or 460 / Marinite pyrocrete / Superkote cement and similar materials	Protected from weather	None	None	N/A	N/A	J
228	Fire stops	EN, FB, FLB, SPB, SNS, SRE, SSR	Flame-Mastic / Silicone elastomer	Protected from weather	Cracking, Delamination, Separation, Change in material properties	Fire Protection (B.2.16)	VII.G-1 (A-19)	3.3.1-61	B, 523
229	Fire wraps	FB, SNS, SRE,SSR	Fiberboard / Foamglas / Gypsum board / Siltemp blanket / Thermo-lag panels (and similar materials)	Protected from weather	None	Fire Protection (B.2.16)	N/A	N/A	J, 524

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
Miscellaneous Materials									
230	Thermal insulation (non-metallic)	SNS, SRE, SSR	Fiberglass / Calcium silicate and similar materials	Protected from weather	None	None	N/A	N/A	J
Threaded Fasteners									
231	Anchor bolts and structural bolts	SNS, SRE, SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11, III.B3-8, III.B4-11, III.B5-8 (T-25)	3.5.1-55	A, 517
232	Anchor bolts and structural bolts	SNS, SRE, SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B3-7, III.B4-10, III.B5-7 (T-30)	3.5.1-39	A
233	Anchor bolts and structural bolts	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6, III.B3-4, III.B4-6, III.B5-4 (TP-3)	3.5.1-55	A, 517

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
234	Anchor bolts and structural bolts	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5, III.B3-3, III.B4-5, III.B5-3 (TP-11)	3.5.1-58	A
235	Anchor bolts and structural bolts	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8, III.B3-5, III.B4-8, III.B5-5	3.5.1-59	A
236	Anchor bolts and structural bolts	SNS, SRE, SSR	Alloy steel / Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B3-7, III.B4-10, III.B5-7 (T-30)	3.5.1-39	A
237	Anchor bolts and structural bolts	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
238	Anchor bolts and structural bolts	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
239	Anchor bolts and structural bolts	SNS, SRE, SSR	Galvanized steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 519

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
240	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-14, III.B1.2-11 (T-25)	3.5.1-55	A, 517
241	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Alloy steel / Carbon steel	Protected from weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13, III.B1.2-10 (T-24)	3.5.1-53	B
242	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B1.1-8, III.B1.2-6 (TP-3)	3.5.1-55	A, 517
243	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B1.1-7, III.B1.2-5 (TP-11)	3.5.1-58	A
244	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B1.1-9, III.B1.2-7 (TP-5)	3.5.1-59	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
245	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Alloy steel / Carbon steel	Exposed to weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-13 III.B1.2-10 (T-24)	3.5.1-53	B
246	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	E, 531
247	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	E, 531
248	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Galvanized steel	Exposed to raw water	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.A6-11 (T-21)	3.5.1-47	E, 528
249	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Stainless steel	Exposed to treated water	Loss of material	ASME Section XI, Subsection IWF (B.2.4)	III.B1.1-11 (TP-10)	3.5.1-49	D, 521

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
250	Anchor bolts and structural bolts (ASME class I, 2, 3 support bolting)	SNS, SRE, SSR	Stainless steel	Exposed to treated water	Loss of material	Water Chemistry (B.2.42)	III.B1.1-11 (TP-10)	3.5.1-49	C, 521
251	Expansion anchors	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-11, III.B3-8, III.B4-11, III.B5-8 (T-25)	3.5.1-55	A, 517
252	Expansion anchors	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B3-7, III.B4-10, III.B5-7 (T-30)	3.5.1-39	A
253	Expansion anchors	SNS, SRE, SSR	Galvanized steel	Protected from weather	Loss of material	Boric Acid Corrosion (B.2.7)	III.B2-6, III.B3-4, III.B4-6, III.B5-4 (TP-3)	3.5.1-55	A, 517
254	Expansion anchors	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5, III.B3-3, III.B4-5, III.B5-3 (TP-11)	3.5.1-58	A

Table 3.5.2-36 (continued): Bulk Structural Commodities									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
255	Expansion anchors	SNS, SRE, SSR	Stainless steel	Protected from weather	None	None	III.B2-8, III.B3-5, III.B4-8, III.B5-5	3.5.1-59	A
256	Expansion anchors	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-10, III.B3-7, III.B4-10, III.B5-7 (T-30)	3.5.1-39	A
257	Expansion anchors	SNS, SRE, SSR	Galvanized steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7, III.B4-7 (TP-6)	3.5.1-50	A
258	Expansion anchors	SNS, SRE, SSR	Stainless steel	Exposed to weather	Loss of material	Structures Monitoring (B.2.39)	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
259	Expansion anchors	SNS, SRE, SSR	Galvanized steel	Exposed to raw water	Loss of material	Structures Monitoring (B.2.39)	III.A6-11 (T-21)	3.5.1-47	E, 519

Notes for Tables 3.5.2-1 through 3.5.2-35

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP has some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP has some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

501. No applicable aging effects have been identified for the component type. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.

502. A plant specific TLAA exists for corrosion of Containment liner test channels.

503. Monitoring of spent fuel pool level and leakage from leak chase channels prescribed in the NUREG-1801 item is not applicable to these components.

504. Cracking is not applicable for components in the refueling cavity liner or fuel pool, including the transfer tube, because temperature does not exceed 140°F.

505. Lead shielding has no applicable aging effects requiring management.

506. Aging effect applies to the foundation's cover (floor) slab.

507. The neutron shield tank is addressed here only for its Reactor Vessel structural support and shielding function. The internal environment, and the pressure boundary function of the tank are addressed in Section 3.3 (Auxiliary Systems).

508. Aging of exterior surfaces of concrete fire barriers exposed to weather, exposed to raw water, or below grade is managed by the Structures Monitoring (B.2.39) Program. Their interior surfaces are managed by the Structures Monitoring (B.2.39) Program and the Fire Protection (B.2.16) Program, similar to interior concrete fire barriers protected from weather.

509. The NUREG-1801 item for freeze-thaw does not list exposed to raw water environment for structures. Freeze-thaw may be possible near the water line and/or at the water/concrete contact surface, and corrosion of embedded steel may also be applicable in this environment. The actual environment is both exposed to weather and exposed to raw water; therefore, the NUREG-1801 environment is considered a match. The identified AMP is used to manage aging effects for the period of extended operation.

510. The NUREG-1801 does not list exposed to raw water environment for this component type. BVPS operating experience has shown cases of water accumulating in valve pits and manholes. Therefore, aging mechanisms pertaining to raw water environments are also applicable to the Unit 1 Valve Pit, the Unit 2 Valve Pit adjacent to the Safeguards Building, and duct line manholes. The identified AMP is used to manage aging effects for the period of extended operation.

511. The identified aging effect is primarily managed by the Structures Monitoring (B.2.39) Program whereas the Fire Protection (B.2.16) Program supplements the overall aging management for the component.

512. The component is for the steel piles supporting the auxiliary demineralized water storage tank pad. The piles are driven to the top of bedrock. Pipe piles driven in soils have been shown to be unaffected by corrosion. Loss of material due to corrosion is not an applicable aging effect for pipe piles per the Structural Tools.

513. Refer to the discussion column of Table 3.5.1-46, which indicates that BVPS is consistent with NUREG-1801 for the program assignment (i.e., the Water Chemistry (B.2.42) Program), and that BVPS monitors fuel pool level at both units as required by Technical Specifications by continuous monitoring of leak chase channel leakage via control room alarms.

514. These components have the same material and experience the same environment as the Spent Fuel Pool liner (when wetted). The Water Chemistry (B.2.42) Program manages loss of material. Monitoring of fuel pool level and leak chase channels activities also indirectly manages these components.

515. The listed AMP is a plant-specific AMP for this item. The BVPS plant-specific AMR concluded Boral does not require aging management for the period of extended operation for its neutron absorbing function; aging management for loss of material of its aluminum constituent is required.

516. NUREG-1801 lists loss of sealing aging effect for elastomers. Loss of sealing is not considered an aging effect but rather a consequence of elastomer degradation. This effect may be caused by cracking and/or change in material properties for elastomeric material. Note C is used since the NUREG-1801 item is intended for Group 6 – water control structure components; however, the line item covers all in-scope structures.

517. Boric acid wastage is an applicable aging mechanism for steel bulk commodities within the Unit 1 and Unit 2 Reactor Containment Buildings, Auxiliary Buildings, Main Steam and Cable Vaults, Pipe Tunnels, Safeguards Buildings, Decontamination Buildings, Fuel Buildings, Refueling Water Storage Tank and Chemical Addition Tank Pads/Surroundings, and the Unit 2 Service Building.

518. The Structures Monitoring (B.2.39) Program is used to manage aging of these components. BVPS did not credit the RG 1.127 program, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, for managing aging. However, the Structures Monitoring (B.2.39) Program includes the elements of the RG 1.127 program necessary for BVPS structures.

519. Component is different, but consistent with NUREG-1801 item number for material, environment and aging effect. These components are located within manholes or valve pits that may contain accumulated water based on BVPS operating experience. Aging mechanisms pertaining to raw water environments that are applicable within manholes or valve pits are managed by the Structures Monitoring (B.2.39) Program.

520. Although there is only a small section of above-grade exterior concrete walls without metal siding, it was assumed that all above grade exterior concrete walls of the ERF Substation Building are exposed to weather.

521. Although the identified NUREG-1801 item is for Class 1 components, it is the closest match for ASME Class 1, 2 and 3 components since there is no Class 2 and 3 (III.B1.2) NUREG-1801 item comparable to NUREG-1801 Item III.B1.1-11.

522. Fire barrier function is applicable to manholes.

523. Ionizing radiation is an applicable aging mechanism for elastomers located in areas where the radiation exceeds the threshold of 106 rads (i.e., areas within the Unit 1 and Unit 2 Reactor Containment Buildings, Auxiliary Buildings, Main Steam and Cable Vaults, Fuel Buildings and the Unit 1 Solid Waste Building). Ionizing radiation mechanism does not apply to elastomers located in mild radiation areas.

524. Although no aging effects were identified for fire wraps, fire wraps provide the necessary fire endurance rating for cable trays, conduits, ductwork and structural members which provide a fire barrier function. Therefore, the Fire Protection (B.2.16) Program supplements aging effects management for fire barrier cable trays, conduits, ductwork and structural members.

525. The 10 CFR Part 50, Appendix J (B.2.1) Program is not applicable to the Containment moisture barrier because it is not a pressure boundary. However, the moisture barrier is specifically required to be monitored by the ASME Section XI, Subsection IWE (B.2.3) Program. Also, loss of sealing is not considered an aging effect but rather a consequence of elastomer degradation. This effect may be caused by cracking and/or change in material properties for elastomeric material.

526. The components are vertical casements made from pipe that are installed in soil between structures. They include carbon steel pump casements (both units) and low alloy steel valve reach rod casements (Unit 1 only). The casements are above the groundwater table and are similar to pipe piles. The soil is fill. Pipe piles driven into disturbed soils have been shown to experience only minor to moderate corrosion. Loss of material due to corrosion is not an applicable aging effect for pipe piles. Due to the similarity of the components to pipe piles loss of material due to corrosion is not considered an applicable aging effect for pump or valve reach rod casements.

527. These below-grade elastomer components are sheltered from air, elevated temperature, and ultraviolet and ionizing radiation. They do not have aging effects requiring management.

528. These components are located underwater in the Intake bays, or in safety-related valve pits that may have accumulated water. These supports for safety-related components are managed by the ASME Section XI- Subsection IWF Program.

529. The identified aging effect is primarily managed by the Masonry Wall Program whereas the Fire Protection Program supplements the overall aging management for the component.

530. The Open Cycle Cooling Water System Program is not applicable to these structural components.

531. The ASME Section XI- Subsection IWF Program is used to manage aging of safety-related structural supports and bolting.

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 INTRODUCTION

This section provides the results of the aging management reviews for electrical and I&C components that are subject to aging management review. Consistent with the methods described in NEI 95-10 [Reference 1.3-7], the Electrical and Instrumentation and Controls aging management reviews focus on commodity groups rather than systems. In Chapter 2, Table 2.5-1 lists the commodity groups that require aging management review. The following electrical commodity groups requiring aging management review are addressed in this section:

- Cable connections (metallic parts);
- Electrical cables and connections;
- Fuse holders - insulation material;
- High voltage insulators;
- Metal enclosed bus (Unit 2 only);
- Switchyard bus and connections (Unit 1 only); and,
- Transmission conductors and connections.

Table 3.6.1, *Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical and Instrumentation and Controls Components*, summarizes the results of aging management reviews and the NUREG-1801 [Reference 1.3-5] comparison for electrical and I&C components. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.6.2 RESULTS

Table 3.6.2-1, *Electrical and Instrumentation and Controls Components—Summary of Aging Management Evaluation*, summarizes the results of aging management reviews and the NUREG-1801 comparison for the electrical and I&C components.

3.6.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for electrical and I&C components subject to aging management review. Programs are described in Appendix B. Further details are provided in Table 3.6.2-1.

Materials

Electrical and I&C components are constructed of the following materials.

- Aluminum (includes silver plating)
- Cement
- Copper and copper alloys (includes silver plating)
- Galvanized steel
- Insulation material - various organic polymers
- Malleable iron
- Porcelain
- Stainless steel
- Steel
- Various metals used for electrical contacts

Environment

Electrical and I&C components are exposed to the following environments.

- Adverse localized environment
- Air – indoor
- Air – outdoor
- Air with borated water leakage

Aging Effects Requiring Management

The following aging effects associated with electrical and I&C components require management.

- Loosening of bolted connections
- Loss of circuit continuity
- Loss of material
- Reduced insulation resistance

Aging Management Programs

The following aging management programs manage the effects of aging on electrical and I&C components.

- Boric Acid Corrosion (Section B.2.7)
- Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection (Section B.2.10)
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B.2.11)
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (Section B.2.12)
- Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B.2.21)
- Metal Enclosed Bus (Unit 2 only) (Section B.2.26)
- Structures Monitoring (Section B.2.39)

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. For the electrical and I&C systems, Section 3.6.2.2 of NUREG-1800 [Reference 1.3-4] discusses these aging effects and other issues that require further evaluation. The following sections, numbered in accordance with the discussions in NUREG-1800, explain the BVPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification (EQ) analyses of electrical equipment are TLAAs as defined in 10 CFR 54.3 [Reference 1.3-3]. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of EQ TLAAs is addressed in Section 4.4.

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

The discussion in NUREG-1800 concerns effects of these aging mechanisms on high voltage insulators.

The insulators evaluated for BVPS license renewal are those used to support uninsulated, high-voltage electrical components such as overhead transmission conductors and Switchyard bus. The high voltage insulators support conductors for the recovery of offsite power following SBO.

The Unit 1 path includes overhead transmission conductors and Switchyard bus located between Switchyard breakers and the system station service transformers. The Unit 2 path includes overhead transmission conductors between Switchyard breakers and the system station service transformers. High voltage insulators associated with these paths are subject to aging management review.

Various airborne materials, such as dust, salt and industrial effluents, can contaminate insulator surfaces. The buildup of surface contamination is gradual and in most areas washed away by rain. The glazed and coated insulator surface aids this contamination removal. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near facilities that discharge soot or near the seacoast where salt spray is prevalent. BVPS is not located near the seacoast where salt spray is considered, however; BVPS is located west of a fossil generation plant. The fossil generation plant is a modern plant that does not emit soot. The fossil generation plant existed prior to the completion of the BVPS facility, and plant operating experience does not identify any issues associated with the buildup of surface contamination on the high voltage insulators. In addition, this area normally receives more than moderate rainfall, and any gradual buildup is washed away by rain. Although abnormal weather conditions may affect insulators, these are event-driven effects, not age-related effects. Surface contamination is not a significant aging effect for BVPS high-voltage insulators, so it is not an aging effect requiring management.

Mechanical wear due to wind loading and vibration is a potential aging effect for strain and suspension insulators subject to movement. Industry experience has shown that, when overhead transmission conductors are subjected to a substantial wind, they do not normally vibrate or sway, and that any movement will subside after a short period. A review of BVPS operating experience has determined that wear has not been apparent during routine inspections. Loss of material due to wear is not significant, and will not cause a loss of intended function of the insulators. Therefore, loss of material is not an aging effect requiring management for insulators.

There are no aging effects requiring management for high-voltage insulators.

3.6.2.2.3 Loss of Material due to Wind Induced Abrasion and Fatigue, Loss of Conductor Strength due to Corrosion, and Increased Resistance of Connection due to Oxidation or Loss of Pre-load

Overhead transmission conductors are uninsulated, stranded electrical cables used outside buildings in high voltage applications. The transmission conductor commodity group includes the associated fastening hardware, but excludes the high-voltage insulators. Major active equipment assemblies include their associated overhead transmission conductor terminations.

Overhead transmission conductors are subject to aging management review if they are necessary for recovery of offsite power following an SBO. At BVPS, overhead transmission conductors located between the Switchyard breakers and the system station service transformers support recovery of offsite power following an SBO. Other transmission conductors are not subject to aging management review since they do not perform a license renewal intended function.

Wind loading can cause overhead transmission conductor vibration, or sway. Consideration is given to wind loading during the design and installation phase. Loss of material that could be caused by overhead transmission conductor vibration or sway is not a significant aging effect in that it would not cause a loss of intended function if left unmanaged for the period of extended operation. The effects of wind loading and vibration on strain and suspension insulators are discussed in Section 3.6.2.2.2.

The most prevalent mechanism contributing to loss of conductor strength of an aluminum conductor steel reinforced transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. Corrosion in aluminum conductor steel reinforced conductors is a very slow-acting mechanism, and the corrosion rates depend largely on air quality, which includes suspended particles chemistry, sulfur dioxide concentration in air, precipitation, fog chemistry and meteorological conditions. Air quality in rural areas typically contains low concentrations of suspended particles and sulfur dioxide, which keeps the corrosion rate to a minimum. A fossil plant is located east of BVPS, the prevailing winds are from the west, and there are no other industries in the immediate rural area. Tests performed by Ontario Hydroelectric showed a 30-percent loss of composite conductor strength of an 80-year old aluminum conductor steel reinforced conductor due to corrosion.

There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. As described in the following paragraphs, there is ample strength margin to maintain the transmission conductor intended function through the period of extended operation.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60-percent of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind and temperature. The aging management review of the BVPS overhead transmission conductors reviewed these specific attributes.

The BVPS overhead transmission conductors subject to aging management review were bounded by the Ontario Hydro test population. The BVPS overhead transmission conductors have an ultimate strength margin greater than the Ontario Hydro test cables after 80 years of service. The installed configuration at BVPS is representative of the tested samples, so the conclusions in the Ontario Hydro study are valid for BVPS. Therefore, loss of conductor strength due to corrosion of the overhead transmission conductors in not significant, and is not an aging effect requiring management for the period of extended operation.

The design of the transmission conductor bolted connections precludes torque relaxation, and the BVPS plant specific operating experience supports this statement, since plant operating experience has not identified any failures of Switchyard connections due to aging. The typical design of Switchyard bolted connections includes Belleville washers and is coated with an anti-oxidant compound (a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connection thus reducing the chances of corrosion. Based on operating experience, this method of installation has been shown to provide a corrosion resistant, low electrical resistance connection. The type of bolting plate and the use of Belleville washers is the industry standard to preclude torque relaxation. BVPS design incorporates the use of Belleville washers on bolted electrical connections of dissimilar metals to compensate for temperature changes, maintain the proper torque and prevent loosening. This method of assembly is consistent with the good bolting practices recommended by industry guidelines. Based on this discussion, loosening of bolted connections is not an aging effect requiring management.

There are no aging effects requiring management for transmission conductors or connections.

Switchyard bus is uninsulated, un-enclosed, rigid electrical conductors used in medium and high voltage applications. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus establishes electrical connections to disconnect switches, Switchyard breakers, and transformers. The Unit 1 Switchyard bus between the Switchyard breaker and the overhead transmission conductor to the system station service transformer supports recovery of offsite power following SBO, and is subject to aging management review. Switchyard bus outside the path of offsite power recovery does not require aging management review since it does not perform a license renewal intended function.

The Switchyard bus subject to aging management review is constructed of rigid aluminum pipe. The Switchyard bus is connected to short lengths of flexible conductors to minimize vibration from supports and active components such as circuit breakers. Based on this design configuration, wind induced vibration is not a significant aging mechanism. The bolted connections associated with the Switchyard bus are for the connections to station post insulators used to support the bus. All other connections to the bus are welded. The components involved in Switchyard bus connections are constructed from aluminum, galvanized steel and stainless steel. No organic materials are involved.

With no rigid connections to moving or vibrating equipment, loss of material due to vibration is not a significant aging effect requiring management. Aluminum bus exposed to the service conditions of the BVPS 138kV Switchyard does not experience any appreciable aging effects, except for minor oxidation, which does not impact the ability of the Switchyard bus to perform its intended function. Therefore, it is concluded that general corrosion resulting in the oxidation of the Switchyard bus is not an aging effect requiring management.

Connection surface oxidation and loosening of bolted connections for aluminum Switchyard bus are not applicable since the Switchyard bus connections requiring aging management review are welded connections. However, the flexible conductors, which are welded to the Switchyard bus, are bolted to the other Switchyard components. These Switchyard component connections are also included in the routine maintenance of the 138 kV Switchyard, which verifies the effectiveness of the connection design and installation practices. Flexible conductors were not considered part of the Switchyard bus, but were added to the Switchyard bus commodity for completeness. These flexible conductor bolted connections are assembled similar to the transmission conductor bolted connections discussed previously in this section. For environmental conditions at BVPS, no significant aging has been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect Switchyard bus to active components.

Switchyard connections requiring aging management review are welded and bolted connections. Neither of these connection types require aging management, because the loosening of bolted connections is not a significant aging effect.

Connection surface oxidation for aluminum Switchyard bus is not applicable since Switchyard bus connections requiring aging management review are welded connections. For ambient environmental conditions at BVPS, no aging effects have been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect Switchyard bus. Therefore, there are no aging effects requiring management for aluminum Switchyard bus or connections.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.1.3 for discussion of BVPS quality assurance procedures and administrative controls for aging management programs.

3.6.2.3 Time-Limited Aging Analyses

The only Time-Limited Aging Analyses (TLAAs) identified for electrical and I&C components are evaluations for environmental qualification (EQ). These TLAAs are evaluated in Section 4.4.

3.6.3 CONCLUSION

The electrical and I&C components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21(a)(1). The aging management programs selected to manage aging effects for electrical and I&C components are identified in Section 3.6.2.1 and in the following tables. A description of aging management programs is provided in Appendix B of this application, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Based on the demonstrations provided in Appendix B, the effects of aging associated with electrical and I&C components will be managed such that there is reasonable assurance the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1
Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical and Instrumentation and Controls Components

Table 3.6.1 : Electrical and Instrumentation and Controls Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-01	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental qualification of electric components	Yes, TLAA	Not applicable. EQ equipment is not subject to aging management review because replacement is based on qualified life. EQ analyses are evaluated as TLAAs in Section 4.4. See Section 3.6.2.2.1 for further evaluation.
3.6.1-02	Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. BVPS will manage the aging effects with the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.11) Program. This program includes inspection of non-EQ electrical and I&C penetration cables and connections.

Table 3.6.1 (continued): Electrical and Instrumentation and Controls Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-03	Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. BVPS will manage the aging effects with the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.12) Program. This program includes review of calibration and surveillance testing results of instrumentation circuits.
3.6.1-04	Conductor insulation for inaccessible medium-voltage (2kV to 35kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. BVPS will manage the aging effects with the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.21) Program. This program includes inspection of medium-voltage cables exposed to significant moisture and voltage, and testing as required. In Table 3.6.2-1, reduced insulation resistance is considered equivalent to the aging effect listed for this item (breakdown of insulation).

Table 3.6.1 (continued): Electrical and Instrumentation and Controls Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-05	Connector contacts for electrical connectors exposed to borated water leakage	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	No	Consistent with NUREG-1801. BVPS manages the aging effect with the Boric Acid Corrosion (B.2.7) Program. This program includes periodic visual inspection of adjacent structures, components, and supports for evidence of leakage and corrosion. In Table 3.6.2-1, loss of circuit continuity is the aging effect resulting from corrosion of connector contact surfaces.
3.6.1-06	Fuse holders (Not Part of a Larger Assembly): Fuse holders - metallic clamp	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse holders	No	Not applicable. A review of BVPS documents indicated that fuse holders utilizing metallic clamps are either part of an active device or located in circuits that perform no LR intended function. Therefore, fuse holders with metallic clamps at BVPS are not subject to aging management review.

Table 3.6.1 (continued): Electrical and Instrumentation and Controls Components, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-07	Metal enclosed bus - Bus / connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Consistent with NUREG-1801. BVPS will manage the aging effect with the Metal Enclosed Bus (Unit 2 only) (B.2.26) Program. This program includes visual inspection of interior portions of the bus, and thermography of the exterior of the energized Unit 2 bus enclosure.
3.6.1-08	Metal enclosed bus - Insulation / insulators	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Metal Enclosed Bus	No	Consistent with NUREG-1801. BVPS will manage the aging effects with the Metal Enclosed Bus (Unit 2 only) (B.2.26) Program. This program includes visual inspection of interior portions of the Unit 2 bus.
3.6.1-09	Metal enclosed bus - Enclosure assemblies	Loss of material due to general corrosion	Structures monitoring program	No	Consistent with NUREG 1801. BVPS will manage the aging effect with the Structures Monitoring (B.2.39) Program. This program includes periodic visual inspection of structures, components, and supports for evidence of corrosion (Unit 2 only).

Table 3.6.1 (continued): Electrical and Instrumentation and Controls Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-10	Metal enclosed bus - Enclosure assemblies	Hardening and loss of strength due to elastomers degradation	Structures monitoring program	No	Not applicable. The in-scope metal enclosed bus at BVPS does not contain elastomers except for the enclosure gaskets, which are consumables. The metal enclosed bus does not contain this aging effect, so no aging management program is required.
3.6.1-11	High voltage insulators	Degradation of insulation quality due to presence of any salt deposits and surface contamination; loss of material caused by mechanical wear due to wind blowing on transmission conductors	Plant specific	Yes, plant specific	Not applicable. Further evaluation is documented in Section 3.6.2.2.2.
3.6.1-12	Transmission conductors and connections; switchyard bus and connections	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	Plant specific	Yes, plant specific	Not applicable. Further evaluation is documented in Section 3.6.2.2.3.

Table 3.6.1 (continued): Electrical and Instrumentation and Controls Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-13	Cable Connections - Metallic parts	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements	No	Consistent with NUREG-1801, with plant-specific AMP assigned. BVPS is providing a plant specific one-time inspection program (Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection (B.2.10)) as an alternate to the NUREG-1801, XI.E6 program. The one-time inspection program will verify the absence of aging effects requiring management.
3.6.1-14	Fuse holders (Not Part of a Larger Assembly) - Insulation material	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.6.2-1
Electrical and Instrumentation and Controls Components – Summary of Aging Management Evaluation

Table 3.6.2-1 : Electrical and Instrumentation and Controls Components									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
1	Cable connections (metallic parts)	CE	Various metals used for electrical contacts	Air - indoor and outdoor	Loosening of bolted connections	Plant Specific - Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection (B.2.10)	VI.A-1 (LP-12)	3.6.1-13	E 601
2	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	CE	Insulation material - various organic polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Reduced insulation resistance	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.11)	VI.A-2 (L-01)	3.6.1-02	A

Table 3.6.2-1 (continued): Electrical and Instrumentation and Controls Components

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
3	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	CE	Insulation material - various organic polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Reduced insulation resistance	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.12)	VI.A-3 (L-02)	3.6.1-03	A
4	Inaccessible medium-voltage (2kV to 35kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	CE	Insulation material - various organic polymers	Adverse localized environment caused by exposure to moisture and voltage stress	Reduced insulation resistance	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.21)	VI.A-4 (L-03)	3.6.1-04	A

Table 3.6.2-1 (continued): Electrical and Instrumentation and Controls Components									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
5	Electrical connections not subject to 10 CFR 50.49 EQ requirements exposed to borated water leakage	CE	Various metals used for electrical contacts	Air with borated water leakage	Loss of circuit continuity	Boric Acid Corrosion (B.2.7)	VI.A.-5 (L-04)	3.6.1-05	A
6	Fuse holders - insulation materials	CE	Insulation material - various organic polymers	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen or >60-year service limiting temperature	Reduced insulation resistance	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.11)	VI.A-6 (LP-03)	3.6.1-02	A
7	Fuse holders - insulation materials	CE	Insulation material - various organic polymers	Air - indoor	None	None	VI.A-7 (LP-02)	3.6.1-14	A

Table 3.6.2-1 (continued): Electrical and Instrumentation and Controls Components

Row No.	Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
8	High voltage insulators	INE	Porcelain, malleable iron, aluminum, galvanized steel, cement	Air - outdoor	None	None	VI.A-9 (LP-07)	3.6.1-11	I
9	High voltage insulators	INE	Porcelain, malleable iron, aluminum, galvanized steel, cement	Air - outdoor	None	None	VI.A-10 (LP-11)	3.6.1-11	I
10	Metal enclosed bus (non-segregated bus) - bus/connections (Unit 2 only)	CE	Aluminum / silver plated aluminum, copper / silver plated copper, copper alloy, stainless steel, steel	Air - indoor	Loosening of bolted connections	Metal Enclosed Bus (Unit 2 only) (B.2.26)	VI.A-11 (LP-04)	3.6.1-07	A

Table 3.6.2-1 (continued): Electrical and Instrumentation and Controls Components									
Row No.	**Component Type**	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
11	Metal enclosed bus (non-segregated bus) - enclosure assemblies (Unit 2 only)	SSR	Steel, galvanized steel	Air - indoor	Loss of material	Structures Monitoring (B.2.39)	VI.A-13 (LP-06)	3.6.1-09	A
12	Metal enclosed bus (non-segregated bus) - insulation / insulators (Unit 2 only)	INE	Insulation material - various organic polymers, porcelain	Air - indoor	Reduced insulation resistance	Metal Enclosed Bus (Unit 2 only) (B.2.26)	VI.A-14 (LP-05)	3.6.1-08	A
13	Switchyard bus (Switchyard bus for SBO recovery) and connections (Unit 1 only)	CE	Aluminum, copper, copper alloy, stainless steel, galvanized steel	Air - outdoor	None	None	VI.A-15 (LP-09)	3.6.1-12	I
14	Transmission conductors (transmission conductors for SBO recovery) and connections	CE	Aluminum, steel	Air - outdoor	None	None	VI.A-16 (LP-08)	3.6.1-12	I

Notes for Table 3.6.2-1

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP has some exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment and aging effect. AMP has some exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 item for material, environment and aging effect, but a different aging management program is credited or NUREG-180 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

601. Based on the NEI/NRC meeting on November 30, 2006, to discuss the NUREG-1801 XI.E6 program, BVPS will implement a one-time inspection program prior to the period of extended operation to verify the absence of aging effects requiring management. See Appendix B, Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection (B.2.10).

4.0 TIME-LIMITED AGING ANALYSES

Chapter 4 describes the Time-Limited Aging Analyses (TLAAs) applicable to BVPS in accordance with 10 CFR 54.3(a) and §54.21(c) [Reference 1.3-3]. Subsequent sections describe time-limited aging analyses within the following common general categories.

- Reactor Vessel Neutron Embrittlement (Section 4.2)
- Metal Fatigue (Section 4.3)
- Environmental Qualification (EQ) of Electric Equipment (Section 4.4)
- Concrete Containment Tendon Prestress (Section 4.5)
- Containment Liner Plate, Metal Containment, and Penetrations Fatigue (Section 4.6)
- Other Plant-Specific Time-Limited Aging Analyses (Section 4.7)

The information on each specific TLAA within these general categories is organized under three subheads:

Summary Description

A brief description of the time-limited aging analysis topic and of the affected components.

Analysis

A description of the current licensing basis analysis, that is, of the time-limited aging analysis itself, including implications of the extended operating period allowed under a renewed license.

Disposition

The disposition of the time-limited aging analysis for the period of extended operation, in accordance with 10 CFR 54.21(c)(1).

Design differences exist between BVPS Unit 1 and Unit 2. Therefore, unit-specific TLAAs are discussed separately throughout this chapter.

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4.1 INTRODUCTION TO TIME-LIMITED AGING ANALYSES

Time-limited aging analyses are defined in 10 CFR 54.3.

Time-limited aging analyses, for the purposes of this part, are those licensee calculations and analyses that:

1. *Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);*
2. *Consider the effects of aging;*
3. *Involve time-limited assumptions defined by the current operating term, for example, 40 years;*
4. *Were determined to be relevant by the licensee in making a safety determination;*
5. *Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and*
6. *Are contained or incorporated by reference in the CLB.*

Section 10 CFR 54.21(c) requires a list of TLAA as part of the application for a renewed license. Section 10 CFR 54.21(c)(2) requires a list of current exemptions to 10 CFR 50 based on time-limited aging analysis as part of the application for a renewed license.

§54.21 *Contents of application -- technical information.*

(c) An evaluation of time-limited aging analyses.

1. *A list of time-limited aging analyses, as defined in §54.3, must be provided. The applicant shall demonstrate that —*
   - *(i). The analyses remain valid for the period of extended operation;*
   - *(ii). The analyses have been projected to the end of the period of extended operation; or*
   - *(iii). The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.*
2. *A list must be provided of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in §54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.*

4.1.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

The process used to identify time-limited aging analyses (TLAA) is consistent with the guidance provided in NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule*, Revision 6, June 2005. Calculations and analyses that could potentially meet the definition of 10 CFR 54.3 were identified by searching current licensing basis documents, including the following:

- UFSAR;
- Technical Specifications;
- Licensing Requirements Manual;
- Quality Assurance Program Manual;
- Environmental Qualification (EQ) Program documents;
- Docketed licensing correspondence; and,
- NRC Safety Evaluation Reports.

Industry documents that list generic TLAA were also reviewed to provide additional assurance of the completeness of the plant-specific list. These documents included NEI 95-10; NUREG-1800, *Standard Review Plan (SRP) for Review for License Renewal Applications for Nuclear Power Plants*, Revision 1, September 2005; NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, September 2005; Westinghouse Engineering Owner's Group Topical Reports; and, NRC safety evaluation reports related to license renewal applications by other licensees.

The TLAA identification process included review of documentation associated with recent plant changes—the Extended Power Uprate and associated supporting License Amendment Requests (e.g., Primary Containment conversion from sub-atmospheric to atmospheric environment, and Best-Estimate Loss of Coolant Accident analyses), the Unit 1 reactor vessel head replacement, and the Unit 1 steam generator replacements.

Only those potential TLAA that meet all six criteria of 10 CFR 54.3(a) require disposition in accordance with §54.21(c). The potential TLAA were evaluated against the six 10 CFR 54.3(a) criteria using information from time-limited aging analysis source documents, such as:

- Design calculations;
- Code stress reports or code design reports;
- Equipment Qualification Packages;
- In-service Inspection reports;
- Plant procedures; and,
- Specifications.

These time-limited aging analysis source documents provided the information and the basis for the dispositions discussed in this chapter.

Table 4.1-1 provides a summary listing of the BVPS TLAA.

Table 4.1-2 provides a summary of the results of a review of potential TLAA identified in NUREG-1800, Tables 4.1-2 and 4.1-3, and identifies the section where the TLAA is reviewed, if applicable.

4.1.2 IDENTIFICATION OF EXEMPTIONS

A review of the UFSAR, NRC Safety Evaluation Reports, Fire Protection Safe Shutdown Reports and NRC docketed correspondence identified BVPS exemptions that have been granted pursuant to 10 CFR 50.12 and are currently in effect. No exemptions that will remain in effect for the period of extended operation are based on TLAA.

Table 4.1-1
List of BVPS Time-Limited Aging Analyses and Resolution

Time-Limited Aging Analysis Description	Disposition [a]	LRA Section
Reactor Vessel Neutron Embrittlement	--	4.2
Pressurized Thermal Shock	**(ii) (iii)**	4.2.2
Charpy Upper Shelf Energy	**(ii)**	4.2.3
Pressure–Temperature (P-T) Limits	**(iii)**	4.2.4
Metal Fatigue	--	4.3
Class 1 fatigue	**(i) (iii)**	4.3.1
Non-Class 1 fatigue	--	4.3.2
Piping and In-Line Components	**(i) (iii)**	4.3.2.1
Pressure Vessels, Heat Exchangers, Storage Tanks, Pumps, and Turbine Casings	**(iii)**	4.3.2.2
Generic Industry Issues on Fatigue	--	4.3.3
Thermal Stresses in Piping Connected to Reactor Coolant Systems (NRC Bulletin 88-08)	**(i)**	4.3.3.1
Pressurizer Surge Line Thermal Stratification (NRC Bulletin 88-11)	**(i)**	4.3.3.2
Effects of Primary Coolant Environment on Fatigue Life	**(ii) (iii)**	4.3.3.3
Environmental Qualification (EQ) of Electric Equipment	**(iii)**	4.4
Concrete Containment Tendon Prestress	Not applicable to BVPS	4.5
Containment Liner Plate, Metal Containment, and Penetrations Fatigue	--	4.6
Containment Liner Fatigue	**(ii)**	4.6.1
Containment Liner Corrosion Allowance	**(ii)**	4.6.2

Table 4.1-1
List of BVPS Time-Limited Aging Analyses and Resolution (continued)

Time-Limited Aging Analysis Description	Disposition [a]	LRA Section
Containment Liner Penetration Fatigue	**(ii)**	4.6.3
Other Time-Limited Aging Analyses	**--**	4.7
Piping Subsurface Indications (Unit 1 only)	**(i) (iii)**	4.7.1
Reactor Vessel Underclad Cracking (Unit 1 only)	**(i) (iii)**	4.7.2
Main Coolant Loop Piping Leak Before Break	**(i) (iii)**	4.7.3.1
Pressurizer Surge Line Piping Leak Before Break	**(i) (iii)**	4.7.3.2
Branch Line Piping Leak Before Break (Unit 2 only)	**(i) (iii)**	4.7.3.3
High Energy Line Break Postulation	**(i) (iii)**	4.7.4
Settlement of Structures (Unit 2 only)	**(iii)**	4.7.5
Crane Load Cycles	**(i)**	4.7.6

a. The disposition of the time-limited aging analysis for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i), (ii), or (iii):
(i) = The analysis remains valid for the period of extended operation;
(ii) = The analysis has been projected to the end of the period of extended operation; or
(iii) = The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Table 4.1-2
Review of Potential Time-Limited Aging Analyses Identified in NUREG-1800 Tables 4.1-2 and 4.1-3

NUREG-1800 TLAA Examples	Applicability to BVPS	Section
From NUREG-1800, Table 4.1-2 – Potential TLAAs		
Reactor vessel neutron embrittlement	Yes	4.2
Concrete containment tendon prestress	BVPS does not have pre-stressed tendons in the Containment Building	4.5
Metal fatigue	Yes	4.3
Environmental qualification of electrical equipment	Yes	4.4
Metal corrosion allowance	Yes	4.6.2
Inservice flaw growth analyses that demonstrate structure stability for 40 years	Yes	4.7.1
Inservice local metal containment corrosion analyses	BVPS does not have a metal containment design	N/A
High-energy line-break postulation based on fatigue cumulative usage factor	Yes	4.7.4
From NUREG-1800, Table 4.1-3 – Additional Examples of Plant-Specific TLAAs		
Intergranular separation in the heat-affected zone (HAZ) of reactor vessel low-alloy steel under austenitic SS [stainless steel] cladding	Yes	4.7.2
Low-temperature overpressure protection (LTOP) analyses	Yes	4.2.4
Fatigue analysis for the main steam supply lines to the turbine-driven auxiliary feedwater pumps	Yes	4.3.2.1
Fatigue analysis of the reactor coolant pump flywheel	Current design basis includes calculations based on 60 years of operation. Therefore, does not meet TLAA criteria	N/A

Table 4.1-2
Review of Potential Time-Limited Aging Analyses Identified in NUREG-1800 Tables 4.1-2 and 4.1-3 (continued)

NUREG-1800 TLAA Examples	Applicability to BVPS	Section
Fatigue analysis of polar crane	Yes	4.7.6
Flow-induced vibration endurance limit for the reactor vessel internals	No potential TLAA identified	N/A
Transient cycle count assumptions for the reactor vessel internals	Yes	4.3.1
Ductility reduction of fracture toughness for the reactor vessel internals	No potential TLAA identified	N/A
Leak before break	Yes	4.7.3
Fatigue analysis for the containment liner plate	Yes	4.6.1
Containment penetration pressurization cycles	Yes	4.6.3
Reactor vessel circumferential weld inspection relief (BWR)	Not applicable to PWRs	N/A

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4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

The following topical areas are discussed in the Reactor Vessel Neutron Embrittlement category.

- Neutron Fluence Values (Section 4.2.1)
- Pressurized Thermal Shock (Section 4.2.2)
- Charpy Upper Shelf Energy (Section 4.2.3)
- Pressure-Temperature Limits (Section 4.2.4)

Neutron embrittlement is the term used to describe changes in mechanical properties of Reactor Vessel materials that result from exposure to fast neutron flux of greater than 1.0E+17 n/cm^2 (E>1.0 MeV) within the vicinity of the reactor core, called the beltline region. The beltline region of a Reactor Vessel, per 10 CFR 50.61 [Reference 1.3-1], is defined as:

> *...the region of the reactor vessel (shell material including welds, heat-affected zones and plates and forgings) that directly surrounds the effective height of the active core and adjacent regions of the reactor vessel that are predicted to experience sufficient neutron radiation damage to be considered in the selection of the most limiting material with regard to radiation damage.*

The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. The rate of neutron exposure is defined as neutron flux, and the cumulative degree of exposure over time is defined as neutron fluence. Fracture toughness of ferritic materials is not only dependent upon fluence, but is also dependent upon temperature. The reference temperature for nil-ductility transition, RT_{NDT}, is an indicator of the transition temperature range above which the material behaves in a ductile manner, and below which it behaves in a brittle manner. As fluence increases, the nil-ductility reference temperature increases. This means higher temperatures are required for the material to continue to act in a ductile manner. This shift in reference temperature is the ΔRT_{NDT} plus a margin term which is added to account for uncertainties associated with the limited amount of data available for making the projections.

In addition to the beltline region, materials that exceed 1.0E+17 n/cm^2 (E>1.0 MeV) are subject to the guidelines provided in Appendix H of 10 CFR 50 [Reference 1.3-1]. In accordance with Appendix H, any materials exceeding 1.0E+17 n/cm^2 (E>1.0 MeV) must be monitored to evaluate the changes in fracture toughness. Reactor vessel materials not traditionally thought of as being plant limiting because of low levels of neutron radiation must now be evaluated to determine the accumulated fluence at end-of-license-extended (EOLE).

Determining the projected reduction in fracture toughness as a function of fluence affects several Reactor Vessel analyses used to support operation of the BVPS Reactor Vessels:

- Neutron Fluence Values;

- Pressurized Thermal Shock (PTS);
- Charpy Upper-Shelf Energy (C_VUSE); and,
- Pressure-Temperature (P-T) Limits.

These analyses evaluate the reduction of fracture toughness of the BVPS Reactor Vessels for 40 years. As such, these analyses are TLAAs and must be dispositioned for the period of extended operation.

4.2.1 NEUTRON FLUENCE VALUES

Loss of fracture toughness is an aging effect caused by the neutron embrittlement aging mechanism that results from prolonged exposure to neutron radiation. This process results in increased tensile strength and hardness of the material with reduced toughness. The rate of neutron exposure is defined as neutron flux, and the cumulative degree of exposure over time is defined as neutron fluence. As neutron embrittlement progresses, the toughness/temperature curve shifts downward (lower fracture toughness), and the curve shifts to the right (brittle/ductile transition temperature increases).

Unit 1

In the spring of 2000, Surveillance Capsule Y was pulled and the analysis was documented in WCAP-15571, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program* [Reference 4.2-1]. For license renewal, WCAP-15571 Supplement 1, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program* [Reference 4.2-2], documents the EOLE analysis for neutron fluence values.

The calculated fast neutron fluence (E> 1.0 MeV) values at the inner surface of the BVPS Unit 1 Reactor Vessel are shown in Table 4.2-1 and Table 4.2-2 for the beltline and extended beltline materials, respectively. These values were projected using ENDF/B-VI cross sections, are based on the results of the Capsule Y analysis, and comply with Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence* [Reference 4.2-3].

These fluence data tabulations include fuel cycle-specific calculated neutron exposures at the end of Cycle 17 (February 2006), as well as future projections to the end of Cycle 18 (the current operating cycle) and for several intervals extending to 54 effective full power years (EFPY). The calculations account for a core power uprate from 2689 megawatts-thermal (MWt) to 2900 MWt at the onset of Cycle 18. Neutron exposure projections beyond the end of Cycle 17 were based on the spatial power distributions and associated plant characteristics of Cycle 18 in conjunction with the uprated power level.

Unit 2

In the spring of 2005, Surveillance Capsule X was pulled and the analysis was documented in WCAP-16527-NP, *Analysis of Capsule X from First Energy Nuclear Operating Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program* [Reference 4.2-4]. For license renewal, WCAP-16527-NP Supplement 1, *Analysis of Capsule X from First Energy Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program* [Reference 4.2-5] documents the EOLE analysis for neutron fluence values.

The calculated fast neutron fluence (E> 1.0 MeV) values at the inner surface of the BVPS Unit 2 Reactor Vessel are shown in Table 4.2-3 and Table 4.2-4 for the beltline and extended beltline materials, respectively. These values were projected using ENDF/B-VI cross sections, are based on the results of the Capsule X analysis, and comply with Reg. Guide 1.190 [Reference 4.2-3].

These fluence data tabulations include fuel cycle-specific calculated neutron exposures at the end of Cycle 11 (April 2005) as well as future projections for several intervals extending to 54 EFPY. The projections were based on the assumption that the core power distributions and associated plant operating characteristics for Cycle 12 were representative of plant operation to 17 EFPY and that the preliminary Cycle 13 (the current operating cycle) core power distributions were applicable beyond 17 EFPY. The calculations account for a core power uprate from 2689 MWt to 2900 MWt at 17 EFPY.

4.2.2 PRESSURIZED THERMAL SHOCK

10 CFR 50.61(b)(1) [Reference 1.3-1] provides rules for protection against pressurized thermal shock events for pressurized water reactors. Licensees are required to perform an updated assessment of the projected values of reference temperature whenever a significant change occurs in projected values of the adjusted reference temperature for pressurized thermal shock (RT_{PTS}), or upon request for a change in the expiration date for the operation of the facility. Irradiation by high-energy neutrons raises the value of RT_{NDT} for the Reactor Vessel. The initial RT_{NDT} is determined through testing of unirradiated material specimens. The shift in reference temperature, ΔRT_{NDT}, is the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials* [Reference 4.2-6], defines the calculation methods for ΔRT_{NDT} and end-of-license (EOL) C_VUSE. RT_{PTS} is defined as the RT_{NDT} value evaluated at the EOL fluence for each of the vessel beltline materials. 10 CFR 50.61(c) provides two methods for determining RT_{PTS}. These methods are also described as Positions 1 and 2 in Regulatory Guide 1.99. Position 1 applies for material that does not have credible surveillance data available, and Position 2 is used when credible material surveillance data is available. Adjusted reference temperatures are calculated for both Positions 1 and 2 by following the guidance in Regulatory Guide 1.99, Sections 1.1 and 2.1, respectively, using copper and nickel content of beltline materials and EOL best estimate fluence projections. 10 CFR 50.61(b)(2) establishes screening criteria for RT_{PTS} as 270°F for plates, forgings, and axial welds, and 300°F for circumferential welds.

Unit 1

Actions to manage the Reactor Vessel fluence at the limiting location have been underway at BVPS Unit 1 since the 1990s. Starting with Cycle 11 in 1995, BVPS instituted a flux management program to manage the fluence effects on the RT_{PTS} value of the limiting plate (lower shell plate B6903-1). This flux management plan included the addition of hafnium rods in the peripheral fuel bundles and continued use of the standard L4P low-leakage core loading. BVPS submitted an updated RT_{PTS} analysis demonstrating that the limiting beltline plate would meet the requirements of 10 CFR 50.61 at the EOL fluence with no further flux management initiatives. In the Safety Evaluation Report (SER) [Reference 4.2-7] issued on October 7, 1997, addressing the PTS status for BVPS Unit 1, the NRC agreed and determined that the RT_{PTS} value for the limiting beltline component (plate B6903-1) at the end of the current operating term would be 267.8°F, and that BVPS Unit 1 met the requirements of 10 CFR 50.61. The operation of Unit 1 with hafnium rods installed for three cycles (removed in fall of 2001) reduced the irradiation rate by approximately 25 percent during that time period. Using the calculated chemistry factor and fluence values identified in the 1997 SER, BVPS determined that the PTS projections for Unit 1 would remain below the PTS screening criteria through the EOL.

In the spring of 2000, Surveillance Capsule Y was pulled and the analysis was documented in WCAP-15571 [Reference 4.2-1]. For license renewal, WCAP-15571 Supplement 1 [Reference 4.2-2] documents the EOLE analysis for PTS.

Using the prescribed PTS Rule (10 CFR 50.61) methodology, RT_{PTS} values were generated for beltline and extended beltline region materials of the BVPS Unit 1 Reactor Vessel for fluence values at EOLE (54 EFPY). The data for the surveillance program plate material is deemed not credible. Therefore, this data was used with a σ_{Δ} (standard deviation for ΔRT_{NDT}) margin of 17°F. The data for the Unit 1 surveillance program weld material is deemed credible. Therefore, this data was used with a σ_{Δ} margin of 14°F. The surveillance capsule materials are representative of the actual vessel plates and intermediate shell longitudinal weld. Chemistry factor values for the BVPS Unit 1 beltline region materials were based on Position 1.1 and 2.1 of Regulatory Guide 1.99 [Reference 4.2-6]. Additionally, chemistry factor values for the BVPS Unit 1 extended beltline materials were based on Position 1.1 of Regulatory Guide 1.99.

The RT_{PTS} values at 54 EFPY for the Unit 1 beltline materials are provided in Table 4.2-5. The extended beltline materials that are expected to receive fluence values greater than 1.0E+17 n/ cm^2 (E>1.0 MeV) were evaluated, and none of these materials were determined to be limiting. The projected RT_{PTS} values for EOLE (54 EFPY) meet the 10 CFR 50.61 screening criteria for beltline and extended beltline materials, with the exception of lower shell plate B6903-1 (heat C6317-1), which slightly exceeds the criteria with a RT_{PTS} of 275.7°F. The screening limit of 270°F for lower shell plate B6903-1 will be reached at a fluence level of 4.961E+19 n/cm^2 (E>1.0 MeV), which is equivalent to 43.87 EFPY. The Unit 1 Reactor Vessel is projected to reach the PTS screening criterion of 270°F on the limiting plate (B6903-1) in the year 2033.

10 CFR 50.61 [Reference 1.3-1] allows that:

> *For each pressurized water nuclear power reactor for which the value of RT_{PTS} for any material in the beltline is projected to exceed the PTS screening criterion using the EOL fluence, the licensee shall implement those flux reduction programs that are reasonably practicable to avoid exceeding the PTS screening criterion set forth in paragraph (b)(2) of this section.*

Therefore, a sensitivity assessment of available flux reduction measures was completed. The sensitivity assessment included several fuel management scenarios (such as low leakage core design, low power peripheral fuel assemblies, reinsertion of hafnium rods, and the use of part length shielded assemblies) and several assumed capacity factors up to 98 percent. Several flux reduction options are available which would maintain the limiting plate below the PTS screening criterion to the EOLE. The flux reduction program will be managed under the Reactor Vessel Integrity Program (Section B.2.35). Documentation of a flux reduction program for Unit 1 will be submitted in accordance with the requirements of 10 CFR 50.61.

The Unit 1 Reactor Vessel fluence will continue to be monitored as part of the Reactor Vessel Integrity Program (Section B.2.35) to ensure the projected fluence remains below that assumed for the relevant neutron embrittlement TLAA. Therefore, the Unit 1 RT_{PTS} TLAA will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

Unit 2

In the spring of 2005, Surveillance Capsule X was pulled and the analysis was documented in WCAP-16527-NP [Reference 4.2-4]. For license renewal, WCAP-16527-NP Supplement 1 [Reference 4.2-5] documents the EOLE analysis for pressurized thermal shock.

Using the prescribed PTS Rule (10 CFR 50.61 [Reference 1.3-1]) methodology, RT_{PTS} values were generated for beltline and extended beltline region materials of the BVPS Unit 2 Reactor Vessel for fluence values at EOLE (54 EFPY). The data for the surveillance program plate material is deemed credible. Therefore, the data was used with a σ_Δ margin of 8.5°F. The data for the Unit 2 surveillance program weld material is deemed credible. Therefore, the data was used with a σ_Δ margin of 14°F. The surveillance capsule materials are representative of the actual vessel plate and intermediate shell longitudinal weld. Chemistry factor values for the BVPS Unit 2 beltline region materials were based on Position 1.1 and 2.1 from Regulatory Guide 1.99 [Reference 4.2-6]. Additionally, chemistry factor values for the BVPS Unit 2 extended beltline materials were based on Position 1.1 of Regulatory Guide 1.99.

The RT_{PTS} values at 54 EFPY for the Unit 2 beltline materials are provided in Table 4.2-6. The extended beltline materials that are expected to receive fluence values greater than 1.0E+17 n/ cm^2 (E>1.0 MeV) were also evaluated. The limiting plate material is the upper shell plate (B9003-2), with a projected EOLE RT_{PTS} value of 160.6°F for 54 EFPY. The limiting weld material is the upper shell longitudinal weld (heat number BOHB (E-8018)), with an EOLE RT_{PTS} value of 128.8°F. The projected RT_{PTS} values for EOLE (54 EFPY) meet the 10 CFR 50.61 screening criteria for beltline and extended beltline materials. Therefore, the Unit 2 RT_{PTS} TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.3 CHARPY UPPER SHELF ENERGY

Per Regulatory Guide 1.99 [Reference 4.2-6], C_VUSE is assumed to decrease as a function of fluence and copper content as indicated in Figure 2 of the Guide when surveillance data is not used. Linear interpolation is permitted. In addition, if surveillance data is to be used, the decrease in upper-shelf energy may be obtained by plotting the reduced plant surveillance data on Figure 2 of the Guide, and fitting the data with a line drawn parallel to the existing lines as the upper bound of all the data. This line should be used in preference to the existing graph. The C_VUSE can be predicted using the corresponding t/4 fluence projection, the copper content of the beltline materials and/or the results of the capsules tested to date using Figure 2 of the Guide. Reactor Vessel beltline materials must have a C_VUSE of no less than 75 ft-lb initially, and must maintain C_VUSE throughout the life of the vessel of no less than 50 ft-lb.

Unit 1

In the spring of 2000, Surveillance Capsule Y was pulled and the analysis was documented in WCAP-15571 [Reference 4.2-1]. For license renewal, WCAP-15571 Supplement 1 [Reference 4.2-2] documents the EOLE analysis for C_VUSE.

For BVPS Unit 1, there exists material surveillance data for Reactor Vessel lower shell plate B6903-1 (heat C6317-1) and the intermediate shell longitudinal weld (heat 305424). The measured drops in C_VUSE for each of these material heats was plotted on Figure 2 of Regulatory Guide 1.99 [Reference 4.2-6] with a horizontal line drawn parallel to the existing lines as the upper bound of all data. Regulatory Guide 1.99, Figures 1 and 2, were used in the determination of the percent decrease in C_VUSE for the beltline and extended beltline materials.

The C_VUSE values at EOLE (54 EFPY) for the BVPS Unit 1 beltline materials are provided in Table 4.2-7. The extended beltline materials that are expected to receive fluence values greater than 1.0E+17 n/cm^2 (E>1.0 MeV) were evaluated, and none of these materials were determined to be limiting. The beltline and extended beltline material C_VUSE values maintain 50 ft-lb or greater at 54 EFPY. Therefore, the Unit 1 C_VUSE analysis has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Unit 2

In the spring of 2005, Surveillance Capsule X was pulled and the analysis was documented in WCAP-16527-NP [Reference 4.2-4]. For license renewal, WCAP-16527-NP Supplement 1 [Reference 4.2-5] documents the EOLE analysis for C_VUSE.

For BVPS Unit 2, there exists material surveillance data for Reactor Vessel intermediate shell plate B9004-2 (heat C0544-2) and the intermediate shell longitudinal weld (heat 83642). The measured drops in C_VUSE for each of these material heats was plotted on Figure 2 of Regulatory Guide 1.99 [Reference 4.2-6] with a horizontal line drawn parallel to the existing lines as the upper bound of all data. Regulatory Guide 1.99, Figures 1 and 2, were used in the determination of the percent decrease in C_VUSE for the beltline and extended beltline materials.

The C_VUSE values at EOLE (54 EFPY) for the BVPS Unit 2 beltline materials are provided in Table 4.2-8. The beltline material C_VUSE values maintain 50 ft-lb or greater at 54 EFPY. The extended beltline materials that are expected to receive fluence values greater than 1.0E+17 n/cm^2 (E>1.0 MeV) were also evaluated. The extended beltline material C_VUSE values maintain 50 ft-lb or greater at 54 EFPY. Therefore, the Unit 2 C_VUSE analysis has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.4 PRESSURE-TEMPERATURE LIMITS

Appendix G of 10 CFR 50 [Reference 1.3-1] requires that Reactor Vessel boltup, hydrotest, pressure tests, normal operation, and anticipated operational occurrences be accomplished within established pressure-temperature (P-T) limits. These limits are established by calculations that utilize the materials and fluence data obtained from the reactor surveillance capsule analyses. P-T limits are calculated for several years into the future and remain valid for an established period of time not to exceed the current operating license expiration.

BVPS P-T limit curves are operating limits, conditions of the operating license, and are included in the Pressure and Temperature Limits Report, as required by Technical Specifications. They are valid up to a stated vessel fluence limit, and must be revised prior to operating beyond that limit. The latest Pressure and Temperature Limits Report for each unit was submitted to the NRC on March 31, 2005 [Reference 4.2-8]. As part of the power uprate review, the continued applicability of each unit's P-T limits was evaluated.

The provisions of 10 CFR 50, Appendix G, require BVPS to operate within the currently licensed P-T limit curves. These curves are required to be maintained and updated as necessary to maintain plant operation consistent with 10 CFR 50. The Reactor Vessel Integrity Program (Section B.2.35) will maintain the P-T limit curves for both units for the period of extended operation. Therefore, the Unit 1 and Unit 2 P-T limit curves TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

At BVPS, the Low-Temperature Overpressure Protection System is known as the Overpressure Protection System (OPPS). As part of any update, the OPPS setpoints (OPPS enable temperature and power-operated relief valve setpoints) for both units are reviewed and updated as required based on the updated P-T limit curves.

4.2.5 NEUTRON EMBRITTLEMENT TABLES

The following list provides links to the tables that summarize the Neutron Fluence, PTS, and C_VUSE data.

Unit 1 Tables

- Table 4.2-1 Unit 1 Maximum Calculated Fluence
- Table 4.2-2 Unit 1 Calculated Fluence for the Beltline and Extended Beltline
- Table 4.2-5 Unit 1 Beltline Region PTS Data for EOLE
- Table 4.2-7 Unit 1 Beltline Region Charpy Upper-Shelf Energy Data for EOLE

Unit 2 Tables

- Table 4.2-3 Unit 2 Maximum Calculated Fluence
- Table 4.2-4 Unit 2 Calculated Fluence for the Beltline and Extended Beltline
- Table 4.2-6 Unit 2 Beltline Region PTS Data for EOLE
- Table 4.2-8 Unit 2 Beltline Region Charpy Upper-Shelf Energy Data for EOLE

Table 4.2-1
Unit 1 Maximum Calculated Fluence (E>1.0 MeV)

Cycle	Cumulative Irradiation Time (EFPY)	Neutron Fluence (n/cm^2)			
		0°	15°	30°	45°
17	19.6	2.25E + 19	1.17E + 19	6.88E + 18	4.70E + 18
18	21.0	2.40E + 19	1.25E + 19	7.29E + 18	4.98E + 18
Future	25.0	2.85E + 19	1.47E + 19	8.51E + 18	5.80E + 18
Future	32.0	3.63E + 19	1.87E + 19	1.06E + 19	7.24E + 18
Future	36.0	4.08E + 19	2.09E + 19	1.19E + 19	8.06E + 18
Future	40.0	4.53E + 19	2.32E + 19	1.31E + 19	8.87E + 18
Future	48.0	5.42E + 19	2.77E + 19	1.55E + 19	1.05E + 19
Future	54.0	6.09E + 19	3.11E + 19	1.73E + 19	1.17E + 19

Table 4.2-2
Unit 1 Calculated Fluence (E>1.0 MeV)

Material	Neutron Fluence (n/cm^2)		
	19.6 EFPY	48.0 EFPY	54 EFPY
Lower Shell to Lower Closure Head Weld	<1.00E + 17	<1.00E + 17	<1.00E + 17
Lower Shell	2.25E + 19	5.42E + 19	6.09E + 19
Lower Shell Longitudinal Welds	4.70E + 18	1.05E + 19	1.17E + 19
Lower Shell to Intermediate Shell Weld	2.24E + 19	5.40E + 19	6.07E + 19
Intermediate Shell	2.24E + 19	5.39E + 19	6.06E + 19
Intermediate Shell Longitudinal Welds	4.67E + 18	1.05E + 19	1.17E + 19
Intermediate Shell to Upper Shell Weld	2.36E + 18	6.56E + 18	7.45E + 18
Upper Shell	2.36E + 18	6.56E + 18	7.45E + 18
RCS Inlet Nozzle to Upper Shell Weld	<1.00E + 17	2.85E + 17	3.26E + 17
RCS Outlet Nozzle to Upper Shell Weld	<1.00E + 17	2.11E + 17	2.41E + 17

Table 4.2-3
Unit 2 Maximum Calculated Fluence (E>1.0 MeV)

Cycle	Cumulative Irradiation Time (EFPY)	Neutron Fluence (n/cm^2)			
		0°	15°	30°	45°
11	13.9	1.52E + 19	9.43E + 18	7.21E + 18	5.08E + 18
Future	17.0	1.83E + 19	1.12E + 19	8.54E + 18	6.05E + 18
Future	20.0	2.19E + 19	1.32E + 19	9.90E + 18	7.00E + 18
Future	25.0	2.79E + 19	1.64E + 19	1.22E + 19	8.59E + 18
Future	32.0	3.63E + 19	2.09E + 19	1.54E + 19	1.08E + 19
Future	48.0	5.56E + 19	3.12E + 19	2.26E + 19	1.59E + 19
Future	54.0	6.29E + 19	3.50E + 19	2.53E + 19	1.78E + 19

Table 4.2-4
Unit 2 Calculated Fluence (E>1.0 MeV)

Material	Neutron Fluence (n/cm^2)		
	19.6 EFPY	48.0 EFPY	54 EFPY
Lower Shell to Lower Closure Head Weld	<1.00E + 17	<1.00E + 17	<1.00E + 17
Lower Shell	1.52E + 19	5.56E + 19	6.29E + 19
Lower Shell Longitudinal Welds	5.08E + 18	1.59E + 19	1.78E + 19
Lower Shell to Intermediate Shell Weld	1.51E + 19	5.52E + 19	6.24E + 19
Intermediate Shell	1.50E + 19	5.50E + 19	6.22E + 19
Intermediate Shell Longitudinal Welds	5.00E + 18	1.57E + 19	1.76E + 19
Intermediate Shell to Upper Shell Weld	1.16E + 18	5.23E + 18	5.95E + 18
Upper Shell	9.58E + 17	4.32E + 18	4.92E + 18
RCS Inlet Nozzle to Upper Shell Weld	<1.00E + 17	4.29E + 17	4.90E + 17
RCS Outlet Nozzle to Upper Shell Weld	<1.00E + 17	2.05E + 17	2.34E + 17

Table 4.2-5
Unit 1 Beltline Region PTS Data for EOLE

Initial Material Description									EOLE Data					
Reactor Vessel Beltline Region Location	**Reg. Guide Position**	**Material ID**	**Heat #**	**wt % Cu**	**wt% Ni**	**Chemistry Factor**	**RT_{NDT} (°F)**	**σ_i**	**Fluence (10^{19} n/cm^2)**	**Fluence Factor**	**ΔRT_{NDT} (°F)**	**σ_Δ**	**Margin (°F)**	**RT_{PTS} (°F)**
Intermediate Shell Plate	1.1	B6607-1	C4381-1	0.14	0.62	100.5	43	0	6.06	1.4384	144.6	17.0	34.0	221.6
Intermediate Shell Plate	1.1	B6607-2	C4381-2	0.14	0.62	100.5	73	0	6.06	1.4384	144.6	17.0	34.0	251.6
Lower Shell Plate [a]	1.1	B6903-1	C6317-1	0.21	0.54	147.2	27	0	6.09	1.4392	211.9	17.0	34.0	272.9
	2.1					149.2					214.7	17.0	34.0	275.7
Lower Shell Plate	1.1	B7203-2	C6293-2	0.14	0.57	98.7	20	0	6.09	1.4392	142.1	17.0	34.0	196.1
Intermediate to Lower Shell Weld	1.1	11-714	90136	0.27	0.07	124.3	-56	17	6.07	1.4386	178.8	28.0	65.5	188.3
	2.1					84.8					122.0	14.0	44.0	110.0
Intermediate Shell Longitudinal Weld	1.1	19-714 A&B	305424	0.28	0.63	191.7	-56	17	1.17	1.0438	200.1	28.0	65.5	209.6
	2.1					188.8					197.1	28.0	65.5	206.6
Lower Shell Longitudinal Weld	1.1	20-714 A&B	305414	0.34	0.61	210.5	-56	17	1.17	1.0438	219.7	28.0	65.5	229.2
	2.1					223.9					233.7	28.0	65.5	243.2

a. NRR Requested information: %Mn = 1.31, vessel inlet (cold leg) nominal temperature = 542.3°F (pre power uprate) and 543.1°F (power uprate).

Table 4.2-6
Unit 2 Beltline Region PTS Data for EOLE

Initial Material Description									EOLE Data					
Reactor Vessel Beltline Region Location	Reg. Guide Position	Material Identifier	Heat #	wt % Cu	wt % Ni	Chemistry Factor	RT_{NDT} (°F)	σ_I	Fluence (10^{19} n/cm^2)	Fluence Factor	ΔRT_{NDT} (°F)	σ_Δ	Margin (°F)	RT_{PTS} (°F)
Intermediate Shell Plate	1.1	B9004-1	C0544-1	0.065	0.55	40.5	60	0	6.22	1.4429	58.4	17.0	34.0	152.4
Intermediate Shell Plate	1.1	B9004-2	C0544-2	0.06	0.57	37	40	0	6.22	1.4429	53.4	17.0	34.0	127.4
	2.1					51.5					74.3	8.5	17.0	131.3
Lower Shell Plate	1.1	B9005-1	C1408-2	0.08	0.58	51	28	0	6.29	1.4449	73.7	17.0	34.0	135.7
Lower Shell Plate	1.1	B9005-2	C1408-1	0.07	0.57	44	33	0	6.29	1.4449	63.6	17.0	34.0	130.6
Lower Shell Longitudinal Weld	1.1	101-142 A&B	83642	0.046	0.086	34.4	-30	0	1.78	1.1584	39.8	19.9	39.8	49.7
	2.1					12.5					14.5	7.2	14.5	-1.0
Intermediate Shell Longitudinal Weld	1.1	101-124 A&B	83642	0.046	0.086	34.4	-30	0	1.76	1.1554	39.7	19.9	39.7	49.5
	2.1					12.5					14.4	7.2	14.4	-1.1
Intermediate to Lower Shell Weld	1.1	101-171	83642	0.046	0.086	34.4	-30	0	6.24	1.4435	49.7	24.8	49.7	69.3
	2.1					12.5					18.0	9.0	18.0	6.1

Table 4.2-7
Unit 1 Beltline Region Charpy Upper-Shelf Energy Data for EOLE

Material Description						EOLE Data		
Reactor Vessel Beltline Region Location	Material Type	Material Identification	Heat #	wt % Cu	Unirradiated C_VUSE (ft-lb)	t/4 fluence (10^{19} n/cm^2)	Projected C_VUSE Decrease (%)	Projected C_VUSE (t/4) (ft-lb)
Intermediate Shell Plate	A533B Cl.1	B6607-1	C4381-1	0.14	94	3.7781	32	63.9
Intermediate Shell Plate	A533B Cl.1	B6607-2	C4381-2	0.14	83	3.7781	32	56.4
Lower Shell Plate	A533B Cl.1	B6903-1	C6317-1	0.21	83	3.7968	38 [a]	51.5
Lower Shell Plate	A533B Cl.1	B7203-2	C6293-2	0.14	85	3.7968	32	57.8
Intermediate to Lower Shell Weld	Linde 0091	11-714	90136	0.27	144	3.7843	52	69.1
Intermediate Shell Longitudinal Weld	Linde 1092	19-714 A&B	305424	0.28	112	0.7294	28 [b]	80.6
Lower Shell Longitudinal Weld	Linde 1092	20-714 A&B	305414	0.34	>100	0.7294	41	59.0

a. Based on results from Unit 1 Surveillance Plate B6903-1.
b. Based on results from Unit 1 Surveillance Weld (heat 305424).

Table 4.2-8
Unit 2 Beltline Region Charpy Upper-Shelf Energy Data for EOLE

Material Description						EOLE Data		
Reactor Vessel Beltline Region Location	Material Type	Material Identification	Heat #	wt % Cu	Unirradiated C_VUSE (ft-lb)	t/4 fluence (10^{19} n/cm^2)	Projected C_VUSE Decrease (%)	Projected C_VUSE (t/4) (ft-lb)
Intermediate Shell Plate	A533B Cl.1	B9004-1	C0544-1	0.065	83	3.8778	26	61.4
Intermediate Shell Plate	A533B Cl.1	B9004-2	C0544-2	0.060	79	3.8778	14 [a]	67.9
Lower Shell Plate	A533B Cl.1	B9005-1	C1408-2	0.080	82	3.9214	26	60.7
Lower Shell Plate	A533B Cl.1	B9005-2	C1408-1	0.070	78	3.9214	26	57.7
Intermediate to Lower Shell Weld	Linde 1091	101-171	83642	0.046	145	3.8903	6.2 [b]	136.0
Intermediate Shell Longitudinal Weld	Linde 1091	101-124A&B	83642	0.046	145	1.0973	4.6 [b]	138.3
Lower Shell Longitudinal Weld	Linde 1091	101-142A&B	83642	0.046	145	1.1097	4.6 [b]	138.3

a. Based on results from Unit 2 Surveillance Plate B9004-2.
b. Based on results from Unit 2 Surveillance Weld (heat 83642).

4.2.6 SECTION 4.2 REFERENCES

4.2-1 WCAP-15571, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program*, Rev. 0.

4.2-2 WCAP-15571 Supplement 1, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program*, July 2007.

4.2-3 Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence*, March 2001.

4.2-4 WCAP-16527-NP, *Analysis of Capsule X from First Energy Nuclear Operating Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program*, Rev. 0.

4.2-5 WCAP-16527-NP Supplement 1, *Analysis of Capsule X from First Energy Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program*, July 2007.

4.2-6 Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials*, Rev. 2.

4.2-7 Brinkman, Donald S. (NRC), Letter to J. E. Cross (BVPS), *Safety Evaluation Regarding Pressurized Thermal Shock (PTS) Assessment for Beaver Valley Power Station, Unit No. 1 (BVPS-1)*, October 7, 1997.

4.2-8 Pearce, L. William (BVPS), Letter to NRC, *Beaver Valley Power Station, Unit Nos. 1 and 2, BV-1 Docket No. 50-334, License No. DPR-66, BV-2 Docket No. 50-412, License No. NPF-73, Pressure and Temperature Limits Reports*, Revision 1, March 31, 2005.

4.3 METAL FATIGUE

Unit 1 Class 1 components evaluated for fatigue include:

- Reactor Vessel;
- Control rod drive mechanisms (CRDMs);
- Reactor Vessel Internals;
- Pressurizer;
- Replacement steam generators;
- Reactor coolant pumps, and,
- Loop stop valves.

The Unit 1 main coolant loop piping, including the pressurizer surge line, were initially designed and analyzed to ANSI B31.1. The pressurizer surge line has been re-analyzed to ASME Section III to account for stratification issues in accordance with NRC Bulletin 88-11. No other Unit 1 piping systems are designed and analyzed to ASME Section III.

Unit 2 Class 1 components evaluated for fatigue include:

- Reactor Vessel;
- Control rod drive mechanisms (CRDMs);
- Reactor Vessel Internals;
- Pressurizer;
- Steam generators;
- Reactor coolant pumps;
- Loop stop valves; and,
- Piping (main coolant loop piping; pressurizer surge line; pressurizer safety and relief valve piping; and Class 1 portions of various systems integral with the RCS (such as the RHR, CVCS, and SIS)).

The Unit 2 reactor head vent and reactor vessel level instrumentation system piping are also ASME Section III Class 1, but are exempt from full fatigue analysis since they are 1-inch diameter or less.

BVPS non-Class 1 component types within the scope of license renewal evaluated for fatigue include:

- Piping;
- Tubing;
- Fittings;
- Tanks;
- Vessels;

- Heat exchangers;
- Valve bodies and bonnets;
- Pump casings; and,
- Miscellaneous process components.

Evaluation of Metal Fatigue TLAAs

10 CFR 54.21(c) [Reference 1.3-3] requires an evaluation of time-limited aging analyses to demonstrate that either the analyses remain valid for the period of extended operation, the analyses have been projected to the end of the period of extended operation, or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The following information is provided in Section 4.3:

- Section 4.3.1 addresses Class 1 fatigue TLAAs.
- Section 4.3.2 addresses non-Class 1 fatigue TLAAs.
- Section 4.3.3 addresses the BVPS fatigue TLAAs associated with NRC Bulletins 88-08 and 88-11. In addition, this section addresses the effects of the primary coolant environment on fatigue life.
- Section 4.3.4 identifies the transients used to calculate fatigue usage factors for the ASME Class 1 components. For this set of cyclic design transients, the cycles accrued to October 2003 was compiled, and a projection was made of the cycles expected at the end of 60 years of operation to ensure that the results remain below the design allowable cycles.

4.3.1 CLASS 1 FATIGUE

The design of BVPS Class 1 components incorporates the requirements of Section III of the ASME Code, which requires a discrete analysis of the thermal and dynamic stress cycles on components that make up the reactor coolant pressure boundary. The fatigue analyses rely on the definition of design basis transients that envelope the expected cyclic service and the calculation of a cumulative usage factor (CUF). In accordance with ASME Section III, Subsection NB, the CUF shall not exceed 1.0. The required analysis was performed for BVPS and incorporated a set of design basis transients based on the original 40-year operating life of the plant. These ASME Section III, Class 1 fatigue evaluations are contained in the specific piping and component analyses, and, because they are based on a number of design cycles assumed for the life of the plant, these evaluations are TLAAs.

The BVPS original design basis transients including design cycles for the RCS are identified in the UFSAR, Table 4.1-10 for Unit 1, and Table 3.9N-1 for Unit 2 and are replicated in Table 4.3-2. In addition, Table 4.3-2 lists the projected operational cycles that BVPS anticipates will occur during 60 years of plant life. BVPS has reviewed the design cycles against 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation, except in certain specific cases described in the following three subsections. Since the 60-year projected operational cycles were used in determining that the design fatigue analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluations. Therefore, Class 1 components and piping fatigue TLAAs, except in certain specific cases described in the following sections, have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

4.3.1.1 Unit 2 RHR Piping and Unit 2 Charging Line

The Unit 2 RHR piping and the Unit 2 charging line cycles of operation are projected to exceed their respective design cycles during the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) will be used to monitor the transient cycles for the Unit 2 RHR piping and the Unit 2 charging line. As required by the program, corrective actions will be taken (including reanalysis, repair or replacement) such that the design basis of the these components are not exceeded for the period of extended operation. Therefore, the Unit 2 RHR piping and the Unit 2 charging line fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.2 Unit 2 Steam Generator Manway Bolts and Tubes

BVPS was not able to demonstrate that the original design fatigue calculations remained valid through the period of extended operation for the following sub-components of the Unit 2 steam generators:

- Steam generator secondary manway bolts; and,

- Steam generator tubes (U-bend fatigue).

The Unit 2 steam generator secondary manway bolts and the steam generator tubes fatigue analyses are based on a 40-year life (current operating license expires in 2027). In the Extended Power Uprate T_{AVG} coastdown analysis for the secondary manway bolts, BVPS assumed that the Unit 2 steam generators will be replaced by the year 2027. In the Uprate analysis for the U-bends, BVPS assumed that the Unit 2 steam generators will be replaced by the year 2027. As part of the Steam Generator Tube Integrity Program (Section B.2.38), BVPS will perform a reanalysis, repair, or replacement of the affected components such that the design basis of these components is not exceeded for the period of extended operation. Therefore, the Unit 2 steam generator secondary manway bolts and the Unit 2 steam generator tubes fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.3 Unit 1 and Unit 2 Pressurizers

In 1999, the analysis of the Unit 1 pressurizer, lower shell and related components was revised to address improvements to the insurge/outsurge transients identified by the Westinghouse Owners Group. Plant operating procedures were revised to follow the guidance of the Westinghouse Owners Group and to minimize the impact of potential insurges. Prior to the 1999 reanalysis, BVPS Unit 1 had experienced several pressurizer spray transients that challenged the analytical and Technical Specification limit of 320°F difference between the spray line temperature and the pressurizer steam space temperature. Revised transients for initial spray flow were incorporated into the analysis. In 2005, BVPS decided to further revise the operating procedures to optimize the plant shutdown and startup processes. The BVPS Optimized procedures have been shown to meet all recommendations of the Westinghouse Owners Group and have virtually eliminated the potential for insurges. Next, the Extended Power Uprate Project evaluated the revised Uprate transients against the previous analysis. The cumulative usage factors associated with the Unit 1 pressurizer are less than 1.0.

In 2000, the analysis of the Unit 2 pressurizer, lower shell and related components was revised to address revision to the insurge/outsurge transients identified by the Westinghouse Owners Group. Plant operating procedures were revised to follow the guidance of the Westinghouse Owners Group and to minimize the impact of potential insurges. In 2002, BVPS decided to further revise the operating procedures to optimize the plant shutdown and startup processes for Unit 2. The BVPS optimized procedures have been shown to meet all recommendations of the Westinghouse Owners Group and have virtually eliminated the potential for insurges. Next, the Extended Power Uprate Project evaluated the revised Uprate transients against the previous analysis. Since some operating parameters changed, BVPS revised the analysis of the Unit 2 pressurizer, lower shell and related components. In addition, the pressurizer spray nozzle, the safety valve nozzles, the pressure operated relief valve nozzle and the surge line nozzle were potentially impacted by the Pressurizer Weld Overlay Project. Weld overlay was performed during the Unit 2 Cycle 12 Refueling Outage (October - November 2006). Weld overlay for the surge nozzle is discussed in a supplement to the subject analysis. The cumulative usage factors associated with the Unit 2 pressurizer are less than 1.0.

Since the 60-year projected operational cycles were used in determining that the design fatigue analyses for the pressurizers remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) must continue to be used to validate the assumptions used in the evaluations. In addition, the pressurizer insurge cycle assumptions used in the pressurizer analyses require validation for the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program identifies the pressurizer insurge transient as a supplemental transient that requires monitoring. Therefore, the pressurizer fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2 NON-CLASS 1 FATIGUE

BVPS non-Class 1 component types evaluated for fatigue include pipe, tubing, fittings, tanks, vessels, heat exchangers, valve bodies and bonnets, pump casings, turbine casings, and miscellaneous process components.

4.3.2.1 Piping and In-Line Components

The design code for non-Class 1 piping and in-line components (e.g., fittings and valves) within the scope of license renewal is ANSI B31.1 or ASME III, Subsections NC and ND (i.e., Class 2 or 3). These codes specify evaluation of cyclic secondary stresses (i.e., stresses due to thermal expansion and anchor movements) by applying stress range reduction factors against the allowable stress range (S_A). Components with less than 7,000 cycles are limited to the calculated S_A without reduction. Components that are expected to exceed 7,000 cycles have the allowable stress range reduced through the application of the stress range reduction factor.

For those non-Class 1 components identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted by BVPS to determine the approximate frequency of any significant thermal cycling. If the number of equivalent full-temperature cycles is below the limit used for the original design (usually 7,000 cycles, as described above), the component is suitable for extended operation. If the number of equivalent full-temperature cycles exceeds the limit, evaluation of the individual stress calculations will be required.

BVPS evaluated the validity of this assumption for 60 years of plant operation. With the exception of the Unit 2 Emergency Diesel Generator (EDG) Air Start System, the results of this evaluation indicated that the thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, the non-Class 1 piping fatigue TLAAs, with the exception of the Unit 2 EDG Air Start Subsystem fatigue TLAA, remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

The Unit 2 EDG Air Start System contains components potentially subject to fatigue. As part of the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27), BVPS will perform an assessment to determine whether the full-temperature cycles limit will be exceeded for 60 years of operation. Corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the full-temperature cycles of the Unit 2 EDG Air Start System are not exceeded for the period of extended operation. Therefore, the Unit 2 EDG Air Start System fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2.2 Pressure Vessels, Heat Exchangers, Storage Tanks, Pumps, and Turbine Casings

Non-Class 1 pressure vessels, heat exchangers, storage tanks, pumps, and turbine casings are typically designed in accordance with ASME, Section VIII, or ASME, Section III, Subsection NC or ND (i.e., Class 2 or 3). Some tanks and pumps are designed to other industry codes and standards (such as American Water Works Association and Manufacturer's Standardization Society), reactor designer specifications, and architect engineer specifications. Only ASME, Section VIII, Division 2, and ASME, Section III, Subsection NC-3200 design codes include fatigue design requirements. Due to the conservatism in ASME, Section VIII, Division 1, and ASME, Section III, NC-3100/ND-3000, detailed fatigue analyses are not required. If cyclic loading and fatigue usage could be significant, the component designer is expected to specify ASME, Section VIII, Division 2 or NC-3200. For components where there is no required fatigue analysis, cracking due to fatigue is not an aging effect requiring management.

Fatigue analysis is not required for ASME, Section VIII, Division I, Section III, NC-3100, or ND vessels. It is also not required for NC/ND pumps and storage tanks (<15 psig). The design specification identifies the applicable design code for each component.

Only the Unit 2 non-regenerative (letdown), regenerative, and RHR heat exchangers were identified as having a fatigue TLAA, and are dispositioned as described in the following text.

Unit 2 Non-regenerative (Letdown) Heat Exchanger

The Unit 2 non-regenerative (letdown) heat exchanger is designed to ASME, Section III, Class C (tubes) and ASME, Section VIII, Division 1 (shell). The transients for the Unit 2 non-regenerative (letdown) heat exchanger are defined in Westinghouse Equipment Specification G-679150 [Reference 4.3-1]. The fatigue analysis associated with the Unit 2 non-regenerative (letdown) heat exchanger is not bounding for 60 years of operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) will be used to monitor the Unit 2 non-regenerative (letdown) heat exchanger transients. As required by the program, corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the design basis of the Unit 2 non-regenerative (letdown) heat exchanger is not exceeded for the period of extended operation. Therefore, the Unit 2 non-regenerative (letdown) heat exchanger fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Unit 2 Regenerative Heat Exchanger

The Unit 2 regenerative heat exchanger was built to ASME, Section III, Class 2. The transients for the Unit 2 regenerative heat exchanger are defined in Westinghouse Equipment Specification

G-679150. The fatigue analysis associated with the Unit 2 regenerative heat exchanger is not bounding for 60 years of operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) will be used to monitor the Unit 2 regenerative heat exchanger transients. As required by the program, corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the design basis of the Unit 2 regenerative heat exchanger is not exceeded for the period of extended operation. Therefore, the Unit 2 regenerative heat exchanger fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Unit 2 Residual Heat Removal (RHR) Heat Exchangers

The tube side of the Unit 2 RHR heat exchangers were designed in accordance with ASME Section III, Class 2. The shell side of these heat exchangers were designed in accordance with ASME Section III, Class 3. The transients for the Unit 2 RHR heat exchangers are defined in Westinghouse Equipment Specification G-679150. The fatigue analyses associated with the Unit 2 RHR heat exchangers are not bounding for 60 years of operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) will be used to monitor the Unit 2 RHR heat exchangers transients. As required by the program, corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the design basis of the Unit 2 RHR heat exchangers are not exceeded for the period of extended operation. Therefore, the Unit 2 RHR heat exchangers fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.3 GENERIC INDUSTRY ISSUES ON FATIGUE

This section addresses the BVPS fatigue TLAAs associated with NRC Bulletins 88-08 and 88-11. In addition, this section addresses the effects of the primary coolant environment on fatigue life.

4.3.3.1 Thermal Stresses in Piping Connected to Reactor Coolant Systems (NRC Bulletin 88-08)

NRC Bulletin 88-08, *Thermal Stresses in Piping Connected to Reactor Coolant Systems* [Reference 4.3-2], requested that licensees: (1) review their RCS to identify any connected unisolable piping that could be subjected to temperature distributions which would result in unacceptable thermal stresses and any unisolable sections of piping connected to the RCS that may have been subjected to excessive thermal stresses, and, (2) take action, where such piping is identified, to ensure that the piping will not be subjected to unacceptable thermal stresses. There are no specific TLAA associated with the Unit 1 and Unit 2 responses to NRC Bulletin 88-08, with the exception of the Unit 2 RHR line analysis.

The Unit 2 RHR line stratification analysis required a detailed fatigue evaluation to demonstrate compliance with the design code of record (ASME Section III). Based on temperature data established in response to NRC Bulletin 88-08, a conservative thermal stratification load case was developed. Typical cycle periods for the thermal stratification events on the Unit 2 RHR lines were 6 to 8 days, which equated to approximately 2000 cycles for a 40-year plant life (assuming the stratification occurred continuously). A bounding thermal stratification load assuming 7000 cycles was incorporated into the fatigue analysis as an additional load.

Projecting the identified stratification cycles for a 60-year plant life results in 3000 cycles. The 7000 cycles used in the fatigue analysis bounds the 60-year projected cycles. Therefore, the Unit 2 RHR line fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

4.3.3.2 Pressurizer Surge Line Thermal Stratification (NRC Bulletin 88-11)

NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification* [Reference 4.3-3], required a plant-specific or generic analysis demonstrating that the pressurizer surge line meets the applicable design code requirements considering the effects of thermal stratification.

4.3.3.2.1 Unit 1 Evaluation

BVPS participated in a program for partial resolution of this issue through the Westinghouse Owner's Group. As part of this program, pressurizer surge line physical and operating data were collected and summarized for all domestic Westinghouse PWRs. Information relating to piping layout, supports and restraints, components, size, material, operating history, etc., was obtained. This data was evaluated in conjunction with available monitoring data and plant-specific analyses performed by Westinghouse.

In January, 1991, BVPS submitted WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line* [Reference 4.3-4], to the NRC. The NRC approved [Reference 4.3-5] this evaluation.

WCAP-12727 was reviewed for impact due to extended power uprate. A detailed analysis was performed at the controlling location (reactor coolant loop nozzle) to account for temperature effects due to the power uprate. A new cumulative usage factor was calculated and demonstrated to remain less than the Code allowable limit of 1.0.

4.3.3.2.2 Unit 2 Evaluation

Surge line stratification first became apparent at Unit 2 during hot functional testing, and was a predecessor to NRC Bulletin 88-11. Additional instrumentation was temporarily installed to monitor pipe and fluid conditions. From this data, BVPS revised the surge line ASME Section III analysis of record to evaluate stress and fatigue effects.

Subsequently, BVPS contracted Westinghouse to perform a complete reanalysis of the surge line, accounting for thermal stratification and striping. WCAP-12093, *Evaluation of Thermal Stratification for the Beaver Valley Unit 2 Pressurizer Surge Line* [Reference 4.3-6], was submitted to the NRC to address both leak-before-break (LBB) requirements and NRC Bulletin 88-11 concerns for the Unit 2 surge line. The NRC accepted [Reference 4.3-7] WCAP-12093 as meeting the required actions of NRC Bulletin 88-11, and demonstrating that the effects of thermal stratification do not result in the pressurizer surge line exceeding design Code allowable limits.

WCAP-12093 was reviewed for impact due to extended power uprate. A detailed analysis was performed at the controlling location (reactor coolant loop nozzle) to account for temperature effects due to the power uprate. A new cumulative usage factor was calculated and demonstrated to remain less than the Code allowable limit of 1.0.

4.3.3.2.3 Unit 1 and Unit 2 Disposition for License Renewal

Both WCAP-12727 and WCAP-12093 determine the effect of thermal stratification through the imposition of defined thermal stratification cycles upon the stress and fatigue evaluations. The stratification cycles which are incorporated into the cumulative usage factor determination are defined by the 200 heatup and cooldown design transients. Therefore, these NRC Bulletin 88-11 analyses are TLAAs in accordance with 10 CFR 54.3. Section 4.3.4 demonstrates that the 200 heatup and cooldown cycles are bounding for 60 years of operation. Therefore, the Unit 1 and Unit 2 pressurizer surge line fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

4.3.3.3 Effects of Primary Coolant Environment on Fatigue Life

Test data indicate that certain environmental conditions (such as temperature, oxygen content, and strain rate) in the primary systems of light water reactors could result in greater susceptibility to fatigue than would be predicted by fatigue analyses based on the ASME Section III design fatigue curves. The ASME design fatigue curves were based on laboratory tests in air and at low temperatures. Although the failure curves derived from laboratory tests were adjusted to account for effects such as data scatter, size effect, and surface finish, these adjustments may not be sufficient to account for actual plant operating environments.

The environmental condition effects on the fatigue life of selected components were studied under two generic issues; Generic Safety Issue (GSI)-78, *Monitoring of Fatigue Transient Limits for Reactor Coolant System* [Reference 4.3-8], and GSI-166, *Adequacy of Fatigue Life of Metal Components* [Reference 4.3-9]. GSI-78 was developed to determine whether fatigue monitoring was necessary at operating plants, and later included the calculation of risk due to through-wall cracking of metal components due to fatigue. GSI-166 was developed to assess the significance of more recent fatigue test data on the fatigue life of a sample of components in plants where a code fatigue design analysis had been performed. A Fatigue Action Plan was developed to coordinate the efforts on fatigue life estimation and addressed the ongoing issues under GSI-78 and GSI-166 for 40-year plant life.

In closing GSI-166, the NRC concluded that the environmental effects associated with fatigue life are not safety-significant through the end of the initial license term. This conclusion was based on two studies. The first study, which was published as NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components* [Reference 4.3-10], applied the fatigue design curves that incorporated the environmental effects to several plants and identified locations of interest for consideration of environmental effects. The second study was based on a risk analysis on fatigue failures and this study concluded that there are insignificant effects on core damage frequency (CDF) when environmental effects are applied. These two studies formed the basis for concluding that environmental effects are not a concern for the current license. Closure of GSI-166 resulted in the initiation of GSI-190, *Fatigue Evaluation of Metal Components for 60-Year Plant Life* [Reference 4.3-11]. In closing GSI-190, regarding the effects of a reactor water environment on fatigue life, the NRC concluded licensees should address the effects of the coolant environment on component fatigue life as aging management programs are formulated in support of license renewal.

In summary, the NRC concluded that environmental effects have negligible impact on the core damage frequency and therefore no generic regulatory action is required. However, the NRC concluded the environmental effects can increase the frequency of pipe leaks and therefore the licensees who apply for license renewal should address the effects of reactor coolant environment on component fatigue life as part of their aging management reviews.

The BVPS approach to manage the environmental effects upon component fatigue life is to identify limiting locations based on the NRC-sponsored studies reported in NUREG/CR-6260, and reevaluate the limiting locations using the guidance provided in Section X.M1 of NUREG-1801, *Generic Aging Lessons Learned (GALL) Report* [Reference 4.3-12], to demonstrate that cumulative usage factors at these locations are maintained below the Code limit of 1.0.

4.3.3.3.1 Unit 1 and Unit 2 NUREG/CR-6260 Location Determination

NUREG/CR-6260 applied the fatigue design curves that incorporated environmental effects to several plant designs. As the two units at BVPS were designed at different times, the plants are considered different vintages of Westinghouse designed plants based on the design code of the Reactor Coolant System. The Unit 1 reactor coolant pressure boundary piping is designed to ANSI B31.1, and Unit 1 is therefore classified as an older-vintage Westinghouse plant. The Unit 2 reactor coolant pressure boundary piping is designed to ASME Section III, and Unit 2 is therefore classified as a newer-vintage Westinghouse plant.

Section 5.5 of NUREG/CR-6260 identified the following component locations as representative for environmental effects for older-vintage Westinghouse plants. These locations and the subsequent calculations are directly relevant to Unit 1 and are listed as follows:

- Reactor vessel shell and lower head (shell-to-head transition);
- Reactor vessel inlet and outlet nozzles;
- Pressurizer surge line (hot leg nozzle safe end);
- RCS piping charging system nozzle;
- RCS piping safety injection nozzle; and,
- RHR system tee.

Section 5.4 of NUREG/CR-6260 identified the following component locations as representative for environmental effects for newer-vintage Westinghouse plants. These locations and the subsequent calculations are directly relevant to Unit 2 and are listed as follows:

- Reactor vessel shell and lower head (shell-to-head transition);
- Reactor vessel inlet and outlet nozzles;
- Pressurizer surge line (hot leg nozzle safe end);
- RCS piping charging system nozzle (knuckle region);
- RCS piping safety injection nozzle (knuckle region); and,
- RHR System piping (inlet piping transition).

4.3.3.3.2 Unit 1 and Unit 2 NUREG/CR-6260 Location Environmental Fatigue Evaluation

The Unit 1 and Unit 2 NUREG/CR-6260 locations were evaluated using the guidance of NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels* [Reference 4.3-13], and NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels* [Reference 4.3-14]. These reports describe the use of a fatigue life correction factor (F_{en}) to express the effects of the reactor coolant environment upon the material fatigue life. The expression for F_{en} was determined through experimental and statistical data. F_{en} for carbon and low alloy steel is a function of fluid service temperature, material sulfur content, fluid dissolved oxygen, and strain rate. For austenitic stainless steel, F_{en} is a function of fluid service temperature, fluid dissolved oxygen, and strain rate. The cumulative usage factor which includes environmental effects (U_{env}) is determined from the existing 60-year cumulative usage factor (U_{60}) through the use of the fatigue life correction factor:

$$U_{env} = U_{60} * F_{en}$$

To demonstrate acceptable fatigue life including environmental effects, the cumulative usage factor, which includes environmental effects, should remain less than design code allowables (i.e., $U_{env} \leq 1.0$). Therefore, F_{en} was applied to the cumulative usage factors at the Unit 1 and Unit 2 NUREG/CR-6260 locations and compared to the design code allowable limit. It should be noted that three of the NUREG/CR-6260 locations on Unit 1 (charging system nozzle, safety injection nozzle, and the RHR system tee) are designed to ANSI B31.1, which does not require determination of usage factors for fatigue evaluations. Therefore, these locations were re-evaluated in accordance with ASME Section III, 1989 Edition, with 1989 Addenda, and 60-year cumulative usage factors were determined. The appropriate F_{en} was applied to these cumulative usage factors and compared against the ASME Section III allowable limit.

The results of the evaluations of environmental fatigue are detailed in Table 4.3-1.

Table 4.3-1
Summary of Environmental Fatigue Results

Location	Material	Design CUF (U_{60})	NUREG/CR Multiplier	Environmental CUF (U_{env})
UNIT 1				
Reactor Vessel Shell and Lower Head	Low Alloy Steel	0.0102	2.53	0.0258
Reactor Vessel Inlet Nozzle	Low Alloy Steel	0.0663	2.53	0.1679
Reactor Vessel Outlet Nozzle	Low Alloy Steel	0.0508	2.53	0.1286
Surge Line Hot Leg Nozzle	Stainless Steel	0.8600	15.35	13.201
Charging System Nozzle	Stainless Steel	0.1271	15.35	1.95
Safety Injection System Nozzle	Stainless Steel	0.0121	15.35	0.1857
Residual Heat Removal System Tee	Stainless Steel	0.0087	15.35	0.1335

Table 4.3-1
Summary of Environmental Fatigue Results
(continued)

Location	Material	Design CUF (U_{60})	NUREG/CR Multiplier	Environmental CUF (U_{env})
UNIT 2				
Reactor Vessel Shell and Lower Head	Low Alloy Steel	0.0016	2.53	0.0041
Reactor Vessel Inlet Nozzle	Low Alloy Steel	0.0891	2.53	0.2256
Reactor Vessel Outlet Nozzle	Low Alloy Steel	0.0601	2.53	0.1522
Surge Line Hot Leg Nozzle	Stainless Steel	0.93	15.35	14.276
Charging System Nozzle	Stainless Steel	0.75	15.35	11.513
Safety Injection System Nozzle	Stainless Steel	0.0149	15.35	0.229
Residual Heat Removal System Piping	Stainless Steel	1.0305 [a]	15.35	15.818

a. Projected 60-year cycles are expected to exceed the design cycles by 50 percent. To account for the increased cycles, the design fatigue usage (0.687) was increased by 50 percent.

4.3.3.3.3 Unit 1 and Unit 2 Disposition for License Renewal

At several locations (Unit 1 pressurizer surge line and charging system nozzle; Unit 2 pressurizer surge line, charging system nozzle, and RHR system piping), U_{env} exceeded the design code allowable limit of 1.0. For these locations, BVPS will implement one or more of the following as required by the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27):

1. Further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0;
2. Management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g.,

periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC); or,

3. Repair or replacement of the affected locations.

Should BVPS select the option to manage environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted to the NRC prior to the period of extended operation. Therefore, the TLAAs associated with the Unit 1 pressurizer surge line and charging system nozzle, and the Unit 2 pressurizer surge line, charging system nozzle, and RHR system piping have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

The CUFs, including environmental fatigue at the other limiting locations (Unit 1 reactor vessel shell and lower head, reactor vessel inlet and outlet nozzles, safety injection nozzle and RHR system tee; Unit 2 reactor vessel shell and lower head, reactor vessel inlet and outlet nozzles, and safety injection nozzle), have been demonstrated to remain less than the design code allowable limit of 1.0 for the period of extended operation. Therefore, the TLAAs associated with these other locations have been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.4 Nuclear Steam Supply System Transient Cycle Projection for 60-Year Operation

BVPS identified the transients used to calculate fatigue usage factors for the nuclear steam supply system. For this set of cyclic design transients, the number of operational cycles accrued to October 2003 were compiled and a projection was made of the number of operational cycles expected at the end of 60 years of operation to determine whether the results remain below the number of design allowable cycles.

An extrapolation of the number of transients to be accumulated by 60 years of operation was performed. The two options used for extrapolating the number of transient cycles are:

1. Develop histograms of each transient and, based on recent operating history (i.e., the last ten years), project the cumulative number of operational cycles at 60 years; and,
2. Linearly extrapolate the cumulative number of operational cycles at 60 years.

Because plant performance has improved with time, the first option typically results in a more accurate projection, while the second option provides a more conservative number of thermal cycles. With the exception of the plant heatup and cooldown, pressurizer cooldown, and reactor trip transients, the extrapolation for all transients was completed using the second option. For the plant heatup and cooldown and for pressurizer cooldown, the projected cycles were determined using the first option. For the reactor trip transient, the first option was also chosen, but then biased with additional reactor trips as the unit approaches end-of-life. Accrued operational cycles are based on initial operations for Unit 1 of 1975 and Unit 2 of 1986, and use a current plant life as of October 2003. Therefore, the operating lifetimes used for the evaluations were 28 and 17 years for Unit 1 and Unit 2, respectively. The results of the transient cycle extrapolation are presented in Table 4.3-2.

Table 4.3-2
Design and 60-Year Projected Operational Cycles

Design Basis Transient	Design Cycles	Operational Cycles as of October 15, 2003		60-Year Projected Operational Cycles	
		Unit 1	Unit 2	Unit 1	Unit 2
NORMAL CONDITIONS					
Plant Heatup	200	116	31	200	109
Plant Cooldown	200	115	30	200	109
Unit Loading at 5% per Minute	18,300 [a]	831	761	1,781	2,686
Unit Unloading at 5% per Minute	18,300 [a]	830	760	1,781	2,686
10% Step Load Increase	2,000	10	5	21	18
10% Step Load Decrease	2,000	10	5	21	18
Large Step Load Decrease with Steam Dump	200	14	3	30	11
Steady State Fluctuations	Infinite	b	b	b	b
Refueling (Unit 2 only)	80	N/A	10	N/A	35
UPSET CONDITIONS					
Loss of Load without Turbine or Reactor Trip	80	1	2	2	7
Loss of Power	40	11	3	24	11
Loss of Flow (one loop only)	80	20	5	43	18

Table 4.3-2
Design and 60-Year Projected Operational Cycles
(continued)

Design Basis Transient	Design Cycles	Operational Cycles as of October 15, 2003		60-Year Projected Operational Cycles	
		Unit 1	Unit 2	Unit 1	Unit 2
Reactor Trip from Full Power	400	230	45	399	175
Inadvertent Auxiliary Spray	10	0	1	3 [c]	3 [c]
Safety Injection Activation	60	23	4	49	11
RCS Cold Overpressurization	10	0	0	3 [c]	3 [c]
Operational Basis Earthquake	400 / 50 [d]	0	0	b	b
FAULTED CONDITIONS					
Main Reactor Coolant Pipe Break	1	0	0	e	e
Steam Pipe Break	1	0	0	e	e
Steam Generator Tube Rupture	1	0	0	e	e
Design Basis Earthquake	1	0	0	e	e
TEST CONDITIONS					
Turbine Roll Test	10	3	2	f	f
Primary Side Hydrostatic Test	5	1	1	g	g
Secondary Side Hydrostatic Test	5	1	0	g	g
Primary Side Leak Test	50	13	0	g	g

a. Applicable to all RCS components except the reactor vessel head closure studs, for which the applicable number of design cycles for the Unit Loading and Unloading transients is 10,400 for Unit 1 and 14,000 for Unit 2.
b. This design basis transient could not credibly approach the design cycles during the period of extended operation. Therefore, a 60-year projection is not provided.
c. Three cycles of this low-probability transient are projected for conservatism.

d. Operating Basis Earthquake design cycles are 400 for nuclear steam supply system equipment and 50 for piping.
e. Faulted conditions are not included in ASME Section III fatigue evaluations. Therefore, a 60-year projection is not provided.
f. The turbine roll design basis transient is defined by performing this test during Hot Functional Testing when the RCS is heated by reactor coolant pump only. Hot Functional Testing will not be repeated. Therefore, a 60-year projection is not provided.
g. Future hydrostatic and leak testing will be exempted by invoking Code Cases N-498 and/or N-416. Therefore, a 60-year projection is not provided.

4.3.5 SECTION 4.3 REFERENCES

4.3-1 Westinghouse Equipment Specification G-679150, *Auxiliary Heat Exchangers*, Rev. 1.

4.3-2 NRC Bulletin 88-08, *Thermal Stresses in Piping Connected to Reactor Coolant Systems*, June 22, 1988, including Supplements 1 and 2.

4.3-3 NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification*, 12/20/1988.

4.3-4 WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line*, Rev. 0.

4.3-5 De Agazio, Albert W. (NRC), Letter to John D. Sieber (BVPS), *Approval of Leak-Before-Break Analysis* (TAC No. 72110), May 2, 1991.

4.3-6 WCAP-12093, *Evaluation of Thermal Stratification for the Beaver Valley Unit 2 Pressurizer Surge Line*, Rev. 0, including Supplements 1, 2, and 3.

4.3-7 Tam, Peter S. (NRC), Letter to J. D. Sieber (BVPS), Beaver Valley Unit 2 - *Completion of Review on Pressurizer Surge Line Thermal Stratification* (TAC No. 72111), January 18,1990.

4.3-8 NRC Generic Safety Issue (GSI)-78, *Monitoring of Fatigue Transient Limits for Reactor Coolant System*, Rev. 3.

4.3-9 NRC Generic Safety Issue (GSI)-166, *Adequacy of Fatigue Life of Metal Components*, Rev. 2.

4.3-10 NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components*, February 1995.

4.3-11 Generic Safety Issue (GSI)-190, *Fatigue Evaluation of Metal Components for 60-Year Plant Life*, Rev. 2.

4.3-12 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Rev. 1.

4.3-13 NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels*, February 1998 2706.300-001-990, Stress Report Main Loop Stop Valves, Rev. A.

4.3-14 NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels*, March 1999.

4.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

4.4.1 INTRODUCTION

The BVPS existing *Environmental Qualification (EQ) of Electric Components Program* manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, environmental qualification components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. The *Environmental Qualification (EQ) of Electric Components Program* ensures that these environmental qualification components are maintained in accordance with their qualification bases. Aging evaluations for environmental qualification components that specify a qualification of at least 40 years are time-limited aging analyses for license renewal.

4.4.2 EQ COMPONENT REANALYSIS ATTRIBUTES

The reanalysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of the BVPS EQ Program. While a component life-limiting condition may be due to thermal, radiation or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component (de-energized versus energized). The reanalysis of an aging evaluation is documented according to BVPS quality assurance program requirements, which require the verification of assumptions and conclusions. Important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed in the following four subsections.

4.4.2.1 Analytical Methods

The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied during the original evaluation. The Arrhenius methodology is an acceptable model for a thermal aging evaluation. For license renewal radiation aging evaluation, 60-year normal radiation dose is established by extrapolating the 40-year normal dose (40 year dose X 1.5) plus accident radiation dose. 60-year cyclical aging is established in a similar manner. Other models may be justified on a case-by-case basis.

4.4.2.2 Data Collection and Reduction Methods

Reducing excess conservatism in the component service conditions (for example, temperature, radiation, and cycles) used in the prior aging evaluation is the chief method used for a reanalysis. Actual monitored service conditions, such as temperature, are typically lower than the design service conditions used in the prior aging evaluation and, therefore, can support extended thermal life of the equipment.

4.4.2.3 Underlying Assumptions

EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Excess conservatism in thermal life analysis may be reduced by reevaluating material activation energy, to justify a higher value that would support extended life at elevated temperature. Similar methods of reducing excess conservatism in the component service conditions and material properties used in prior aging evaluations may be used for radiation and cyclical aging. Any changes to material activation energy will be justified.

4.4.2.4 Acceptance Criteria and Corrective Actions

If qualification cannot be extended by reanalysis, the component is refurbished or replaced prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace or requalify the component if reanalysis is unsuccessful).

The *Environmental Qualification (EQ) of Electric Components Program* is an existing program established to meet BVPS commitments for 10 CFR 50.49. It is consistent with NUREG-1801, Section X.E1, *Environmental Qualification (EQ) of Electric Components* [Reference 4.4-1].

This program includes consideration of operating experience to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended function(s) during accident conditions after experiencing the effects of inservice aging. Consistent with NRC guidance provided in RIS 2003-09, *Environmental Qualification of Low-Voltage Instrumentation and Control Cables* [Reference 4.4-2], no additional information is required to address GSI 168, *Environmental Qualification of Low-Voltage Instrumentation and Control (I&C) Cables* [Reference 4.4-3].

4.4.3 CONCLUSION

Based upon a review of the existing program and associated operating experience, continued implementation of the *Environmental Qualification (EQ) of Electrical Components Program* provides reasonable assurance that the aging effects will be managed and that the in-scope EQ components will continue to perform their intended function(s) for the period of extended operation. The effects of aging will be managed by the *Environmental Qualification (EQ) of Electrical Components Program* in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

4.4.4 SECTION 4.4 REFERENCES

4.4-1 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Rev. 1.

4.4-2 NRC Regulatory Issue Summary 2003-09, *Environmental Qualification of Low-Voltage Instrumentation and Control Cables*, dated May 2, 2003.

4.4-3 NRC report Generic Safety Issue 168, *Environmental Qualification of Low-Voltage Instrumentation and Control (I&C) Cables*, Rev. 3.

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

This section is not applicable since BVPS does not have pre-stressed tendons in the Containment Building.

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4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENT, AND PENETRATIONS FATIGUE

The Unit 1 and Unit 2 Reactor Containment Building designs are essentially identical. The Containment structures are heavily reinforced concrete, steel-lined vessels with flat base mats, cylindrical walls, and hemispherical domes. The Containments are not structurally integral with any of the structures surrounding them. They are designed and constructed to maintain full Containment integrity when subjected to the temperature and pressures resulting from the design basis accident and the design earthquake conditions and to provide adequate radiation shielding for both normal operation and accident conditions. Provisions are made for the pressure testing of liner seams, penetrations, and access openings, and for leak testing the Containment structure. Several potential TLAAs were identified related to the Containment structure, namely the design of the Containment liner, Containment liner leak channel analyses, and the Containment penetration analyses. These TLAAs are evaluated in the following sections:

- Containment Liner Fatigue (Section 4.6.1);
- Containment Liner Corrosion Allowance (Section 4.6.2); and,
- Containment Liner Penetration Fatigue (Section 4.6.3).

4.6.1 CONTAINMENT LINER FATIGUE

A welded steel liner is attached to the inside face of the concrete shell to ensure a leak tight membrane. The Containment structure is designed to contain the radioactive material released in the unlikely event of a loss of coolant accident. The function of the liner is to act as an essentially gas tight membrane and no credit is taken for the liner's ability to resist primary bursting stresses. Cyclic loads considered in the design of the Unit 1 and Unit 2 liners include:

1. Differential pressure cycling due to plant normal operation, namely startup and shutdown;
2. Thermal cycling due to plant normal operation, namely startup and shutdown; and,
3. Stresses due to seismic cycling.

4.6.1.1 Unit 1 Containment Liner

The Unit 1 Containment liner stress analysis determines a fatigue usage factor based on specific design cyclic loads in accordance with paragraph N-415.2 of the 1968 Edition of ASME Section III. These design loads include 1000 cycles of pressure variation due to normal operations (startup and shutdown), 4000 cycles of temperature variation due to normal operations (startup and shutdown), and 20 cycles of design basis earthquake. The usage factor for the liner was determined to be significantly less than 1.0. The anticipated occurrences of these cycles are described in Table 5.2-13 of the Unit 1 UFSAR as follows:

- 150 cycles of loading due to the differential pressure between operating and atmospheric pressure are anticipated on the basis of 2.5 refueling cycles per year on a 60-year span;
- 600 cycles of loading due to thermal expansion resulting when the liner is exposed to the differential temperature between operating and seasonal refueling temperatures are anticipated on the basis of 10 such variations per year on a 60-year span; and,
- 150 cycles of operating basis earthquake, which is an assumed number of cycles of this type of earthquake for a 60-year span.

As shown above, the design cycles of the Unit 1 Containment liner bound the anticipated pressure and temperature cycles expected through the period of extended operation. The expected stresses resulting from the 60-year anticipated operating basis earthquake cycles were determined to be bounded by those due to the analyzed design basis earthquake cycles. Therefore, the Unit 1 Containment liner fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.6.1.2 Unit 2 Containment Liner

The Unit 2 Containment liner was designed using the 1971 Edition of ASME Section III as a design guideline using stress limits and fatigue criteria based on the rules for code classes MC and 1. As such, a detailed analysis for fatigue is not required if six specific requirements are met as defined in ASME Section III, NB-3222.4(d). This exemption analysis was performed for the 40-year anticipated stress cycles of differential pressure due to normal operation (100 cycles), differential temperature due to normal operation (400 cycles), and ½ safe shutdown earthquake (operational basis earthquake) (100 cycles). To address these 40-year cycles, a re-evaluation of the six fatigue exemption requirements utilizing anticipated 60-year stress cycles was performed. The anticipated occurrences of these cycles are described in Table 3.8-9 of the Unit 2 UFSAR as follows:

- 150 stress cycles of differential pressure loading assuming 2.5 refueling cycles per year on a 60-year span;
- 600 stress cycles of loading due to thermal expansion resulting from exposure to the differential temperature between operating and seasonal refueling temperatures based on 10 such variations per year on a 60-year span; and,
- 150 cycles of operational basis earthquake, which is an assumed number of cycles of this type of earthquake for a 60-year span.

The result of this evaluation determined that the specified normal conditions through the period of extended operation continue to satisfy the requirement for exemption from analysis for cyclic operation. Therefore, the Unit 2 Containment liner fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

4.6.2 CONTAINMENT LINER CORROSION ALLOWANCE

The Reactor Containment Buildings have a continuously welded carbon steel liner which acts as a leak tight membrane. The cylindrical portion of the liners are 3/8 inch thick, the hemispherical dome is ½ inch thick, and the flat floor liner covering the concrete mat is ¼ inch thick. The floor liner plate is covered with approximately two feet of reinforced concrete. All welded seams were originally covered with continuously welded leak test channels that were installed to facilitate leak testing of welds during liner erection. Since initial construction, several test channels have been removed. Also, test channels were not installed on liner plate seams associated with the Unit 1 Steam Generator Replacement Project construction opening. Channels in the hemispherical dome and Containment mat are covered with concrete while those on the cylindrical liner wall are exposed. Test ports that were provided for leak testing were sealed with vent plugs after the completion of the testing. These plugs were to remain in place during subsequent Type A leak rate testing.

During the second refueling outage for Unit 2 in 1990, the results of an inspection performed prior to the Unit 2 Type A Containment leakage rate test showed that 25 test channel vent plugs were missing. Similarly, during a Unit 1 shutdown in 1991, it was determined that 27 vent plugs in the Containment floor liner test channels were missing. The missing test channel vent plugs allowed moisture and condensation inside the test channels, leading to minor corrosion of the liner. BVPS evaluated the test channels to determine the impact to the Containment liner, and submitted the results of the evaluations to the NRC as Amendments 165 and 47, Unit 1 and Unit 2 respectively, to the operating licenses. These amendments were approved by the NRC and documented in an SER [Reference 4.6-1]. After further evaluation, it was concluded that these initial evaluations contained some nonconservative assumptions with regard to the corrosion rates in the test channels. BVPS took corrective action to arrest the corrosion rate in the affected test channels, including inerting and sealing the test channels. The further evaluation and corrective actions are documented in a 1992 Letter to the NRC [Reference 4.6-2]. These corrosion rate analyses meet the 10 CFR 54.3 requirements as TLAAs and must be evaluated for the period of extended operation.

The minimum required thickness for the Containment liners for both units has been determined for the various portions of the liner. The limiting liner portion is the liner floor plate, which has a fabrication thickness of 0.25 inches and a minimum required thickness of 0.125 inches (both units). Thus, the corrosion allowance is 0.125 inches (125 mils). The inerting and sealing of the test channels significantly reduced the theoretical corrosion rates in the channels. The total estimated penetration due to corrosion of the inerted channel was estimated at 69.2 mils for 43 years of plant operation for Unit 1. The total estimated penetration due to corrosion of the inerted channel was estimated at 82.7 mils for 43 years of plant operation at Unit 2. The maximum expected corrosion rate for the carbon steel liner in this low oxygen environment was determined to be 0.39 mils per year. Therefore, projecting the expected corrosion penetration with the maximum expected corrosion rate to the end of the period of extended operation results in an additional 7.8 mils of corrosion. Adding this to the previous expected corrosion penetration depths yields 77.0 mils and 90.5 mils of corrosion penetration for Unit 1 and Unit 2, respectively. These results are well within the liner corrosion allowance of 125 mils.

Therefore, the Containment liner corrosion analyses for Unit 1 and Unit 2 have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.6.3 CONTAINMENT LINER PENETRATION FATIGUE

Communication between the inside and outside of the Unit 1 and Unit 2 reactor Containment is performed via penetrations. The penetrations of interest to license renewal are classified as general piping penetrations, personnel and equipment access hatches, and the fuel transfer tube assembly. Note that the emergency airlock is integral with the equipment hatch for both units. Due to the design and construction time frame difference between the two units, the design code and analysis method utilized for these penetrations varies with the specific unit. Each unit will be discussed separately in the following subsections.

4.6.3.1 Unit 1 Containment Liner Penetration Fatigue

All Unit 1 cold penetrations have the process pipe welded to a plate flange which is anchored to the Containment concrete wall such that loads can be transferred from the piping to the reinforced concrete. Unit 1 hot penetrations (> 180°F) are designed with a sleeve and liner such that water cooled cooling units and appropriate insulation can be located inside the annulus to maintain the concrete temperature within allowable levels. Refer to Unit 1 UFSAR, Figure 5.2-21, for drawings of typical hot and cold piping penetrations. As described in Section 5.2.4.8 of the UFSAR, the evaluation of the penetration discontinuities was done using a computer program entitled SHELL-1 which analyzes axisymmetric thin shells of revolution under unsymmetrical loading. The temperature distribution at discontinuity areas exposed to operating conditions was evaluated using finite difference or finite elements techniques. While ASME Section III was used as a guide in the selection of design stresses used in the analysis of these penetrations, no specific fatigue analysis was completed for the Unit 1 piping penetrations. Therefore, no TLAA is associated with the Unit 1 piping penetrations.

In addition to the piping penetrations, the Unit 1 Containment penetrations include an equipment hatch with integral emergency airlock, a personnel airlock, and the fuel transfer tube (pipe and bellows assembly).

The equipment hatch and integral emergency airlock are designed and analyzed in accordance with ASME Section III, Division 1, Subsection NE (Class MC). Subsection NE states that any portions not satisfying the fatigue exemption as described in Subsection NB-3222(d) require further fatigue evaluation. Therefore, a fatigue exemption was completed for the Unit 1 equipment hatch in accordance with Subsection NB-3222(d). This exemption was based on assumed cycles for a 40 year life, namely, 10 pressurization events due to LOCA and 80 cycles of startup and shutdown. It is highly unlikely that Unit 1 will reach 10 pressurization events due to LOCA during 60 years of operation. The assumption of 80 cycles of startup and shutdown is not bounding for 60 years of operation. A reanalysis was performed using 240 startup and shutdown cycles that bounds the number of projected cycles for the period of extended operation. Therefore, the Unit 1 equipment hatch fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

The Unit 1 personnel air lock is analyzed to ASME Section III, Class B. However, no fatigue analysis was completed for this air lock. Therefore, no TLAA is associated with the Unit 1 personnel air lock.

The Unit 1 fuel transfer tube pipe was analyzed to ASME Section III, Division 1, Subsection NC. The analysis for the fuel transfer tube pipe uses a stress range reduction factor of 1.0 (<7,000 cycles). However, as the fuel transfer tube pipe experiences operational cycles only during refueling, the fuel transfer tube pipe experiences essentially no thermal cycles. The existing fuel transfer tube pipe stress analysis remains valid through the period of extended operation. Therefore, the Unit 1 fuel transfer tube pipe fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

The Unit 1 fuel transfer tube bellows were analyzed to ASME Section III, Division 1, Subsection NC. The bellows stress analysis determined acceptability based on the bellows experiencing displacements due to a design basis earthquake. The assumed design cycles were 600. This number of design basis earthquake cycles is highly unlikely to occur during the period of extended operation. The fuel transfer tube bellows stress analysis remains valid through the period of extended operation. Therefore, the Unit 1 fuel transfer tube bellows fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

4.6.3.2 Unit 1 Containment Penetration Bellows

The bellows (metal expansion joints) are part of the system evaluation boundary of the Unit 1 River Water System and are located at the discharge piping connections from the recirculation spray heat exchangers inside Containment. The piping and in-line components of the BVPS Unit 1 River Water System are designed and analyzed to the 1967 Edition of B31.1. This code specifies evaluation of cyclic secondary stresses (i.e., stresses due to thermal expansion and anchor movements) by applying stress range reduction factors against the allowable stress range (SA).

For those non-Class 1 components identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted to determine the approximate frequency of significant thermal cycling. If the number of equivalent full-temperature cycles is below the limit used for the current design (7,000 cycles in this case), the component is suitable for extended operation. If the number of equivalent full-temperature cycles exceeds the limit, evaluation of the individual stress calculations will be required.

BVPS evaluated the validity of this assumption for 60 years of plant operation. The Unit 1 Recirculation Spray System is normally in standby operation, and, including any periodic testing, will experience significantly less than the full-temperature cycle limit of 7,000 cycles for the period of extended operation. Therefore, the Unit 1 Recirculation Spray System fatigue analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.6.3.3 Unit 2 Containment Liner Penetration Fatigue

Unit 2 process piping penetrations are designed and analyzed to the 1971 Edition through 1972 Winter Addenda of ASME Section III, Division 1, Class 2 (i.e., Subsection NC), which complies with the process piping system requirements of which these penetrations are a part. The penetrations are further analyzed to the more stringent Class MC (i.e., Subsection NE) requirements. Section III, Division 1, Class 2 requirements include a stress range reduction factor which accounts for an assumed number of thermal cycles. Additionally, Section III, Division 1, Class MC states that any portions not satisfying the fatigue exemption as described in Subsection NB-3222(d) require further fatigue evaluation. These thermal cycles and fatigue exemptions are based on a design number of cycles for the plant life. As such, the Unit 2 piping penetration analyses are classified as TLAAs and require disposition for the period of extended operation.

For the Unit 2 process piping penetrations identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted to determine the approximate frequency of significant thermal cycling. If the number of equivalent full-temperature cycles is below the limit used for the current design, the component is suitable for extended operation. If the number of equivalent full-temperature cycles exceeds the limit, evaluation of the individual stress calculations will be required.

BVPS evaluated the validity of this assumption for 60 years of plant operation. The results of this evaluation indicate that the thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, these piping penetration fatigue analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

In addition, the Unit 2 Containment penetrations include an equipment hatch with integral emergency airlock, a personnel airlock, and the fuel transfer tube (pipe and bellows assembly).

The equipment hatch and integral emergency airlock are designed and analyzed in accordance with ASME Section III, Division 1, Subsection NE (Class MC). Subsection NE states that any portions not satisfying the fatigue exemption as described in Subsection NB-3222(d) require further fatigue evaluation. Therefore, a fatigue exemption was completed for the Unit 2 equipment hatch in accordance with Subsection NB-3222(d). This exemption was based on assumed cycles for a 40 year life, namely, 10 pressurization events due to LOCA and 80 cycles of startup and shutdown. It is highly unlikely that Unit 2 will reach 10 pressurization events due to LOCA during 60 years of operation. The assumption of 80 cycles of startup and shutdown is not bounding for 60 years of operation. A reanalysis was performed using 240 startup and shutdown cycles that bounds the number of projected cycles for the period of extended operation. Therefore, the Unit 2 equipment hatch fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

The Unit 2 personnel air lock is analyzed to ASME Section III, Division 1, Subsection NE (Class MC). However, no fatigue analysis was completed for this air lock. Therefore, no TLAA is associated with the Unit 2 personnel air lock.

The Unit 2 fuel transfer tube pipe was analyzed to ASME Section III, Class 2. The analysis for the fuel transfer tube pipe uses a stress range reduction factor of 1.0 (<7,000 cycles). However, as the fuel transfer tube pipe experiences operational cycles only during refueling, the fuel transfer tube pipe experiences essentially no thermal cycles. The existing fuel transfer tube pipe stress analysis remains valid through the period of extended operation. Therefore, the Unit 2 fuel transfer tube pipe fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

The Unit 2 fuel transfer tube bellows were analyzed to ASME Section III, Class MC. The bellows stress report determined acceptability based on the bellows experiencing displacements due to a design basis earthquake. The design cycles in this stress report were 600. This number of design basis earthquake cycles is highly unlikely to occur during the period of extended operation. The existing fuel transfer tube bellows stress report remains valid through the period of extended operation. Therefore, the Unit 2 fuel transfer tube bellows fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

4.6.4 SECTION 4.6 REFERENCES

4.6-1 De Agazio, Albert W. (NRC), Letter to J. D. Sieber (BVPS), *Beaver Valley Units 1 and 2 - Issuance of Amendments 165 and 47: Containment Structural Integrity - Change Request Nos. 181/45*, June 23, 1992.

4.6-2 Sieber, J. D. (BVPS), Letter to NRC, *Beaver Valley Power Station, Unit No. 1 and No. 2, BV-1 Docket No. 50-334, License No. DPR-66, BV-2 Docket No. 50-412, License No. NPF-73, Revision to SER for Amendments 165 and 47*, December 30, 1992.

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 PIPING SUBSURFACE INDICATIONS (UNIT 1 ONLY)

During a Unit 1 inservice inspection performed in the Cycle 11 Refueling Outage (March - May, 1996), an indication was identified on the RCS loop C cold leg between an elbow and a section of straight pipe which exceeded the ASME Code, Section XI, subsection IWB-3500 acceptance criteria. This section of pipe is Class 1 cast austenitic stainless steel (CASS) piping. Subsequently, an analysis was performed to ensure that this indication would remain within ASME Code, Section XI, Appendix C evaluation acceptance standards. This evaluation, approved by the NRC [Reference 4.7-1], concluded that the postulated flaw met the applicable requirements with significant margins of safety to the end of the service lifetime. This flaw growth evaluation is a TLAA because it contained two parameters that are based on the service life of the piping, namely thermal aging and fatigue transient cycles.

Thermal aging in CASS will continue until the saturation, or fully-aged, point is reached. The limiting fracture toughness properties were those of the straight pipe, which has a relatively high ferrite content. Therefore, the fully aged (saturated) fracture toughness properties of the straight pipe were used in the analysis. Since the analysis relies on fully aged stainless steel material properties, the analysis does not have a material property time-dependency that requires further evaluation for license renewal.

The flaw evaluation includes the postulation of an initial flaw and the growth of that flaw based on imposed loading transients. The cycle assumptions used in the analysis are conservative compared to the BVPS original design cycles. The BVPS original design basis transients including design cycles for the RCS are identified in Table 4.3-2, along with the projected operational cycles that BVPS anticipates will occur for 60 years of plant life. BVPS has reviewed the design cycles against 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the flaw growth analysis remains valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) must continue to be used to validate the assumptions used in the evaluation. Therefore, the Unit 1 flaw growth TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

4.7.2 REACTOR VESSEL UNDERCLAD CRACKING (UNIT 1 ONLY)

Intergranular separations (underclad cracking) in low-alloy steel heat-affected zones under austenitic stainless steel weld claddings were first detected in SA-508, Class-2, Reactor Vessel forgings in 1970 during examination of Nucleoelectrica Argentina SA's Atucha-1 Reactor Vessel.

They have been reported to exist in SA-508, Class 2, Reactor Vessel forgings manufactured to a coarse-grain practice and clad by high-heat-input submerged arc processes. The regulatory position regarding this issue is found in Regulatory Guide 1.43, *Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components* [Reference 4.7-2]. Regulatory Guide 1.43 states that detection of underclad cracks *normally requires destructively removing the cladding to the weld fusion line and examining the exposed base metal either by metallographic techniques or with liquid penetrant or magnetic particle testing methods*. The Westinghouse Owners Group issued topical report WCAP-15338-A, *A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants* [Reference 4.7-3], that provides flaw evaluations based on Section XI of the American Society of Mechanical Engineers (ASME) Code to justify that the Westinghouse reactor pressure vessels with underclad cracks are acceptable for 60 years.

For the Unit 2 Reactor Vessel, no high-heat-input welding processes which could induce underclad cracking were used in the cladding of the Reactor Vessel SA-508 Class 2 forgings. Therefore, the Unit 2 Reactor Vessel is not susceptible to underclad cracking.

The Unit 1 Reactor Vessel does not contain SA 508, Class 2 forgings in the beltline regions. Only the vessel and closure head flanges and inlet and outlet nozzles are fabricated from SA 508, Class 2 forgings. The evaluation contained in WCAP-15338-A has been used to demonstrate that fatigue growth of the subject flaws will be minimal over 60 years and the presence of the underclad cracks are of no concern relative to the structural integrity of the Reactor Vessel.

The cycle assumptions used in the flaw growth analysis are conservative compared to the BVPS original design cycles. The BVPS original design basis transients including design cycles for the RCS are identified in Table 4.3-2 along with the projected operational cycles that BVPS anticipates will occur for 60 years of plant life. BVPS has reviewed the design cycles against the 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the flaw growth analysis remains valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluation. Therefore, the Unit 1 flaw growth TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

4.7.3 LEAK BEFORE BREAK

Leak before break (LBB) analyses evaluate postulated flaw growth in piping to alter the structural design basis. These analyses address the thermal aging of the CASS piping and fatigue transients that drive the flaw growth over the operating life of the plant. Because these analyses could be influenced by time, LBB analyses are identified as potential TLAAs. These potential TLAAs are evaluated in the following subsections.

4.7.3.1 Main Coolant Loop Piping Leak Before Break

The Unit 1 and Unit 2 primary loop piping material is CASS. The original structural design basis for both units' reactor coolant loops required that the dynamic effects of pipe breaks be considered. Subsequent to the original BVPS Unit 1 and Unit 2 designs, an additional concern of asymmetric blowdown loads was raised as described in Unresolved Safety Issue (USI) A-2, *Asymmetric Blowdown Loads on Reactor Primary Coolant Systems* [Reference 4.7-4], and Generic Letter 84-04, *Safety Evaluation of Westinghouse Topical Reports Dealing with Elimination of Postulated Pipe Breaks in PWR Primary Main Loops* [Reference 4.7-5]. However, research by the NRC and industry coupled with operating experience determined that safety could be negatively impacted by the placement of pipe whip restraints on certain systems. As a result, NRC and industry initiatives resulted in demonstrating that LBB criteria can be applied to RCS piping based on fracture mechanics technology and material toughness.

The current LBB evaluation for the Unit 1 main coolant loop piping is documented in WCAP-11317, *Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Beaver Valley Unit 1* [Reference 4.7-6]. This evaluation (including Supplements 1 and 2) was approved by the NRC in a Safety Evaluation Report (SER) [Reference 4.7-7] in 1987. BVPS reviewed this LBB evaluation to ensure that the elimination of the pipe breaks continues to be justified at power uprate operating conditions. The fracture toughness values calculated in WCAP-11317 were determined to be conservative. The potential Unit 1 main coolant loop piping LBB TLAAs in WCAP-11317 include thermal aging of CASS and the fatigue crack growth analysis.

The current LBB evaluation for the Unit 2 main coolant loop piping is documented in WCAP-11923, *Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Beaver Valley Unit 2 After Reduction of Snubbers* [Reference 4.7-8]. This evaluation was approved by the NRC in an SER [Reference 4.7-9] in 1991. BVPS reviewed this LBB evaluation to ensure that the elimination of the pipe breaks continues to be justified at power uprate operating conditions. The fracture toughness values calculated in WCAP-11923 were determined to be conservative. The potential Unit 2 main coolant loop piping LBB TLAAs in WCAP-11923-P include the thermal aging of CASS and the fatigue crack growth analysis.

Thermal aging in CASS will continue until the saturation, or fully-aged, point is reached. As the LBB evaluations for both units use saturated (fully-aged) fracture toughness properties, the analyses do not have a material property time-dependency that requires further evaluation for license renewal. There is no thermal aging TLAA associated with the Unit 1 or Unit 2 main coolant loop piping LBB analyses.

Accumulation of actual fatigue transient cycles over time could invalidate the fatigue crack growth analyses. A fatigue crack growth analysis of the reactor vessel inlet nozzle to safe-end region was performed to determine its sensitivity to the presence of small cracks. The nozzle to safe-end connection was selected because crack growth calculated at this location is representative of the entire primary loop. The nozzle to safe-end connection configuration includes an SA 508 Class 2 or Class 3 stainless steel clad nozzle connected to a stainless steel safe end by a stainless steel (Unit 1) or nickel-based alloy (Unit 2) weld. A fatigue crack growth rate law for the stainless steel clad low-alloy steel nozzle was obtained from ASME Section XI. Fatigue crack growth rate laws for stainless steel and Alloy 600 in a PWR environment were developed based on available industry literature. The crack growth rate laws were evaluated for all normal, upset, and test Reactor Vessel fatigue transients.

The cycle assumptions used in the fatigue crack growth analyses are conservative compared to the BVPS original design cycles. The BVPS original design basis transients including design cycles for the RCS are identified in Table 4.3-2 along with the projected operational cycles that BVPS anticipates will occur for 60 years of plant life. BVPS has reviewed the design cycles against the 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the fatigue crack growth analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Table B.2.27) must continue to be used to validate the assumptions used in the evaluations. Therefore, the Unit 1 and Unit 2 main coolant loop piping LBB TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

4.7.3.2 Pressurizer Surge Line Piping Leak Before Break

The current LBB evaluation for the Unit 1 pressurizer surge line piping is documented in WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line* [Reference 4.7-10]. This evaluation was approved by the NRC in an SER [Reference 4.7-11] in 1991. BVPS reviewed this LBB evaluation to ensure that elimination of pressurizer surge line pipe breaks from the structural design basis continues to be justified at power uprate operating conditions. The surge line piping is fabricated from wrought austenitic stainless steel and is not susceptible to reduction of fracture toughness by thermal embrittlement. Therefore, the only TLAA in WCAP-12727 that requires disposition for license renewal is the fatigue crack growth analysis.

The current LBB evaluation for the Unit 2 pressurizer surge line piping is documented in WCAP-12093, *Evaluation of Thermal Stratification for the Beaver Valley Unit 2 Pressurizer Surge Line* [Reference 4.7-12]. This evaluation (including Supplements 1 and 2) was approved by the NRC in an SER [Reference 4.7-13] in 1990. These analyses were based on a maximum temperature difference of 315°F between the pressurizer and the hot leg. Subsequent to the 1990 SER, a system temperature difference of approximately 360°F was experienced in the plant during heatup. To address this issue, WCAP-12093-P, Supplement 3, *Evaluation of Pressurizer Surge Line Transients Exceeding 320°F for Beaver Valley Unit 2* [Reference 4.7-14], was prepared and submitted to the NRC. This evaluation was approved by the NRC in an SER [Reference 4.7-9] in 1991. Supplement 3 concludes that the maximum stress intensity, fatigue usage factor, and growth of postulated cracks are not significantly affected, and that the 40-year design life is not impacted by this larger temperature difference. In addition, operating procedures were revised to add precautions and limitations to prevent exceeding a 320°F system temperature difference.

BVPS reviewed this LBB evaluation to ensure that elimination of pressurizer surge line pipe breaks from the structural design basis continues to be justified at power uprate operating conditions. The surge line piping is fabricated from wrought austenitic stainless steel and is not susceptible to reduction of fracture toughness by thermal embrittlement. Therefore, the only TLAA in WCAP-12093 and its supplements that requires disposition for license renewal is the fatigue crack growth analysis.

Fatigue crack growth analyses of selected pressurizer surge line locations were performed to determine sensitivity to the presence of small cracks. The consideration in the Unit 1 and Unit 2 analyses that could be influenced by time is the accumulation of actual fatigue transient cycles over time that could invalidate the fatigue crack growth analyses reported in WCAP-12727 and WCAP-12093 (including supplements).

The cycle assumptions used in the fatigue crack growth analyses are conservative compared to the BVPS original design cycles. The BVPS original design basis transients including design cycles for the RCS are identified in Table 4.3-2 along with the projected operational cycles that BVPS anticipates will occur for 60 years of plant life. BVPS has reviewed the design cycles against the 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the fatigue crack growth analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) must continue to be used to validate the assumptions used in the evaluations. Therefore, the Unit 1 and Unit 2 pressurizer surge line piping LBB TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

4.7.3.3 Branch Line Piping Leak Before Break (Unit 2 only)

As documented in a BVPS response [Reference 4.7-15] to an NRC request for additional information in 2005, Unit 1 has not implemented LBB on any branch line piping segments.

The Unit 2 branch line piping LBB analyses were approved by the NRC in NUREG-1057, Supplement No. 4, *Safety Evaluation Report Related to the Operation of Beaver Valley Power Station Unit 2* [Reference 4.7-16]. As there are no cast materials used for the subject piping, thermal aging of these lines is not a consideration. Fatigue crack growth calculations were performed at the piping limiting locations; namely the piping locations with the highest stress based on normal and safe shutdown earthquake loads. An assumed crack of a size which exceeds the ASME, Section XI acceptance criteria was analytically subjected to the internal piping loads occurring at these limiting locations. The analysis verified that, after a 40 year plant life, the crack would not grow to a through-wall crack of a size which would present risk of unstable growth leading to complete pipe severance. The fatigue transients utilized for the crack growth evaluations were those used in the ASME, Section III, Class 1 stress analyses for the particular line. As these fatigue transients and the resulting crack growth evaluation are based on a 40 year plant life, the Unit 2 branch piping LBB analyses are TLAAs that require disposition for the period of extended operation.

Fatigue crack growth analyses of selected RHR, SIS, and RCS loop bypass line locations were performed to determine sensitivity to the presence of small cracks. The consideration in the Unit 2 branch line LBB analysis that could be influenced by time is the accumulation of actual fatigue transient cycles over time that could invalidate the fatigue crack growth analyses.

The cycle assumptions used in the fatigue crack growth analyses are conservative compared to the BVPS original design cycles. The BVPS original design basis transients including design cycles for the RCS are identified in Table 4.3-2 along with the projected operational cycles that BVPS anticipates will occur for 60 years of plant life. BVPS has reviewed the design cycles against the 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the fatigue crack growth analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Table B.2.27) must continue to be used to validate the assumptions used in the evaluations. Therefore, the Unit 1 and Unit 2 branch line piping LBB TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

4.7.4 HIGH ENERGY LINE BREAK POSTULATION

In accordance with 10 CFR 50, General Design Criterion No. 4, *Environmental and Missile Design Bases* [Reference 1.3-1], special measures have been taken in the design and construction of Unit 1 and Unit 2 to protect SSCs required to place the reactor in a safe cold shutdown condition from the dynamic effects associated with the postulated rupture of piping.

As described in Section 5.2.6.3 of the Unit 1 UFSAR, compliance with this criterion is ensured through specific placement of piping and components (protection barriers). The careful layout of piping and components offers adequate protection against the dynamic effects associated with a postulated pipe rupture except in the case of the main steam and feedwater lines outside the crane wall. In the case of these two piping systems, Regulatory Guide 1.46, *Protection Against Pipe Whip Inside Containment* [Reference 4.7-17], was the base document used in establishing the break locations for evaluation. These Unit 1 piping systems are designed to ANSI B31.1 which is not addressed in Regulatory Guide 1.46. However, B31.1 is similar to ASME Section III, Class 2 piping such that the Class 2 piping requirements of Regulatory Guide 1.46 were used for these lines. Similarly, Section 3.6B.2.1.1.1 of the Unit 2 UFSAR states that the break locations for ASME Section III, Class 1, 2, and 3 piping systems (outside the scope of those exempted through LBB evaluations as described in Section 4.7.3) are determined in compliance with Regulatory Guide 1.46.

ANSI B31.1, ASME Class 2 and ASME Class 3 postulated break locations are determined, in part, at each location where the maximum stress range associated with normal and upset conditions and an operating basis earthquake event, derived from the piping stress analysis, exceeds established criterion. These break location determinations do not use cumulative usage factors. Therefore, these postulated break location determinations require no further evaluation for license renewal.

For the Unit 2 Class 1 systems, Regulatory Guide 1.46 states that postulated break locations be determined, in part, using any intermediate locations between terminal ends where the cumulative usage factor derived from the piping fatigue analysis under the loadings associated with specified seismic events and operational plant conditions exceeded 0.1. These fatigue evaluations are TLAAs since they are based on a set of fatigue transients that are based on the life of the plant. The cycle assumptions used in the fatigue crack growth analyses are conservative compared to the BVPS original design cycles [Reference 4.7-18]. The BVPS original design basis transients including design cycles for the RCS are identified in Table 4.3-2 along with the projected operational cycles that BVPS anticipates will occur for 60 years of plant life. BVPS has reviewed the design cycles against the 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the fatigue crack growth analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) must continue to be used to validate the assumptions used in the evaluations. Therefore, the piping fatigue analyses used for determining the postulation of break locations in Class 1 lines remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

4.7.5 SETTLEMENT OF STRUCTURES (UNIT 2 ONLY)

The foundation soils in the main plant area consist of compacted select granular fill and medium dense to dense in-situ granular soils. Site subsurface profiles within the plant area are discussed in the UFSAR. Total static settlement of the plant structures founded on granular soils was assumed to consist of two components: an elastic component, and a time-dependent component, which was assumed to be equal in magnitude to the elastic component. Each in-scope plant structure typically has a shake space between it and any adjacent structures to allow independent movement in the event of earthquake loading. These shake spaces also allow for differential settlement between plant structures. Such settlement can affect safety-related piping that penetrates the structure.

Observed settlement data was used to predict settlement of structures that are penetrated by piping. The settlement predictions were based on an assumed 40-year plant life. Analyses for affected piping include stresses that would be imposed by the predicted settlement. Therefore, the predicted settlement values of plant structures are used in the design stress analyses of various piping systems which span structures or exit structures into the surrounding soil (buried piping).

The Unit 2 settlement assumptions are based on predicted 40-year settlement values and, therefore, the piping stress analyses that use settlement assumptions are TLAAs that must be dispositioned for the period of extended operation.

As documented in UFSAR Section 2.5.4.13, the settlement of each Unit 2 Category I structure was monitored during construction, and will be monitored throughout the life of the plant until the settlement of a particular structure has been determined to be stable as defined by the Settlement Monitoring Program (Unit 2 only) (Section B.2.37). For such structures, settlement monitoring is then discontinued. The Settlement Monitoring Program provides the requirements to measure the settlement of Unit 2 structures at selected locations. If the settlement of a structure exceeds that anticipated, a review of current analysis (as it relates to the integrity of the structure and the maintenance of settlement assumptions in the associated piping stress analyses) is required.

The Settlement Monitoring Program (Unit 2 only) ensures that the current 40-year settlement assumptions in the Unit 2 pipe stress analyses are maintained for the period of extended operation. Therefore, the Unit 2 piping fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

4.7.6 CRANE LOAD CYCLES

In Generic Letter 80-113, *Control of Heavy Loads* [Reference 4.7-19], the NRC requested all licensees of operating plants to review their controls for handling of heavy loads to determine the extent to which the guidelines of NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants* [Reference 4.7-20], were satisfied, and to identify the changes and modifications that would be required to fully satisfy these requirements. NUREG-0612 requires verification that crane designs comply with the guidelines of Crane Manufacturer's Association of America Specification #70 (CMAA-70), *Specifications for Electric Overhead Traveling Cranes* [Reference 4.7-21], and Chapter 2-1 of ANSI B30.2-1976, *Overhead and Gantry Cranes* [Reference 4.7-22], including the demonstration of equivalency of actual design requirements for instances where specific compliance with these standards is not provided. The crane design determination of allowable stress range for repeated loads is required in accordance with Section 3.4.8 of CMAA-70. Allowable stress range is based on service class and joint category. The service class is based on a calculation of mean effective load factor (includes load magnitude and load probability), load classes, and load cycles. The minimum number of load cycles in CMAA-70 is 20,000, for Class A cranes, with a mean effective load factor range of 0.35-0.53. The load cycle parameter of the service class is based on the estimated number of load cycles (crane lifts) over the service life of the component and is therefore classified as a TLAA in accordance with 10 CFR 54.3.

The NRC published its review of the BVPS Unit 1 response to the generic letter in a Technical Evaluation Report, *Control of Heavy Loads* [Reference 4.7-23]. As discussed in the Technical

Evaluation Report, only two Unit 1 cranes were designed to CMAA-70, and, therefore, have TLAAs associated with their design. These two Unit 1 cranes are the:

- Fuel cask crane (CR-15); and,
- Moveable platform and hoists crane (CR-27).

Unit 2 responded to the NUREG-0612 generic letter in correspondence dated September 21, 1981 [Reference 4.7-24]. In this correspondence, BVPS determined that three cranes were designed to CMAA-70. Therefore, only these three Unit 2 cranes have TLAAs associated with their design. These cranes are the:

- Polar crane (CRN201);
- Spent fuel cask trolley (CRN215); and,
- Moveable platform with hoists crane (CRN227).

The two Unit 1 cranes and the three Unit 2 cranes may conservatively be classified as Service Class A cranes. The total load cycles and mean effective load factors for the five cranes have been estimated for the period of extended operation. Even using conservative estimates, total load cycles are well below 20,000, and mean effective load factors are maintained within or below the Service Class A bounds (0.35 - 0.53) for 60 years. Therefore, crane allowable stress ranges as defined in CMAA-70 will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.7 SECTION 4.7 REFERENCES

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4.7-2 Regulatory Guide 1.43, *Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components*, May 1973.

4.7-3 WCAP-15338-A, *A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants*, October 2002.

4.7-4 Unresolved Safety Issue (USI) A-2, *Asymmetric Blowdown Loads on Reactor Primary Coolant Systems*, Rev. 2.

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4.7-9 De Agazio, Albert W. (NRC), Letter to J. D. Sieber (BVPS), *Elimination of Dynamic Effects of Postulated Pressurizer Surge Line Rupture and Elimination of Reactor Coolant System Component Support Snubbers*, April 8, 1991.

4.7-10 WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line,* Rev. 0.

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4.7-14 Sieber, J. D. (BVPS), Letter to NRC, *Beaver Valley Power Station, Unit No. 2, Docket No. 50-412, License No. NPF-73, Primary Component Support Snubber Elimination*, August 10, 1990.

4.7-15 Pearce, William L. (BVPS), Letter to NRC, *Responses to a Request for Additional Information in Support of License Amendment Request Nos. 302 and 173*, May 26, 2005.

4.7-16 NUREG-1057, Supplement No. 4, *Safety Evaluation Report Related to the Operation of Beaver Valley Power Station Unit 2; Docket No. 50-412 Duquesne Light Company*, March 1987

4.7-17 Regulatory Guide 1.46, *Protection Against Pipe Whip Inside Containment*, May 1973.

4.7-18 NRC Letter, Timothy G. Colburn (NRC), to James H. Lash (FENOC), *Beaver Valley Power Station, Unit 1 and Unit 2 (BVPS-1 and 2) - Issuance of Amendment Regarding the 8-Percent Extended Power Uprate*, July 19, 2006.

4.7-19 NRC Generic Letter 80-113, *Control of Heavy Loads*, December 22, 1980.

4.7-20 NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants*, July 1980.

4.7-21 Crane Manufacturers Association of America Specification #70 (CMAA-70), *Specifications for Electric Overhead Traveling Cranes*, Revised 1983.

4.7-22 ANSI B30.2-1976, *Overhead and Gantry Cranes*, 1976.

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4.7-24 Woolever, E. J. (BVPS), Letter to Darrel G. Eisenhut (NRC), *Generic Letter 81-07 Control of Heavy Loads*, September 21, 1981.

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APPENDIX A

UPDATED FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

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APPENDIX A
UPDATED FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

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A.0 INTRODUCTION

This appendix provides the information to be submitted in the UFSAR Supplement as required by 10 CFR 54.21(d) [Reference 1.3-3] for the BVPS License Renewal Application (LRA). The LRA contains the technical information required by 10 CFR 54.21(a) and (c). Section 3 of the BVPS LRA identifies the programs and activities that will manage the effects of aging for the period of extended operation, and Appendix B provides descriptions of those programs and activities. Section 4 of the LRA documents the evaluations of time-limited aging analyses (TLAAs) for the period of extended operation. LRA Section 3, Section 4, and Appendix B have been used to prepare the program and activity descriptions for the BVPS UFSAR Supplement information in this Appendix.

This Appendix is divided into five sections:

- Section A.1 contains summary descriptions of the Unit 1 and Unit 2 programs used to manage the effects of aging during the period of extended operation;
- Section A.2 contains summary descriptions of the Unit 1 TLAAs during the period of extended operation;
- Section A.3 contains summary descriptions of the Unit 2 TLAAs during the period of extended operation;
- Section A.4 contains a listing of the Unit 1 commitments associated with license renewal; and,
- Section A.5 contains a listing of the Unit 2 commitments associated with license renewal.

The information presented in these five sections will be incorporated in the BVPS Unit 1 and Unit 2 UFSARs following issuance of the renewed operating licenses in accordance with 10 CFR 50.71(e) [Reference 1.3-1].

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A.1 SUMMARY DESCRIPTIONS OF AGING MANAGEMENT PROGRAMS

The license renewal integrated plant assessment and evaluation of time-limited aging analyses (TLAAs) identified existing and new aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation. This section describes the aging management programs and activities identified during the integrated plant assessment that will be required. Aging management programs will be implemented as identified in the list of license renewal commitments. The aging management programs associated with TLAAs are located in Sections A.1.14, A.1.27, and A.1.37.

Three elements of an effective aging management program that are common to all aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the BVPS Quality Assurance (QA) Program, which implements the requirements of 10 CFR 50, Appendix B. Using the BVPS Corrective Action Program, adverse conditions are identified and categorized as conditions adverse to quality or significant conditions adverse to quality based on the significance and consequences of the specific problem identified. BVPS corrective actions, confirmation process, and administrative controls are consistent with NUREG-1801.

A.1.1 10 CFR PART 50, APPENDIX J PROGRAM

The BVPS 10 CFR Part 50, Appendix J Program monitors Containment leak rate. Containment leak rate tests are required to assure that (a) leakage through primary reactor Containment and systems and components penetrating primary Containment shall not exceed allowable values specified in technical specifications or associated bases and (b) periodic surveillance of reactor Containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of Containment, and systems and components penetrating primary Containment.

Appendix J provides two options, A and B, either of which can be chosen to meet the requirements of a Containment leak rate test program. BVPS uses option B, the performance-based approach. The Containment leak rate tests are performed in accordance with the guidelines contained in NRC Regulatory Guide 1.163, *Performance-Based Containment Leak-Testing Program* [Reference A.1-1] and NEI 94-01, *Industry Guidance for Implementing Performance-Based Options of 10 CFR Part 50 Appendix J* [Reference A.1-2].

A.1.2 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD PROGRAM

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsections IWB, IWC, and IWD, and is subject to the limitations and modifications of 10 CFR 50.55a. The program provides for condition monitoring of Class 1, 2, and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting. The program is updated as required by 10 CFR 50.55a.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is augmented by the Water Chemistry Program (Section A.1.42) where applicable.

A.1.3 ASME SECTION XI, SUBSECTION IWE PROGRAM

The ASME Section XI, Subsection IWE Program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE. In conformance with 10 CFR 50.55a(g)(4)(ii), the BVPS ASME Section XI, Subsection IWE Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified twelve months before the start of the inspection interval.

This program is implemented through plant procedures, which provide for inservice inspection of Class MC and metallic liners of Class CC components.

A.1.4 ASME SECTION XI, SUBSECTION IWF PROGRAM

The ASME Section XI, Subsection IWF Program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWF. In conformance with 10 CFR 50.55a(g)(4)(ii), the BVPS ASME Section XI, Subsection IWF Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified twelve months before the start of the inspection interval.

This program is implemented through plant procedures, which provide for visual examination of inservice inspection Class 1, 2, and 3 supports in accordance with the requirements of ASME Code Case N-491, *Alternate Rules for Examination of Class 1, 2, 3, and MC Component Supports of Light-Water Cooled Power Plants* [Reference A.1-5].

A.1.5 ASME SECTION XI, SUBSECTION IWL PROGRAM

The ASME Section XI, Subsection IWL Program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL. In conformance with 10 CFR 50.55a(g)(4)(ii), the BVPS ASME Section XI, Subsection IWL Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified twelve months before the start of the inspection interval.

The program consists of periodic visual inspections of the reinforced concrete Containment structures. An additional commitment requires that the inspectors be trained and certified in accordance with ASME, Section IX, Subsection IWL (1992 edition with the 1992 Addenda) standards. The BVPS concrete Containment structures do not utilize a post-tensioning system; therefore, the IWL requirements associated with a post-tensioning system are not applicable.

A.1.6 BOLTING INTEGRITY PROGRAM

The Bolting Integrity Program implements industry recommendations for a comprehensive bolting integrity program, as delineated in NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants* [Reference A.1-6], and EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants* [Reference A.1-7]. Also, it implements industry recommendations for comprehensive bolting maintenance, as delineated in EPRI TR-104213, *Bolted Joint Maintenance & Application Guide* [Reference A.1-8], for pressure retaining bolting and structural bolting.

The program includes periodic inspection of closure bolting for indication of loss of preload, cracking, and loss of material due to corrosion, rust, etc. It also includes preventive measures to preclude or minimize loss of preload and cracking.

The program inspections are implemented through other Aging Management Programs listed as follows:

- ASME Section XI, *Inservice Inspection, Subsections IWB, IWC, & IWD Program*
- ASME Section XI, *Subsection IWE Program*
- ASME Section XI, *Subsection IWF Program*
- Structures Monitoring Program
- External Surfaces Monitoring Program

A.1.7 BORIC ACID CORROSION PROGRAM

The Boric Acid Corrosion Program manages loss of material due to borated water leakage by performing periodic visual inspections. The program relies in part on implementation of recommendations of NRC Generic Letter 88-05, *Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants* [Reference A.1-9].

The scope of the program inspections includes all systems that contain borated water, as well as components and systems that may be potentially impacted by borated water leakage. The program includes provisions for (a) determination of the principal location of leakage, (b) examination requirements and procedures for locating small leaks, and (c) engineering evaluations and corrective actions. If borated water leakage is discovered, either by program inspections or by other activities, it is evaluated and resolved using the Corrective Action Program.

A.1.8 BURIED PIPING AND TANKS INSPECTION PROGRAM

The Buried Piping and Tanks Inspection Program includes (a) preventive measures to mitigate corrosion, and, (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried steel and stainless steel components. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components are inspected when excavated during maintenance or planned inspections. The program requires that, for each unit at BVPS, at least one opportunistic or focused inspection be performed and documented within the ten year period prior to, and within the ten year period after entering, the period of extended operation.

A.1.9 CLOSED-CYCLE COOLING WATER SYSTEM PROGRAM

The Closed-Cycle Cooling Water System Program includes: (1) preventive measures to minimize corrosion, and (2) periodic system and component performance testing and inspection to monitor the effects of corrosion and confirm that intended functions are met. This program manages loss of material, cracking, and reduction of heat transfer for components exposed to closed cooling water systems (Reactor / Primary Plant Component Cooling Water, Chilled Water, diesel-driven fire pump engine cooling water, Emergency Diesel Generator cooling water, Security Diesel Generator cooling water, Emergency Response Facility (ERF) diesel generator cooling water, and Unit 2 diesel-driven station standby air compressor engine cooling water).

These systems are closed cooling loops with controlled chemistry, consistent with the NUREG-1801 [Reference 1.3-5] description of a closed cycle cooling water system. The adequacy of chemistry control is confirmed on a routine basis by sampling and ensuring contaminants and additives are within established limits, and by equipment performance monitoring to identify aging effects. These chemistry activities are controlled using BVPS procedures and processes and are based on EPRI guidance for closed cooling water chemistry located in EPRI 1007820 (EPRI 107396, Rev. 1) [Reference A.1-10].

A.1.10 ELECTRICAL CABLE CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS ONE-TIME INSPECTION PROGRAM

The Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program is a one-time inspection program that inspects and tests the metallic parts of the cable connection. A representative sample of electrical cable connection population subject to aging management review is inspected or tested. Electrical connections covered under the Environmental Qualification (EQ) Program (Section A.1.14), or connections inspected or tested as part of a preventive maintenance program, are excluded from aging management review.

This sampling program provides a one-time inspection to verify that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an aging issue that requires a periodic aging management program. The design of these connections accounts for the stresses associated with ohmic heating, thermal cycling, and dissimilar metal connections. Therefore, these stressors or mechanisms should not be a significant aging issue. However, confirmation of the lack of aging effects is required. The factors considered for sample selection are application (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selection will be documented. Any unacceptable conditions found during the inspection will be evaluated through the Corrective Action Program.

For Unit 2 only, the metallic parts of metal enclosed bus connections are managed by the Metal Enclosed Bus Program (Unit 2 only) (Section A.1.26), and are therefore not included within the scope of the program. There is no in-scope metal enclosed bus at Unit 1.

A.1.11 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS PROGRAM

The Electrical Cables And Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program provides reasonable assurance that intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation and moisture can be maintained consistent with the current licensing basis through the period of extended operation. An "adverse localized environment" is an environment that is significantly more severe than the specified service condition for the insulated cable or connection.

A representative sample of accessible insulated cables and connections within the scope of license renewal and located in adverse localized environments will be visually inspected at least once every 10 years for cable and connection jacket surface anomalies such as embrittlement, discoloration, cracking or surface contamination. The program requires the first inspection to be completed prior to entering the period of extended operation. The technical basis for sampling is derived from the guidance provided by applicable industry documents.

A.1.12 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS PROGRAM

The Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program demonstrates that sensitive (high voltage – low current applications) instrument cables and connections susceptible to aging effects caused by exposure to adverse localized environments caused by heat, radiation, and moisture are adequately managed so that there is reasonable assurance that the cables and connections will perform their intended function in accordance with the current licensing basis during the period of extended operation. An "adverse localized environment" is an environment that is significantly more severe than the specified service condition for the cable. This aging management program requires a review of non-EQ instrumentation circuit calibration results at least once every ten years, with the initial performance of this program to occur prior to the period of extended operation. BVPS will incorporate into the program the appropriate technical information and guidance provided in industry documents.

A.1.13 ELECTRICAL WOODEN POLES/STRUCTURES INSPECTION PROGRAM (UNIT 2 ONLY)

The Electrical Wooden Poles/Structures Inspection Program manages aging effects for wooden poles subject to aging management, such as insect and woodpecker damage, reduced circumference, and moisture intrusion. Appropriate aging management methods include pole sounding, pole boring, and underground inspection.

A.1.14 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRICAL COMPONENTS PROGRAM

The Environmental Qualification (EQ) of Electrical Components Program manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49 qualification methods. As required by 10 CFR 50.49, environmental qualification program components not qualified for the current license term are refurbished, replaced, or their qualification extended prior to reaching the aging limits established in the evaluations. Aging evaluations for environmental qualification program components are time-limited aging analyses (TLAAs) for license renewal.

A.1.15 EXTERNAL SURFACES MONITORING PROGRAM

The External Surfaces Monitoring Program is based on system inspections and walkdowns. This program consists of periodic inspections to monitor the external surfaces of in-scope steel components and other metal components for material degradation and leakage, and periodic inspection of in-scope elastomer components for hardening, loss of strength or cracking through physical manipulation. The program will also require inspection of the Emergency Response Facility (ERF) diesel generator jacket water radiator fins for build-up of dust, dirt and debris. Additionally, the program is credited with managing aging effects of internal surfaces, for situations in which material and environment combinations are the same for internal and external surfaces such that external surface condition is representative of internal surface condition.

Loss of material due to boric acid corrosion is managed by the Boric Acid Corrosion Program.

A.1.16 FIRE PROTECTION PROGRAM

The Fire Protection Program is a condition monitoring and performance monitoring program, comprised of tests and inspections that follow the applicable National Fire Protection Association (NFPA) recommendations. The Fire Protection Program manages the aging effects on fire barrier penetration seals; fire barrier walls, ceilings and floors; fire wraps and fire rated doors (automatic and manual) that perform a current licensing basis fire barrier intended function. It also manages the aging effects on the diesel engine-driven fire pump fuel oil supply line. The Fire Protection Program also manages the aging effects on the halon and carbon dioxide fire suppression systems.

A.1.17 FIRE WATER SYSTEM PROGRAM

The Fire Water System Program applies to the water filled fire protection subsystems consisting of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, tanks, and aboveground and underground piping and components that are tested in accordance with applicable National Fire Protection Association (NFPA) codes and standards. This program is credited with managing loss of material and reduction of heat transfer (reduction of heat transfer applies to the diesel-driven fire pump jacket water and oil coolers) for the water-filled Fire Protection Systems. Program activities include periodic inspection and hydro-testing of hydrants and hose stations, performing sprinkler head inspections, and conducting system flow tests. These tests and inspections follow applicable NFPA guidelines as well as recommendations from the fire insurance carrier. Such testing assures functionality of the systems. Also, many of these systems are normally maintained at required operating pressure and monitored such that leakage resulting in loss of system pressure is immediately detected and corrective actions initiated.

All sprinkler heads will be replaced, or a sample population will be inspected using the guidance of NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems* [Reference A.1-11]. NFPA 25, Section 5.3.1.1.1 states that "where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing." If the sampling method is chosen, NFPA 25 also contains guidance to perform this sampling every 10 years after initial field service testing.

A.1.18 FLOW-ACCELERATED CORROSION PROGRAM

The Flow-Accelerated Corrosion Program is based on EPRI guidelines in NSAC-202L-R2, *Recommendations for an Effective Flow Accelerated Corrosion Program* [Reference A.1-12]. The program predicts, detects, and monitors wall thinning in piping, valve bodies, and other in-line components. Analytical evaluations and periodic examinations of locations that are most susceptible to wall thinning due to flow-accelerated corrosion are used to predict the amount of wall thinning. The program includes analyses to determine critical locations. Initial inspections are performed to determine the extent of thinning at these critical locations, and follow-up inspections are used to confirm the predictions. Inspections are performed using ultrasonic, visual or other approved inspection techniques capable of detecting wall thinning. Repairs and replacements are performed as necessary.

A.1.19 FLUX THIMBLE TUBE INSPECTION PROGRAM

The Flux Thimble Tube Inspection Program serves to identify loss of material due to wear prior to leakage by monitoring for and predicting unacceptable levels of wall thinning in the Movable

Incore Detector System Flux Thimble Tubes, which serve as a Reactor Coolant System pressure boundary. The program implements the recommendations of NRC IE Bulletin 88-09, *Thimble Tube Thinning in Westinghouse Reactors* [Reference A.1-13].

The main attribute of the program is periodic nondestructive examination of the flux thimble tubes which provides actual values of existing tube wall thinning. This information provides the basis for an extrapolation to determine when tube wall thinning will progress to an unacceptable value. Based on this prediction, preemptive actions are taken to reposition, replace or isolate the affected thimble tube prior to a pressure boundary failure.

A.1.20 FUEL OIL CHEMISTRY PROGRAM

The Fuel Oil Chemistry Program is a mitigation and condition monitoring program which manages aging effects of the internal surfaces of oil storage tanks and associated components in systems that contain diesel fuel oil. The program includes (a) surveillance and monitoring procedures for maintaining diesel fuel oil quality by controlling contaminants in accordance with ASTM Standards D 975, D 1796, D 2276 and D 4057; (b) periodic sampling of fuel oil tanks and new fuel oil shipments for the presence of water and contaminants, and draining of any accumulated water from the tanks; (c) sampling of fuel oil tanks and new fuel oil shipments for numerous other factors such as sediment, viscosity, and flash point; (d) periodic or conditional visual inspection of internal surfaces or wall thickness measurements (e.g., ultrasonic testing) of tanks.

The One-Time Inspection Program (Section A.1.30) will be used to verify the effectiveness of the Fuel Oil Chemistry Program.

A.1.21 INACCESSIBLE MEDIUM-VOLTAGE CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS PROGRAM

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program demonstrates that inaccessible, non-EQ medium-voltage cables susceptible to aging effects caused by moisture and voltage stress are adequately managed so that there is reasonable assurance that the cables will perform their intended function in accordance with the current licensing basis during the period of extended operation.

In this aging management program, periodic actions are taken, at least once every two years, to prevent cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes and conduit, and draining water, as needed. In-scope, medium-voltage cables exposed to significant moisture and significant voltage are tested to provide an indication of the condition of the conductor insulation. The specific type of test performed is determined prior to the initial test, and is a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or other testing that is state-of-the-art at the time the test is performed. Testing is conducted at least once every 10 years, with initial testing completed prior to the period of extended operation.

A.1.22 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS PROGRAM

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program consists of inspections of the internal surfaces of piping, piping components, ducting and other components within the scope of license renewal that are not covered by other aging management programs. The internal inspections are performed during periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. These inspections will assure that existing environmental conditions are not causing material degradation that could result in a loss of intended function.

A.1.23 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS PROGRAM

The Inspection of Overhead Heavy Load & Light Load (Related To Refueling) Handling Systems Program manages loss of material of structural components for heavy load and fuel handling components within the scope of license renewal and subject to aging management. The program is implemented through plant procedures and preventive maintenance activities that provide for visual inspections of the in-scope load handling components.

The inspections are focused on structural components that make up the bridge, trolley, and rails of the cranes and hoists. These cranes and hoists also comply with the maintenance rule requirements provided in 10 CFR 50.65.

Overhead heavy load cranes are controlled in accordance with the guidance provided in NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants* [Reference A.1-14].

A.1.24 LUBRICATING OIL ANALYSIS PROGRAM

The purpose of the Lubricating Oil Analysis Program is to ensure the lubricating oil environment for in-scope mechanical systems is maintained to the required quality. The program monitors and controls abnormal levels of contaminants (primarily water and particulates) for in-scope components in the lubricating oil systems, thereby preserving an environment that is not conducive to loss of material, cracking, or reduction of heat transfer.

The One-Time Inspection Program (Section A.1.30) will be used to verify the effectiveness of the Lubricating Oil Analysis Program.

A.1.25 MASONRY WALL PROGRAM

The Masonry Wall Program manages the aging effects of masonry walls that are within the scope of License Renewal and subject to aging management review. The program consists of visual inspections to identify cracks in masonry walls and ensure the sound condition of structural steel supports and bracing associated with masonry walls.

Masonry walls in close proximity to, or having attachments from, safety-related systems or components are inspected in response to NRC IE Bulletin 80-11, *Masonry Wall Design* [Reference A.1-15], and NRC Information Notice 87-67, *Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11* [Reference A.1-16]. These inspections consist of a visual examination by qualified personnel to ensure that the evaluation basis for these walls remains valid through the period of extended operation.

In addition, a general visual inspection is performed on both safety-related and nonsafety-related masonry walls that are within the scope of license renewal. These inspections are implemented by the Structures Monitoring Program (Section A.1.39) and consist of visual inspection for cracking in joints, deterioration of penetrations, missing or broken blocks, missing mortar, and general mechanical soundness of steel supports.

A.1.26 METAL ENCLOSED BUS PROGRAM (UNIT 2 ONLY)

The Metal Enclosed Bus Program is applicable only to the Unit 2 480-VAC Metal Enclosed Bus Feeders to the Emergency Substations (2-8 and 2-9). The program requires visual inspections of in-scope metal enclosed bus internal surfaces for aging degradation of insulating and conductive components. The visual inspection also identifies evidence of foreign debris, excessive dust buildup, or moisture intrusion. The bus insulating system, including the internal supports, is visually inspected for structural integrity and signs of aging degradation. A sample of accessible bolted connections are checked for loose connection using thermography. Inspections are completed prior to the period of extended operation and every 10 years thereafter.

A.1.27 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY PROGRAM

The Metal Fatigue of Reactor Coolant Pressure Boundary Program is a time-limited aging analysis (TLAA) program that uses preventive measures to mitigate fatigue cracking caused by anticipated cyclic strains in metal components of the reactor coolant pressure boundary. The preventive measures consist of monitoring and tracking critical thermal and pressure transients for Reactor Coolant System components to prevent the fatigue design limit from being exceeded. Critical transients are the subset of the design transients that are expected to approach or exceed the number of design cycles during the sixty year operating life of the units. Prior to exceeding the fatigue design limit, preventive and/or corrective actions are triggered by the program.

In addition, environmental effects are evaluated in accordance with NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves for Selected Nuclear Power Plant Components* [Reference A.1-17] and the guidance of EPRI Technical Report MRP-47, *Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application* [Reference A.1-18]. Selected components are evaluated using material specific guidance presented in NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels* [Reference A.1-19], and in NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels* [Reference A.1-20].

A.1.28 NICKEL-ALLOY NOZZLES AND PENETRATIONS PROGRAM

For the Nickel-Alloy Nozzles and Penetrations Program, regarding activities for managing the aging of nickel-alloy and nickel-alloy clad components susceptible to primary water stress corrosion cracking - PWSCC (other than upper reactor vessel closure head nozzles and penetrations), BVPS commits to develop a plant-specific aging management program that will implement applicable:

1. NRC Orders, Bulletins and Generic Letters, and,
2. staff-accepted industry guidelines.

A.1.29 NICKEL-ALLOY PENETRATION NOZZLES WELDED TO THE UPPER REACTOR VESSEL CLOSURE HEADS PROGRAM

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head Program manages cracking due to primary water stress corrosion cracking in nickel-alloy vessel head penetration nozzles. The program scope includes the reactor vessel closure head, upper vessel head penetration nozzles, and associated welds. The program also is used in conjunction with the Boric Acid Corrosion Program to examine the reactor vessel upper head for any loss of material due to boric acid wastage. This program was developed in response to NRC Order EA-03-009, *Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors* [Reference A.1-21], and First Revised Order EA-03-009, *Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors*

[Reference A.1-22]. Detection of cracking is accomplished through implementation of a combination of bare metal visual examination (external surface of head) and non-visual examination techniques.

A.1.30 ONE-TIME INSPECTION PROGRAM

The One-Time Inspection Program requires one-time inspections to verify effectiveness of the Water Chemistry Program (Section A.1.42), the Fuel Oil Chemistry Program (Section A.1.20), and the Lubricating Oil Analysis Program (Section A.1.24). One-time inspections may be needed to address concerns for potentially long incubation periods for certain aging effects on structures and components. There are cases where either (a) an aging effect is not expected to occur but there is insufficient data to completely rule it out, or (b) an aging effect is expected to progress very slowly. For these cases, there will be confirmation that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly as not to affect the component or structure intended function during the extended period of operation. The one-time inspections provide additional assurance that, either aging is not occurring, or aging is so insignificant that an aging management program is not warranted.

The elements of the program include:

- Determination of a representative sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience;
- Identification of the inspection locations in the system or component based on the aging effect, or areas susceptible to concentration of agents that promote certain aging effects;
- Determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined; and,
- Evaluation of the need for follow-up examinations to monitor the progression of any aging degradation.

In addition to verifying program effectiveness, the program is used to verify loss of material is not occurring in the following components:

- Steam generator feedwater ring; and,
- Selected bottoms of tanks that sit on concrete pads (by volumetric examination).

When evidence of an aging effect is revealed by a one-time inspection, the routine evaluation of the inspection results would identify appropriate corrective actions.

A.1.31 ONE-TIME INSPECTION OF ASME CODE CLASS 1 SMALL BORE PIPING PROGRAM

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program manages cracking of stainless steel ASME Code Class 1 piping less than 4 inches nominal pipe size (NPS 4), which includes pipes, fittings, and branch connections. The program will manage this aging effect by performing volumetric examinations for selected ASME Code Class 1 small-bore butt welds.

Should evidence of significant aging be revealed by the one-time inspection, periodic inspection will be proposed, as managed by a plant-specific aging management program.

A.1.32 OPEN-CYCLE COOLING WATER SYSTEM PROGRAM

The Open-Cycle Cooling Water System Program implements the site commitments to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Equipment* [Reference A.1-23], including Supplement 1. This program manages the aging effects on the open-cycle cooling water systems such that the systems will be able to fulfill their intended function during the period of extended operation. The program includes surveillance and control techniques to manage aging effects caused by biofouling, corrosion, erosion, protective coating failures, and silting in the River Water (Unit 1 only) / Service Water (Unit 2 only) Systems or structures and components serviced by the systems.

A.1.33 PWR VESSEL INTERNALS PROGRAM

For the PWR Vessel Internals Program, regarding activities for managing the aging of Reactor Vessel internal components and structures, BVPS provided in Table A.4-1 (Unit 1 only) and Table A.5-1 (Unit 2 only) commitments to:

1. Participate in the industry programs applicable to BVPS for investigating and managing aging effects on reactor internals;
2. Evaluate and implement the results of the industry programs as applicable to the BVPS reactor internals; and,
3. Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for the BVPS reactor internals to the NRC for review and approval.

A.1.34 REACTOR HEAD CLOSURE STUDS PROGRAM

The Reactor Head Closure Studs Program at BVPS Unit 1 and Unit 2 manages the aging effects of the reactor head closure studs, nuts, washers and associated Reactor Vessel flange threads. The program is part of the BVPS ASME Code Section XI Inservice Inspection Program. The examinations are performed in accordance with Code Section XI, 1989 edition with no Addenda. The Program is updated periodically as required by 10 CFR 50.55a. The program preventive measures are consistent with the recommendations of Regulatory Guide 1.65, *Materials and Inspections for Reactor Vessel Closure Studs* [Reference A.1-24].

A.1.35 REACTOR VESSEL INTEGRITY PROGRAM

The Reactor Vessel Integrity Program manages loss of fracture toughness due to neutron embrittlement in reactor materials exposed to neutron fluence exceeding 1.0E+17 n/cm^2 (E>1.0 MeV). The program is based on 10 CFR 50, Appendix H, *Reactor Vessel Material Surveillance Requirements*, and ASTM Standard E 185-82, *Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels* [Reference A.1-25] (incorporated by reference into 10 CFR 50, Appendix H). Capsules are periodically removed during the course of plant operating life. Neutron embrittlement is evaluated through surveillance capsule testing and evaluation, fluence calculations and monitoring of effective full power years (EFPYs). Best-estimate values of Reactor Vessel accumulated neutron fluence are determined utilizing analytical models that satisfy the guidance contained in NRC Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence* [Reference A.1-26]. Data resulting from the program is used to:

- Determine pressure-temperature limits, minimum temperature requirements, and end-of-life Charpy upper-shelf energy (C_VUSE) in accordance with the requirements of 10 CFR 50 Appendix G, *Fracture Toughness Requirements*; and,
- Determine end-of-life RT_{PTS} values in accordance with 10 CFR 50.61, *Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock.*

The Reactor Vessel Integrity Program provides guidance for removal and testing or storage of material specimen capsules. All capsules that have been withdrawn were tested and stored. Standby capsules at Unit 1 and Unit 2 will be available for future testing. Standby capsules from each unit will be removed from the vessel when the neutron fluences are approximately equivalent to the expected vessel wall neutron fluence at 60 years of operation (corrected for lead and capacity factors).

In addition, the Reactor Vessel Integrity Program implements flux reduction programs as required by 10 CFR 50.61.

A.1.36 SELECTIVE LEACHING OF MATERIALS PROGRAM

The Selective Leaching of Materials Inspection Program includes a one-time visual inspection and hardness examination of selected components that are susceptible to selective leaching. The program scope includes components and commodities (such as piping, pump casings, valve bodies and heat exchanger components) made of copper alloys with zinc content greater than 15% or gray cast iron which are exposed to a raw water, treated water, air, condensation, or soil environment.

This program determines whether selective leaching is occurring for selected components. Should evidence of significant aging be revealed by the one-time inspection or previous operating experience, the Corrective Action Program is used for the unacceptable inspection findings. The resolution will include evaluation for expansion of the inspection sample size, locations, and frequency.

A.1.37 SETTLEMENT MONITORING PROGRAM (UNIT 2 ONLY)

The Settlement Monitoring Program (Unit 2 only) is an existing plant-specific condition monitoring program for structures and piping that are within the scope of license renewal. The program monitors the settlement of structures to prevent stresses in the structures or piping from increasing beyond analyzed stress levels. The analyses of the structures and piping addressed by the program are time-limited aging analyses (TLAAs) discussed in Section A.3.6.3. The Settlement Monitoring Program ensures that the current 40-year settlement assumptions in the Unit 2 pipe stress analyses are maintained for the period of extended operation.

A.1.38 STEAM GENERATOR TUBE INTEGRITY PROGRAM

The Steam Generator Tube Integrity Program is based on NEI 97-06, *Steam Generator Program Guidelines* [Reference A.1-27]. The Steam Generator Tube Integrity Program is credited for aging management of the tubes, tube plugs, tube supports, and the secondary-side internal components whose failure could prevent the steam generator from fulfilling its intended safety function. The program includes performance criteria that are intended to provide assurance that steam generator tube integrity is being maintained consistent with the plant's licensing basis, and provides guidance for monitoring and maintaining the tubes to provide assurance that the performance criteria are met at all times between scheduled inspections of the tubes.

The Steam Generator Tube Integrity Program provides the requirements for inspection activities for the detection of flaws in tubes, plugs, tube supports, and secondary-side internal components needed to maintain tube integrity. Degradation assessments identify both potential and existing degradation mechanisms. Inservice inspections (i.e., eddy current testing, ultrasonic testing and visual inspections) are used for the detection of flaws. Condition monitoring compares the inspection results against performance criteria, and an operational assessment provides a prediction of tube conditions to ensure that the performance criteria will not be exceeded during the next operating cycle. Primary to secondary leakage is continually monitored during operation.

A.1.39 STRUCTURES MONITORING PROGRAM

The Structures Monitoring Program implements the requirements of 10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants* (the Maintenance Rule), using the guidance of NUMARC 93-01, *Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants* [Reference A.1-28] and Regulatory Guide 1.160, *Monitoring the Effectiveness of Maintenance at Nuclear Power Plants* [Reference A.1-29].

The program relies on periodic visual inspections to monitor the condition of structures and structural components so that intended functions are maintained through the period of extended operation.

A.1.40 THERMAL AGING AND NEUTRON IRRADIATION EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS) PROGRAM

The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program inpects Reactor Vessel Internals in accordance with ASME Code Section XI, Subsection IWB, Category B-N-3. This inspection is augmented to detect the effects of loss of fracture toughness due to thermal aging and neutron irradiation embrittlement of CASS components. The program includes identification of the limiting susceptible components from the standpoint of thermal aging susceptibility, neutron fluence, and cracking. For each identified component, aging management is accomplished through either a supplemental examination or a component-specific evaluation, including a mechanical loading assessment.

BVPS participates in the EPRI Materials Reliability Project established to investigate the impacts of aging on PWR vessel internal components. The results of this project provide additional bases for the inspections and evaluations performed under this program.

A.1.41 THERMAL AGING EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS) PROGRAM

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program inspects Reactor Coolant System components in accordance with the ASME Boiler and Pressure Vessel

Code, Section XI. The ASME Section XI inspection is augmented to detect the effects of loss of fracture toughness due to thermal aging embrittlement of cast austenitic stainless steel components. This program includes a determination of the susceptibility of the subject cast austenitic stainless steel components to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. For potentially susceptible components, aging management is accomplished utilizing additional inspections or a component-specific flaw tolerance evaluation. Additional inspections or evaluations are not required for components that are determined not to be susceptible to thermal aging embrittlement. Screening for susceptibility to thermal aging embrittlement is not required for pump casings and valve bodies. The existing ASME Section XI inspection requirements, including the alternative requirements of ASME Code Case N-481 *Alternate Examination Requirements for Cast Austenitic Pump Casings*, [Reference A.1-30], are adequate for all pump casings and valve bodies.

In addition, cast austenitic stainless steel components that are not part of the reactor coolant pressure boundary, but that have service conditions above 250° C (> 482° F), are included in this program. These components will be inspected, evaluated, or replaced as appropriate if screening determines they are susceptible to thermal aging embrittlement. The screening exclusion (pump casings and valve bodies) is not applicable to these components.

A.1.42 WATER CHEMISTRY PROGRAM

The main objective of the Primary and Secondary Water Chemistry Program is to mitigate damage caused by corrosion and stress corrosion cracking. The Water Chemistry Program relies on monitoring and control of water chemistry based on EPRI TR-105714, Rev. 5 (TR-1002884), *PWR Primary Water Chemistry Guidelines* [Reference A.1-31], and EPRI TR-102134, Rev. 6 (TR-1008224), *PWR Secondary Water Chemistry Guidelines* [Reference A.1-32].

The One-Time Inspection Program (XI.M32) will be used to verify the effectiveness of the Water Chemistry Program for the circumstances identified in NUREG-1801 that require augmentation of the Water Chemistry Program.

A.1.43 APPENDIX A.1 REFERENCES

A.1-1 Regulatory Guide 1.163, *Performance-Based Containment Leak-Testing Program,* September 1995.

A.1-2 NEI 94-01, *Industry Guidance for Implementing Performance-Based Options of 10 CFR Part 50 Appendix J,* Rev. 0.

A.1-3 WCAP 14572, Rev. 1-NP-A, Addenda 1, *Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report.*

A.1-4 NRC letter dated 4/9/04, *Beaver Valley Power Station, Unit Nos. 1 and 2 (BVPS-1 and 2) - Risk-Informed Inservice Inspection (RI-ISI) Program.*

A.1-5 ASME Code Case N-491, *Alternate Rules for Examination of Class 1, 2, 3, and MC Component Supports of Light-Water Cooled Power Plants,* March 28, 2000.

A.1-6 NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,* October 17, 1991.

A.1-7 EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants,* May 5, 1988.

A.1-8 EPRI TR-104213, *Bolted Joint Maintenance & Application Guide,* December 1, 1995.

A.1-9 NRC Generic Letter 88-05, *Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants,* March 17, 1988.

A.1-10 EPRI 1007820 (EPRI TR-107396, Rev. 1), *Closed Cooling Water Chemistry Guideline*, Rev. 1.

A.1-11 National Fire Protection Association NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems,* 2002 Edition.

A.1-12 NSAC-202L-R2, *Recommendations for an Effective Flow Accelerated Corrosion Program,* April 1999.

A.1-13 NRC IE Bulletin 88-09, *Thimble Tube Thinning in Westinghouse Reactors,* July 26, 1988.

A.1-14 NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants,* July 1980.

A.1-15 NRC IE Bulletin 80-11, *Masonry Wall Design,* May 8, 1980.

A.1-16 NRC Information Notice 87-67, *Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11,* December 31, 1987.

A.1-17 NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves for Selected Nuclear Power Plant Components,* February 28, 1995.

A.1-18 EPRI Technical Report MRP-47, *Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application,* September 1, 2005.

A.1-19 NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels,* February 1998.

A.1-20 NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels,* April 1999.

A.1-21 NRC Order EA 03-009, *Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors,* February 11, 2003.

A.1-22 NRC First Revised Order EA-03-009, *Issuance of Revised Order EA-09-003 Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors,* February 11, 2004.

A.1-23 NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Equipment,* including Supplement 1, July 18, 1989.

A.1-24 Regulatory Guide 1.65, *Materials and Inspections for Reactor Vessel Closure Studs,* October 1973.

A.1-25 ASTM Standard E 185-82, *Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels,* June 2002.

A.1-26 Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence*, March 2001.

A.1-27 NEI 97-06, *Steam Generator Program Guidelines,* Rev. 2, May 2005.

A.1-28 NUMARC 93-01, *Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,* Rev. 3, October 8, 1999.

A.1-29 Regulatory Guide 1.160, *Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,* Rev. 2, March 1997.

A.1-30 ASME Code Case N-481, *Alternate Examination Requirements for Cast Austenitic Pump Casings,* May 20, 1998.

A.1-31 EPRI TR-105714, Rev. 5 (TR-1002884), *PWR Primary Water Chemistry Guidelines*

A.1-32 EPRI TR-102134, Rev. 6 (TR-1008224), *PWR Secondary Water Chemistry Guidelines*

A.2 EVALUATION SUMMARIES OF UNIT 1 TIME-LIMITED AGING ANALYSES

A.2.1 INTRODUCTION

Time-limited aging analyses (TLAAs) are defined in 10 CFR 54.3 [Reference A.2-3] as:

> *Time-limited aging analyses, for the purposes of this part, are those licensee calculations and analyses that:*
>
> 1. *Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);*
> 2. *Consider the effects of aging;*
> 3. *Involve time-limited assumptions defined by the current operating term, for example, 40 years;*
> 4. *Were determined to be relevant by the licensee in making a safety determination;*
> 5. *Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and*
> 6. *Are contained or incorporated by reference in the CLB.*

Once identified, TLAAs must be evaluated and dispositioned as described in the following section of 10 CFR 54:

> §54.21 *Contents of application -- technical information.*
>
> *(c) An evaluation of time-limited aging analyses.*
>
> 1. *A list of time-limited aging analyses, as defined in §54.3, must be provided. The applicant shall demonstrate that —*
>   - *(i). The analyses remain valid for the period of extended operation;*
>   - *(ii). The analyses have been projected to the end of the period of extended operation; or*
>   - *(iii). The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.*

This chapter provides a summary of the TLAAs identified in the BVPS License Renewal Application, and includes the following topics:

- Reactor Vessel Neutron Embrittlement (Section A.2.2)

- Metal Fatigue (Section A.2.3)
- Environmental Qualification (EQ) of Electric Equipment (Section A.2.4)
- Containment Liner Plate, Metal Containment, and Penetrations Fatigue (Section A.2.5)
- Other Plant-Specific Time-Limited Aging Analyses (Section A.2.6)
- Appendix A.2 References (Section A.2.7)

A.2.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Analyses that address the effects of neutron irradiation embrittlement of the Reactor Vessels and were identified as TLAAs are summarized in the following sections:

- Neutron Fluence Values (Section A.2.2.1)
- Pressurized Thermal Shock (Section A.2.2.2)
- Charpy Upper Shelf Energy (Section A.2.2.3)
- Pressure-Temperature Limits (Section A.2.2.4)

A.2.2.1 Neutron Fluence Values

Loss of fracture toughness is an aging effect caused by the neutron embrittlement aging mechanism that results from prolonged exposure to neutron radiation. This process results in increased tensile strength and hardness of the material with reduced toughness. The rate of neutron exposure is defined as neutron flux, and the cumulative degree of exposure over time is defined as neutron fluence. As neutron embrittlement progresses, the toughness/temperature curve shifts down (lower fracture toughness), and the curve shifts to the right (brittle/ductile transition temperature increases).

In the spring of 2000, Surveillance Capsule Y was pulled and the analysis was documented in WCAP-15571, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program* [Reference A.2-4]. For license renewal, WCAP-15571 Supplement 1, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program* [Reference A.2-5], documents the end-of-license-extended (EOLE) analysis for neutron fluence values.

The fluence values were projected using ENDF/B-VI cross sections, are based on the results of the Capsule Y analysis, and comply with Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence* [Reference A.2-6].

The fluence projections include fuel cycle-specific calculated neutron exposures at the end of Cycle 17 (February 2006), as well as future projections to the end of Cycle 18 (September 2007) and for several intervals extending to 54 effective full power years (EFPY). The calculations account for a core power uprate from 2689 megawatts-thermal (MWt) to 2900 MWt at the onset of Cycle 18. Neutron exposure projections beyond the end of Cycle 17 were based on the spatial power distributions and associated plant characteristics of Cycle 18 in conjunction with the uprated power level.

A.2.2.2 Pressurized Thermal Shock

In the spring of 2000, Surveillance Capsule Y was pulled and the analysis was documented in WCAP-15571 [Reference A.2-4]. For license renewal, WCAP-15571 Supplement 1 [Reference A.2-5] documents the EOLE analysis for pressurized thermal shock (PTS).

Using the prescribed PTS Rule (10 CFR 50.61 [Reference A.2-7]) methodology, reference temperature for pressurized thermal shock (RT_{PTS}) values were generated for beltline and extended beltline region materials of the BVPS Unit 1 Reactor Vessel for fluence values at EOLE (54 EFPY). The projected RT_{PTS} values for EOLE (54 EFPY) meet the 10 CFR 50.61 screening criteria for beltline and extended beltline materials, with the exception of lower shell plate B6903-1 (heat C6317-1), which slightly exceeds the criteria with a RT_{PTS} of 275.7°F. The screening limit of 270°F for lower shell plate B6903-1 will be reached at a fluence level of 4.961E+19 n/cm^2 (E>1.0 MeV), which is equivalent to 43.87 EFPY. The Unit 1 Reactor Vessel is projected to reach the PTS screening criterion of 270°F on the limiting plate (B6903-1) in the year 2033.

10 CFR 50.61 [Reference A.2-7] allows that:

> *For each pressurized water nuclear power reactor for which the value of RT_{PTS} for any material in the beltline is projected to exceed the PTS screening criterion using the EOL fluence, the licensee shall implement those flux reduction programs that are reasonably practicable to avoid exceeding the PTS screening criterion set forth in paragraph (b)(2) of this section.*

Therefore, a sensitivity assessment of available flux reduction measures was completed. The sensitivity assessment included several fuel management scenarios (such as low leakage core design, low power peripheral fuel assemblies, reinsertion of hafnium rods, and the use of part length shielded assemblies) and several assumed capacity factors up to 98 percent. Several flux reduction options are available which would maintain the limiting plate below the PTS screening criterion to the EOLE. The flux reduction program will be managed under the Reactor Vessel Integrity Program. Documentation of a flux reduction program for Unit 1 will be submitted in accordance with the requirements of 10 CFR 50.61.

The Unit 1 Reactor Vessel fluence will continue to be monitored as part of the Reactor Vessel Integrity Program to ensure the projected fluence remains below that assumed for the relevant neutron embrittlement TLAA. Therefore, the Unit 1 RT_{PTS} TLAA will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2.3 Charpy Upper Shelf Energy

In the spring of 2000, Surveillance Capsule Y was pulled and the analysis was documented in WCAP-15571 [Reference A.2-4]. For license renewal, WCAP-15571 Supplement 1 [Reference A.2-5] documents the EOLE analysis for Charpy upper-shelf energy (C_VUSE).

For Unit 1, there exists material surveillance data for Reactor Vessel lower shell plate B6903-1 (heat C6317-1) and the intermediate shell longitudinal weld (heat 305424). The measured drops in C_VUSE for each of these material heats was plotted on Figure 2 of Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials* [Reference A.2-8], with a horizontal line drawn parallel to the existing lines as the upper bound of all data. Regulatory Guide 1.99, Figures 1 and 2, were used in the determination of the percent decrease in C_VUSE for the beltline and extended beltline materials.

The beltline and extended beltline material C_VUSE values were determined to maintain 50 ft-lb or greater at 54 EFPY. Therefore, the Unit 1 C_VUSE analysis has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.2.4 Pressure-Temperature Limits

BVPS pressure-temperature (P-T) limit curves are operating limits, conditions of the operating license, and are included in the Pressure and Temperature Limits Report, as required by Technical Specifications. They are valid up to a stated vessel fluence limit, and must be revised prior to operating beyond that limit. The provisions of 10 CFR 50, Appendix G [Reference A.2-7], require BVPS to operate within the currently licensed P-T limit curves. These curves are required to be maintained and updated as necessary to maintain plant operation consistent with 10 CFR 50. The Reactor Vessel Integrity Program will maintain the P-T limit curves for Unit 1 for the period of extended operation. Therefore, the Unit 1 P-T limit curves TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

At BVPS, the Low-Temperature Overpressure Protection System is known as the Overpressure Protection System (OPPS). As part of any update, the OPPS setpoints (OPPS enable temperature and power-operated relief valve setpoints) for both units are reviewed and updated as required based on the updated P-T limit curves.

A.2.3 METAL FATIGUE

The analysis of metal fatigue is a TLAA for Class 1 and selected non-Class 1 mechanical components within the scope of license renewal. The following sections summarize the analyses associated with metal fatigue of fluid systems:

- Class 1 Fatigue Evaluations (Section A.2.3.1)
- Non-Class 1 Fatigue Evaluations (Section A.2.3.2)
- Generic Industry Issues on Fatigue (Section A.2.3.3)

A.2.3.1 Class 1 Fatigue Evaluations

The design of BVPS Class 1 components incorporates the requirements of Section III of the ASME Code, which requires a discrete analysis of the thermal and dynamic stress cycles on components that make up the reactor coolant pressure boundary. The fatigue analyses rely on the definition of design basis transients that envelope the expected cyclic service and the calculation of a cumulative usage factor (CUF). In accordance with ASME Section III, Subsection NB, the cumulative usage factor shall not exceed 1.0. The required analysis was performed for BVPS, and incorporated a set of design basis transients based on the original 40-year operating life of the plant. These ASME Section III, Class 1 fatigue evaluations are contained in the specific piping and component analyses and stress reports and, because they are based on a number of design cycles assumed for the life of the plant, these evaluations are TLAAs.

The BVPS original design basis transients including design cycles for the RCS are identified in Table 4.1-10 of the UFSAR. BVPS reviewed the design cycles against 60-year projected operational cycles and determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the design fatigue analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluations. Therefore, Class 1 components and piping fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

A.2.3.1.1 Unit 1 Pressurizer

In 1999, the analysis of the Unit 1 pressurizer, lower shell and related components was revised to address improvements to the insurge/outsurge transients identified by the Westinghouse Owners Group. Plant operating procedures were revised to follow the guidance of the Westinghouse Owners Group and to minimize the impact of potential insurges. Prior to the 1999 reanalysis, BVPS Unit 1 had experienced several pressurizer spray transients that challenged the analytical and Technical Specification limit of 320°F difference between the spray line temperature and the pressurizer steam space temperature. Revised transients for initial spray flow were incorporated into the analysis. In 2005, BVPS decided to further revise the operating procedures to optimize the plant shutdown and startup processes. The BVPS Optimized procedures have been shown to meet all recommendations of the Westinghouse Owners Group and have virtually eliminated the potential for insurges. Next, the Extended Power Uprate Project evaluated the revised Uprate transients against the previous analysis. The cumulative usage factors associated with the Unit 1 pressurizer are less than 1.0. Since the 60-year projected operational cycles were used in determining that the pressurizer design fatigue analysis remains valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluation. In addition, the pressurizer insurge cycle assumptions used in the pressurizer analysis require validation for the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program identifies the pressurizer insurge transient as a supplemental transient that requires monitoring. Therefore, the pressurizer fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3.2 Non-Class 1 Fatigue Evaluations

A.2.3.2.1 Piping and In-Line Components

The design code for non-Class 1 piping and in-line components (e.g., fittings and valves) within the scope of license renewal is ANSI B31.1 or ASME III Subsections NC and ND. These codes specify evaluation of cyclic secondary stresses (i.e., stresses due to thermal expansion and anchor movements) by applying stress range reduction factors against the allowable stress range (S_A).

For all those non-Class 1 components identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted by BVPS to determine the approximate frequency of any significant thermal cycling. If the number of equivalent full temperature cycles is below the limit used for the current design, the component is suitable for extended operation. If the number of equivalent full temperature cycles exceeds the limit, evaluation of the individual stress calculations will be required.

BVPS evaluated the validity of this assumption for 60 years of plant operation. The results of this evaluation indicate that the thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, these piping fatigue analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.3.3 Generic Industry Issues on Fatigue

This section addresses the BVPS fatigue TLAAs associated with NRC Bulletins 88-08 and 88-11. In addition, this section addresses the effects of the primary coolant environment on fatigue life.

A.2.3.3.1 Pressurizer Surge Line Thermal Stratification (NRC Bulletin 88-11)

NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification* [Reference A.2-9], required a plant-specific or generic analysis demonstrating that the pressurizer surge line meets the applicable design code requirements considering the effects of thermal stratification.

In response to the Bulletin, BVPS submitted a plant-specific analysis, WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line* [Reference A.2-10], to the NRC. The NRC approved [Reference A.2-11] this evaluation. WCAP-12727 determined the effects of thermal stratification in the surge line through the imposition of defined thermal stratification cycles upon the stress and fatigue evaluations. The stratification cycles incorporated into the cumulative usage factor determination are defined by the 200 heatup and cooldown design transients. Therefore, this NRC Bulletin 88-11 analysis is a TLAA in accordance with 10 CFR 54.3.

WCAP-12727 was reviewed for impact due to extended power uprate. A detailed analysis was performed at the controlling location (reactor coolant loop nozzle) to account for temperature effects due to the power uprate. A new cumulative usage factor was calculated and demonstrated to remain less than the Code allowable limit of 1.0.

The 200 heatup and cooldown transients were determined to remain bounding for the period of extended operation. Therefore, the Unit 1 pressurizer surge line fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A.2.3.3.2 Effects of Primary Coolant Environment on Fatigue Life

Test data indicate that certain environmental conditions (such as temperature, oxygen content, and strain rate) in the primary systems of light water reactors could result in greater susceptibility to fatigue than would be predicted by fatigue analyses based on the ASME Section III design fatigue curves. One NRC study, documented in NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components* [Reference A.2-12], applied the fatigue design curves that incorporated environmental effects to several plant designs. The results of studies performed on this topic, including NUREG/CR-6260, were summarized in Generic Safety Issue (GSI)-190, *Fatigue*

Evaluation of Metal Components for 60-Year Plant Life [Reference A.2-13]. In closing GSI-190, regarding the effects of a reactor water environment on fatigue life, the NRC concluded that licensees should address the effects of the coolant environment on component fatigue life as aging management programs are formulated in support of license renewal.

The Unit 1 reactor coolant pressure boundary piping is designed to B31.1, and is therefore classified as an older-vintage Westinghouse plant.

Section 5.5 of NUREG/CR-6260 identified the following component locations as representative for environmental effects for older-vintage Westinghouse plants. These locations and the subsequent calculations are directly relevant to Unit 1, and include the:

- Reactor vessel shell and lower head (shell-to-head transition);
- Reactor vessel inlet and outlet nozzles;
- Pressurizer surge line (hot leg nozzle safe end);
- RCS piping charging system nozzle;
- RCS piping safety injection nozzle; and,
- RHR system tee.

The NUREG/CR-6260 locations were evaluated using the guidance of NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels* [Reference A.2-14], and NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels* [Reference A.2-15]. These reports describe the use of a fatigue life correction factor (F_{en}) to express the effects of the reactor coolant environment upon the material fatigue life. The expression for F_{en} was determined through experimental and statistical data. F_{en} for carbon and low alloy steel is a function of fluid service temperature, material sulfur content, fluid dissolved oxygen, and strain rate. For austenitic stainless steel, F_{en} is a function of fluid service temperature, fluid dissolved oxygen, and strain rate. The cumulative usage factor which includes environmental effects (U_{env}) is determined from the existing 60-year cumulative usage factor (U_{60}) through the use of the fatigue life correction factor:

$$U_{env} = U_{60} * F_{en}$$

To demonstrate acceptable fatigue life including environmental effects, the cumulative usage factor, which includes environmental effects, should remain less than design code allowables (i.e., $U_{env} \leq 1.0$). Therefore, F_{en} was applied to the cumulative usage factors at the NUREG/CR-6260 locations and compared to the design code allowable limit.

At two locations (pressurizer surge line and charging system nozzle), U_{env} exceeded the design code allowable limit of 1.0. For these locations, BVPS will implement one or more of the following as required by the Metal Fatigue of Reactor Coolant Pressure Boundary Program:

1. Further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0;
2. Management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC); or,
3. Repair or replacement of the affected locations.

Should BVPS select the option to manage environmentally-assisted fatigue during the period of extended operation, details of the aging management program, such as scope, qualification, method, and frequency, will be submitted to the NRC prior to the period of extended operation. Therefore, the pressurizer surge line and charging system nozzle TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

The cumulative usage factors including environmental fatigue at the other locations (reactor vessel shell and lower head, reactor vessel inlet and outlet nozzles, safety injection nozzle and RHR system tee) have been demonstrated to remain less than the design code allowable limit of 1.0 for the period of extended operation. Therefore, the fatigue TLAAs associated with these locations have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A.2.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

The BVPS existing Environmental Qualification (EQ) of Electric Components Program manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, environmental qualification components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. The Environmental Qualification of Electric Components Program ensures that these environmental qualification components are maintained in accordance with their qualification bases. Aging evaluations for environmental qualification components that specify a qualification of at least 40 years are time-limited aging analyses for license renewal.

The Environmental Qualification (EQ) of Electric Components Program is an existing program established to meet BVPS commitments for 10 CFR 50.49. Continued implementation of the Environmental Qualification (EQ) of Electrical Components Program provides reasonable assurance that the aging effects will be managed and that the in-scope EQ components will continue to perform their intended function(s) for the period of extended operation. The effects of aging will be managed by the program in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

A.2.5 CONTAINMENT LINER PLATE, METAL CONTAINMENT, AND PENETRATIONS FATIGUE

Several potential TLAA associated with the Containment structure were identified and are summarized in the following sections:

- Containment Liner Fatigue (Section A.2.5.1)
- Containment Liner Corrosion Allowance (Section A.2.5.2)
- Containment Liner Penetration Fatigue (Section A.2.5.3)

A.2.5.1 Containment Liner Fatigue

The Unit 1 Containment liner stress analysis determines a fatigue usage factor based on specific design cyclic loads in accordance with paragraph N-415.2 of the 1968 Edition of ASME Section III. These design loads include 1000 cycles of pressure variation due to normal operations (startup and shutdown), 4000 cycles of temperature variation due to normal operations (startup and shutdown), and 20 cycles of design basis earthquake. The usage factor for the liner was determined to be significantly less than 1.0. The anticipated occurrences of these cycles are described in Table 5.2-13 of the Unit 1 UFSAR as follows:

- 150 cycles of loading due to the differential pressure between operating and atmospheric pressure are anticipated on the basis of 2.5 refueling cycles per year on a 60-year span;
- 600 cycles of loading due to thermal expansion resulting when the liner is exposed to the differential temperature between operating and seasonal refueling temperatures are anticipated on the basis of 10 such variations per year on a 60-year span; and,
- 150 cycles of operating basis earthquake, which is an assumed number of cycles of this type of earthquake for a 60-year span.

As shown above, the design cycles of the Unit 1 Containment liner bound the anticipated pressure and temperature cycles expected through the period of extended operation. The expected stresses resulting from the 60-year anticipated operating basis earthquake cycles were determined to be bounded by those due to the analyzed design basis earthquake cycles. Therefore, the Unit 1 Containment liner fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.5.2 Containment Liner Corrosion Allowance

The Reactor Containment Building has a continuously welded carbon steel liner which acts as a leak-tight membrane. The cylindrical portion of the liner is 3/8-inch thick, the hemispherical dome is 1/2-inch thick, and the flat floor liner covering the concrete mat is 1/4-inch thick. The floor liner plate is covered with approximately two feet of reinforced concrete. All welded seams were originally covered with continuously welded leak test channels that were installed to facilitate leak testing of welds during liner erection. Since initial construction, several test channels have been removed. Also, test channels were not installed on liner plate seams associated with the Unit 1 Steam Generator Replacement Project construction opening. Channels in the hemispherical dome and Containment mat are covered with concrete while those on the cylindrical liner wall are exposed. Test ports that were provided for leak testing were sealed with vent plugs after the completion of the testing. These plugs were to remain in place during subsequent Type-A leak rate testing.

During a Unit 1 shutdown in 1991, it was determined that 27 vent plugs in the Containment floor liner test channels were missing. The missing test channel vent plugs allowed moisture and condensation inside the test channels, leading to minor corrosion of the liner. BVPS evaluated the test channels to determine the impact to the Containment liner, and submitted the results of the evaluations to the NRC as Amendments 165 and 47, Unit 1 and Unit 2 respectively, to the operating licenses. These amendments were approved by the NRC and documented in an SER [Reference A.2-16]. After further evaluation, it was concluded that these initial evaluations contained some nonconservative assumptions with regard to the corrosion rates in the test channels. BVPS took corrective action to arrest the corrosion rate in the affected test channels, including inerting and sealing the test channels. The further evaluation and corrective actions are documented in a 1992 Letter to the NRC [Reference A.2-17]. These corrosion rate analyses meet the 10 CFR 54.3 requirements as TLAAs and must be evaluated for the period of extended operation.

The minimum required thickness for the Containment liner has been determined for the various portions of the liner. The limiting liner portion is the liner floor plate, which has a fabrication thickness of 0.25 inches and a minimum required thickness of 0.125 inches. Thus, the corrosion allowance is 0.125 inches (125 mils). The inerting and sealing of the test channels significantly reduced the theoretical corrosion rates in the channels. The total estimated penetration due to corrosion of the inerted channel was estimated at 69.2 mils for 43 years of plant operation. The maximum expected corrosion rate for the carbon steel liner in this low oxygen environment was determined to be 0.39 mils per year. Therefore, projecting the expected corrosion penetration with the maximum expected corrosion rate to the end of the period of extended operation results in an additional 7.8 mils of corrosion. Adding this to the previous expected corrosion penetration depths yields 77.0 mils of corrosion penetration. This result is well within the corrosion allowance of 125 mils.

Therefore, the Unit 1 Containment liner corrosion analysis has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.5.3 Containment Liner Penetration Fatigue

A.2.5.3.1 Equipment Hatch

The equipment hatch and integral emergency airlock are designed and analyzed in accordance with ASME Section III, Division 1, Subsection NE (Class MC). Subsection NE states that any portions not satisfying the fatigue exemption as described in Subsection NB-3222(d) require further fatigue evaluation. Therefore, a fatigue exemption was completed for the Unit 1 equipment hatch in accordance with Subsection NB-3222(d). This exemption was based on assumed cycles for a 40-year life, namely 10 pressurization events due to LOCA, and 80 cycles of startup and shutdown. It is highly unlikely that Unit 1 will reach 10 pressurization events due to LOCA for 60 years of operation. The assumption of 80 cycles of startup and shutdown is not bounding for 60 years of operation. A reanalysis was performed using 240 startup and shutdown cycles that bounds the number of projected cycles for the period of extended operation. Therefore, the equipment hatch fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.5.3.2 Fuel Transfer Tube

The fuel transfer tube pipe was analyzed to ASME Section III, Division 1, Subsection NC. The analysis for the fuel transfer tube pipe uses a stress range reduction factor of 1.0 (<7,000 cycles). However, as the fuel transfer tube pipe experiences operational cycles only during refueling, the fuel transfer tube pipe experiences essentially no thermal cycles. The existing fuel transfer tube pipe fatigue TLAA remains valid through the period of extended operation. Therefore, the Unit 1 fuel transfer tube pipe fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

The fuel transfer tube bellows were analyzed to ASME Section III, Division 1, Subsection NC. The bellows stress analyses determined acceptability based on the bellows experiencing displacements due to a design basis earthquake. The assumed design cycles were 600. This number of design basis earthquake cycles is highly unlikely to occur during the period of extended operation. The fuel transfer tube bellows fatigue TLAAs remain valid through the period of extended operation. Therefore, the fuel transfer tube bellows fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A.2.5.3.3 Containment Penetration Bellows

The bellows (metal expansion joints) are part of the system evaluation boundary of the River Water System and are located at the discharge piping connections from the recirculation spray heat exchangers inside Containment. The piping and in-line components of the River Water System are designed and analyzed to the 1967 Edition of B31.1. This code specifies evaluation of cyclic secondary stresses (i.e., stresses due to thermal expansion and anchor movements) by applying stress range reduction factors against the allowable stress range (SA).

For those non-Class 1 components identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted to determine the approximate frequency of significant thermal cycling. If the number of equivalent full-temperature cycles is below the limit used for the current design (7,000 cycles in this case), the component is suitable for extended operation. If the number of equivalent full-temperature cycles exceeds the limit, evaluation of the individual stress calculations will be required.

BVPS evaluated the validity of this assumption for 60 years of plant operation. The Recirculation Spray System is normally in standby operation, and, including any periodic testing, will experience significantly less than the full-temperature cycle limit of 7,000 cycles for the period of extended operation. Therefore, the Recirculation Spray System fatigue analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.6 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

The plant-specific TLAAs summarized in this section include:

- Piping Subsurface Indications (Section A.2.6.1)
- Reactor Vessel Underclad Cracking (Section A.2.6.2)
- Leak Before Break (Section A.2.6.3)
- Crane Load Cycles (Section A.2.6.4)

A.2.6.1 Piping Subsurface Indications

During a Unit 1 inservice inspection performed in the Cycle 11 Refueling Outage (March - May, 1996), an indication was identified on the RCS loop C cold leg between an elbow and a section of straight pipe which exceeded the ASME Code, Section XI, subsection IWB-3500 acceptance criteria. This section of pipe is Class 1 cast austenitic stainless steel (CASS) piping. Subsequently, an analysis was performed to ensure that this indication would remain within ASME Code, Section XI, Appendix C evaluation acceptance standards. This evaluation, approved by the NRC [Reference A.2-18], concluded that the postulated flaw met the applicable requirements with significant margins of safety to the end of the service lifetime. This flaw growth evaluation is a TLAA because it contained two parameters that are based on the service life of the piping, namely thermal aging and fatigue transient cycles.

Thermal aging in CASS will continue until the saturation, or fully-aged, point is reached. The limiting fracture toughness properties were those of the straight pipe, which has a relatively high ferrite content. Therefore, the fully aged (saturated) fracture toughness properties of the straight pipe were used in the analysis. Since the analysis relies on fully aged stainless steel material properties, the analysis does not have a material property time-dependency that requires further evaluation for license renewal.

The flaw evaluation includes the postulation of an initial flaw and the growth of that flaw based on imposed loading transients. The cycle assumptions used in the analysis are conservative compared to the BVPS original design transients. The BVPS original design basis transients including design cycles are identified in Table 4.1-10 of the UFSAR. BVPS has reviewed the design cycles against 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the flaw growth analysis remains valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluation. Therefore, the Unit 1 flaw growth TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

A.2.6.2 Reactor Vessel Underclad Cracking

WCAP-15338-A, *A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants* [Reference A.2-20], evaluates the impact of cracks beneath austenitic stainless steel weld cladding on reactor pressure vessel integrity for 60 years of operation.

The Unit 1 Reactor Vessel does not contain SA 508, Class 2 forgings in the beltline regions. Only the vessel and closure head flanges and the inlet and outlet nozzles are fabricated from SA 508, Class 2 forgings. The evaluation contained in WCAP-15338-A has been used to demonstrate that fatigue growth of the subject flaws will be minimal over 60 years and the presence of the underclad cracks are of no concern relative to the structural integrity of the Reactor Vessel.

The cycle assumptions used in the flaw growth analysis are conservative compared to the BVPS original design transients. The BVPS original design basis transients including design cycles are identified in Table 4.1-10 of the UFSAR. BVPS has reviewed the design cycles against 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the flaw growth analysis remains valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluation. Therefore, the Unit 1 flaw growth TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

A.2.6.3 Leak Before Break

Leak before break (LBB) analyses evaluate postulated flaw growth in piping to alter the structural design basis. BVPS has determined that the fatigue crack growth analysis is a TLAA that requires disposition for license renewal.

For the LBB analyses discussed in the following two subsections, the only consideration that could be influenced by time is the accumulation of actual fatigue transient cycles. The cycle assumptions used in the analyses are conservative compared to the BVPS original design transients. The BVPS original design basis transients including design cycles are identified in Table 4.1-10 of the UFSAR. BVPS has reviewed the design cycles against 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the flaw growth analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluations. Therefore, the Unit 1 flaw growth TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

A.2.6.3.1 Main Coolant Loop Piping Leak Before Break

The current LBB evaluation for the main coolant loop piping is documented in WCAP-11317, *Technical Justification for Eliminating Large Primary Loop Pipe*

Rupture as the Structural Design Basis for Beaver Valley Unit 1 [Reference A.2-21]. This evaluation (including Supplements 1 and 2) was approved by the NRC in a Safety Evaluation Report [Reference A.2-22] in 1987.

A.2.6.3.2 Pressurizer Surge Line Piping Leak Before Break

The current LBB evaluation for the pressurizer surge line piping is documented in WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line* [Reference A.2-23]. This evaluation was approved by the NRC in a Safety Evaluation Report [Reference A.2-24] in 1991.

A.2.6.4 Crane Load Cycles

In the response to NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants* [Reference A.2-26], BVPS determined that two cranes, the fuel cask crane (CR-15), and the moveable platform and hoists (CR-27), were designed to comply with Crane Manufacturers Association of America Specification #70 (CMAA-70), *Specifications for Electric Overhead Traveling Cranes* [Reference A.2-27]. Therefore, these cranes have a TLAA associated with their design calculations.

These cranes may conservatively be classified as Service Class A cranes. The total load cycles and mean effective load factors for the cranes have been estimated for the period of extended operation. Even using conservative estimates, total load cycles are well below 20,000, and mean effective load factors are maintained within or below the Service Class A bounds (0.35 - 0.53) for 60 years. Therefore, crane allowable stress ranges as defined in CMAA-70 will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.7 APPENDIX A.2 REFERENCES

A.2-1 [BVPS License Renewal Application – later].

A.2-2 [NRC SER for BVPS License Renewal – later].

A.2-3 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants.*

A.2-4 WCAP-15571, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program*, Rev. 0.

A.2-5 WCAP-15571 Supplement 1, *Analysis of Capsule Y from First Energy Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program*, June 2007.

A.2-6 Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence*, March 2001.

A.2-7 10 CFR 50, *Domestic Licensing of Production and Utilization Facilities.*

A.2-8 Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials*, Rev. 2.

A.2-9 NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification*, December 20, 1988.

A.2-10 WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line*, Rev. 0.

A.2-11 De Agazio, Albert W. (NRC), Letter to John D. Sieber (BVPS), *Approval of Leak-Before-Break Analysis (TAC No. 72110)*, May 2, 1991.

A.2-12 NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components*, February 1995.

A.2-13 Generic Safety Issue (GSI)-190, *Fatigue Evaluation of Metal Components for 60-Year Plant Life*, Rev. 2.

A.2-14 NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels*, February 1998.

A.2-15 NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels*, March 1999.

A.2-16 De Agazio, Albert W. (NRC), Letter to J. D. Sieber (BVPS), *Beaver Valley Units 1 And 2 - Issuance of Amendments 165 and 47: Containment Structural Integrity - Change Request Nos. 181/45*, June 23, 1992.

A.2-17 Sieber, J. D. (BVPS), Letter to NRC, *Beaver Valley Power Station, Unit No. 1 and No. 2, BV-1 Docket No. 50-334, License No. DPR-66, BV-2 Docket No. 50-412, License No. NPF-73, Revision to SER for Amendments 165 and 47*, December 30, 1992.

A.2-18 Brinkman, Donald S. (NRC), Letter to J.E. Cross (BVPS), *Evaluation of Flaw Indication in Reactor Coolant System (RCS) Cold Leg Pipe Weld, Beaver Valley Power Station, Unit No. 1 (BVPS-1)*, May 1, 1996.

A.2-19 WCAP-7733, *Reactor Vessels Weld Cladding - Base Metal Interaction*, July 1971.

A.2-20 WCAP-15338-A, *A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants*, October 2002.

A.2-21 WCAP-11317, *Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Beaver Valley Unit 1*, March 1987 (including Supplements 1 and 2).

A.2-22 Tam, Peter S. (NRC), Letter to J.D. Sieber (BVPS), *Beaver Valley Unit 1 - Removal of Large-Bore Snubbers from Primary Coolant Loops*, December 9, 1987.

A.2-23 WCAP-12727, *Evaluation of Thermal Stratification for the Beaver Valley Unit 1 Pressurizer Surge Line*, Rev. 0.

A.2-24 De Agazio, Albert W. (NRC), Letter to J. D. Sieber (BVPS), *Approval of Leak-Before-Break Analysis*, May 2, 1991.

A.2-25 Regulatory Guide 1.46, *Protection Against Pipe Whip Inside Containment*, May 1973.

A.2-26 NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants*, July 1980.

A.2-27 Crane Manufacturers Association of America Specification #70 (CMAA-70), *Specifications for Electric Overhead Traveling Cranes*, Revised 1983.

A.3 EVALUATION SUMMARIES OF UNIT 2 TIME-LIMITED AGING ANALYSES

A.3.1 INTRODUCTION

Time-limited aging analyses (TLAAs) are defined in 10 CFR 54.3 [Reference A.3-3] as:

Time-limited aging analyses, for the purposes of this part, are those licensee calculations and analyses that:

1. *Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);*
2. *Consider the effects of aging;*
3. *Involve time-limited assumptions defined by the current operating term, for example, 40 years;*
4. *Were determined to be relevant by the licensee in making a safety determination;*
5. *Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and*
6. *Are contained or incorporated by reference in the CLB.*

Once identified, TLAAs must be evaluated and dispositioned as described in the following section of 10 CFR 54:

§54.21 *Contents of application -- technical information.*

(c) An evaluation of time-limited aging analyses.

1. *A list of time-limited aging analyses, as defined in §54.3, must be provided. The applicant shall demonstrate that —*
   - *(i). The analyses remain valid for the period of extended operation;*
   - *(ii). The analyses have been projected to the end of the period of extended operation; or*
   - *(iii). The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.*

This chapter provides a summary of the TLAAs identified in the BVPS License Renewal Application, and includes the following topics:

- Reactor Vessel Neutron Embrittlement (Section A.3.2)

- Metal Fatigue (Section A.3.3)
- Environmental Qualification (EQ) of Electric Equipment (Section A.3.4)
- Containment Liner Plate, Metal Containment, and Penetrations Fatigue (Section A.3.5)
- Other Plant-Specific Time-Limited Aging Analyses (Section A.3.6)
- Appendix A.3 References (Section A.3.7)

A.3.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Four analyses that address the effects of neutron irradiation embrittlement of the Reactor Vessel have been identified as TLAAs. These analyses are summarized in the following sections:

- Neutron Fluence Values (Section A.3.2.1)
- Pressurized Thermal Shock (Section A.3.2.2)
- Charpy Upper Shelf Energy (Section A.3.2.3)
- Pressure-Temperature Limits (Section A.3.2.4)

A.3.2.1 Neutron Fluence Values

Loss of fracture toughness is an aging effect caused by the neutron embrittlement aging mechanism that results from prolonged exposure to neutron radiation. This process results in increased tensile strength and hardness of the material with reduced toughness. The rate of neutron exposure is defined as neutron flux, and the cumulative degree of exposure over time is defined as neutron fluence. As neutron embrittlement progresses, the toughness/temperature curve shifts downward (lower fracture toughness), and the curve shifts to the right (brittle/ductile transition temperature increases).

In the spring of 2005, Surveillance Capsule X was pulled and the analysis was documented in WCAP-16527-NP, *Analysis of Capsule X from First Energy Nuclear Operating Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program* [Reference A.3-4]. For license renewal, WCAP-16527-NP Supplement 1, *Analysis of Capsule X from First Energy Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program* [Reference A.3-5] documents the end-of-license-extended (EOLE) analysis for neutron fluence values.

The fluence values were projected using ENDF/B-VI cross sections, are based on the results of the Capsule X analysis, and comply with Reg. Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence* [Reference A.3-6].

The fluence projections include fuel cycle-specific calculated neutron exposures at the end of Cycle 11 (April 2005) as well as future projections for several intervals extending to 54 EFPY. The projections were based on the assumption that the core power distributions and associated plant operating characteristics for Cycle 12 were representative of plant operation to 17 EFPY and that the preliminary Cycle 13 (began November 2006) core power distributions were applicable beyond 17 EFPY. The calculations account for a core power uprate from 2689 MWt to 2900 MWt at 17 EFPY.

A.3.2.2 Pressurized Thermal Shock

In the spring of 2005, Surveillance Capsule X was pulled and the analysis was documented in WCAP-16527-NP [Reference A.3-4]. For license renewal, WCAP-16527-NP Supplement 1 [Reference A.3-5] documents the EOLE analysis for pressurized thermal shock (PTS).

Using the prescribed PTS Rule (10 CFR 50.61 [Reference A.3-7]) methodology, reference temperature for pressurized thermal shock (RT_{PTS}) values were generated for beltline and extended beltline region materials of the BVPS Unit 2 Reactor Vessel for fluence values at EOLE (54 EFPY). The projected RT_{PTS} values for EOLE (54 EFPY) meet the 10 CFR 50.61 screening criteria for beltline and extended beltline materials. Therefore, the Unit 2 RT_{PTS} TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.2.3 Charpy Upper Shelf Energy

In the spring of 2005, Surveillance Capsule X was pulled and the analysis was documented in WCAP-16527-NP [Reference A.3-4]. For license renewal, WCAP-16527-NP Supplement 1 [Reference A.3-5] documents the EOLE analysis for Charpy upper-shelf energy (C_VUSE).

For Unit 2, there exists material surveillance data for Reactor Vessel intermediate shell plate B9004-2 (heat C0544-2) and the intermediate shell longitudinal weld (heat 83642). The measured drops in C_VUSE for each of these material heats was plotted on Figure 2 of Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials* [Reference A.3-8], with a horizontal line drawn parallel to the existing lines as the upper bound of all data. Regulatory Guide 1.99 Figures 1 and 2 were used in the determination of the percent decrease in C_VUSE for the beltline and extended beltline materials.

The beltline and extended beltline material C_VUSE values were determined to maintain 50 ft-lb or greater at 54 EFPY. Therefore, the Unit 2 C_VUSE analysis has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.2.4 Pressure-Temperature Limits

BVPS pressure-temperature (P-T) limit curves are operating limits, conditions of the operating license, and are included in the Pressure and Temperature Limits Report, as required by Technical Specifications. They are valid up to a stated vessel fluence limit, and must be revised prior to operating beyond that limit. The provisions of 10 CFR 50, Appendix G [Reference A.3-7], require BVPS to operate within the currently licensed P-T limit curves. These curves are required to be maintained and updated as necessary to maintain plant operation consistent with 10 CFR 50. The Reactor Vessel Integrity Program will maintain the P-T limit curves for Unit 2 for the period of extended operation. Therefore, the Unit 2 P-T limit curves TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

At BVPS, the Low-Temperature Overpressure Protection System is known as the Overpressure Protection System (OPPS). As part of any update, the OPPS setpoints (OPPS enable temperature and power-operated relief valve setpoints) for both units are reviewed and updated as required based on the updated P-T limit curves.

A.3.3 METAL FATIGUE

The analysis of metal fatigue is a TLAA for Class 1 and selected non-Class 1 mechanical components within the scope of license renewal. The following sections summarize the analyses associated with metal fatigue of fluid systems:

- Class 1 Fatigue Evaluations (Section A.3.3.1)
- Non-Class 1 Fatigue Evaluations (Section A.3.3.2)
- Generic Industry Issues on Fatigue (Section A.3.3.3)

A.3.3.1 Class 1 Fatigue Evaluations

The design of BVPS Class 1 components incorporates the requirements of Section III of the ASME Code, which requires a discrete analysis of the thermal and dynamic stress cycles on components that make up the reactor coolant pressure boundary. The fatigue analyses rely on the definition of design basis transients that envelope the expected cyclic service and the calculation of a cumulative usage factor (CUF). In accordance with ASME Section III, Subsection NB, the CUF shall not exceed 1.0. The required analysis was performed for BVPS and incorporated a set of design basis transients based on the original 40-year operating life of the plant. These ASME Section III, Class 1 fatigue evaluations are contained in the specific piping and component analyses and stress reports and, because they are based on a number of design transient cycles assumed for the life of the plant, these evaluations are TLAAs.

The BVPS original design basis transients including design cycles for the RCS are identified in Table 3.9N-1 of the UFSAR. BVPS has reviewed the design cycles against 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation, except in certain specific cases described in the following three subsections. Since the 60-year projected operational cycles were used in determining that the design fatigue analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluations. Therefore, Class 1 components and piping fatigue TLAAs, except in certain specific cases described in the following three subsections, have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

A.3.3.1.1 Unit 2 RHR Piping and Unit 2 Charging Line

The RHR piping and the charging line cycles of operation are projected to exceed their respective design cycles during the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will be used to monitor the transient cycles for the RHR piping and the Unit 2 charging line. As required by the program, corrective actions will be taken (including reanalysis, repair or replacement) such that the design basis of the these components are not exceeded for the period of extended operation. Therefore, the RHR piping and the charging line fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.1.2 Unit 2 Steam Generator Manway Bolts and Tubes

BVPS was not able to demonstrate that the original design fatigue calculations remained valid through the period of extended operation for the following sub-components of the Unit 2 steam generators:

- Steam generator secondary manway bolts; and,
- Steam generator tubes (U-bend fatigue).

The Unit 2 steam generator secondary manway bolts and the steam generator tubes fatigue analyses are based on a 40-year life (i.e., to 2027). In the Extended Power Uprate T_{AVG} coastdown analysis for the secondary manway bolts, BVPS assumed that the Unit 2 steam generators will be replaced by the year 2027. In the Uprate analysis for the U-bends, BVPS assumed that the Unit 2 steam generators will be replaced by the year 2027. As part of the Steam Generator Tube Integrity Program, BVPS will perform a reanalysis, repair, or replacement of the affected components such that the design bases of the these components are not exceeded for the period of extended operation. Therefore, the steam generator secondary manway bolts and the steam generator tubes fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.1.3 Unit 2 Pressurizer

In 2000, the analysis of the Unit 2 pressurizer, lower shell and related components was revised to address revision to the insurge/outsurge transients identified by the Westinghouse Owners Group. Plant operating procedures were revised to follow the guidance of the Westinghouse Owners Group and to minimize the impact of potential insurges. In 2002, BVPS decided to further revise the operating procedures to optimize the plant shutdown and startup processes for Unit 2. The BVPS optimized procedures have been shown to meet all recommendations of the Westinghouse Owners Group and have virtually eliminated the potential for insurges. Next, the Extended Power Uprate Project evaluated the revised Uprate transients against the previous analysis. Since some operating parameters changed, BVPS revised the analysis of the Unit 2 pressurizer, lower shell and related components. In addition, the pressurizer spray nozzle, the safety valve nozzles, the pressure operated relief valve nozzle and the surge line nozzle were potentially impacted by the Pressurizer Weld Overlay Project. Weld overlay was performed during the Unit 2 Cycle 12 Refueling Outage (October - November 2006). Weld overlay for the surge nozzle is discussed in a supplement to the subject analysis. The cumulative usage factors associated with the Unit 2 pressurizer are less than 1.0. Since the 60-year projected operational cycles were used in determining that the pressurizer design fatigue analysis remains valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program (Section B.2.27) must continue to be used to validate the assumptions used in the evaluation. In addition, the pressurizer insurge cycle assumptions used in the pressurizer analysis require validation for the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program identifies the pressurizer insurge transient as a supplemental transient that requires monitoring. Therefore, the pressurizer fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.2 Non-Class 1 Fatigue Evaluations

A.3.3.2.1 Piping and In-Line Components

The design code for non-Class 1 piping and in-line components (e.g., fittings and valves) within the scope of license renewal is ANSI B31.1 or ASME III, Subsections NC and ND. These codes specify evaluation of cyclic secondary stresses (i.e., stresses due to thermal expansion and anchor movements) by applying stress range reduction factors against the allowable stress range (SA).

For those non-Class 1 components identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted by BVPS to determine the approximate frequency of any significant thermal cycling. If the number of equivalent full-temperature cycles is below the limit used for the current design, the component is suitable for extended operation. If the number of equivalent full-temperature cycles exceeds the limit, evaluation of the individual stress calculations will be required.

BVPS evaluated the validity of this assumption for 60 years of plant operation. With the exception of the Unit 2 Emergency Diesel Generator (EDG) Air Start System, the results of this evaluation indicated that the thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, the non-Class 1 piping fatigue TLAAs, with the exception of the EDG Air Start System fatigue TLAA, remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

The EDG Air Start System contains components potentially subject to fatigue. As part of the Metal Fatigue of Reactor Coolant Pressure Boundary Program, BVPS will perform an assessment to determine whether the full-temperature cycles limit would be exceeded for 60 years of operation. Corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the full-temperature cycles limit of the EDG Air Start System is not exceeded for the period of extended operation. Therefore, the EDG Air Start System fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.2.2 Pressure Vessels, Heat Exchangers, Storage Tanks, Pumps, and Turbine Casings

Non-Class 1 pressure vessels, heat exchangers, storage tanks, pumps, and turbine casings are typically designed in accordance with ASME Section VIII or ASME Section III, Subsection NC or ND (e.g., Class 2 or 3). Some tanks and pumps are designed to other industry codes and standards (such as American Water Works Association and Manufacturer's Standardization Society), reactor designer specifications, and architect engineer specifications. Only ASME Section VIII, Division 2, and ASME Section III, Subsection NC-3200, design codes include fatigue design requirements. Due to the conservatism in ASME Section VIII Division 1 and ASME Section III NC-3100/ND-3000 detailed fatigue analyses are not required. If cyclic loading and fatigue usage could be significant, the component designer is expected to specify ASME Section VIII Division 2 or NC-3200. For components where there is no required fatigue analysis, cracking due to fatigue is not an aging effect requiring management.

Fatigue analysis is not required for ASME Section VIII Division I, Section III NC-3100 or ND vessels. It is also not required for NC/ND pumps and storage tanks (<15 psig). The design specification identifies the applicable design code for each component.

Only the Unit 2 non-regenerative (letdown), regenerative, and RHR heat exchangers were identified as having fatigue TLAAs, and are dispositioned as described in the following text.

A.3.3.2.2.1 Non-regenerative (Letdown) Heat Exchanger

The Unit 2 non-regenerative (letdown) heat exchanger is designed to ASME, Section III, Class C (tubes) and ASME, Section VIII, Division 1 (shell). The transients for the non-regenerative (letdown) heat exchanger are defined in Westinghouse Equipment Specification G-679150 [Reference A.3-9]. The fatigue analysis associated with the Unit 2 non-regenerative (letdown) heat exchanger is not bounding for 60 years of operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will be used to monitor the Unit 2 non-regenerative (letdown) heat exchanger transients. As required by the program, corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the design basis of the Unit 2 non-regenerative (letdown) heat exchanger is not exceeded for the period of extended operation. Therefore, the Unit 2 non-regenerative (letdown) heat exchanger fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.2.2.2 Regenerative Heat Exchanger

The Unit 2 regenerative heat exchanger was built to ASME, Section III, Class 2. The transients for the Unit 2 regenerative heat exchanger are defined in Westinghouse Equipment Specification G-679150. The fatigue analysis associated with the Unit 2 regenerative heat exchanger is not bounding for 60 years of operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will be used to monitor the regenerative heat exchanger transients. As required by the program, corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the design basis of the regenerative heat exchanger is not exceeded for the period of extended operation. Therefore, the Unit 2 regenerative heat exchanger fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.2.2.3 Residual Heat Removal (RHR) Heat Exchangers

The tube side of the Unit 2 RHR heat exchangers were designed in accordance with ASME Section III, Class 2. The shell side of these heat exchangers were designed in accordance with ASME Section III, Class 3. The transients for the RHR heat exchangers are defined in Westinghouse Equipment Specification G-679150. The fatigue analyses associated with the RHR heat exchangers are not bounding for 60 years of operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will be used to monitor the Unit 2 RHR heat exchangers transients. As required by the program, corrective actions will be taken as appropriate (including reanalysis, repair or replacement), such that the design basis of the Unit 2 RHR heat exchangers are not exceeded for the period of extended operation. Therefore, the Unit 2 RHR heat exchangers fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.3.3 Generic Industry Issues on Fatigue

This section addresses the BVPS fatigue TLAAs associated with NRC Bulletins 88-08 and 88-11. In addition, this section addresses the effects of the primary coolant environment on fatigue life.

A.3.3.3.1 Thermal Stresses in Piping Connected to Reactor Coolant System (NRC Bulletin 88-08)

NRC Bulletin 88-08, *Thermal Stresses in Piping Connected to Reactor Coolant Systems* [Reference A.3-10], requested that licensees: (1) review their RCS to identify any connected unisolable piping that could be subjected to temperature distributions which would result in unacceptable thermal stresses and any unisolable sections of piping connected to the RCS that may have been subjected to excessive thermal stresses, and, (2) take action, where such piping is identified, to ensure that the piping will not be subjected to unacceptable thermal stresses. There are no specific TLAA associated with the Unit 2 responses to NRC Bulletin 88-08, with the exception of the ASME Class 2 RHR line analysis.

The Unit 2 RHR line stratification analysis required a detailed fatigue evaluation to demonstrate compliance with the design code of record (ASME Section III). Based on temperature data established in response to NRC Bulletin 88-08, a conservative thermal stratification load case was developed. Typical cycle periods for the thermal stratification events on the Unit 2 RHR lines were 6 to 8 days, which equated to approximately 2000 cycles for a 40-year plant life (assuming the stratification occurred continuously). A bounding thermal stratification load assuming 7000 cycles was incorporated into the fatigue analysis as an additional load. Projecting the identified stratification cycles for a 60-year plant life results in 3000 cycles. The 7000 cycles used in the fatigue analysis bounds the 60-year projected cycles. Therefore, the Unit 2 RHR line fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A.3.3.3.2 Pressurizer Surge Line Thermal Stratification (NRC Bulletin 88-11)

NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification* [Reference A.3-11], required a plant-specific or generic analysis demonstrating that the pressurizer surge line meets the applicable design code requirements considering the effects of thermal stratification.

Pressurizer surge line stratification first became apparent at Unit 2 during hot functional testing, and was a predecessor to NRC Bulletin 88-11. Additional instrumentation was temporarily installed to monitor pipe and fluid conditions. From this data, BVPS revised the surge line ASME Section III analysis of record to evaluate stress and fatigue effects.

Subsequently, BVPS contracted Westinghouse to perform a complete reanalysis of the surge line, accounting for thermal stratification and striping. WCAP-12093, *Evaluation of Thermal Stratification for the Beaver Valley Unit 2 Pressurizer Surge Line* [Reference A.3-12], was submitted to the NRC to address both leak-before-break (LBB) requirements and NRC Bulletin 88-11 concerns for the surge line. The NRC accepted [Reference A.3-13] WCAP-12093 as meeting the required actions of NRC Bulletin 88-11, and demonstrating that the effects of thermal stratification do not result in the pressurizer surge line exceeding design Code allowable limits.

WCAP-12093 determined the effect of thermal stratification through the imposition of defined thermal stratification cycles upon the stress and fatigue evaluations. The stratification cycles incorporated into the cumulative usage factor determination are defined by the 200 heatup and cooldown design transients.

Therefore, these NRC Bulletin 88-11 analyses are TLAAs in accordance with 10 CFR 54.3.

WCAP-12093 was reviewed for impact due to extended power uprate. A detailed analysis was performed at the controlling location (reactor coolant loop nozzle) to account for temperature effects due to the power uprate. A new cumulative usage factor was calculated and demonstrated to remain less than the Code allowable limit of 1.0.

The 200 heatup and cooldown transients were determined to remain bounding for the period of extended operation. Therefore, the Unit 2 pressurizer surge line fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A.3.3.3.3 Effects of Primary Coolant Environment on Fatigue Life

Test data indicate that certain environmental conditions (such as temperature, oxygen content, and strain rate) in the primary systems of light water reactors could result in greater susceptibility to fatigue than would be predicted by fatigue analyses based on the ASME Section III design fatigue curves. One NRC study, documented in NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components* [Reference A.3-14], applied the fatigue design curves that incorporated environmental effects to several plant designs. The results of studies performed on this topic, including NUREG/CR-6260, were summarized in Generic Safety Issue (GSI)-190, *Fatigue Evaluation of Metal Components for 60-Year Plant Life* [Reference A.3-15]. In closing GSI-190, regarding the effects of a reactor water environment on fatigue life, the NRC concluded that licensees should address the effects of the coolant environment on component fatigue life as aging management programs are formulated in support of license renewal.

The Unit 2 reactor coolant pressure boundary piping is designed to ASME Section III, and is therefore classified as a newer-vintage Westinghouse plant.

Section 5.4 of NUREG/CR-6260 identified the following component locations as representative for environmental effects for newer-vintage Westinghouse plants. These locations and the subsequent calculations are directly relevant to Unit 2 and include the:

- Reactor vessel shell and lower head (shell-to-head transition);
- Reactor vessel inlet and outlet nozzles;
- Pressurizer surge line (hot leg nozzle safe end);
- RCS piping charging system nozzle (knuckle region);
- RCS piping safety injection nozzle (knuckle region); and,
- RHR system piping (inlet piping transition).

The NUREG/CR-6260 locations were evaluated using the guidance of NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels* [Reference A.3-16], and NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels* [Reference A.3-17]. These reports describe the use of a fatigue life correction factor (F_{en}) to express the effects of the reactor coolant environment upon the material fatigue life. The expression for F_{en} was determined through experimental and statistical data. F_{en} for carbon and low alloy steel is a function of fluid service temperature, material sulfur content, fluid dissolved oxygen, and strain rate. For austenitic stainless steel, F_{en} is a function of fluid service temperature, fluid dissolved oxygen, and strain rate. The cumulative usage factor which includes environmental effects (U_{env}) is determined from the existing 60-year cumulative usage factor (U_{60}) through the use of the fatigue life correction factor:

$$U_{env} = U_{60} * F_{en}$$

To demonstrate acceptable fatigue life including environmental effects, the cumulative usage factor, which includes environmental effects, should remain less than design code allowables (i.e., $U_{env} \leq 1.0$). Therefore, F_{en} was applied to the cumulative usage factors at the Unit 2 NUREG/CR-6260 locations and compared to the design code allowable limit.

At three locations (pressurizer surge line, charging system nozzle, and RHR system piping), U_{env} exceeded the design code allowable limit of 1.0. For these locations, BVPS will implement one or more of the following as required by the Metal Fatigue of Reactor Coolant Pressure Boundary Program:

1. Further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0;
2. Management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC); or,
3. Repair or replacement of the affected locations.

Should BVPS select the option to manage environmentally-assisted fatigue during the period of extended operation, details of the aging management program, such as scope, qualification, method, and frequency, will be submitted to the NRC prior to the period of extended operation. Therefore, the TLAAs associated with the pressurizer surge line, charging system nozzle, and RHR system piping have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

The cumulative usage factors including environmental fatigue at the other locations (reactor vessel shell and lower head, reactor vessel inlet and outlet nozzles, and safety injection nozzle), have been demonstrated to remain less than the design code allowable limit of 1.0 for the period of extended operation. Therefore, the TLAAs associated with these locations have been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

The BVPS existing Environmental Qualification (EQ) of Electric Components Program manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, environmental qualification components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. The Environmental Qualification of Electric Components Program ensures that these environmental qualification components are maintained in accordance with their qualification bases. Aging evaluations for environmental qualification components that specify a qualification of at least 40 years are time-limited aging analyses for license renewal.

The Environmental Qualification (EQ) of Electric Components Program is an existing program established to meet BVPS commitments for 10 CFR 50.49. Continued implementation of the Environmental Qualification (EQ) of Electrical Components Program provides reasonable assurance that the aging effects will be managed and that the in-scope EQ components will continue to perform their intended function(s) for the period of extended operation. The effects of aging will be managed by the program in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

A.3.5 CONTAINMENT LINER PLATE, METAL CONTAINMENT, AND PENETRATIONS FATIGUE

Several potential TLAA associated with the Containment structure were identified and are summarized in the following sections:

- Containment Liner Fatigue (Section A.3.5.1)
- Containment Liner Corrosion Allowance (Section A.3.5.2)
- Containment Liner Penetration Fatigue (Section A.3.5.3)

A.3.5.1 Containment Liner Fatigue

The Containment liner was designed using the 1971 Edition of ASME Section III as a design guideline using stress limits and fatigue criteria based on the rules for code classes MC and 1. As such, a detailed analysis for fatigue is not required if six specific requirements are met as defined in ASME Section III, NB-3222.4(d). This exemption analysis was performed for the 40-year anticipated stress cycles of differential pressure due to normal operation (100 cycles), differential temperature due to normal operation (400 cycles), and ½ safe shutdown earthquake (operational basis earthquake) (100 cycles). To address these 40-year cycles, a re-evaluation of the six fatigue exemption requirements utilizing anticipated 60-year stress cycles was performed. The anticipated occurrences of these cycles are described in Table 3.8-9 of the Unit 2 UFSAR as follows:

- 150 stress cycles of differential pressure loading assuming 2.5 refueling cycles per year on a 60-year span;
- 600 stress cycles of loading due to thermal expansion resulting from exposure to the differential temperature between operating and seasonal refueling temperatures based on 10 such variations per year on a 60-year span; and,
- 150 cycles of operational basis earthquake, which is an assumed number of cycles of this type of earthquake for a 60-year span.

The result of this evaluation determined that the specified normal conditions through the period of extended operation continue to satisfy the requirement for exemption from analysis for cyclic operation. Therefore, the Unit 2 Containment liner fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.5.2 Containment Liner Corrosion Allowance

The Reactor Containment Building has a continuously welded carbon steel liner which acts as a leak-tight membrane. The cylindrical portion of the liner is 3/8 inch thick, the hemispherical dome is ½ inch thick, and the flat floor liner covering the concrete mat is ¼ inch thick. The floor liner plate is covered with approximately two feet of reinforced concrete. All welded seams were originally covered with continuously welded leak test channels that were installed to facilitate leak testing of welds during liner erection. Since initial construction, several test channels have been removed. Channels in the hemispherical dome and Containment mat are covered with concrete while those on the cylindrical liner wall are exposed. Test ports that were provided for leak testing were sealed with vent plugs after the completion of the testing. These plugs were to remain in place during subsequent Type A leak rate testing.

During the second refueling outage for Unit 2 in 1990, the results of an inspection performed prior to the Type A Containment leakage rate test showed that 25 test channel vent plugs were missing. The missing test channel vent plugs allowed moisture and condensation inside the test channels, leading to minor corrosion of the liner. BVPS evaluated the test channels to determine the impact to the Containment liner, and submitted the results of the evaluations to the NRC as Amendments 165 and 47, Unit 1 and Unit 2 respectively, to the operating licenses. These amendments were approved by the NRC and documented in an SER [Reference A.3-18]. After further evaluation, it was concluded that these initial evaluations contained some nonconservative assumptions with regard to the corrosion rates in the test channels. BVPS took corrective action to arrest the corrosion rate in the affected test channels, including inerting and sealing the test channels. The further evaluation and corrective actions are documented in a 1992 Letter to the NRC [Reference A.3-19]. These corrosion rate analyses meet the 10 CFR 54.3 requirements as TLAAs and must be evaluated for the period of extended operation.

The minimum required thickness for the Containment liner has been determined for the various portions of the liner. The limiting liner portion is the liner floor plate, which has a fabrication thickness of 0.25 inches and a minimum required thickness of 0.125 inches. Thus, the corrosion allowance is 0.125 inches (125 mils). The inerting and sealing of the test channels significantly reduced the theoretical corrosion rates in the channels. The total estimated penetration due to corrosion of the inerted channel was estimated at 82.7 mils for 43 years of plant operation. The maximum expected corrosion rate for the carbon steel liner in this low oxygen environment was determined to be 0.39 mils per year. Therefore, projecting the expected corrosion penetration with the maximum expected corrosion rate to the end of the period of extended operation results in an additional 7.8 mils of corrosion. Adding this to the previous expected corrosion penetration depths yields 90.5 mils of corrosion penetration. This result is well within the corrosion allowance of 125 mils.

Therefore, the Unit 2 Containment liner corrosion analysis has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.5.3 Containment Liner Penetration Fatigue

A.3.5.3.1 Containment Process Piping Penetrations

Unit 2 process piping penetrations are designed and analyzed to the 1971 Edition through 1972 Winter Addenda of ASME Section III, Division 1, Class 2 (i.e., Subsection NC), which complies with the process piping system requirements of which these penetrations are a part. The penetrations are further analyzed to the more stringent Class MC (i.e., Subsection NE) requirements. Section III, Division 1, Class 2 requirements include a stress range reduction factor which accounts for an assumed number of thermal cycles. Additionally, Section III, Division 1, Class MC states that any portions not satisfying the fatigue exemption as described in Subsection NB-3222(d) require further fatigue evaluation. These thermal cycles and fatigue exemptions are based on a design number of cycles for the plant life. As such, the Unit 2 piping penetration analyses are classified as TLAAs and require disposition for the period of extended operation.

For the Unit 2 process piping penetrations identified as subject to cracking due to fatigue, a review of system operating characteristics was conducted to determine the approximate frequency of significant thermal cycling. If the number of equivalent full-temperature cycles is below the limit used for the current design, the component is suitable for extended operation. If the number of equivalent full-temperature cycles exceeds the limit, evaluation of the individual stress calculations will be required.

BVPS evaluated the validity of this assumption for 60 years of plant operation. The results of this evaluation indicate that the thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, these piping penetration fatigue analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.3.5.3.2 Equipment Hatch

The equipment hatch and integral emergency airlock are designed and analyzed in accordance with ASME Section III, Division 1, Subsection NE (Class MC). Subsection NE states that any portions not satisfying the fatigue exemption as described in Subsection NB-3222(d) require further fatigue evaluation. Therefore, a fatigue exemption was completed for the Unit 2 equipment hatch in accordance with Subsection NB-3222(d). This exemption was based on assumed cycles for a 40 year life, namely 10 pressurization events due to LOCA, and 80 cycles of startup and shutdown. It is highly unlikely that Unit 2 will reach 10 pressurization events due to LOCA for 60 years of operation. The assumption of 80 cycles of startup and shutdown is not bounding for 60 years of operation. A reanalysis was performed using 240 startup and shutdown cycles that bounds the number of projected cycles for the period of extended operation. Therefore, the equipment hatch fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A.3.5.3.3 Fuel Transfer Tube

The fuel transfer tube pipe was analyzed to ASME Section III, Class 2. The analysis for the fuel transfer tube pipe uses a stress range reduction factor of 1.0 (<7,000 cycles). However, as the fuel transfer tube pipe experiences operational cycles only during refueling, the fuel transfer tube pipe experiences essentially no thermal cycles. The existing fuel transfer tube pipe fatigue TLAA remains valid through the period of extended operation. Therefore, the fuel transfer tube pipe fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

The fuel transfer tube bellows were analyzed to ASME Section III, Class MC. The bellows stress analyses determined acceptability based on the bellows experiencing displacements due to a design basis earthquake. The assumed design cycles were 600. This number of design basis earthquake cycles is highly unlikely to occur during the period of extended operation. The fuel transfer tube bellows fatigue TLAAs remain valid through the period of extended operation. Therefore, the fuel transfer tube bellows fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A.3.6 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

The plant-specific TLAAs summarized in this section include:

- Leak Before Break (Section A.3.6.1)
- High Energy Line Break Postulation (Section A.3.6.2)
- Settlement Of Structures (Section A.3.6.3)
- Crane Load Cycles (Section A.3.6.4)

A.3.6.1 Leak Before Break

Leak before break (LBB) analyses evaluate postulated flaw growth in piping to alter the structural design basis. BVPS has determined that the fatigue crack growth analysis is a TLAA that requires disposition for license renewal.

For the LBB analyses discussed in the following three subsections, the only consideration that could be influenced by time is the accumulation of actual fatigue transient cycles. The cycle assumptions used in the analyses are conservative compared to the BVPS original design transients. The BVPS original design basis transients including design cycles are identified in Table 3.9N-1 of the UFSAR. BVPS has reviewed the design cycles against the 60-year projected operational cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year projected operational cycles were used in determining that the fatigue crack growth analyses remain valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluations. Therefore, the LBB TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

A.3.6.1.1 Main Coolant Loop Piping Leak Before Break

The current LBB evaluation for the main coolant loop piping is documented in WCAP-11923, *Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Beaver Valley Unit 2 After Reduction of Snubbers* [Reference A.3-20]. This evaluation was approved by the NRC in an SER [Reference A.3-21] in 1991.

A.3.6.1.2 Pressurizer Surge Line Piping Leak Before Break

The current LBB evaluation for the pressurizer surge line piping is documented in WCAP-12093, *Evaluation of Thermal Stratification for the Beaver Valley Unit 2 Pressurizer Surge Line* [Reference A.3-22]. This evaluation (including Supplements 1 and 2) was approved by the NRC in an SER [Reference A.3-23] in 1990. These analyses were based on a maximum temperature difference of 315°F between the pressurizer and the hot leg. Subsequent to the 1990 SER, a system temperature difference of approximately 360°F was experienced in the plant during heatup. To address this issue, WCAP-12093-P, Supplement 3, *Evaluation of Pressurizer Surge Line Transients Exceeding 320°F for Beaver Valley Unit 2* [Reference A.3-24], was prepared and submitted to the NRC. This evaluation was approved by the NRC in an SER [Reference A.3-25] in 1991.

A.3.6.1.3 Branch Line Piping Leak Before Break

The Unit 2 branch line piping LBB analyses were approved by the NRC in NUREG-1057, Supplement No. 4, *Safety Evaluation Report Related to the Operation of Beaver Valley Power Station Unit 2* [Reference A.3-26].

A.3.6.2 High Energy Line Break Postulation

In accordance with 10 CFR 50, General Design Criterion No. 4, *Environmental and Missile Design Bases*, special measures have been taken in the design and construction of Unit 2 to protect SSCs required to place the reactor in a safe cold shutdown condition from the dynamic effects associated with the postulated rupture of piping.

For the Class 1 systems, Regulatory Guide 1.46, *Protection Against Pipe Whip Inside Containment* [Reference A.3-27], states that postulated break locations be determined, in part, using any intermediate locations between terminal ends where the cumulative usage factor derived from the piping fatigue analysis under the loadings associated with specified seismic events and operational plant conditions exceeded 0.1. These fatigue evaluations are TLAAs since they are based on a set of fatigue transients that are based on the life of the plant.

The cycle assumptions used in the fatigue analyses are conservative compared to the BVPS original design transients [Reference A.3-28]. The BVPS original design basis transients including design cycles are identified in Table 3.9N-1 of the UFSAR. BVPS has reviewed the design cycles against the 60-year projected cycles and has determined that the design cycles are bounding for the period of extended operation. Since the 60-year cycle projections were used in determining that the fatigue analyses remains valid for 60 years, the Metal Fatigue of Reactor Coolant Pressure Boundary Program must continue to be used to validate the assumptions used in the evaluations. Therefore, the piping fatigue analyses used for determining the postulation of break locations in Class 1 lines remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

A.3.6.3 Settlement Of Structures

The foundation soils in the main plant area consist of compacted select granular fill and medium dense to dense in situ granular soils. Site subsurface profiles within the plant area are discussed in the UFSAR. Total static settlement of the plant structures founded on granular soils was assumed to consist of two components: an elastic component, and a time-dependent component, which was assumed to be equal in magnitude to the elastic component. Each in-scope plant structure typically has a shake space between it and any adjacent structures to allow independent movement in the event of earthquake loading. These shake spaces also allow for differential settlement between plant structures. Such settlement can affect safety-related piping that penetrates the structure.

Observed settlement data was used to predict settlement of structures that are penetrated by piping. The settlement predictions were based on an assumed 40-year plant life. Stress analyses for affected piping include stresses that would be imposed by the predicted settlement. Therefore, the predicted settlement values of plant structures are used in the design stress analyses of various piping systems which span structures or exit structures into the surrounding soil (buried piping). The settlement assumptions are based on projected 40 year settlement values and, as such, the piping stress analyses that use these settlement assumptions are TLAAs which must be dispositioned for the period of extended operation.

As documented in UFSAR Section 2.5.4.13, the settlement of each Category I structure was monitored during construction, and will be monitored throughout the life of the plant until the settlement of a particular structure has been determined to be stable as defined by the Settlement Monitoring Program (Section A.1.37). For such structures, settlement monitoring is then discontinued. The Settlement Monitoring Program provides the requirements to measure the settlement of structures at selected locations. If the settlement of a structure exceeds that anticipated, a review of current analysis (as it relates to the integrity of the structure and the maintenance of settlement assumptions in the associated piping stress analyses) is required.

The Settlement Monitoring Program ensures that the current 40-year settlement assumptions in the pipe fatigue analyses are maintained for the period of extended operation. Therefore, the piping fatigue TLAAs have been dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A.3.6.4 Crane Load Cycles

In the response to NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants* [Reference A.3-29], BVPS determined that three cranes, the polar crane (2CRN-201), spent fuel cask trolley (2MHF-CRN215), and the moveable platform and hoists (2MHF-CRN227), were designed to comply with Crane Manufacturers Association of America Specification #70 (CMAA-70), *Specifications for Electric Overhead Traveling Cranes* [Reference A.3-30]. Therefore, these cranes have a TLAA associated with their design calculations.

These cranes may conservatively be classified as Service Class A cranes. The total load cycles and mean effective load factors for the cranes have been estimated for the period of extended operation. Even using conservative estimates, total load cycles are well below 20,000, and mean effective load factors are maintained within or below the Service Class A bounds (0.35 - 0.53) for 60 years. Therefore, crane allowable stress ranges as defined in CMAA-70 will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.3.7 APPENDIX A.3 REFERENCES

A.3-1 [BVPS License Renewal Application – later].

A.3-2 [NRC SER for BVPS License Renewal – later].

A.3-3 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*.

A.3-4 WCAP-16527-NP, *Analysis of Capsule X from First Energy Nuclear Operating Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program*, Rev. 0.

A.3-5 WCAP-16527-NP Supplement 1, *Analysis of Capsule X from First Energy Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program*, June 2007.

A.3-6 Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence*, March 2001.

A.3-7 10 CFR 50, *Domestic Licensing of Production and Utilization Facilities*.

A.3-8 Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials*, Rev. 2.

A.3-9 Westinghouse Equipment Specification G-679150, *Auxiliary Heat Exchangers*, Rev. 1.

A.3-10 NRC Bulletin 88-08, *Thermal Stresses in Piping Connected to Reactor Coolant Systems*, June 22, 1988, (including Supplements 1 and 2).

A.3-11 NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification*, December 20, 1988.

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A.3-23 Tam, Peter S. (NRC), Letter to J. D. Sieber (BVPS), *Beaver Valley Unit 2 - Completion of Review on Pressurizer Surge Line Thermal Stratification*, January 18, 1990.

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A.3-27 Regulatory Guide 1.46, *Protection Against Pipe Whip Inside Containment*, May 1973.

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A.4 UNIT 1 LICENSE RENEWAL COMMITMENTS

Table A.4-1 identifies those actions committed to by FENOC for BVPS Unit 1 in the BVPS License Renewal Application (LRA). These regulatory commitments will be tracked within the FENOC regulatory commitment management program. Any other actions discussed in the LRA represent intended or planned actions by FENOC. These other actions are described only as information and are not regulatory commitments. This list will be revised as necessary in subsequent amendments to reflect changes resulting from NRC audit questions and BVPS responses to NRC requests for additional information.

Table A.4-1
Unit 1 License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
1	Implement the Buried Piping and Tanks Inspection Program as described in LRA Section B.2.8.	Will be implemented within the 10 years prior to January 29, 2016	LRA	A.1.8 B.2.8
2	Enhance the Closed-Cycle Cooling Water System Program to: • Add the diesel-driven fire pump (Unit 1 only) to the program; • Detail performance testing of heat exchangers and pumps, and provide direction to perform visual inspections of system components; • Identify closed-cycle cooling water system parameters that will be trended to determine if heat exchanger tube fouling or corrosion product buildup exists; • Control performance tests and perform visual inspections at the required frequency.	January 29, 2016	LRA	A.1.9 B.2.9

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
3	Implement the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program as described in LRA Section B.2.10.	Will be implemented within the 10 years prior to January 29, 2016	LRA	A.1.10 B.2.10
4	Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as described in LRA Section B.2.11.	January 29, 2016	LRA	A.1.11 B.2.11
5	Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program as described in LRA Section B.2.12.	January 29, 2016	LRA	A.1.12 B.2.12
6	Implement the External Surfaces Monitoring Program as described in LRA Section B.2.15.	January 29, 2016	LRA	A.1.15 B.2.15
7	Enhance the Fire Protection Program to: • Include a new attachment in the BVPS Fire Protection Program administrative procedure to address the Fire Protection Systems that are in scope for license renewal purposes; • Provide details of the NUREG-1801 inspection and testing guidelines, the plant implementation strategy, surveillance test and inspection frequencies, and affected implementing procedure(s); and,	January 29, 2016	LRA	A.1.16 B.2.16

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
7, cont.	• Provide inspection guidance details to include degradation such as concrete cracking and spalling, and loss of material of fire barrier walls, ceilings and floors that may affect the fire rating of the assembly or barrier.			
8	Enhance the Fire Water System Program to: • Include a program requirement to perform flow test or inspection of all accessible fire water headers and piping during the period of extended operation at an interval determined by the Fire Protection System Engineer; • Include a program requirement that a representative number of fire water piping locations be identified if piping visual inspections are used as an alternative to non-intrusive testing; • Include a program requirement which allows test or inspection results from an accessible section of pipe to be extrapolated to an inaccessible, but similar section of pipe. If no similar section of accessible pipe is available, then alternative testing or inspection activities must be used; • Include a program requirement that, at least once prior to the period of extended operation, all accessible Fire Protection headers and piping shall be flow tested in accordance with NFPA 25 or visually/ultrasonically inspected;	Will be implemented within the 10 years prior to January 29, 2016	LRA	A.1.17 B.2.17

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
8, cont.	• Include steps in the program procedure that require testing or replacement of sprinkler heads that will have been in service for 50 years; and, • Include a program requirement to perform a fire water subsystem internal inspection any time a subsystem (including fire pumps) is breached for repair or maintenance.			
9	Enhance the Flux Thimble Tube Inspection Program to: • Include a requirement in the program procedure to state that, if a flux thimble tube cannot be inspected over the tube length (tube length that is subject to wear due to restriction or other defect), and cannot be shown by analysis to be satisfactory for continued service, the thimble tube must be removed from service to ensure the integrity of the Reactor Coolant System pressure boundary.	January 29, 2016	LRA	A.1.19 B.2.19
10	Enhance the Fuel Oil Chemistry Program to: • Revise the implementing procedure for sampling and testing the diesel-driven fire pump fuel oil storage tank (Unit 1 only) to include a test for particulate and accumulated water in addition to the test for sediment and water; and,	January 29, 2016	LRA	A.1.20 B.2.20

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
10, cont.	• Generate a new implementing procedure for sampling and testing the security diesel generator fuel oil day tank (Common) for accumulated water, particulate contamination, and sediment / water.			
11	Implement the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as described in LRA Section B.2.21.	January 29, 2016	LRA	A.1.21 B.2.21
12	Implement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program as described in LRA Section B.2.22.	January 29, 2016	LRA	A.1.22 B.2.22
13	Enhance the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program to: • Include guidance in the program administrative procedure to inspect for loss of material due to corrosion on Unit 1 crane and trolley structural components and rails; and, • Include guidance in the crane and hoist inspection procedures to inspect for loss of material due to corrosion on Unit 1 crane and trolley structural components and rails or extendable arms, as appropriate.	January 29, 2016	LRA	A.1.23 B.2.23

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
14	Enhance the Masonry Wall Program to: • Include in program scope additional masonry walls identified as having aging effects requiring management for license renewal.	January 29, 2016	LRA	A.1.25 B.2.25
15	For the Nickel-Alloy Nozzles and Penetrations Program, regarding activities for managing the aging of nickel-alloy components and nickel-alloy clad components susceptible to primary water stress corrosion cracking - PWSCC (other than upper reactor vessel closure head nozzles and penetrations), BVPS commits to develop a plant-specific aging management program that will implement applicable: 1. NRC Orders, Bulletins and Generic Letters; and, 2. Staff-accepted industry guidelines.	January 29, 2016	LRA	A.1.28 B.2.28
16	Implement the One-Time Inspection Program as described in LRA Section B.2.30.	Will be implemented within the 10 years prior to January 29, 2016	LRA	A.1.30 B.2.30
17	Implement the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program as described in LRA Section B.2.31.	Will be implemented within the 10 years prior to January 29, 2016	LRA	A.1.31 B.2.31

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
18	For the PWR Vessel Internals Program, regarding activities for managing the aging of Reactor Vessel internal components and structures, BVPS commits to: 1. Participate in the industry programs applicable to BVPS Unit 1 for investigating and managing aging effects on reactor internals; 2. Evaluate and implement the results of the industry programs as applicable to the BVPS Unit 1 reactor internals; and, 3. Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for the BVPS Unit 1 reactor internals to the NRC for review and approval.	January 29, 2014	LRA	A.1.33 B.2.33
19	Implement the Selective Leaching of Materials Program as described in LRA Section B.2.36.	January 29, 2016	LRA	A.1.36 B.2.36
20	Enhance the Structures Monitoring Program to: • Include in program scope additional structures and structural components identified as having aging effects requiring management for license renewal; • Include inspection guidance in program implementing procedures to detect significant cracking in concrete surrounding the anchors of vibrating equipment;	January 29, 2016	LRA	A.1.39 B.2.39

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
20, cont.	• Include a requirement in program procedures to perform opportunistic inspections of normally inaccessible below-grade concrete when excavation work uncovers a significant depth; • Include a requirement in program procedures to perform periodic sampling of groundwater for pH, chloride concentration, and sulfate concentration; and, • Include a requirement in program procedures to monitor elastomeric materials used in seals and sealants, including compressible joints and seals, waterproofing membranes, etc., associated with in-scope structures and structural components for cracking and change in material properties.			
21	Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.2.40.	January 29, 2016	LRA	A.1.40 B.2.40
22	Implement the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.2.41.	January 29, 2016	LRA	A.1.41 B.2.41
23	Enhance the Water Chemistry Program to: • Change BVPS frequency for reactor coolant silica monitoring to once per week for Operational Modes 1 and 2, and once per day during heatup in Operational Modes 3 and 4 to be consistent with EPRI guidelines.	January 29, 2016	LRA	A.1.42 B.2.42

Table A.4-1
Unit 1 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
24	Documentation of a flux reduction program for Unit 1 will be submitted in accordance with the requirements of 10 CFR 50.61	In accordance with the requirements of 10 CFR 50.61	LRA	A.2.2.2 4.2.2
25	Of the NUREG/CR-6260 locations, the U_{env} (60 years) of the Unit 1 surge line hot leg nozzle and charging nozzle exceeded the design code allowable of 1.0. For these two locations, BVPS will implement one or more of the following: • Further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0; • Management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC); or • Repair or replacement of the affected locations.	January 29, 2016	LRA	A.2.3.3.2 4.3.3.3.3
26	Evaluate Unit 1 Extended Power Uprate operating experience prior to the period of extended operation for license renewal aging management program adjustments.	January 29, 2016	None	Appendix B.2

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A.5 UNIT 2 LICENSE RENEWAL COMMITMENTS

Table A.5-1 identifies those actions committed to by FENOC for BVPS Unit 2 in the BVPS License Renewal Application (LRA). These regulatory commitments will be tracked within the FENOC regulatory commitment management program. Any other actions discussed in the LRA represent intended or planned actions by FENOC. These other actions are described only as information and are not regulatory commitments. This list will be revised as necessary in subsequent amendments to reflect changes resulting from NRC audit questions and BVPS responses to NRC requests for additional information.

Table A.5-1
Unit 2 License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
1	Implement the Buried Piping and Tanks Inspection Program as described in LRA Section B.2.8.	Will be implemented within the 10 years prior to May 27, 2027	LRA	A.1.8 B.2.8
2	Enhance the Closed-Cycle Cooling Water System Program to: • Add the diesel-driven fire pump (Unit 1 only) and the diesel-driven standby air compressor (Unit 2 only) to the program; • Detail performance testing of heat exchangers and pumps, and provide direction to perform visual inspections of system components; • Identify closed-cycle cooling water system parameters that will be trended to determine if heat exchanger tube fouling or corrosion product buildup exists; • Control performance tests and perform visual inspections at the required frequency.	May 27, 2027	LRA	A.1.9 B.2.9

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
3	Implement the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program as described in LRA Section B.2.10.	Will be implemented within the 10 years prior to May 27, 2027	LRA	A.1.10 B.2.10
4	Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as described in LRA Section B.2.11.	May 27, 2027	LRA	A.1.11 B.2.11
5	Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program as described in LRA Section B.2.12.	May 27, 2027	LRA	A.1.12 B.2.12
6	Implement the Electrical Wooden Poles/Structures Inspection Program as described in LRA Section B.2.13.	Will be implemented within the 5 years prior to May 27, 2027	LRA	A.1.13 B.2.13
7	Implement the External Surfaces Monitoring Program as described in LRA Section B.2.15.	May 27, 2027	LRA	A.1.15 B.2.15
8	Enhance the Fire Protection Program to: • Include a new attachment to the BVPS Fire Protection Program administrative procedure to address the Fire Protection Systems that are in scope for license renewal purposes;	May 27, 2027	LRA	A.1.16 B.2.16

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
8, cont.	• Provide details of the NUREG-1801 inspection and testing guidelines, the plant implementation strategy, surveillance test and inspection frequencies, and affected implementing procedure(s); and, • Provide inspection guidance details to include degradation such as concrete cracking and spalling, and loss of material of fire barrier walls, ceilings and floors that may affect the fire rating of the assembly or barrier.			
9	Enhance the Fire Water System Program to: • Include a program requirement to perform flow test or inspection of all accessible fire water headers and piping during the period of extended operation at an interval determined by the Fire Protection System Engineer; • Include a program requirement that requires a representative number of fire water piping locations be identified if piping visual inspections are used as an alternative to non-intrusive testing; • Include a program requirement that allows test or inspection results from an accessible section of pipe to be extrapolated to an inaccessible, but similar section of pipe. If no similar section of accessible pipe is available, then alternative testing or inspection activities must be used;	Will be implemented within the 10 years prior to May 27, 2027	LRA	A.1.17 B.2.17

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
9, cont.	• Include a program requirement that, at least once prior to the period of extended operation, all accessible Fire Protection headers and piping shall be flow tested in accordance with NFPA 25 or visually/ultrasonically inspected; • Include steps in the program procedure that require testing or replacement of sprinkler heads that will have been in service for 50 years; and, • Include a program requirement to perform a fire water subsystem internal inspection any time a subsystem (including fire pumps) is breached for repair or maintenance.			
10	Enhance the Flux Thimble Tube Inspection Program to: • Include a requirement in the program procedure to state that, if a flux thimble tube cannot be inspected over the tube length (tube length that is subject to wear due to restriction or other defect), and cannot be shown by analysis to be satisfactory for continued service, the thimble tube must be removed from service to ensure the integrity of the Reactor Coolant System pressure boundary.	May 27, 2027	LRA	A.1.19 B.2.19

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
11	Enhance the Fuel Oil Chemistry Program to: • Revise the implementing procedure for sampling and testing the diesel-driven fire pump fuel oil storage tank (Unit 1 only) to include a test for particulate and accumulated water in addition to the test for sediment and water; and, • Generate a new implementing procedure for sampling and testing the security diesel generator fuel oil day tank (Common) for accumulated water, particulate contamination, and sediment / water.	May 27, 2027	LRA	A.1.20 B.2.20
12	Implement the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as described in LRA Section B.2.21.	May 27, 2027	LRA	A.1.21 B.2.21
13	Implement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program as described in LRA Section B.2.22.	May 27, 2027	LRA	A.1.22 B.2.22
14	Enhance the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program to: • Include guidance in the program administrative procedure to inspect for loss of material due to corrosion on Unit 2 crane and trolley structural components and rails; and,	May 27, 2027	LRA	A.1.23 B.2.23

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
14, cont.	Include guidance in the crane and hoist inspection procedures to inspect for loss of material due to corrosion on Unit 2 crane and trolley structural components and rails or extendable arms, as appropriate.			
15	Enhance the Masonry Wall Program to: • Include in program scope additional masonry walls identified as having aging effects requiring management for license renewal.	May 27, 2027	LRA	A.1.25 B.2.25
16	Implement the Metal Enclosed Bus Program as described in LRA Section B.2.26.	May 27, 2027	LRA	A.1.26 B.2.26
17	For the Nickel-Alloy Nozzles and Penetrations Program, regarding activities for managing the aging of nickel-alloy components and nickel-alloy clad components susceptible to primary water stress corrosion cracking - PWSCC (other than upper reactor vessel closure head nozzles and penetrations), BVPS commits to develop a plant-specific aging management program that will implement applicable: 1. NRC Orders, Bulletins and Generic Letters; and, 2. Staff-accepted industry guidelines.	May 27, 2027	LRA	A.1.28 B.2.28
18	Implement the One-Time Inspection Program as described in LRA Section B.2.30.	Will be implemented within the 10 years prior to May 27, 2027	LRA	A.1.30 B.2.30

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
19	Implement the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program as described in LRA Section B.2.31.	Will be implemented within the 10 years prior to May 27, 2027	LRA	A.1.31 B.2.31
20	For the PWR Vessel Internals Program, regarding activities for managing the aging of Reactor Vessel internal components and structures, BVPS commits to: 1. Participate in the industry programs applicable to BVPS Unit 2 for investigating and managing aging effects on reactor internals; 2. Evaluate and implement the results of the industry programs as applicable to the BVPS Unit 2 reactor internals; and, 3. Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for the BVPS Unit 2 reactor internals to the NRC for review and approval.	May 27, 2025	LRA	A.1.33 B.2.33
21	Implement the Selective Leaching of Materials Program as described in LRA Section B.2.36.	May 27, 2027	LRA	A.1.36 B.2.36
22	Enhance the Structures Monitoring Program to: • Include in program scope additional structures and structural components identified as having aging effects requiring management for license renewal;	May 27, 2027	LRA	A.1.39 B.2.39

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
22, cont.	• Include inspection guidance in program implementing procedures to detect significant cracking in concrete surrounding the anchors of vibrating equipment; • Include a requirement in program procedures to perform opportunistic inspections of normally inaccessible below-grade concrete when excavation work uncovers a significant depth; • Include a requirement in program procedures to perform periodic sampling of groundwater for pH, chloride concentration, and sulfate concentration; and, • Include a requirement in program procedures to monitor elastomeric materials used in seals and sealants, including compressible joints and seals, waterproofing membranes, etc., associated with in-scope structures and structural components for cracking and change in material properties.			
23	Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.2.40.	May 27, 2027	LRA	A.1.40 B.2.40
24	Implement the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.2.41.	May 27, 2027	LRA	A.1.41 B.2.41

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
25	Enhance the Water Chemistry Program to: • Change BVPS frequency for reactor coolant silica monitoring to once per week for Operational Modes 1 and 2, and once per day during heatup in Operational Modes 3 and 4, to be consistent with EPRI guidelines.	May 27, 2027	LRA	A.1.42 B.2.42
26	The Unit 2 steam generator secondary manway bolts and the steam generator tubes fatigue analyses are based on a 40-year life (current operating license expires in 2027). As part of the Steam Generator Tube Integrity Program, BVPS will perform a reanalysis, repair, or replacement of the affected components such that the design basis of these components is not exceeded for the period of extended operation.	May 27, 2027	LRA	A.3.3.1 4.3.1
27	BVPS will perform an assessment of the Unit 2 Emergency Diesel Generator Air Start System to determine whether the full-temperature cycles limit would be exceeded for 60 years of operation. This assessment will be performed prior to the period of extended operation.	May 27, 2027	LRA	A.3.3.2.1 4.3.2.1

Table A.5-1
Unit 2 License Renewal Commitments
(continued)

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
28	Of the NUREG/CR-6260 locations, the U_{env} (60 years) of the Unit 2 surge line nozzle, charging nozzle, and RHR line exceeded the design code allowable of 1.0. For these three locations, BVPS will implement one or more of the following: • Further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0; • Management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC); or, • Repair or replacement of the affected locations.	May 27, 2027	LRA	A.3.3.3.3 4.3.3.3.3
29	Evaluate Unit 2 Extended Power Uprate operating experience prior to the period of extended operation for license renewal aging management program adjustments.	May 27, 2027	None	Appendix B.2

APPENDIX B

AGING MANAGEMENT PROGRAMS AND ACTIVITIES

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APPENDIX B
AGING MANAGEMENT PROGRAMS AND ACTIVITIES

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B.0 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

B.1 INTRODUCTION

B.1.1 OVERVIEW

The aging management review results for the integrated plant assessment of Beaver Valley Power Station (BVPS) are presented in Sections 3.1 through 3.6 of this application. The programs credited in the integrated plant assessment for managing aging effects are described in this appendix.

Each aging management program described in this appendix has ten elements in accordance with the guidance in NUREG-1800 [Reference 1.3-4], Appendix A.1, *Aging Management Review - Generic*, Table A.1-1, *Elements of an Aging Management Program for License Renewal*. For aging management programs that are comparable to the programs described in Sections X and XI of NUREG-1801, *Generic Aging Lessons Learned (GALL) Report* [Reference 1.3-5], the ten elements have been compared to the elements of the NUREG-1801 program. For plant-specific programs which do not correlate with NUREG-1801, the ten elements are addressed in the program discussion.

Design differences exist between BVPS Unit 1 and Unit 2 due to the fact that the two units were constructed eleven years apart as evidenced by the license expiration dates for each unit. Those design differences that impact aging management for each unit are identified by a unit-specific designator ((Unit 1 only); (Unit 2 only); (Common)) in the appropriate section of this application.

B.1.2 FORMAT OF PRESENTATION

For those aging management programs that are comparable to the programs described in Sections X and XI of NUREG-1801, the program discussion is presented in the following format:

- **Program Description** — abstract of the overall program.
- **NUREG-1801 Consistency** — summary of the degree of consistency between the BVPS program and the corresponding NUREG-1801 program, when applicable (i.e., degree of similarity, etc.).
- **Exceptions to NUREG-1801** — exceptions to the NUREG-1801 program, including a justification for the exceptions (when applicable).

- **Enhancements** — future program enhancements with a proposed schedule for their completion (when applicable), including additional program features to manage aging effects not addressed by the NUREG-1801 program.
- **Operating Experience** — discussion of operating experience information specific to the program.
- **Conclusion** — statement of reasonable assurance that the program is effective, or will be effective, once implemented with necessary enhancements.

For plant-specific programs and new programs, the above format is generally followed, with additional discussion of each of the ten elements.

B.1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

Three elements common to all aging management programs (AMPs) are corrective actions, confirmation process and administrative controls. These elements are included in the BVPS Quality Assurance (QA) Program, which implements the requirements of 10 CFR Part 50 [Reference 1.3-1], Appendix B. A description of the QA Program is provided in Unit 1 UFSAR, Appendix A, and Unit 2 UFSAR, Chapter 17.

Discussion of the three elements is presented in the following paragraphs. Corrective actions have program-specific details which are included in the descriptions of the individual programs in this report, but further discussion of the confirmation process and administrative controls is not necessary and is not included in the descriptions of the individual programs.

Corrective Actions

BVPS quality assurance procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. Adverse conditions, such as failures, malfunctions, deficiencies, deviations, defective hardware and non-conformances, or human performance, programmatic, organizational, or management weaknesses, are identified and corrected in a timely manner. Using the BVPS Corrective Action Program, adverse conditions are identified and categorized as conditions adverse to quality or significant conditions adverse to quality based on the significance and consequences of the specific problem identified. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the nonconformance is determined and that corrective action is taken to preclude recurrence. In addition, the root cause of the significant condition adverse to quality and the corrective action implemented are documented and reported to appropriate levels of management. BVPS corrective actions are consistent with NUREG-1801.

Confirmation Process

BVPS quality assurance procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR 50, Appendix B. The First Energy Nuclear Operating Company (FENOC) Quality Assurance Program applies to BVPS safety-related structures and components. Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished per the existing BVPS Corrective Action Program and document control program. The confirmation process is part of the Corrective Action Program and includes:

- Reviews to assure that proposed actions are adequate,
- Tracking and reporting of open corrective actions, and
- Review of corrective action effectiveness based on the significance category of the identified condition or management discretion.

Any follow-up inspection required by the confirmation process is documented in accordance with the Corrective Action Program. The Corrective Action Program constitutes the confirmation process for aging management programs and activities. The BVPS confirmation process is consistent with NUREG-1801.

Administrative Controls

BVPS quality assurance procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR 50, Appendix B. The FENOC Quality Assurance Program applies to BVPS safety-related structures and components. Administrative (document) control for both safety-related and nonsafety-related structures and components is accomplished per the existing document control program. The BVPS administrative controls are consistent with NUREG-1801.

B.1.4 OPERATING EXPERIENCE

Industry operating experience was incorporated into the license renewal process through the use of license renewal guidance documents that incorporated operating experience regarding aging effects requiring management. Industry operating experience applicable to BVPS since issuance of the industry guidance documents was reviewed and evaluated. The industry operating experience review included a broad list of industry documents and databases, such as generic NRC communications, Regulatory Issue Summaries, Institute for Nuclear Power Operations (INPO) operating experience database and the Licensee Event Report (LER) database, and the World Association of Nuclear Operators (WANO) operating experience database. These information sources were reviewed through directed system and component searches to identify examples of industry age-related degradation applicable to BVPS.

Review of plant-specific operating experience was performed to identify aging effects experienced at BVPS, and to demonstrate that existing BVPS aging management programs

(AMPs) credited for license renewal are effective for the management of aging effects. The review of plant-specific operating experience included review of site documents and electronic database searches, such as the BVPS LER database, the Condition Report Evaluation and Status Tracking database (a major component of the station Corrective Action Program), recent System and Program Health Reports, self-assessments, Quality Assurance audits, and NRC reviews. In addition, interviews with BVPS program owners and system engineers were conducted using interview forms with a list of questions pertaining to aging effects on plant systems and structures.

The operating experience evaluations demonstrate that the existing AMPs will continue to effectively manage aging effects during the period of extended operation. Site procedures require reviews of site and relevant industry operating experience as the site continues operation through the period of extended operation.

B.1.5 LIST OF BVPS AGING MANAGEMENT PROGRAMS

The following BVPS aging management programs are described in the sections listed in Table B.1-1. Programs in this table are identified as either "existing" or "new". Additionally, the programs are either comparable to programs described in NUREG-1801, or are plant-specific. The correlation between NUREG-1801 programs and BVPS programs is shown in Table B.1-2.

Table B.1-1
BVPS Aging Management Programs

Aging Management Program Title	LRA Section	Status
10 CFR Part 50, Appendix J	B.2.1	Existing
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	B.2.2	Existing
ASME Section XI, Subsection IWE	B.2.3	Existing
ASME Section XI, Subsection IWF	B.2.4	Existing
ASME Section XI, Subsection IWL	B.2.5	Existing
Bolting Integrity	B.2.6	Existing
Boric Acid Corrosion	B.2.7	Existing
Buried Piping and Tanks Inspection	B.2.8	New
Closed-Cycle Cooling Water System	B.2.9	Existing
Electrical Cable Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements One-Time Inspection	B.2.10	New
Electrical Cables and Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements	B.2.11	New
Electrical Cables and Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	B.2.12	New
Electrical Wooden Poles/Structures Inspection (Unit 2 only)	B.2.13	New

Table B.1-1
BVPS Aging Management Programs
(continued)

Aging Management Program Title	LRA Section	Status
Environmental Qualification (EQ) of Electrical Components	B.2.14	Existing
External Surfaces Monitoring	B.2.15	New
Fire Protection	B.2.16	Existing
Fire Water System	B.2.17	Existing
Flow-Accelerated Corrosion	B.2.18	Existing
Flux Thimble Tube Inspection	B.2.19	Existing
Fuel Oil Chemistry	B.2.20	Existing
Inaccessible Medium-Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements	B.2.21	New
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	B.2.22	New
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B.2.23	Existing
Lubricating Oil Analysis	B.2.24	Existing
Masonry Wall	B.2.25	Existing
Metal Enclosed Bus (Unit 2 only)	B.2.26	New
Metal Fatigue of Reactor Coolant Pressure Boundary	B.2.27	Existing
Nickel-Alloy Nozzles and Penetrations	B.2.28	New
Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head	B.2.29	Existing
One-Time Inspection	B.2.30	New
One-Time Inspection of ASME Code Class 1 Small Bore Piping	B.2.31	New
Open-Cycle Cooling Water System	B.2.32	Existing

Table B.1-1
BVPS Aging Management Programs
(continued)

Aging Management Program Title	LRA Section	Status
PWR Vessel Internals	B.2.33	New
Reactor Head Closure Studs	B.2.34	Existing
Reactor Vessel Integrity	B.2.35	Existing
Selective Leaching of Materials	B.2.36	New
Settlement Monitoring (Unit 2 only)	B.2.37	Existing
Steam Generator Tube Integrity	B.2.38	Existing
Structures Monitoring	B.2.39	Existing
Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	B.2.40	New
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	B.2.41	New
Water Chemistry	B.2.42	Existing

B.1.6 BVPS AGING MANAGEMENT PROGRAM CORRELATION TO NUREG-1801 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 Aging Management Programs and BVPS Aging Management Programs is shown in Table B.1-2. Links are provided to the BVPS program discussions, and plant-specific programs are listed at the end of the table.

Table B.1-2
BVPS Aging Management Program Correlation to NUREG-1801 Aging Management Programs

NUREG-1801 Number	NUREG-1801 Program	BVPS Program	LRA Section
NUREG-1801 Vol. 2 - Chapter X: Time-Limited Aging Analyses Programs			
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Metal Fatigue of Reactor Coolant Pressure Boundary	B.2.27
X.S1	Concrete Containment Tendon Prestress	BVPS does not have pre-stressed tendons in the Containment Building	--
X.E1	Environmental Qualification (EQ) of Electrical Components	Environmental Qualification (EQ) of Electrical Components	B.2.14
NUREG-1801 Vol. 2 - Chapter XI: Aging Management Programs			
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	B.2.2
XI.M2	Water Chemistry	Water Chemistry	B.2.42
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs	B.2.34
XI.M4	BWR Vessel ID Attachment Welds	Not applicable to PWRs	--
XI.M5	BWR Feedwater Nozzle	Not applicable to PWRs	--
XI.M6	BWR Control Rod Drive Return Line Nozzle	Not applicable to PWRs	--
XI.M7	BWR Stress Corrosion Cracking	Not applicable to PWRs	--

Table B.1-2
BVPS Aging Management Program Correlation to NUREG-1801 Aging Management Programs (continued)

NUREG-1801 Number	NUREG-1801 Program	BVPS Program	LRA Section
XI.M8	BWR Penetrations	Not applicable to PWRs	--
XI.M9	BWR Vessel Internals	Not applicable to PWRs	--
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion	B.2.7
XI.M11	Nickel-Alloy Nozzles and Penetrations	Nickel Alloy Nozzles and Penetrations	B.2.28
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head	B.2.29
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	B.2.41
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	B.2.40
XI.M14	Loose Part Monitoring	Not credited for aging management	--
XI.M15	Neutron Noise Monitoring	Not credited for aging management	--
XI.M16	PWR Vessel Internals	PWR Vessel Internals	B.2.33
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion	B.2.18
XI.M18	Bolting Integrity	Bolting Integrity	B.2.6
XI.M19	Steam Generator Tube Integrity	Steam Generator Tube Integrity	B.2.38
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System	B.2.32
XI.M21	Closed-Cycle Cooling Water System	Closed-Cycle Cooling Water System	B.2.9
XI.M22	Boraflex Monitoring	Not credited for aging management	--

Table B.1-2
BVPS Aging Management Program Correlation to NUREG-1801 Aging Management Programs (continued)

NUREG-1801 Number	NUREG-1801 Program	BVPS Program	LRA Section
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B.2.23
XI.M24	Compressed Air Monitoring	Not credited for aging management	--
XI.M25	BWR Reactor Water Cleanup System	Not applicable to PWRs	--
XI.M26	Fire Protection	Fire Protection	B.2.16
XI.M27	Fire Water System	Fire Water System	B.2.17
XI.M28	Buried Piping and Tanks Surveillance	Not credited for aging management	--
XI.M29	Aboveground Steel Tanks	Not credited for aging management	--
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry	B.2.20
XI.M31	Reactor Vessel Surveillance	Not credited for aging management. The Reactor Vessel Integrity Program (B.2.35) manages aging of Reactor Vessel materials.	--
XI.M32	One-Time Inspection	One-Time Inspection	B.2.30
XI.M33	Selective Leaching of Materials	Selective Leaching of Materials	B.2.36
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection	B.2.8
XI.M35	One-Time Inspection of ASME Code Class 1 Small Bore Piping	One-Time Inspection of ASME Code Class 1 Small Bore Piping	B.2.31
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring	B.2.15
XI.M37	Flux Thimble Tube Inspection	Flux Thimble Tube Inspection	B.2.19

Table B.1-2
BVPS Aging Management Program Correlation to NUREG-1801 Aging Management Programs (continued)

NUREG-1801 Number	NUREG-1801 Program	BVPS Program	LRA Section
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	B.2.22
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis	B.2.24
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE	B.2.3
XI.S2	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL	B.2.5
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF	B.2.4
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J	B.2.1
XI.S5	Masonry Wall Program	Masonry Wall	B.2.25
XI.S6	Structures Monitoring Program	Structures Monitoring	B.2.39
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Not credited for aging management. However, the Structures Monitoring Program (B.2.39) includes elements of the RG 1.127 program for BVPS structures.	--
XI.S8	Protective Coating Monitoring and Maintenance Program	Not credited for aging management. Protective coatings are not relied upon to manage the effects of aging	--
XI.E1	Electrical Cables and Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements	Electrical Cables and Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements	B.2.11
XI.E2	Electrical Cables and Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Cables and Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	B.2.12

Table B.1-2
BVPS Aging Management Program Correlation to NUREG-1801 Aging Management Programs (continued)

NUREG-1801 Number	NUREG-1801 Program	BVPS Program	LRA Section
XI.E3	Inaccessible Medium-Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements	Inaccessible Medium-Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements	B.2.21
XI.E4	Metal Enclosed Bus	Metal Enclosed Bus (Unit 2 only). There is no in-scope metal enclosed bus at Unit 1.	B.2.26
XI.E5	Fuse Holders	Not credited for aging management. Insulation for fuse holders is addressed by the Electrical Cables and Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements Program (B.2.11).	--
XI.E6	Electrical Cable Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements	Not credited for aging management. See plant-specific Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program (B.2.10).	--
Plant-Specific Programs			
NA	Plant-specific Program	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection	B.2.10
NA	Plant-specific Program	Electric Wooden Poles/Structures Inspection (Unit 2 only)	B.2.13
NA	Plant-specific Program	Reactor Vessel Integrity	B.2.35
NA	Plant-specific Program	Settlement Monitoring (Unit 2 only)	B.2.37

B.1.7 BVPS AGING MANAGEMENT PROGRAM CONSISTENCY WITH NUREG-1801 AGING MANAGEMENT PROGRAMS

BVPS Aging Management Programs were compared to NUREG-1801 Aging Management Programs for consistency. The results of the comparison are shown in Table B.1-3, and fall into one of four categories:

- Plant-specific [not comparable to a NUREG-1801 Aging Management Program];
- Program consistent with NUREG-1801;
- Program with enhancement(s) [to align with NUREG-1801]; or,
- Program with exception(s) to NUREG-1801.

Table B.1-3
BVPS Aging Management Program Consistency with NUREG-1801 Aging Management Programs

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancement(s)	Programs with Exception(s) to NUREG-1801
10 CFR Part 50, Appendix J	--	Yes	--	--
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	--	--	--	Yes
ASME Section XI, Subsection IWE	--	--	--	Yes
ASME Section XI, Subsection IWF	--	--	--	Yes
ASME Section XI, Subsection IWL	--	Yes	--	--
Bolting Integrity	--	Yes	--	--
Boric Acid Corrosion	--	Yes	--	--
Buried Piping and Tanks Inspection	--	Yes	--	--

Table B.1-3
BVPS Aging Management Program Consistency with NUREG-1801 Aging Management Programs (continued)

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancement(s)	Programs with Exception(s) to NUREG-1801
Closed-Cycle Cooling Water System	--	Yes	Yes	--
Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection	Yes	--	--	--
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	--	Yes	--	--
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	--	Yes	--	--
Electrical Wooden Poles/ Structures Inspection (Unit 2 only)	Yes	--	--	--
Environmental Qualification (EQ) of Electrical Components	--	Yes	--	--
External Surfaces Monitoring	--	Yes	--	--
Fire Protection	--	--	Yes	Yes
Fire Water System	--	Yes	Yes	--
Flow-Accelerated Corrosion	--	Yes	--	--
Flux Thimble Tube Inspection	--	Yes	Yes	--

Table B.1-3
BVPS Aging Management Program Consistency with NUREG-1801 Aging Management Programs (continued)

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancement(s)	Programs with Exception(s) to NUREG-1801
Fuel Oil Chemistry	--	--	Yes	Yes
Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	--	Yes	--	--
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	--	Yes	--	--
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	--	Yes	Yes	--
Lubricating Oil Analysis	--	Yes	--	--
Masonry Wall	--	Yes	Yes	--
Metal Enclosed Bus (Unit 2 only)	--	Yes	--	--
Metal Fatigue of Reactor Coolant Pressure Boundary	--	Yes	--	--
Nickel-Alloy Nozzles and Penetrations	--	Yes	--	--
Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head	--	Yes	--	--
One-Time Inspection	--	Yes	--	--
One-Time Inspection of ASME Code Class 1 Small Bore Piping	--	Yes	--	--

Table B.1-3
BVPS Aging Management Program Consistency with NUREG-1801 Aging Management Programs (continued)

Program Name	Plant Specific	NUREG-1801 Comparison		
		Programs Consistent with NUREG-1801	Programs with Enhancement(s)	Programs with Exception(s) to NUREG-1801
Open-Cycle Cooling Water System	--	Yes	--	--
PWR Vessel Internals	--	Yes	--	--
Reactor Head Closure Studs	--	--	--	Yes
Reactor Vessel Integrity	Yes	--	--	--
Selective Leaching of Materials Inspection	--	--	--	Yes
Settlement Monitoring (Unit 2 only)	Yes	--	--	--
Steam Generator Tube Integrity	--	Yes	--	--
Structures Monitoring	--	Yes	Yes	--
Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	--	Yes	--	--
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	--	Yes	--	--
Water Chemistry	--	Yes	Yes	--

B.2 AGING MANAGEMENT PROGRAMS

B.2.1 10 CFR PART 50, APPENDIX J

Program Description

The BVPS 10 CFR Part 50, Appendix J Program monitors Containment leak rate. Containment leak rate tests are required to assure that: (a) leakage through primary Reactor Containment and systems and components penetrating primary Containment will not exceed allowable values specified in technical specifications or associated bases, and (b) periodic surveillance of Reactor Containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of Containment, and systems and components penetrating primary Containment.

Appendix J provides two options, A and B, either of which can be chosen to meet the requirements of a Containment leak rate test program. BVPS uses option B, the performance-based approach. The Containment leak rate tests are performed in accordance with the guidelines contained in NRC Regulatory Guide 1.163, *Performance-Based Containment Leak-Testing Program* [Reference B.3-1] and NEI 94-01, *Industry Guidance for Implementing Performance-Based Options of 10 CFR Part 50 Appendix J* [Reference B.3-2].

NUREG-1801 Consistency

The 10 CFR Part 50, Appendix J Program is an existing program that is consistent with NUREG-1801 [Reference 1.3-5], Section XI.S4, *10 CFR Part 50, Appendix J.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

As stated in NUREG-1801, Section XI.S4, *10 CFR Part 50, Appendix J*, "To date, the 10 CFR Part 50, Appendix J, LRT program has been effective in preventing unacceptable leakage through the Containment pressure boundary. Implementation of Option B for testing frequency must be consistent with plant-specific operating experience." BVPS uses the Option B program. The program strategy and frequency are directly driven by program operating experience. The results of previous inspections are used to establish inspection parameters and formulate corrective actions.

When a penetration is found to be outside the established administrative leakage limits, evaluations are performed and corrective actions taken to restore it to within the limits. Some site-specific examples follow.

The most recent Unit 1 Type A test, conducted on April 14, 2006, showed a leakage rate (including the Type B and Type C Penalty Additions and Tank Change Volume Corrections) within the limits of the Acceptance Criteria. The most recent Unit 2 Type A test, conducted on November 10, 1993, showed a leakage rate within the limits of the Acceptance Criteria.

During the most recent Type C tests, the Unit 1 inside Containment purge exhaust valve and the Unit 2 inside Containment radiation monitor return check valve had leak rates that exceeded their administrative limits. The Unit 1 inside Containment purge exhaust valve was cleaned and retested, resulting in an acceptable leak rate. The Unit 2 inside Containment radiation monitor return check valve was repaired and re-tested, resulting in an acceptable leak rate.

A self-assessment of the BVPS Appendix J Program was conducted in 2005 to identify areas to optimize Type-C testing activities performed during scheduled refueling outages (specifically, scope selection). Four Strengths, seven Noteworthy Items, and one Area For Improvement were identified. The assessment team concluded that the program is effective in satisfying the requirements of 10 CFR 50.54(o), 10 CFR 50, Appendix J, Option B, NEI 94-01, and Regulatory Guide 1.163.

Confirmation of Containment integrity, along with identification and resolution of program discrepancies, provides reasonable assurance that the program is effective for managing loss of material of components.

Conclusion

Continued implementation of the 10 CFR Part 50, Appendix J Program provides reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.2 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD

Program Description

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is in accordance with ASME Section XI 1989 edition (with no Addenda) and is subject to the limitations and modifications of 10 CFR 50.55a [Reference 1.3-1]. The program provides for condition monitoring of Class 1, 2, and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting. The program is updated as required by 10 CFR 50.55a.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is augmented by the Water Chemistry Program (Section B.2.42) where applicable.

NUREG-1801 Consistency

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is an existing program that is consistent with NUREG-1801, Section XI.M1, *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD*, with exception.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope of Program**

  NUREG-1801, Section XI.M1, *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* specifies the use of ASME Section XI, 2001 edition through 2002 and 2003 Addenda. The applicable ASME Code for the third (Unit 1 only) and second (Unit 2 only) intervals of the BVPS ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is ASME Section XI, 1989 edition (with no Addenda). The use of the 1989 edition of the ASME Code is consistent with provisions in 10 CFR 50.55a to use the Code in effect 12 months prior to the start of the inspection interval. BVPS will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

- **Parameters Monitored or Inspected**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Detection of Aging Effects**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Monitoring and Trending**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Acceptance Criteria**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Corrective Actions**

  See the exception regarding differences in ASME Code edition under Scope of Program.

Enhancements

None

Operating Experience

The extent and schedule of the inspection and test techniques prescribed by the program are designed to maintain structural integrity and ensure that aging effects will be discovered and repaired before the loss of intended function of the component.

For Class 1, 2, or 3 components, the inspection schedule of IWB-2400, IWC-2400, or IWD-2400, respectively, and the extent and frequency of IWB-2500-1, IWC-2500-1, or IWD-2500-1, respectively, provides for timely detection of degradation. The BVPS Inservice Inspection (ISI) Program is an existing program that encompasses ASME Section XI, Subsections IWA, IWB, IWC, IWD and IWF requirements. The ISI Program is based on ASME Inspection Program B (IWA-2432), which has 10-year inspection intervals.

During the Unit 1 Cycle 17 Refueling Outage (February - April 2006), Inservice Inspection (ISI) examinations were performed on Class 1, 2, 3 and MC components. Class 1 examinations (welds, Class 1 bolting, VT-3 visual examinations, and ISI piping VT-2), Class 2 examinations (welds, bolting-UT, supports-visual, ISI piping VT-2), visual examinations of Class 3 supports, and Class MC examinations on the liner plate, new concrete patch, moisture barrier, and equipment hatch bolting were performed as part of this inspection. The Class 1 piping System Leakage Test was performed prior to plant start-up from the outage. Class 1 bolted connections were examined during the outage. Also, Class 2 and 3 system functional and system inservice tests were performed in accordance with 40-month pressure testing requirements. There were no recorded ISI non-destructive examination deficiencies in the Cycle 17 Refueling Outage.

During the Unit 2 Cycle 10 Refueling Outage (September - October 2003), Inservice Inspection (ISI) examinations were performed on Class 1, 2, and MC components. Class 1 examinations (pipe welds and RCP flywheel), and Class 2 examinations (welds, supports-visual) were performed. The Class 1 piping System Leakage Test was performed prior to plant start-up from the outage. Class 1 bolted connections were examined during the outage. Also, Class 2 and 3 system functional and system inservice tests were performed on various systems to fulfill the current 40-month pressure testing requirement. There were no recorded ISI non-destructive examination deficiencies in the Cycle 10 Refueling Outage.

If results are found to be outside of acceptable limits, the affected components are either repaired, evaluated for acceptance as is, or replaced. Identification of degradation and corrective action prior to loss of intended function provide reasonable assurance that the program is effective for managing aging effects.

A self-assessment of the ISI program was completed in November 2004. The assessment team evaluated thirteen assessment areas. Also, the assessment included a review of industry operating experience related to ISI that identified a situation where UT examination volume was marginally acceptable. The BVPS program was reviewed and found to have incorporated the ISI extended examination volume requirement in their UT procedures. Overall the BVPS ISI program was evaluated to be implemented effectively. No technical issues were identified, and the identified items were limited to administrative issues that would clarify facets of the program and strengthen the overall ISI program. All of the identified items were resolved through the Corrective Action Program.

Quality Assurance surveillances in 2004 identified minor issues that, if corrected, would improve program performance and reduce human errors, but did not identify issues or findings that would impact the overall effectiveness of the program. The review of the ISI program identified items for improvement with the procedure references, format inconsistencies, and properly processing a Westinghouse evaluation. The Corrective Action Program was used to revise the program, and to process the evaluation in accordance with the required procedures.

NRC inspections of ISI were performed during the Unit 1 Cycle 17 Refueling Outage and the Unit 2 Cycle 12 Refueling Outage (October - November 2006). The NRC Integrated Inspection Reports (dated July 28, 2006 and January 24, 2007) state that no findings of significance were identified for this inspection. The inspectors assessed the ISI activities by reviewing documentation and interviewing personnel associated with these activities. The inspectors also reviewed a sample of Corrective Action Program documents to assess the licensee's effectiveness in problem identification and resolution. During the Unit 2 inspection, the inspectors also interviewed staff and reviewed evaluations for defects found during non-destructive examination that were to be left in service.

Because the ASME Code is a consensus document that has been widely used over a long period, it has been shown to be effective in managing aging effects in Class 1, 2, and 3 components and their integral attachments in light-water cooled power plants (see Chapter I of NUREG-1801, Volume 2).

Conclusion

Continued implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.3 ASME SECTION XI, SUBSECTION IWE

Program Description

The ASME Section XI, Subsection IWE Program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE, 1992 edition with the 1992 Addenda, within the limitations and modifications required by the Code of Federal Regulations in 10 CFR 50.55a.

This program is implemented through plant procedures, which provide for inservice inspection of Class MC and metallic liners of Class CC components.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWE Program is an existing program that is consistent with NUREG-1801, Section XI.S1, *ASME Section XI, Subsection IWE*, with exception.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope of Program**

  NUREG-1801, Section XI.S1, *ASME Section XI, Subsection IWE* specifies the use of ASME Section XI, 2001 edition through 2002 and 2003 Addenda. The applicable ASME Code for the first inspection interval of the BVPS ASME Section XI, Subsection IWE Program is ASME Section XI, 1992 edition through the 1992 Addenda. The use of the 1992 edition through the 1992 Addenda of the ASME Code is consistent with provisions in 10 CFR 50.55a to use the Code in effect 12 months prior to the start of the inspection interval. BVPS will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

- **Parameters Monitored or Inspected**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Detection of Aging Effects**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Monitoring and Trending**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Acceptance Criteria**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Corrective Actions**

  See the exception regarding differences in ASME Code edition under Scope of Program.

Enhancements

None

Operating Experience

The ASME Section XI, Subsection IWE program inspections, as recommended by NRC Information Notice IN 97-10 [Reference B.3-3], have identified containment liner plate deficiencies such as paint flaking, chipping, blistering, and other minor damage. The inspections have also identified a few instances of caulking deficiencies. The inspections have been effective in identifying minor irregularities on the inside surface of the liner plate before significant corrosion damage occurred.

The frequency and scope of examination specified in 10 CFR 50.55a and Subsection IWE ensure that aging effects would be detected before they would compromise the design-basis requirements. As indicated in IWE-2400, inservice examinations and pressure tests are performed in accordance with one of two inspection programs, A or B, on a specified schedule. IWE-3000 provides acceptance standards for components of steel containments and liners of concrete containments. ASME Section XI, Subsection IWE was incorporated into 10 CFR 50.55a in 1996. Prior to this time, operating experience pertaining to degradation of steel components of containment was gained through the inspections required by 10 CFR Part 50, Appendix J and ad hoc inspections conducted by licensees and the NRC.

BVPS performed Inservice Inspection (ISI) IWE examinations on the liner, penetrations, and welded attachments during the Unit 1 Cycle 17 Refueling Outage (February - April 2006) to meet the 2nd Period examination requirements of the initial IWE Interval. There were no recorded ISI non-destructive examination deficiencies in the outage.

A temporary construction opening was created for the Unit 1 steam generator and reactor head replacements during the Unit 1 Cycle 17 Refueling Outage (February - April 2006). Three areas of corrosion were identified on the Containment liner plate during initial visual inspection. These areas were located on the outside of the liner, which was on the side in contact with the concrete. Loss of material was identified for all three areas of corrosion. Ultrasonic testing (UT) measurements were performed at each location. Test results indicated spots below nominal wall thickness for the liner plate in two of three areas. The same two areas also contained evidence of pitting. The third area had evidence of minor material loss but remained at or above the nominal plate thickness with minimal pitting. The two areas found to have wall thickness below nominal were replaced. The third area was placed in service without repair or replacement, but was examined following re-painting to allow future examinations to monitor potential degradation. The probable cause for the liner plate corrosion is exposure to the elements during initial construction. Once construction of the Containment structure was complete, exposure to water ceased and available oxygen was quickly depleted by the oxidation process itself.

BVPS documented the Containment liner corrosion issue in the Corrective Action Program. Corrective actions included follow-up inspections and repairs, and programmatic changes to more thoroughly evaluate the Containment liner plates to facilitate identification and repair of any corrosion on the steel liner. Specifically, corrosion area #3 will be ultrasonically thickness tested during each of the next three 40 month periods as part of the Inservice Inspection (ISI) 10-year plan.

Following the Unit 1 Cycle 17 Refueling Outage, test procedures for the evaluation of the Containment liner plates were modified at both units. Specifically, if the visual examination detects surface flaws on the liner plate or suspect areas on the liner plate that could potentially impact the leak tightness or structural integrity of the liner, then surface or volumetric examinations shall be performed to characterize the condition (i.e., depth, size, shape, orientation).

During the Unit 2 Cycle 10 Refueling Outage (September - October 2003) Inservice Inspection (ISI), the Unit 2 Containment Liner and associated components (penetrations, welded attachments, bolting) were examined in accordance with 10 CFR 50.55a(b)(2)(ix). The general visual examination found no conditions that affected either Containment structural integrity or leak tightness. Minor deficiencies were reported involving flaking paint and paint scratches. These areas did not impact structural integrity and were subsequently cleaned and re-painted. VT-3 examinations were also completed on the moisture barrier and on the bolting removed from the reactor cavity blind flange and the equipment hatch. The moisture barrier and bolting examinations found no unacceptable conditions. There were no ISI non-destructive examination deficiencies in the Unit 2 Cycle 10 Refueling Outage.

Identification of deficiencies and subsequent corrective actions, along with engineering evaluation of inspection results, provide reasonable assurance that the program will be effective for managing loss of material. In addition, the general lack of degradation, demonstrated through a regular program of inspections, provides reasonable assurance that the program is effective for managing aging effects for the Containment liner plate.

Conclusion

Continued implementation of the ASME Section XI, Subsection IWE Program provides reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.4 ASME SECTION XI, SUBSECTION IWF

Program Description

The ASME Section XI, Subsection IWF Program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWF, 1989 edition (with no Addenda), within the limitations and modifications required by the Code of Federal Regulations in 10 CFR 50.55a.

This program is implemented through plant procedures, which provide for visual examination of inservice inspection Class 1, 2, and 3 supports in accordance with the requirements of ASME Code Case N-491, *Alternate Rules for Examination of Class 1, 2, 3, and MC Component Supports of Light-Water Cooled Power Plants* [Reference B.3-4].

NUREG-1801 Consistency

The ASME Section XI, Subsection IWF Program is an existing program that is consistent with NUREG-1801, Section XI.S3, *ASME Section XI, Subsection IWF*, with exception.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope of Program**

  NUREG-1801, Section XI.S3, *ASME Section XI, Subsection IWF* specifies the use of ASME Section XI, 2001 edition through 2002 and 2003 Addenda. The applicable ASME Code for the third (Unit 1 only) and second (Unit 2 only) intervals of the BVPS ASME Section XI, Subsection IWF Program is ASME Section XI, 1989 edition (with no Addenda). The use of the 1989 edition (with no Addenda) of the ASME Code is consistent with provisions in 10 CFR 50.55a to use the Code in effect 12 months prior to the start of the inspection interval. BVPS will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

- **Parameters Monitored or Inspected**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Detection of Aging Effects**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Monitoring and Trending**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Acceptance Criteria**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Corrective Actions**

  See the exception regarding differences in ASME Code edition under Scope of Program.

Enhancements

None

Operating Experience

The VT-3 visual examination for supports is specified in Table IWF-2500-1. The complete inspection scope is repeated every 10-year inspection interval. Identification of unacceptable conditions triggers an expansion of the inspection scope in accordance with IWF-2430, and re-examination of the supports requiring corrective actions during the next inspection period in accordance with IWF-2420(b).

During the Unit 1 Cycle 17 Refueling Outage (February - April 2006), Inservice Inspection (ISI) examinations were performed on Class 1, 2, 3 and MC components. Class 1 examinations (VT-3 visual examinations for pipe and vessel supports), Class 2 examinations (supports-visual), and visual examinations of Class 3 supports were performed as part of this inspection. There were no recorded ISI non-destructive examination deficiencies in the outage.

During the Unit 2 Cycle 10 Refueling Outage (September - October 2003), Inservice Inspection (ISI) examinations were performed on Class 1, 2, and MC components. Class 2 examinations (supports-visual) were performed. There were no ISI non-destructive examination deficiencies in the outage.

QA surveillances in 2004 identified minor issues that would improve program performance and reduce human errors, but did not identify issues or findings that would impact the overall effectiveness of the program. The review of the ISI program identified items for improvement with the procedure references, format inconsistencies, and properly processing a Westinghouse evaluation. The Corrective Action Program was used to document and track all minor issues identified during the QA surveillance.

The ASME Section XI, Subsection IWF program at BVPS is updated to account for industry operating experience. ASME Section XI industry code is also revised every three years with addenda issued in the interim, which allows the code to be updated to reflect operating experience. The requirement to update the ASME Section XI, Subsection IWF program to reference more recent editions of ASME Section XI at the end of each inspection interval ensures the program reflects enhancements due to operating experience that have been incorporated into ASME Section XI. The ASME Section XI, Subsection IWF program has been effective in identifying, evaluating, and correcting component support deficiencies, including corrosion and misalignment.

Identification of minor deficiencies and non-conformities documented and resolved using the Corrective Action Program, along with engineering evaluation of inspection results, provides reasonable assurance that the program will remain effective for managing loss of material of components. In addition, the general lack of degradation, demonstrated through a regular program of inspections, provides reasonable assurance that the program is effective for managing aging effects for passive components. To date, IWF sampling inspections have been effective in managing aging effects for ASME Class 1, 2, 3, and MC supports. There is reasonable assurance that the Subsection IWF inspection program will be effective through the period of extended operation.

Conclusion

Continued implementation of the ASME Section XI, Subsection IWF Program provides reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.5 ASME SECTION XI, SUBSECTION IWL

Program Description

The ASME Section XI, Subsection IWL Program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWL, 1992 edition with the 1992 Addenda, within the limitations and modifications required by the Code of Federal Regulations in 10 CFR 50.55a.

The program consists of periodic visual inspections of the reinforced concrete Containment structures. An additional commitment requires that the inspectors be trained and certified in accordance with ASME, Section IX, Subsection IWL (1992 edition with the 1992 Addenda) standards. The BVPS concrete Containment Buildings do not utilize a post-tensioning system; therefore, the IWL requirements associated with a post-tensioning system are not applicable.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWL Program is an existing program that is consistent with NUREG-1801, Section XI.S2, *ASME Section XI, Subsection IWL.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The ASME Section XI, Subsection IWL Program, by its nature, is sensitive to plant and industry operating experience. The program is based on guidelines established by the American Society of Mechanical Engineers (ASME) and the American Concrete Institute (ACI), which in part, are based on actual commercial operating experience. Program inspectors are tasked with identifying and addressing any unusual or unexpected appearance on the exposed, exterior surface of the Containment Buildings. Previous BVPS Containment Building inspections have identified minor issues such as mildew and rust stains, spalling, surface cracks, and loose foreign materials. Inspection findings and the resulting corrective actions were documented and tracked using the BVPS Corrective Action Program.

A regular program of Containment concrete (IWL) inspections has been established in which all accessible external surfaces of the Unit 1 and Unit 2 Containment Buildings are visually inspected every 5 years. The scope and level of detail of these inspections are procedurally defined. However, relevant industry operating experience also provides a contemporary basis for what to look for in the inspections. For example, an Institute of Nuclear Power Operations operating experience message alerted all plants to look for embedded wood (from construction) and other articles when performing Containment concrete inspections. Subsequent inspections at BVPS identified a few small articles (form ties, small pieces of wood, etc.) embedded in the Containment Building exterior concrete. All identified articles were confined to the outer surface concrete and were successfully removed, and any remaining void was appropriately patched.

The most recent Containment structure IWL inspections were performed during the Unit 1 Cycle 17 Refueling Outage (February - April 2006) and the Unit 2 Cycle 10 Refueling Outage (October - November 2006). Inspection results confirmed the physical condition of the concrete for Unit 1 and Unit 2 Containment structures was satisfactory. There were no identified non-conformities, unusual wear, or damage observed on the exterior concrete at either unit. The Unit 1 IWL evaluation included inspection of the new concrete applied at the temporary construction opening used for steam generator and reactor head replacement access.

Identification of Containment structure non-conformities, along with appropriate corrective actions and engineering evaluation of inspection results, provide reasonable assurance that the IWL program will effectively manage Containment structure loss of material and cracking. The general lack of degradation, demonstrated through regular inspections, provides evidence that the program is effective in managing aging effects for the Containment structures.

BVPS Containment Buildings do not utilize prestressing or post-tensioning systems in their design and construction, therefore these systems are neither evaluated nor assessed.

Conclusion

Continued implementation of the ASME Section XI, Subsection IWL Program provides reasonable assurance that the aging effects will be managed so that the structures within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.6 BOLTING INTEGRITY

Program Description

The Bolting Integrity Program implements industry recommendations for a comprehensive bolting integrity program, as delineated in NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants* [Reference B.3-5], and EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants* [Reference B.3-6]. Also, it implements industry recommendations for comprehensive bolting maintenance, as delineated in EPRI TR-104213, *Bolted Joint Maintenance & Application Guide* [Reference B.3-7], for pressure retaining bolting and structural bolting.

The program includes periodic inspection of closure bolting for indication of loss of preload, cracking, and loss of material due to corrosion, rust, etc. It also includes preventive measures to preclude or minimize loss of preload and cracking.

The program inspections are implemented through other aging management programs listed as follows:

- ASME Section XI, *Inservice Inspection, Subsections IWB, IWC, & IWD Program;*
- ASME Section XI, *Subsection IWE Program;*
- ASME Section XI, *Subsection IWF Program;*
- Structures Monitoring Program; and,
- External Surfaces Monitoring Program.

NUREG-1801 Consistency

The Bolting Integrity Program is an existing program that is consistent with NUREG-1801, Section XI.M18, *Bolting Integrity.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Bolting Integrity Program manages the effects of aging on bolting within the scope of license renewal. It includes periodic inspection of closure bolting for indication of loss of preload, cracking, and loss of material due to corrosion. It also includes preventive measures to preclude or minimize loss of preload and cracking. The Bolting Integrity Program inspections are implemented through other aging management program inspections. Consequently, the frequency, acceptance criteria, and degree of inspection depends on factors including location, type of bolting, importance to safety, age, environmental conditions, and service requirements. The Corrective Action Program is used to document and correct degradation of bolting.

Visual inspections of bolted connections that have identified blistered coating and corrosion have been documented in the Corrective Action Program. Corrective actions were completed to ensure future integrity of the bolted connections. For example, in 2002, during a VT-1 visual inspection of reactor coolant pump flange bolts, the condition of a bolt was determined to be unsatisfactory. The specific condition observed was blistering of the bolt coating in the mid-shank area between the head and threads. The threads were also noted to be lightly rusted. The bolt was replaced.

Visual inspections of bolted connections that have identified inadequate thread engagement and loose or less than flush nuts have been documented in the Corrective Action Program. Corrective actions were completed to ensure future integrity of the bolted connections. For example, in 2003, during a refueling outage, an inspector noted a loose nut on one of the flange studs for the downstream flange of a strainer. The strainer flange nuts were re-torqued.

The program has evaluated industry operating experience for applicability, as documented in the Corrective Action Program. For example, in 2003, an industry operating experience notice was issued. It described a condition in which Emergency Diesel Generator temperature control valve internal poppet cap screw heads were found broken. The cause was determined to be intergranular stress corrosion cracking on the brass bolts that were in tension in the sodium-nitrite treated jacket water system. This condition was determined to be applicable to the BVPS Unit 2 Emergency Diesel Generators, because the same temperature control valves are used on the jacket water and intercooler systems. A review of inspections, configuration, and chemistry parameters determined that BVPS Emergency Diesel Generator operability was not challenged by the issues raised in the industry operating experience.

The Bolting Integrity Program has identified and resolved bolting aging issues through the Corrective Action Program. The Bolting Integrity Program has been evaluated against industry operating experience as appropriate. Identification of degradation and resolution of corrective actions prior to loss of intended function, along with reviews of program effectiveness, provide reasonable assurance that the program is effective for managing aging effects for passive components.

Conclusion

Continued implementation of the Bolting Integrity Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.7 BORIC ACID CORROSION

Program Description

The Boric Acid Corrosion Program manages loss of material due to borated water leakage through periodic visual inspections. The program relies in part on implementation of recommendations of NRC Generic Letter 88-05, *Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants* [Reference B.3-8].

The scope of the program inspections includes all systems that contain borated water, as well as components and systems that may be potentially impacted by borated water leakage. The program includes provisions for (a) determination of the principal location of leakage, (b) examination requirements and procedures for locating small leaks, and (c) engineering evaluations and corrective actions. If borated water leakage is discovered, either by program inspections or by other activities, it is evaluated and resolved using the Corrective Action Program.

NUREG-1801 Consistency

The Boric Acid Corrosion Program is an existing program that is consistent with NUREG-1801, Section XI.M10, *Boric Acid Corrosion.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Frequent monitoring of locations where potential boric acid leakage could occur, and timely repair if leakage is detected, prevents or mitigates boric acid corrosion by minimizing reactor coolant leakage. NRC Generic Letter 88-05 recommends that corrective actions to prevent recurrences of degradation caused by borated water leakage be included in the program inspection.

Minor boric acid leakage detected during inspections of the BVPS Containment and Auxiliary Buildings was documented and evaluated as required by the boric acid corrosion control process, which included the use of the corrective action process. Identification of degradation and corrective action prior to loss of intended function provide reasonable assurance that the program is effective for managing aging effects for passive components.

Fleet and site procedures provide a structured approach for the evaluation and mitigation of borated water leakage which has the potential to affect structures and components within the scope of license renewal.

A self-assessment conducted in July of 2006 determined that the Boric Acid Corrosion Program was effective. The assessment generated several minor items for program enhancement:

- The BAC program tracks RCS inventory as recommended in WCAP-15988-NP, *Generic Guidance to Best Practice 88-05 Boric Acid Inspection Program* [Reference B.3-9], Section 4.4; however, other parameters such as airborne particulate activity, humidity, temperature could also be tracked and trended by the program.
- The self-assessment also recommended that boric acid leakage be added to the respective system health report.
- WCAP 15988-NP states that high radiation areas with infrequent access should be evaluated to determine boric acid corrosion susceptibility and required inspection frequency. The self-assessment recommended that the program be expanded to address high radiation areas with infrequent access.

An action plan was implemented to incorporate the recommendations, and an SAP Action Tracking Item was generated to track the action plan items to completion. The self-assessment also identified areas of good performance, including employee training, the use of the corrective action process, and the improving trend for tracking leaks at BVPS.

The Boric Acid Program at BVPS was enhanced to include recommendations of the Westinghouse Owner's Group, EPRI guidelines, NRC Bulletin 2002-01, *Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity,* and NRC Bulletin 2003-02, *Leakage from Reactor Coolant Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity* [Reference B.3-10]. For example, in response to NRC Bulletin 2002-01 and the Davis-Besse reactor head event, BVPS identified susceptible locations and performed volumetric and bare-metal visual examinations on the Reactor Vessel top head Alloy 600 materials, as well as bare-metal visual inspections of the Reactor Vessel bottom-mounted instrumentation tubes for Unit 1 and Unit 2. Other susceptible locations, such as Alloy 82/182 pressurizer top head nozzles and Reactor Vessel hot leg nozzles, were also examined. BVPS incorporated other appropriate changes to the program as a result of specific FENOC operating experience and the Fleet Boric Acid Corrosion Control Program based on the Davis-Besse event.

Continued process improvements through incorporation of industry recommendations provide reasonable assurance that the program will remain effective for managing aging effects for passive components during the period of extended operation.

Conclusion

Continued implementation of the Boric Acid Corrosion Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.8 BURIED PIPING AND TANKS INSPECTION

Program Description

The Buried Piping and Tanks Inspection Program is a new program that BVPS will implement prior to the period of extended operation.

This program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried components constructed of steel and stainless steel. Preventive measures will be in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components will be inspected when excavated for maintenance or a planned inspection. The program requires that, for each unit at BVPS, at least one opportunistic or focused inspection be performed and documented within the 10-year period prior to, and within the 10-year period after entering, the period of extended operation.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program is a new program that is consistent with NUREG-1801, Section XI.M34, *Buried Piping and Tanks Inspection.*

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.M34, are provided as follows:

- **Scope of Program**

  The program will manage the aging of buried components (piping and tanks) within the scope of license renewal that are exposed to soil.

- **Preventive Actions**

  In accordance with industry practice, coatings and wrapping are used to protect against corrosion by isolating the external surface of the piping from the soil environment. The program will ensure that the integrity of the coatings and wrappings of buried pipe is maintained.

- **Parameters Monitored / Inspected**

  When the opportunity arises, buried piping and tanks will be visually inspected for coating and wrapping integrity. Any evidence of damaged wrapping or coating defects, such as coating perforation, holidays, or other damage, is an indicator of possible corrosion damage to the external surface of piping and tanks.

- **Detection of Aging Effects**

  The program requires that, for each unit at BVPS, at least one opportunistic or focused inspection be performed and documented within the 10-year period prior to, and within the 10-year period after entering, the period of extended operation. Buried piping and tanks will be opportunistically inspected whenever they are excavated during maintenance. The inspections will be performed in areas with the highest likelihood of corrosion, and in areas with a history of corrosion, based on plant-specific and industry operating experience.

  If there are no opportunities for inspection within the 10-year period prior to the period of extended operation, the program will require that a focused inspection at each unit be performed and documented. Likewise, if there are no opportunities for inspection within the 10-year period after entering the period of extended operation, the program will require that a focused inspection at each unit be performed and documented.

- **Monitoring and Trending**

  Results of previous inspections will be used to identify susceptible locations for future inspections.

- **Acceptance Criteria**

  Any coating and wrapping degradations found during inspections of buried piping and tanks will be evaluated, tracked, and repaired using the Corrective Action Program.

- **Corrective Actions**

  This element is discussed in Section B.1.3.

- **Confirmation Process**

  This element is discussed in Section B.1.3.

- **Administrative Controls**

  This element is discussed in Section B.1.3.

- **Operating Experience**

  Industry operating experience has shown that buried steel and cast iron components have experienced corrosion degradation. Critical areas include those at the interface where the component transitions from aboveground to underground. This is an area where coatings are often missing or damaged.

Leaks have occurred in BVPS buried piping components, and these leaks have been identified and repaired. This plant-specific operating experience demonstrates that leaks have been identified early enough to ensure no loss of intended function. As an example, the buried piping within the Service Water System at Unit 2 experienced a significant leak in 2003. The leak was identified, located, and corrective action was taken to repair the affected pipe.

The review of plant-specific operating experience has shown that buried piping failures are caused by protective coating/wrapping breeches or improper selection or use of backfill. Scheduled or opportunistic inspections of selected buried piping allow evaluation of the coating/wrapping and surrounding backfill. The BVPS Buried Piping and Tanks Inspection Program will incorporate plant-specific and industry operating experience in the selection of piping or tanks for inspection.

Conclusion

The implementation of the Buried Piping and Tanks Inspection Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.9 CLOSED-CYCLE COOLING WATER SYSTEM

Program Description

The Closed-Cycle Cooling Water System Program includes: (1) preventive measures to minimize corrosion, and (2) periodic system and component performance testing and inspection to monitor the effects of corrosion and confirm that intended functions are met. This program manages loss of material, cracking, and reduction of heat transfer for components exposed to closed cooling water systems (Primary Component and Neutron Shield Tank Cooling Water, Chilled Water, diesel-driven fire pump engine cooling water (Common), Emergency Diesel Generator Cooling Water, Security Diesel Generator Cooling Water (Common), Emergency Response Facility Substation diesel generator cooling water (Common), and Unit 2 diesel-driven station standby air compressor engine cooling water).

These systems are closed cooling loops with controlled chemistry, consistent with the NUREG-1801 description of a closed cycle cooling water system. The adequacy of chemistry control is confirmed on a routine basis by sampling and ensuring contaminants and additives are within established limits, and by equipment performance monitoring to identify aging effects. These chemistry activities are controlled using BVPS procedures and processes and are based on EPRI guidance for closed cooling water chemistry located in EPRI 1007820 (EPRI 107396, Rev. 1) [Reference B.3-11].

NUREG-1801 Consistency

The Closed-Cycle Cooling Water System Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M21, *Closed-Cycle Cooling Water System*.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Program Elements Affected:

- **Scope of Program**

  Add the diesel-driven fire pump (Unit 1 only) and the diesel-driven standby air compressor (Unit 2 only) to the Closed-Cycle Cooling Water System Program.

- **Parameters Monitored / Inspected**

  The Closed-Cycle Cooling Water System Program will be enhanced to detail performance testing of heat exchangers and pumps and provide direction to perform visual inspections of system components.

- **Detection of Aging Effects**

  The Closed-Cycle Cooling Water System Program will be enhanced to identify closed-cycle cooling water system parameters that will be trended to determine if heat exchanger tube fouling or corrosion product buildup exists.

- **Monitoring and Trending**

  The Closed-Cycle Cooling Water System Program will be enhanced to control performance tests and to perform visual inspections at the required frequency.

Operating Experience

The Closed-Cycle Cooling Water System Program is an existing program that includes preventive measures to manage loss of material, cracking, and reduction of heat transfer for passive components which make up the closed-cycle cooling water (CCCW) systems.

Multiple operating experience tools are used to assess, evaluate, and improve the management of passive aging of the CCCW systems. This includes Corrective Action Program documents, self assessments, quality assessment audits, latent issues reports, Institute for Nuclear Power Operations (INPO) operating experience documents (operating experience messages, Significant Event Reports, Significant Event Notifications, Significant Operating Experience Reports, etc.), and NRC documents (Information Notices, Generic Letters, Bulletins, etc.). Corrective Action Program items or SAP Activity Tracking items will be used to track and document the site response to any internal or external document which is or may be applicable to BVPS.

A Self Assessment was performed on chemistry control of closed cooling water systems in March of 2007. There were two specific program improvement recommendations which were documented using the Corrective Action Program and will be tracked in SAP. The program improvements are (1) evaluating the feasibility of a corrosion coupon monitoring system and (2) determining if implementation of a sessile microbiological monitoring system provides a cost-justified benefit. Including these program recommendations into the Corrective Action Program and SAP Program will ensure that these potential improvements are tracked until it is determined whether or not to implement the proposed changes. The basis for either decision will be documented in the CR investigation summary.

The integrity of the CCCW Systems is ensured by monitoring and maintaining water chemistry parameters within acceptable limits, and by inspecting the physical condition of system piping.

Unexpected CCCW System conditions are addressed through the Corrective Action Program for resolution and to provide documented guidance for similar, future events (operating experience).

BVPS evaluated for applicability an INPO operating experience message regarding unexpected temperature control valve bolting corrosion in the Emergency Diesel Generator (EDG) Jacket Water System. The EDG at the affected plant was built by the same manufacturer as the BVPS Unit 2 EDGs. BVPS was also notified via the EDG owners group (Fairbanks-Morse), of which BVPS is an affiliated member. BVPS documented the assessment of this industry operating experience event in the Corrective Action Program, which provides tracking, documentation and an engineering basis for why no specific actions were needed.

The Closed Cycle Cooling Water System Program has been effective at managing aging effects for passive components which make up the closed cooling water systems. Use of corrective action process to identify, track, and document applicable operating experience events, and improvement recommendations from self-assessments, latent issues reports, and quality assessment audits provide reasonable assurance that the CCCW program, as enhanced, will effectively manage passive component loss of material, cracking, and reduction of heat transfer.

Conclusion

Continued implementation of the Closed-Cycle Cooling Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions, consistent with the current licensing basis, for the period of extended operation.

B.2.10 ELECTRICAL CABLE CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS ONE-TIME INSPECTION

Program Description

The Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program is a new, plant-specific program that will focus on the metallic parts of the cable connection. This sampling program will be implemented and completed prior to the period of extended operation. A representative sample of electrical cable connection population subject to aging management review will be inspected or tested. Electrical connections covered under the EQ program, or connections inspected or tested as part of a preventative maintenance program will be excluded from aging management review. The program is a plant-specific alternate to NUREG-1801, XI.E6, *Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements.*

This sampling program will provide a one-time inspection to verify that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an aging issue that requires a periodic aging management program. The design of these connections accounts for the stresses associated with ohmic heating, thermal cycling, and dissimilar metal connections. Therefore, these stressors or mechanisms should not be a significant aging issue. However, confirmation of the lack of aging effects will be required. The factors to be considered for sample selection will be application (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selection will be documented. Any unacceptable conditions found during the inspection will be evaluated through the Corrective Action Program.

For Unit 2 only, the metallic parts of metal enclosed bus connections are managed by the Metal Enclosed Bus Program (Unit 2 only) [Section B.2.26] as delineated in NUREG-1801, XI.E4, *Metal Enclosed Bus,* and are therefore not included within the scope of the program. There is no in-scope metal enclosed bus at Unit 1.

This aging management program is an alternate to NUREG-1801, XI.E6, and will adequately manage the aging effects listed for connections not included in the EQ program.

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1800 [Reference 1.3-4], Appendix A, are provided as follows:

- **Scope of Program**

  Non-EQ connections associated with cables in scope of license renewal are part of this program. This program does not include the higher voltage (> 35 kV) connections, such as the Switchyard connections. In-scope connections are evaluated for applicability of this program. The criteria for including connections in this program are that the connection is a bolted connection, and is not covered under the EQ program or an existing preventative maintenance program.

- **Preventive Actions**

  This one-time inspection program is a condition monitoring program; therefore, no actions are taken as part of this program to prevent or mitigate aging degradation.

- **Parameters Monitored / Inspected**

  This program will focus on the metallic parts of the cable connections. The one-time inspection verifies that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an aging effect that requires a periodic aging management program.

- **Detection of Aging Effects**

  A representative sample of electrical connections within the scope of license renewal, and subject to aging management review will be inspected or tested prior to the period of extended operation to verify there are no aging effects requiring management during the period of extended operation. The factors to be considered for sample selection will be application (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected is to be documented. Inspection methods may include thermography, contact resistance testing, or other appropriate methods including visual based on plant configuration and industry guidance. The one-time inspection provides additional confirmation to support industry operating experience that shows electrical connections have not experienced a high degree of failures, and that existing installation and maintenance practices are effective.

- **Monitoring and Trending**

  Trending actions are not included as part of this program because this is one-time inspection program.

- **Acceptance Criteria**

  The acceptance criteria for each inspection / surveillance are defined by the specific type of inspection or test performed for the specific type of cable connections. Acceptance criteria ensure that the intended functions of the cable connections can be maintained consistent with the current licensing basis.

- **Corrective Actions**

  If the inspection or test acceptance criteria are not met, the Corrective Action Program will be used to perform an evaluation for extent-of-condition, the indications of aging effects, and possible changes to the one-time inspection program such as increased frequency and sample size. As discussed in the appendix to NUREG-1801, the requirements of 10 CFR Part 50, Appendix B, is acceptable to address the corrective actions. The BVPS Corrective Action Program, which is implemented in accordance with requirements of 10 CFR Part 50, Appendix B, applies to the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program.

This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program is a new aging management program for which there is no plant-specific program operating experience for program effectiveness.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. Future operating experience will be appropriately incorporated into the program.

  Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 Section XI.E6 program description.

Enhancements

None

Conclusion

The implementation of the Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements One-Time Inspection Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.11 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The Electrical Cables And Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that BVPS will implement prior to the period of extended operation.

The Electrical Cables And Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation and moisture can be maintained consistent with the current licensing basis through the period of extended operation. An "adverse localized environment" is an environment that is significantly more severe than the specified service condition for the insulated cable or connection.

A representative sample of accessible insulated cables and connections within the scope of license renewal and located in adverse localized environments will be visually inspected at least once every 10 years for cable and connection jacket surface anomalies, such as embrittlement, discoloration, cracking or surface contamination. The program will require the first inspection to be completed prior to the period of extended operation. The technical basis for sampling will be derived from the guidance provided by applicable EPRI and IEEE documents.

NUREG-1801 Consistency

The Electrical Cables And Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that is consistent with NUREG-1801, Section XI.E1, *Electrical Cables And Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements.*

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.E1, are provided as follows:

- **Scope of Program**

  The program will address accessible electrical cables and connections not subject to 10CFR50.49 environmental qualification requirements within the scope of license renewal, and are prone to adverse localized environments.

- **Preventive Actions**

  The program is a visual inspection program and does not contain actions to prevent or mitigate aging degradation. This program is a condition monitoring program.

- **Parameters Monitored / Inspected**

  The program will require the use of walkdowns using the general area and/or focused approach to identify adverse localized environments that pertain to non-EQ cables and connections. The technical basis for a representative sample will be determined using EPRI guidance. Using EPRI documents as a guide, non-EQ cables and connections will be inspected for surface anomalies, such as embrittlement, discoloration, cracking, or surface contamination.

- **Detection of Aging Effects**

  The program will address determination of unacceptable, visual indications of surface anomalies due to aging degradation from heat, radiation, or moisture in the presence of oxygen. Visual inspection of a representative sample will be performed at least once every 10 years, with the first inspection to be completed prior to the period of extended operation.

- **Monitoring and Trending**

  Trending will not be required by the program. However, inspection data sheets will be maintained as program/plant records that are available for review and/or trending during subsequent walkdown inspections. Any trending required by the Corrective Action Program will not be eliminated by this program.

- **Acceptance Criteria**

  The program will provide acceptance criteria that accessible cables and connections are to be free from unacceptable, visual indications of surface anomalies. The technical information and guidance provided by applicable EPRI and IEEE documents are used as general references in the program for performance of visual inspections and evaluations to identify unacceptable indications that, if left un-managed, could lead to a loss of the intended function.

- **Corrective Actions**

  The program will require an engineering evaluation for all unacceptable visual indications of cable and connection jacket surface anomalies. Engineering will evaluate the age and operating environment of the component, as well as the severity of the anomaly and whether such an anomaly has previously been correlated to degradation of conductor insulation or connections. Corrective actions may include, but are not limited to, testing, shielding or otherwise changing the environment, or relocation or replacement of the affected cable or connection. Determination as to whether an unacceptable condition or situation is applicable to other accessible or inaccessible cables or connections will be made as part of the Corrective Action Program.

  This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The Electrical Cables And Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the Electrical Cables And Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.12 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS

Program Description

The Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program that BVPS will implement prior to the period of extended operation.

The purpose of this aging management program will be to demonstrate that sensitive (high voltage – low current applications) instrument cables and connections susceptible to aging effects caused by exposure to adverse localized environments caused by heat, radiation, and moisture will be adequately managed so that there is reasonable assurance that the cables and connections will perform their intended function in accordance with the current licensing basis during the period of extended operation. An "adverse localized environment" is an environment that is significantly more severe than the specified service environment for the cable. This aging management program will require a review of non-EQ instrumentation circuit calibration results at least once every 10 years, with the initial performance of this program to occur prior to the period of extended operation. BVPS will incorporate into the program the appropriate technical information and guidance provided in NUREG/CR-5643, *Insights Gained From Aging Research*, SAND96-0344, *Aging Management Guideline for Commercial Nuclear Power Plants - Electrical cable and Terminations*, and other industry documents.

NUREG-1801 Consistency

The Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program that is consistent with NUREG-1801, Section XI.E2, *Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.*

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.E2, are provided as follows:

- **Scope of Program**

  The program includes electrical cables and connections within the scope of license renewal that are used in high range radiation monitoring (outside Containment) and excore nuclear instrumentation, and are not subject to 10CFR50.49 environmental qualifications.

- **Preventive Actions**

  This program is a condition monitoring program. The program provides for timely detection of aging effects, but does not prevent or mitigate aging degradation.

- **Parameters Monitored / Inspected**

  The program provides the direction necessary for the review of calibration (surveillance) records of low-current instrumentation circuits. The plant surveillance procedures determine the parameters that are monitored for the high range radiation monitors and the excore detector circuits. These calibrations are required by Technical Specifications, and include the entire circuit based on the surveillance procedures.

- **Detection of Aging Effects**

  The program will review the calibration results of the high range radiation monitors and the excore instrumentation circuits. The calibration procedure includes a loop calibration with all components including the detectors connected. The first review of calibration results will be completed before the period of extended operation and at least every 10 years thereafter. The technical specification surveillances (calibrations) are performed at the periodicity stated in the technical specifications, which is more frequent than once every 10 years. An evaluation will be performed through the Corrective Action Process if any of the surveillance acceptance criteria are not met.

  The alternate method of performing cable testing is not used since the calibration procedures include the entire circuit.

- **Monitoring and Trending**

  Trending will not be included as part of the program. However, the review of calibration results will be documented and maintained as part of plant records.

- **Acceptance Criteria**

  The program outlines development of acceptance criteria for the review of calibration results. The calibration surveillances contain acceptance criteria for the specific circuit, and the Corrective Action Process is used if values do not meet the acceptance criteria.

- **Corrective Actions**

  This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.13 ELECTRICAL WOODEN POLES/STRUCTURES INSPECTION (UNIT 2 ONLY)

Program Description

The Electrical Wooden Poles/Structures Inspection Program is a new plant-specific program that BVPS will implement prior to the period of extended operation. This program is applicable only to Unit 2. There are no in-scope electrical wooden poles/structures at Unit 1.

The Electrical Wooden Poles/Structures Inspection Program manages aging effects for wooden poles subject to aging management, such as insect and woodpecker damage, reduced circumference, and moisture intrusion. Appropriate aging management methods include pole sounding, pole boring, and underground inspection. There is no comparable NUREG-1801 aging management program.

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1800 [Reference 1.3-4], Appendix A, are provided as follows:

- **Scope of Program**

  Several electrical wooden poles (wooden H-frame structures) at BVPS Unit 2 have been identified to be within the scope of license renewal and subject to aging management.

- **Preventive Actions**

  This electrical pole and structures inspection program is a condition monitoring program as described in Appendix A.1.1 of NUREG-1800. The program provides for timely detection of aging effects and does not support preventive or mitigating actions. No actions are taken as part of this inspection to prevent or mitigate aging degradation.

- **Parameters Monitored / Inspected**

  The wooden poles within the license renewal scope are inspected for loss of material due to insect, and woodpecker damage, reduced circumference, and moisture intrusion, and inspected for change in material properties due to moisture damage. The visual inspection portion of the activity also includes the cross-arms, guys, hardware, static supports, and insulators.

- **Detection of Aging Effects**

  Inspection on a 10-year period is adequate to ensure detection prior to loss of intended function. The typical life of a wooden pole, based on industry experience is 30-40 years. Industry experience over several decades indicates that a 10-year inspection interval is adequate.

- **Monitoring and Trending**

  This is not a trending activity. The 10-year inspection provides for timely identification of aging effects. Reports are generated and responded to in a timely manner. The first inspection will be performed within a 5-year period prior to the expiration of the current license.

- **Acceptance Criteria**

  No unacceptable indications of loss of material, or change in material properties are found as determined by a qualified inspector.

- **Corrective Actions**

  This element is discussed in Section B.1.3.

- **Confirmation Process**

  This element is discussed in Section B.1.3.

- **Administrative Controls**

  This element is discussed in Section B.1.3.

- **Operating Experience**

  The Electrical Wooden Poles/Structures Inspection Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Enhancements

None

Conclusion

The implementation of the Electrical Wooden Poles/Structures Inspection Program will provide reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.14 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRICAL COMPONENTS

Program Description

The Environmental Qualification (EQ) of Electrical Components Program manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49 qualification methods. As required by 10 CFR 50.49, environmental qualification program components not qualified for the current license term are refurbished, replaced, or their qualification extended prior to reaching the aging limits established in the evaluations. Aging evaluations for environmental qualification program components are time-limited aging analyses (TLAAs) for license renewal.

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electrical Components Program is an existing program that is consistent with NUREG-1801, Section X.E1, *Environmental Qualification (EQ) of Electrical Components*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

On a continuing basis, the Environmental Qualification (EQ) of Electrical Components Program, as administrated by the EQ program engineer, ensures that the design and installation of 10 CFR 50.49 Harsh Environment equipment meets site-specific EQ requirements. These EQ requirements, in turn, provide reasonable assurance that the equipment will operate/function properly for the time period relied upon to prevent the occurrence of, or mitigate the effects of, an accident or plant transient.

The overall effectiveness of the EQ of Electric Components Program is demonstrated by the excellent operating experience for systems, structures, and components in the program. A self-assessment in 2006 was performed based upon industry operating experience that identified discrepancies in the information contained within the Preventative Maintenance (PM) database and the associated EQ program documentation. The self-assessment found that one of the 94 EQ Maintenance Assessment Packages was deficient in the PM database and would have caused the equipment to be installed beyond its qualified life value. A Corrective Action Program report was generated to correct the replacement frequency from 22 years to 20 years.

The Corrective Action Program is used to identify program and component issues, as well as document program engineering assessments and reviews that have or could have an impact on the performance of the EQ program. The Corrective Action Program has been used to document potential program deficiencies based on industry operating experience and track corrective actions, when necessary.

As stated in NUREG-1801, Section X.E1, *Environmental Qualification (EQ) of Electric Components*, "EQ programs include consideration of operating experience to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended functions during accident conditions after experiencing the effects of in-service aging." The BVPS program is in compliance with 10 CFR 50.49 and is deemed effective at managing aging effects for electric components.

Conclusion

Continued implementation of the Environmental Qualification (EQ) of Electrical Components Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.15 External Surfaces Monitoring

Program Description

The External Surfaces Monitoring Program is a new program that BVPS will implement prior to the period of extended operation.

The External Surfaces Monitoring Program is based on system inspections and walkdowns. This program will consist of periodic inspections to monitor the external surfaces of in-scope steel components and other metal components for material degradation and leakage, and periodic inspection of in-scope elastomer components for hardening, loss of strength or cracking through physical manipulation. The program will also require inspection of the Emergency Response Facility (ERF) diesel generator jacket water radiator fins for build-up of dust, dirt and debris. Additionally, the program is credited with managing aging effects of internal surfaces, for situations in which material and environment combinations are the same for internal and external surfaces such that external surface condition is representative of internal surface condition.

Loss of material due to boric acid corrosion is managed by the Boric Acid Corrosion Program [Section B.2.7].

NUREG-1801 Consistency

The External Surfaces Monitoring Program is a new program that is consistent with NUREG-1801, Section XI.M36, *External Surfaces Monitoring.*

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.E1, are provided as follows:

- **Scope of Program**

  The program will require visual inspection of the external surfaces of in-scope components and monitoring of the external surfaces of steel components and other metal components within the scope of license renewal and subject to aging management review for loss of material and leakage. The program will require inspection of in-scope elastomer components for hardening, loss of strength or cracking. The program will also require inspection of the ERF diesel generator jacket water radiator fins for build-up of dust, dirt and debris.

Inspections shall include, but will not be limited to the following types of inspection:

- Visual inspection for indications of general corrosion (applicable to steel components), pitting corrosion, and crevice corrosion of exposed metal surfaces. For steel components, general corrosion is expected to be present and detectable. If pitting and crevice corrosion should exist, then general corrosion will manifest itself as visible rust or rust by-products (e.g., discoloration or coating degradation) and will be detectable prior to any loss of intended function.
- Visual inspection of elastomers for indications of hardening, loss of strength and cracking. The inspection will include physical manipulation of elastomers to visually confirm flexibility.
- Visual inspection of the ERF diesel generator jacket water radiator fins for build-up of dust, dirt and debris. The ERF diesel generator jacket water radiator is a coil/fin type heat exchanger where the fins are exposed to an air-outdoor environment. The applicable aging effect is reduction of heat transfer due to build-up of dust, dirt and debris.

The External Surfaces Monitoring program is credited with managing aging effects of internal surfaces, for situations in which material and environment combinations are the same for internal and external surfaces, such that external surface condition is representative of internal surface condition.

- **Preventive Actions**

The External Surfaces Monitoring Program is a visual monitoring program that does not include preventive actions.

- **Parameters Monitored / Inspected**

The program will require the use of periodic plant system inspections and walkdowns to monitor for material degradation and leakage. The program inspects components such as piping, piping components, ducting and other components. The inspection parameters will include the following:

- Corrosion and material wastage (loss of material);
- Leakage from or onto external surfaces;
- Worn, flaking, or oxide-coated surfaces;
- Corrosion stains on thermal insulation; and,
- Protective coating degradation (cracking and flaking).

The program provides for inspection of bolting used in pressure retaining components (non-safety related) as required by the Bolting Integrity Program.

- **Detection of Aging Effects**

The program will require periodic visual inspection of in-scope steel components and other metal components to identify loss of material. The program will require periodic inspection of in-scope elastomer components for hardening, loss of strength or cracking. The program will also require periodic inspection of the ERF diesel generator jacket water radiator fins for build up of dust, dirt and debris.

For metal surfaces that are painted or coated, the program will inspect these surfaces to confirm integrity of the paint or coating. If no degradation is indicated, then no additional inspection of the subject surface will be required.

The program is credited with managing aging effects of internal surfaces, for situations in which material and environment combinations are the same for internal and external surfaces, such that external surface condition is representative of internal surface condition.

The program will require a visual inspection to be conducted for in-scope component surfaces at least once per fuel cycle. This frequency allows inspections of components that may be in locations that are only accessible during outages. As such, component surfaces that are inaccessible or not readily visible during plant operations are inspected during refueling outages.

Component surfaces that are inaccessible or not readily visible during plant operations and refueling outages will be inspected at such intervals that will provide reasonable assurance that the effects of aging will be managed such that applicable components will perform their intended function during the period of extended operation.

Component surfaces that are insulated will be inspected when the external surface is exposed (i.e., maintenance) at such intervals that will provide reasonable assurance that the effects of aging will be managed such that applicable components will perform their intended function during the period of extended operation.

The intervals of inspection may be adjusted as necessary based on BVPS inspection results and industry experience.

- **Monitoring and Trending**

The program provides qualification requirements for personnel associated with visual inspection activities in accordance with site controlled procedures and processes.

Formal trending will not be required by the program. However, inspection results will be maintained in accordance with System Engineering Walkdown procedures and as such, the inspection results will be available for review and trending during subsequent walkdown inspections. Also, the program will require that deficiencies are documented in the BVPS Corrective Action Program and allow results to be trended.

- **Acceptance Criteria**

  The program defines acceptance criteria as no unacceptable visual indication of leakage, loss of material, hardening and loss of strength or cracking, and reduction of heat transfer that would lead to loss of intended function during the period of extended operation. Visual indications with respect to system design standards, procedural requirements, current licensing basis, industry codes or standards, and engineering evaluations shall be evaluated by assigned engineering personnel. Evaluation of visual indications will determine if the results are acceptable or if corrective action is required.

- **Corrective Actions**

  This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The External Surfaces Monitoring Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the External Surfaces Monitoring Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.16 FIRE PROTECTION

Program Description

The Fire Protection Program is a condition monitoring and performance monitoring program, comprised of tests and inspections that follow the applicable National Fire Protection Association (NFPA) recommendations. The Fire Protection Program manages the aging effects on fire barrier penetration seals; fire barrier walls, ceilings and floors; fire wraps and fire rated doors (automatic and manual) that perform a current licensing basis fire barrier intended function. The program also manages the aging effects on the diesel engine-driven fire pump fuel oil supply line. The Fire Protection Program also manages the aging effects on the halon and carbon dioxide fire suppression systems.

NUREG-1801 Consistency

The Fire Protection Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M26, *Fire Protection*, with exception.

Exceptions to NUREG-1801

Program Elements Affected:

- **Parameters Monitored / Inspected**

  Halon and carbon dioxide systems Inspections and Testing.

  The frequency of functional testing for the BVPS halon and carbon dioxide systems will be at least once every 18 months, which is less frequent than the NUREG-1801, XI.M26 guideline of at least one test every 6 months for the detection of aging degradation. Previous inspections and testing of the halon and carbon dioxide systems at the 18-month frequency have not identified aging degradation issues. Continued testing and inspection at the current frequency is not expected to reduce the functional reliability of either system during the period of extended plant operation. However, to ensure the optimum integrity of the in-scope halon and carbon dioxide systems, each will be inspected at least once every 6 months during the period of extended operation. Testing will continue to be performed at least once every 18 months during the period of extended operation; therefore, only the frequency of testing will be an exception.

- **Detection of Aging Effects**

  See the exception regarding differences in testing frequency under Parameters Monitored / Inspected.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Program Elements Affected:

- **Scope of Program**

  Add a new attachment to the BVPS Fire Protection Program administrative procedure to address the Fire Protection Systems that are in scope for license renewal purposes. The attachment will detail NUREG-1801 inspection and testing guidelines, the plant implementation strategy, surveillance test and inspection frequencies, and affected implementing procedure(s).

- **Parameters Monitored / Inspected**

  Enhance the inspection guidance to include degradation such as concrete cracking and spalling, and loss of material of fire barrier walls, ceilings and floors that may affect the fire rating of the assembly or barrier.

  Also, the program enhancements described under the Scope of Program program element are necessary for consistency with this program element.

- **Detection of Aging Effects**

  The program enhancements described under the Scope of Program program element are necessary for consistency with this program element.

- **Monitoring and Trending**

  The program enhancements described under the Scope of Program program element are necessary for consistency with this program element.

- **Acceptance Criteria**

  The program enhancements described under the Scope of Program program element are necessary for consistency with this program element.

Operating Experience

Operating experience is effectively evaluated and implemented at BVPS to maintain the Fire Protection System in the highest state of operability. This is accomplished by promptly identifying and documenting (using SAP or the Corrective Action Program) any conditions or events which could compromise Fire Protection System component and/or structure operability. In addition, industry operating experience, self assessments, and independent audits provide additional input to ensure that system operability is maintained at an optimum level.

An example of effective operating experience involves missing or damaged fire seals on fire doors, roll-up doors, shakespaces, and wall penetrations which were identified during inspections, surveillance activities, and plant operator rounds between 2001 and 2006. Discrepancies in fire barrier wrappings were detected during periodic surveillances in 2003. These findings were documented in the Corrective Action Program. Immediate actions were completed to repair these fire barriers. Identification of deficiencies and timely corrective actions provide reasonable assurance that the program will remain effective for managing loss of material of components.

A triennial fire protection team inspection in January 2007 assessed whether the plant has implemented an adequate Fire Protection Program and that post-fire safe shutdown capabilities have been established and are being properly maintained. The inspection team also evaluated the material condition of fire area boundaries, fire doors, and fire dampers, and reviewed the surveillance and functional test procedures for the diesel fire pump and other components. Additionally, the team reviewed the surveillance procedures for structural fire barriers, penetration seals, and structural steel. No findings of significance were identified. Reviews of program specifics provide reasonable assurance that the program is effective for managing loss of material of components.

The Fire Protection System Program has been effective at managing aging effects of passive components which make up its scope. Identification of previous program weaknesses, and subsequent corrective actions, in conjunction with recent assessment where no issues or findings were noted, provides reasonable assurance that the program remains effective for managing age related degradation of fire protection passive components.

Conclusion

Continued implementation of the Fire Protection Program provides reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.17 FIRE WATER SYSTEM

Program Description

The Fire Water System Program applies to the water filled fire protection subsystems consisting of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, tanks, and aboveground and underground piping and components that are tested in accordance with applicable National Fire Protection Association (NFPA) codes and standards. This program is credited with managing loss of material and reduction of heat transfer (reduction of heat transfer applies to the diesel-driven fire pump jacket water and oil coolers) for the water-filled Fire Protection Systems. Program activities include periodic inspection and hydro-testing of hydrants and hose stations, performing sprinkler head inspections, and conducting system flow tests. These tests and inspections follow applicable NFPA guidelines as well as recommendations from the fire insurance carrier. Such testing assures functionality of the systems. Also, many of these systems are normally maintained at required operating pressure and monitored such that leakage resulting in loss of system pressure is immediately detected and corrective actions initiated.

All sprinkler heads will be replaced, or a sample population will be inspected using the guidance of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems* [Reference B.3-12]. NFPA 25, Section 5.3.1.1.1 states that, "where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing." If the sampling method is chosen, NFPA 25 also contains guidance to perform this sampling every 10 years after initial field service testing.

NUREG-1801 Consistency

The Fire Water System Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M27, *Fire Water System.*

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Program Elements Affected:

- **Parameters Monitored / Inspected**

  Add a program requirement to perform flow test or inspection of all accessible fire water headers and piping during the period of extended operation at an interval determined by the Fire Protection System Engineer.

- **Detection of Aging Effects**

  Add a program requirement that requires a representative number of fire water piping locations be identified if piping visual inspections are used as an alternative to non-intrusive testing.

  Add a program requirement which allows test or inspection results from an accessible section of pipe to be extrapolated to an inaccessible, but similar section of pipe. If no similar section of accessible pipe is available, then alternative testing or inspection activities must be used.

  Add a program requirement that states that at least once prior to the period of extended operation, all accessible Fire Protection headers and piping shall be flow tested in accordance with NFPA 25 or visually/ultrasonically inspected.

  Add steps to program procedure which require testing or replacement of sprinkler heads that will have been in service for 50 years prior to entering the period of extended operation.

  Also, the program enhancement described under the Scope of Program program element is necessary for consistency with this program element.

- **Monitoring and Trending**

  Add a program requirement to perform a fire water subsystem internal inspection any time a subsystem (including fire pumps) is breached for repair or maintenance.

Operating Experience

Buried piping constructed of gray cast iron is susceptible to de-alloying corrosion (selective leaching). There have been multiple instances of buried Fire Protection pipe failures at both BVPS units that were attributed to this phenomenon. In all cases, the damaged buried piping was promptly identified, isolated, and subsequently replaced with a plastic-wrapped ductile cast iron pipe which is resilient to selective leaching. These piping failures represent a long-standing deficiency with the use of gray cast iron for underground fire headers and pipes. These buried gray cast iron pipes will be age managed and/or replaced as described in the Buried Piping and

Selective Leaching GALL programs. The Buried Piping Program will include a formal evaluation of operating experience based on these fire water system pipe failures. In the Main Control Room, fire water header pressure is continuously monitored (by way of fire pump auto start status) for unexpected drops in pressure which could be indicative of an underground (or aboveground) piping failure.

Through wall pipe leaks in aboveground pipes have occurred within the Fire Water System throughout the life of both units. Most of these leaks are slow (i.e., drops per minute) at discovery and are attributable to microbiologically-influenced corrosion (MIC) activity. Once identified, the affected section of pipe is replaced or repaired.

A self assessment was performed in 2006 for the Fire Protection System, including the Fire Protection Water Systems, which accounted for the highest number of equipment degradation issues. This is not an unexpected result given the large number of active components, the use of untreated river water, and the age of the system. Actions to improve the health of the Fire Protection water suppression system are on-going or planned, including chemical treatment, replacement of sectional valves with resilient wedge gate valves, and a piping replacement plan.

In January 2007, the NRC completed a triennial fire protection team inspection at BVPS to assess whether the plant has implemented an adequate Fire Protection Program and to ensure that post-fire safe shutdown capabilities have been established and are being properly maintained. The inspection team reviewed the adequacy of selected pre-action and wet pipe sprinklers, including the adequacy of surveillance procedures. No findings of significance were identified.

A industry event of interest, described in an INPO operating experience message, involves an exploding battery on the diesel-driven fire pump when the pump was started for a surveillance run. Evaluation of the event and impact to BVPS test procedures were tracked and documented in the Corrective Action Program. Battery preventative maintenance procedures at BVPS were evaluated and determined to provide sufficient guidance to preclude a hydrogen ignition. A possible causal factor for the exploding battery may be related to utilizing the battery beyond the vendor recommended maximum lifetime. A recurring BVPS maintenance item to replace the diesel-driven fire pump battery every 192 weeks was confirmed.

Operating experience events are evaluated and implemented at BVPS to maintain the effectiveness of the Fire Water System Program. Use of operating experience also demonstrates awareness of and compliance with Industry guidelines. Identification of system degradation and taking corrective action prior to loss of intended function provide evidence that the program effectively manages loss of material from fire water system components.

Conclusion

Continued implementation of the Fire Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.18 FLOW-ACCELERATED CORROSION

Program Description

The Flow-Accelerated Corrosion Program is based on EPRI guidelines in NSAC-202L-R2, *Recommendations for an Effective Flow Accelerated Corrosion Program* [Reference B.3-13]. The program predicts, detects, and monitors wall thinning in piping, valve bodies, and other in-line components. Analytical evaluations and periodic examinations of locations that are most susceptible to wall thinning due to flow-accelerated corrosion are used to predict the amount of wall thinning. The program includes analyses to determine critical locations. Initial inspections are performed to determine the extent of thinning at these critical locations, and follow-up inspections are used to confirm the predictions. Inspections are performed using ultrasonic or other approved inspection techniques capable of detecting wall thinning. Repairs and replacements are performed as necessary.

NUREG-1801 Consistency

The Flow-Accelerated Corrosion Program is an existing program that is consistent with NUREG-1801, Section XI.M17, *Flow-Accelerated Corrosion.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Flow-Accelerated Corrosion Program has evolved through industry experience and is now described in NSAC-202L-R2. This program includes (a) an evaluation to determine critical locations, (b) initial operational inspections to determine the extent of thinning at these locations, and (c) follow-up inspections to confirm predictions, or repair or replace components as necessary. Thus, the frequency of the inspections on individual locations is determined by the results of previous inspections. The program has been effective in managing loss of material (wall thinning) due to flow-accelerated corrosion, as shown in program inspection reports.

For the program inspections during the last Unit 1 refueling outage (Cycle 17 Refueling Outage, February - April 2006), 73 locations were originally scheduled for inspection. 13 additional areas were examined as expanded scope. There were 5 planned replacement areas identified. Emergent replacements were performed when unexpected wall thinning was identified. The Corrective Action Program was used to track and resolve issues identified during the outage.

For the program inspections during the last Unit 2 refueling outage (Cycle 12 Refueling Outage, October - November 2006), 75 locations were inspected. Two (2) additional areas were examined as expanded scope. There were 9 planned replacement areas identified. Emergent replacements were performed when unexpected wall thinning was identified. The Corrective Action Program was used to track and resolve issues identified during the outage.

A self-assessment of the Flow-Accelerated Corrosion program at BVPS was performed in September, 2006. The assessment found that, in practice, the program was in compliance with NRC Inspection Procedure 49001. However, several procedural and process enhancements were recommended to clarify the guidance and strengthen the process. All recommendations were incorporated into the program.

A fleet review of best practices for the Flow-Accelerated Corrosion Program at all FirstEnergy sites was performed as part of the development of a fleet-wide program procedure. Guidance from the EPRI CHECWORKS User's Group was applied to the program procedure. Comparison of program techniques, conformance to industry standards, recent audit and inspection results, and use of shared "best practices" in the development of fleet-wide procedures provide reasonable assurance that the program will remain effective for managing aging effects for passive components.

Conclusion

Continued implementation of the Flow-Accelerated Corrosion Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation

B.2.19 FLUX THIMBLE TUBE INSPECTION

Program Description

The Flux Thimble Tube Inspection Program serves to identify loss of material due to wear prior to leakage by monitoring for and predicting unacceptable levels of wall thinning in the Movable Incore Detector System Flux Thimble Tubes, which serve as a Reactor Coolant System (RCS) pressure boundary. The program implements the recommendations of NRC IE Bulletin 88-09, *Thimble Tube Thinning in Westinghouse Reactors* [Reference B.3-14].

The main attribute of the program is periodic nondestructive examination (NDE) of the flux thimble tubes which provides actual values of existing tube wall thinning. This information provides the basis for an extrapolation to determine when tube wall thinning will progress to an unacceptable value. Based on this prediction, preemptive actions are taken to reposition, replace or isolate the affected thimble tube prior to a pressure boundary failure.

NUREG-1801 Consistency

The Flux Thimble Tube Inspection Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M37, *Flux Thimble Tube Inspection.*

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Program Element Affected:

- **Corrective Actions**

  Add a requirement to the program procedure to state that, if a flux thimble tube cannot be inspected over the tube length (tube length that is subject to wear due to restriction or other defect), and cannot be shown by analysis to be satisfactory for continued service, the thimble tube must be removed from service to ensure the integrity of the RCS pressure boundary.

Operating Experience

Eddy current examinations are performed on all accessible flux thimble tubes during every other refueling outage. The results are used as a starting value for calculating projected wear rates for the subsequent two fuel cycles. If thimble tube wear is projected to exceed 70% through wall (TW) thinning, then the tube will be repositioned, replaced, or capped at the seal table. The 70%

TW threshold used at BVPS is more restrictive than the 80% limit recommended by Westinghouse (WCAP-12866) and also includes a margin for instrument uncertainty.

During the Unit 1 Cycle 13 Refueling Outage (February - April 2000), a proactive decision was made to replace 18 flux thimble tubes at Unit 1 which were either inoperable or showed the greatest amount of tube wall thinning. This action was taken to ensure that the Technical Specification minimum number of operable flux thimble tubes would be satisfied.

During the Unit 1 Cycle 15 Refueling Outage (March - April 2003), the next successive Unit 1 outage where flux thimble tube eddy-current measurements were performed, several of the tubes replaced during the Cycle 13 outage displayed elevated wall thinning. As described in the *Flux Thimble Eddy Current Data Evaluation Report* for the Unit 1 Cycle 15 Refueling Outage, this was due in part to use of a limiting (worst case) value in the wear calculation since there was no prior wear history for the replaced tubes. Of those with significant wall thinning, only two tubes were projected to exceed the BVPS 70% threshold for wall thinning during the following two fuel cycles. Westinghouse specifically recommended repositioning of two flux thimble tubes prior to the beginning of Unit 1 Cycle 17 (November 2004).

At Unit 2, the *Flux Thimble Eddy Current Data Evaluation Report* for the Cycle 10 Refueling Outage (September - October 2003) identified a single flux thimble tube that was projected to approach the BVPS 70% acceptance criteria for wall thinning. Since the tube in question had been repositioned once before, BVPS, with input from Westinghouse, decided to cap the flux thimble at the seal table.

The Flux Thimble Tube Examination Program establishes limits on tube wall thinning which provide reasonable assurance that the thimble tube pressure boundary will be maintained during normal plant operating conditions. FENOC will continue to monitor operating experience documentation for potential applicability to BVPS, and documentation relative to BVPS is entered into either the Corrective Action Program or SAP Activity Tracking for resolution.

The BVPS Flux Thimble Tube Examination Program is established to meet the requested actions of NRC Bulletin 88-09. Identification of flux thimble tube degradation prior to loss of function is an indication that the program effectively manages the aging effects of the flux thimble tube RCS pressure boundary.

Conclusion

Continued implementation of the Flux Thimble Tube Inspection Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.20 FUEL OIL CHEMISTRY

Program Description

The Fuel Oil Chemistry Program is a mitigation and condition monitoring program which manages aging effects of the internal surfaces of oil storage tanks and associated components in systems that contain diesel fuel oil. The program includes (a) surveillance and monitoring procedures for maintaining diesel fuel oil quality by controlling contaminants in accordance with ASTM Standards D 975, D 1796, D 2276 and D 4057; (b) periodic sampling of fuel oil tanks and new fuel oil shipments for the presence of water and contaminants, and draining of any accumulated water from the tanks; (c) sampling of fuel oil tanks and new fuel oil shipments for numerous other factors such as sediment, viscosity, and flash point; (d) periodic or conditional visual inspection of internal surfaces or wall thickness measurements (e.g., ultrasonic testing) of tanks.

The One-Time Inspection Program (Section B.2.30) will be used to verify the effectiveness of the Fuel Oil Chemistry Program.

NUREG-1801 Consistency

The Fuel Oil Chemistry Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M30, *Fuel Oil Chemistry*, with exception.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope of Program**

  BVPS does not use ASTM standard D 2709. BVPS uses ASTM D 1796 versus ASTM D 2709 for guidance on the determination of water and sediment contamination. The use of ASTM D 1796, with an acceptance criterion for water and sediment content of less than or equal to 0.05% is required by BVPS Technical Specification Surveillance Requirements.

  BVPS does not use ASTM standard D 6217. BVPS uses ASTM D 2276 versus ASTM D 6217 for guidance on the determination of particulate contamination. The use of ASTM D 2276, with an acceptance criterion of a total particulate contamination of less than 10 mg/liter, is required by BVPS Technical Specification Surveillance Requirements.

- **Preventive Actions**

  Biocides, stabilizers, and corrosion inhibitors are not used at BVPS. A recent review, documented using the Corrective Action Program, evaluated the possibility of using fuel oil additives, and determined that additives would not provide any significant benefit and thus were not recommended for use at BVPS. Results from "for-cause" testing, performed in response to Corrective Action Program reports written when excessive sediment was detected within a fuel oil system, indicate that microbiological activity has not been a problem in any fuel oil subsystem at BVPS. Due to the materials of construction and a lack of water in the fuel oil tanks, there is also no benefit to the addition of corrosion inhibitors or metal deactivators to the fuel oil.

- **Parameters Monitored / Inspected**

  See the two exceptions regarding use of different ASTM standards under Scope of Program.

  BVPS does not routinely sample fuel oil for microbiological organisms. BVPS monitors for corrosion products and sediment; if detected, BVPS will evaluate the need for further laboratory analysis to detect the presence of microbiological organisms or by-products.

  BVPS does not use a filter with a pore size of 3.0 microns when testing fuel oil for particulates. BVPS will continue to use the 0.8 micron pore size filter recommended by ASTM D 2276 (which is required by BVPS Technical Specification Surveillance Requirements). Use of a filter with a smaller pore size results in a larger sample of particulates because smaller particles are retained. Thus, use of a 0.8 micron filter is more conservative than use of a 3.0 micron filter.

- **Monitoring and Trending**

  See the exception regarding not routinely sampling fuel oil for microbiological organisms under Parameters Monitored / Inspected.

- **Acceptance Criteria**

  See the two exceptions regarding use of different ASTM standards under Scope of Program.

  See the exception regarding not using a filter with a pore size of 3.0 microns under Parameters Monitored / Inspected.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Program Elements Affected:

- **Parameters Monitored / Inspected**

  Revise implementing procedure for sampling and testing the diesel-driven fire pump fuel oil storage tank (Unit 1 only) to include a test for particulate and accumulated water in addition to the test for sediment and water.

Generate a new implementing procedure for sampling and testing the security diesel generator fuel oil day tank (Common) for accumulated water, particulate contamination, and sediment/water.

- **Detection of Aging Effects**

  The two program enhancements described under the Parameters Monitored / Inspected program element are necessary for consistency with this program element.

Operating Experience

The Fuel Oil Chemistry Program is an existing program that utilizes sampling and analysis to ensure that adequate diesel fuel quality is maintained to prevent loss of material and fouling in the various in-scope fuel oil systems. Exposure of fuel oil to contaminants such as water and particulates is also minimized by periodic draining of accumulated water, tank interior cleaning, and by verifying the quality of new oil before its introduction into the storage tanks.

Water has occasionally been discovered in various BVPS diesel fuel oil storage tanks during sampling activities. In accordance with sampling and analysis procedures, any detected water is removed from the affected tank as part of the sampling process.

There have been multiple, but infrequent, instances during the past five years, where fuel oil particulate concentrations were near or above the Technical Specification limit for Emergency Diesel Generator fuel oil storage tanks. Four Corrective Action Program items were identified since 2002, which documented elevated fuel oil particulate levels in Emergency Diesel Generator fuel oil storage and day tanks. In all cases, corrective actions were taken such as recirculating the tank contents through a particulate filter. Other than these events, fuel oil sample results from 2001 through 2005 reveal that fuel oil quality is being maintained in compliance with industry standards. Regular analysis and confirmation of diesel fuel quality provide reasonable assurance that the program is effectively managing fuel oil chemistry.

A sampling schedule for diesel generator fuel oil tanks has been established, to allow timely identification of excessive concentrations of water and/or particulates, which will minimize tank loss of material. Sampling frequency is adequate as evidenced by the relatively few instances of particulate levels exceeding the Technical Specification limit. A recent CR identified elevated particulate levels which had yet to exceed the limit, but were monitored with sufficient frequency to identify a rising trend.

An important element of fuel oil (or any other) analysis is operation of the testing laboratory. Fuel oil samples from BVPS are sent to Beta Laboratory (a First Energy subsidiary) after an initial set of factors are measured at the BVPS site. The laboratory completes the oil analysis by measuring parameters such as viscosity, flash point, and percent sulfur.

A fleet oversight Quality Assurance audit was conducted to assess the operation practices and regulatory compliance of the Beta Laboratory facility. The principal tool for this assessment was the FENOC Quality Assurance Program Manual. The results of the audit reveal that Beta Lab is effective in performing analyses of the fuel oil samples from BVPS, however multiple areas for improvement were identified and Corrective Action Program items were generated to document and track the recommended improvements. The Quality Assurance audit process provides an additional level of assurance that the fuel oil chemistry program will continue to effectively monitor and manage fuel oil chemistry.

Conclusion

Continued implementation of the Fuel Oil Chemistry Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.21 INACCESSIBLE MEDIUM-VOLTAGE CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that BVPS will implement prior to the period of extended operation.

The purpose of this aging management program will be to demonstrate that inaccessible, non-EQ medium-voltage cables, susceptible to aging effects caused by moisture and voltage stress, will be managed such that there is reasonable assurance that the cables will perform their intended function in accordance with the current licensing basis during the period of extended operation.

In this aging management program, periodic actions are taken, at least once every two years, to prevent cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes and conduit, and draining water, as needed. In-scope, medium-voltage cables exposed to significant moisture and significant voltage are tested to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or other testing that is state-of-the-art at the time the test is performed. Testing will be conducted at least once every 10 years, with initial testing completed prior to the period of extended operation.

NUREG-1801 Consistency

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that is consistent with NUREG-1801, Section XI.E3, *Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*.

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.E3, are provided as follows:

- **Scope of Program**

  The program is applicable to inaccessible medium-voltage cables within the scope of license renewal that are exposed to significant moisture simultaneously with significant voltage.

  The definition for significant moisture and significant voltage defined in the program is consistent with NUREG-1801. Cables qualified for submergence (i.e., submarine cables) are excluded from this program.

- **Preventive Actions**

  The program identifies the applicable manholes and will require inspection of these manholes once every two years to inspect for water collection in cable manholes, and draining of water as needed.

- **Parameters Monitored / Inspected**

  The program allows that the specific type of test performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, as described in EPRI guidance documents, or other testing that is state-of-the-art at the time the test is performed.

- **Detection of Aging Effects**

  Testing of medium-voltage cables exposed to significant moisture and significant voltage that are within the scope of the program will be conducted at least once every 10 years, with the first inspection to be completed prior to the period of extended operation.

  The program identifies the applicable manholes and will require inspection of these manholes at least once every two years. The inspection frequency will be based on actual plant experience with water accumulation in the manhole, with the first inspection to be completed prior to the period of extended operation.

- **Monitoring and Trending**

  Trending will not be included as part of the program. However, all test and inspection results will be maintained as part of plant records. Therefore, these results are available for review and/or trending during subsequent tests and inspections as needed.

- **Acceptance Criteria**

  The acceptance criteria will be defined by the specific type of test performed and the specific cable tested.

- **Corrective Actions**

  The program will require that unacceptable cable test results are documented in the BVPS Corrective Action Program. Any subsequent engineering evaluations and extent-of-condition determinations are conducted according to the Corrective Action Program.

  This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new BVPS aging management program for which there is no plant-specific operating experience for program effectiveness. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801, Section XI.E3 program description. BVPS plant-specific operating experience is consistent with the operating experience in the program description.

  The BVPS program is based on industry operating experience. As such, incorporation of industry and plant-specific operating experience into the program provides reasonable assurance that the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will manage the effects of aging such that the applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Future operating experience will be appropriately incorporated into the program.

  BVPS currently has a manhole inspection program, which identifies and evaluates water collection in the manholes. This prevention program has been effective in monitoring and evaluating the exposure of cable and cable supports located in manholes to water. Reducing the exposure to water minimizes the aging effects of the applicable non-EQ medium-voltage cables, so these cables will continue to perform their intended function.

  BVPS plant-specific operating experience demonstrates the effectiveness of the prevention portion of the XI.E3 program. The BVPS manhole inspection was last performed in September 2006. The findings included missing seals, cracked walls, corroded supports, and water intrusion. No cable damage was found. No water was reported in in-scope manholes.

The plant-specific operating experience supports the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualifications Requirements Program manhole inspection frequency of once every two years for in-scope manholes. The lack of cable failures combined with the plant-specific operating experience for manhole inspections supports the cable testing frequency of at least once every 10 years.

Conclusion

The implementation of the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.22 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program that BVPS will implement prior to the period of extended operation.

The program will consist of inspections of the internal surfaces of piping, piping components, ducting and other components within the scope of license renewal that are not covered by other aging management programs. These internal inspections are performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. These inspections will assure that existing environmental conditions are not causing material degradation that could result in a loss of intended function.

NUREG-1801 Consistency

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program that is consistent with NUREG-1801, Section XI.M38, *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components.*

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.M38, are provided as follows:

- **Scope of Program**

  The program will consist of inspections of the internal surfaces of piping, piping components, ducting and other components within the scope of license renewal that are not managed by other aging management programs. The program will include inspection for indications of borated water leakage on internal surfaces, where applicable.

- **Preventive Actions**

  The program will be a condition monitoring program; therefore, no preventive actions or steps exist to mitigate component degradation.

- **Parameters Monitored / Inspected**

  The program will inspect for visible evidence of corrosion which may indicate possible loss of material. Inspections will be performed during the periodic system and component surveillance tests or during the performance of maintenance activities (whether scheduled outages or otherwise) when internal surfaces are made accessible for visual inspection.

- **Detection of Aging Effects**

  For inspections that are performed during periodic system and component surveillance tests, established inspection intervals will provide for a timely detection of degradation prior to the loss of intended function.

  Inspections that are conducted during maintenance activities, when the surfaces are made accessible, are performed on an opportunistic basis. When systems are opened up for maintenance activities, the program will delineate that inspection locations should be chosen that are most likely to exhibit aging effects based on industry and plant-specific operating experience.

  For metal surfaces that are painted or coated, the program will require a visual inspection to confirm integrity of the paint or coating. Inspection parameters will include discoloration, blistering, cracking and flaking. If no degradation is indicated, no additional inspection of the subject surface will be required.

- **Monitoring and Trending**

  The program will require visual inspection activities to be performed by personnel qualified in accordance with applicable BVPS procedures and processes.

  The program will monitor aging degradation of internal surfaces. Trending of aging degradation of internal surfaces will be accomplished through the Corrective Action Program.

- **Acceptance Criteria**

  The program will inspect for indications of paint/coating degradation, corrosion, fouling, cracking, and build-up of dust/dirt/debris that could affect component intended function.

  Inspection results not meeting the acceptance criteria shall be documented and processed in accordance with the Corrective Action Program.

- **Corrective Actions**

  This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program for which there is no operating experience for program effectiveness. Industry and plant-specific operating experience will be evaluated in the development of this program. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801, Section XI.M38 program description. BVPS plant-specific operating experience is consistent with the operating experience in the program description.

  Inspection of internal surfaces during the performance of periodic surveillances and maintenance activities has been in effect at BVPS in support of plant component reliability programs.

  For example, a 1999 internal inspection of a tank visually indicated that the protective coating was not degraded. However, rust scale was found on the bottom of the tank and was determined to have originated from carbon steel piping between the compressor and the tank. An engineering examination and evaluation was conducted on the piping to determine its condition. The piping was found to be within acceptable design margins for continued operation.

  These inspection and follow-up engineering evaluation activities have proven effective in maintaining the material condition of plant systems, structures, and components, including the internal surfaces of piping and ducting components. Future operating experience will be appropriately incorporated into the program.

  Incorporation of operating experiences provides reasonable assurance that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will manage the aging effects of such components through the period of extended operation.

Conclusion

The implementation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.23 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Program Description

The Inspection of Overhead Heavy Load & Light Load (Related To Refueling) Handling Systems Program manages loss of material of structural components for heavy load and fuel handling components within the scope of license renewal and subject to aging management. The program is implemented through plant procedures and preventive maintenance activities that provide for visual inspections of the in-scope load handling components.

The inspections are focused on structural components that make up the bridge, trolley, and rails of the cranes and hoists. These cranes and hoists also comply with the maintenance rule requirements provided in 10 CFR 50.65.

Overhead heavy load cranes are controlled in accordance with the guidance provided in NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants* [Reference B.3-15].

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M23, *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.*

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Program Elements Affected:

- **Scope of Program**

  Include guidance in the program administrative procedure to inspect for loss of material due to corrosion on crane and trolley structural components and rails.

- **Detection of Aging Effects**

  Include guidance in the crane and hoist inspection procedures to inspect for loss of material due to corrosion on crane and trolley structural components and rails or extendable arms, as appropriate.

Operating Experience

There are relatively few events involving aging of passive crane components such as rails. BVPS and industry operating experiences are regularly reviewed and documented using the Corrective Action Program or SAP. An example of a plant operating experience event occurred in 2003 in the Waste Handling Building when programmatic deficiencies and degraded crane material conditions related to a lift of a high integrity container (HIC) grapple necessitated a Stop Work Order for radiological lifts. This action demonstrates the BVPS commitment to only use equipment that is acceptable material condition, especially when dealing with radiological loads.

An event at another Westinghouse PWR resulted in two BVPS procedures being modified to apply the lesson-learned. The evolution being performed was the polar crane lift removal of the reactor lower internals. Due to an alignment problem which had not been identified, the crane experienced an overload condition. BVPS changed the lower head lift procedure to verify alignment prior to attempting to lift the lower internals.

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program and its associated activities are effective at managing aging effects of the cranes and hoists structural components (including bridge, trolley, rails, and girders). A review of applicable Corrective Action Program documents indicated that BVPS has not experienced aging-related degradation of cranes within the scope of license renewal and subject to aging management. Several corrective actions documented reviews of industry guidance and experience. The review of industry Operating Experience events, however, did not identify any age-related degradation applicable to the subject cranes. This operating experience provides reasonable assurance that inspection of the in-scope load handling equipment will ensure the program remains effective for managing age-related degradation of passive components during the period of extended operation.

Conclusion

Continued implementation of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.24 LUBRICATING OIL ANALYSIS

Program Description

The purpose of the Lubricating Oil Analysis Program is to ensure the lubricating oil environment for in-scope mechanical systems is maintained to the required quality. The program monitors and controls abnormal levels of contaminants (primarily water and particulates) for in-scope components in the lubricating oil systems, thereby preserving an environment that is not conducive to loss of material, cracking, or reduction of heat transfer.

The One-Time Inspection Program (Section B.2.30) will be used to verify the effectiveness of the Lubricating Oil Analysis Program.

NUREG-1801 Consistency

The Lubricating Oil Analysis Program is an existing program that is consistent with NUREG-1801, Section XI.M39, *Lubricating Oil Analysis*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Lubricating Oil Analysis Program is an existing program that maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to loss of material, cracking, or fouling. Program activities include sampling and analysis of lubricating oil for contaminants, water, particulates, and bearing wear materials.

Analysis of samples taken in 2006 from lube oil subsystems for several in-scope pumps and motors showed that the oil in these components was within normal tolerances and was satisfactory for continued use. However, the presence of elevated amounts of water, wear particles, and contaminants in routine sampling led to documenting the issues in the Corrective Action Program. Use of warning level indicators to direct corrective actions prior to equipment degradation provides evidence that the program is effective in managing aging effects caused by oil impurities.

The BVPS practice of regular lube oil system analysis is consistent with industry operating experience in which significant and potentially disabling failures could have been prevented by following this same policy. A specific example is described in NRC Information Notice, 2001-06 in which a 40-fold increase in particle count for the lube oil in a high-head SI pump thrust bearing was not recognized as a potential indicator of bearing damage.

Other good practices such as assessing the storage and distribution of lubricating oil from the site warehouse helps to ensure that high quality contaminant-free oil is added to the lubricating systems for in-scope pumps and motors.

The BVPS Lubricating Oil Analysis Program incorporates operating experience from the sampling and testing of lubricating oil for the various in-scope pump and motor bearing packages. Operating experience has shown that a precursor event to bearing failures is elevated lubricating oil particulate concentration. The program is designed to detect this elevated particulate concentration which allows preemptive actions such as oil replacement to be performed prior to loss of intended function. Current operating experience (Corrective Action Program documents, Information Notices, etc.) validates the effectiveness of the BVPS Lubricating Oil Analysis Program. The BVPS Lubricating Oil Analysis Program has been effective at managing aging effects by periodically sampling and analyzing lubricating oil from these in-scope components.

Conclusion

Continued implementation of the Lubricating Oil Analysis Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.25 MASONRY WALL

Program Description

The Masonry Wall Program manages the aging effects of masonry walls that are within the scope of License Renewal and subject to aging management review. The program consists of visual inspections to identify cracks in masonry walls and ensure the sound condition of structural steel supports and bracing associated with masonry walls.

Masonry walls in close proximity to, or having attachments from, safety-related systems or components are inspected in response to NRC IE Bulletin 80-11, *Masonry Wall Design* [Reference B.3-16], and NRC Information Notice 87-67, *Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11* [Reference B.3-17]. These inspections consist of a visual examination by qualified personnel to ensure that the evaluation basis for these walls remains valid through the period of extended operation.

In addition, a general visual inspection is performed on both safety-related and nonsafety-related masonry walls that are within the scope of license renewal. These inspections are implemented by the Structures Monitoring Program [Section B.2.39] and consist of visual inspection for cracking in joints, deterioration of penetrations, missing or broken blocks, missing mortar, and general mechanical soundness of steel supports.

NUREG-1801 Consistency

The Masonry Wall Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S5, *Masonry Wall Program*.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Program Element Affected:

- **Scope of Program**

  The scope of the existing program is comprised of masonry walls within the scope of 10 CFR 50.65 (The Maintenance Rule). The scope of the program will be enhanced to include additional masonry walls identified as having aging effects requiring management for License Renewal.

Operating Experience

BVPS inspections show adequate performance of required 10-year masonry wall inspections per IEB 80-11 [Reference B.3-16] and IN 87-67 [Reference B.3-17]. The last safety-related masonry wall inspection was performed in June, 2000 and the results were forwarded to design engineering for evaluation.

The 10-year inspection was completed in 2001 on the Structures as outlined in the Maintenance Rule System Basis Documents. The inspection included safety and nonsafety-related masonry walls. Overall, the report concluded that the plant structures were in good condition and performing well. The inspections found no conditions requiring immediate maintenance or repair. Conditions noted were minor in nature and did not affect the structural integrity of any of the structures reviewed. Some cracks in the mortar joints of masonry walls were observed. In general, the cracks corresponded to those noted in past masonry wall inspections. All observed cracks were narrow and tight. Cracks previously repaired had not reoccurred.

Identification of minor degradation and monitoring of indications provide reasonable assurance that the program is effective for managing cracking of masonry walls and masonry wall joints for both safety and nonsafety-related masonry walls.

Conclusion

Continued implementation of the Masonry Wall Program provides reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.26 METAL ENCLOSED BUS (UNIT 2 ONLY)

Program Description

The Metal Enclosed Bus Program is a new program that BVPS will implement prior to the period of extended operation. This program is applicable only to the Unit 2 480-VAC Metal Enclosed Bus Feeders to the Emergency Substations (2-8 and 2-9). There is no in-scope metal enclosed bus at Unit 1.

In-scope metal enclosed bus internal surfaces will be visually inspected for aging degradation of insulating and conductive components. This visual inspection will also identify evidence of foreign debris, excessive dust buildup, or moisture intrusion. The bus insulating system, including the internal supports, will be visually inspected for structural integrity and signs of aging degradation. A sample of accessible bolted connections will be checked for loose connection using thermography. Inspections will be completed prior to the period of extended operation and every 10 years thereafter.

NUREG-1801 Consistency

The Metal Enclosed Bus Program is a new program that is consistent with NUREG-1801, Section XI.E4, *Metal Enclosed Bus*.

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.E4, are provided as follows:

- **Scope of Program**

  The program applies to metal enclosed buses within the scope of license renewal, specifically the Unit 2 480 VAC Metal Enclosed Bus Feeders to the Emergency Substations (2-8 and 2-9).

- **Preventive Actions**

  This program is a condition monitoring inspection program. No actions are taken by this program to prevent or mitigate aging degradation.

- **Parameters Monitored / Inspected**

  The program requires that a sample of accessible bolted connections will be visually inspected and tested for loose connections. The program provides for the inspection of the internal portion of metal enclosed buses for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of moisture intrusion. The bus insulation will be inspected for signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. The internal bus supports will be inspected for structural integrity and signs of cracks.

- **Detection of Aging Effects**

  The program requires that a sample of accessible bolted connections will be checked for loose connection by use of thermography. The program elects not to perform measurement of connection resistance using a low range ohmmeter.

  The program will require visual inspection of the internal surfaces of metal enclosed buses for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of moisture intrusion, bus insulation for signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation, and internal bus supports for structural integrity and signs of cracks.

  Inspection activities required by the program will be performed prior to the period of extended operation and at least every 10 years thereafter.

- **Monitoring and Trending**

  Trending will not be included as part of the program. However, all test/inspection results are documented and retained in accordance with plant procedures.

- **Acceptance Criteria**

  The program requires that when thermography is used, bolted connections need to be below the maximum allowed temperature for the application. The program elects not to perform measurement of connection resistance using a low range ohmmeter. Therefore, no acceptance criterion is required for resistance measurement tests.

  The program requires that metal enclosed buses shall be free from unacceptable visual indications of surface anomalies, which suggest that conductor insulation degradation exists. In addition, no unacceptable indication of corrosion, cracks, foreign debris, excessive dust buildup or evidence of moisture intrusion is to exist. An unacceptable indication is defined as a noted condition or situation that, if left un-managed, could lead to a loss of intended function.

- **Corrective Actions**

  The program requires that further investigation, evaluation and extent-of-condition determination are performed as part of the BVPS Corrective Action Program.

This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The Metal Enclosed Bus Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the Metal Enclosed Bus Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.27 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY

Program Description

The Metal Fatigue of Reactor Coolant Pressure Boundary Program is a time-limited aging analysis (TLAA) program that uses preventive measures to mitigate fatigue cracking caused by anticipated cyclic strains in metal components of the reactor coolant pressure boundary. The preventive measures consist of monitoring and tracking critical thermal and pressure transients for RCS components to prevent the fatigue design limit from being exceeded. Critical transients are the subset of the design transients that are expected to approach or exceed the number of design cycles during the sixty year operating life of the units. These critical transients include plant heatup, plant cooldown, reactor trip from full power (Unit 1 only), inadvertent auxiliary spray, safety injection activation (Unit 1 only), and RCS cold overpressurization. Supplemental transients were also identified by the program for monitoring. These supplemental transients include pressurizer insurge transient, selected Chemical and Volume Control System transients, Auxiliary Feedwater injections and RHR actuation (Unit 2 only). Prior to exceeding the fatigue design limit, preventive and/or corrective actions are triggered by the program.

In addition, environmental effects are evaluated in accordance with NUREG/CR-6260, *Application of NUREG/CR-5999 Interim Fatigue Curves for Selected Nuclear Power Plant Components* [Reference B.3-18], and the guidance of EPRI Technical Report MRP-47, *Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application* [Reference B.3-19]. Selected components are evaluated using material specific guidance presented in NUREG/CR-6583, *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels* [Reference B.3-20], and in NUREG/CR-5704, *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels* [Reference B.3-21].

NUREG-1801 Consistency

The Metal Fatigue of Reactor Coolant Pressure Boundary Program is an existing program that is consistent with NUREG-1801, Section X.M1, *Metal Fatigue of Reactor Coolant Pressure Boundary*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Concerns for the overall health of the transient/cycle counting program were documented using the Corrective Action Program. Corrective actions included identifying a program owner, developing an administration program document and updating it to incorporate responsibilities, improving cycle counting, and establishing a process for engineering to evaluate plant data. Fatigue monitoring to date indicates that the number of design transient events assumed in the original design analysis will be sufficient for a 60-year operating period. The program has remained responsive to emerging issues and concerns, particularly the pressurizer surge and spray nozzle, hot leg surge nozzle, and surge line transients.

For example, in 2002, a Westinghouse evaluation identified that the BVPS Unit 2 letdown, charging, and excess letdown piping could potentially exceed their design allowable cycle counts for several design transients. However, further evaluation of existing plant operations and the physical separation distance of the letdown and excess letdown piping demonstrated that no further evaluation of the letdown or excess letdown piping was required for current operation or for the period of extended operation. A re-analysis of the charging piping was required to account for the appropriate transients for a 60-year plant life.

This responsiveness to emerging issues and continued program improvements provide evidence that the program will remain effective for managing cumulative fatigue damage for passive components.

Conclusion

Continued implementation of the Metal Fatigue of Reactor Coolant Pressure Boundary Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.28 NICKEL-ALLOY NOZZLES AND PENETRATIONS

For the Nickel-Alloy Nozzles and Penetrations Program, regarding activities for managing the aging of nickel-alloy and nickel-alloy clad components susceptible to primary water stress corrosion cracking - PWSCC (other than upper reactor vessel closure head nozzles and penetrations), BVPS has provided in Appendix A a commitment to develop a plant-specific aging management program that will implement applicable:

1. NRC Orders, Bulletins and Generic Letters; and,
2. staff-accepted industry guidelines.

B.2.29 NICKEL-ALLOY PENETRATION NOZZLES WELDED TO THE UPPER REACTOR VESSEL CLOSURE HEAD

Program Description

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head Program manages cracking due to primary water stress corrosion cracking in nickel-alloy vessel head penetration nozzles. The program scope includes the reactor vessel closure head, upper vessel head penetration nozzles, and associated welds. The program also is used in conjunction with the Boric Acid Corrosion Program to examine the reactor vessel upper head for any loss of material due to boric acid wastage. This program was developed in response to NRC Order EA-03-009, *Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors* [Reference B.3-22], and NRC First Revised Order EA-03-009, *Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors* [Reference B.3-23]. Detection of cracking is accomplished through implementation of a combination of bare metal visual examination (external surface of head) and non-visual examination techniques.

NUREG-1801 Consistency

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head Program is an existing program that is consistent with NUREG-1801, Section XI.M11A, *Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (PWRS Only).*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The BVPS Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head Program manages cracking due to primary water stress corrosion cracking in nickel-alloy vessel head penetration nozzles. Detection of cracking is accomplished through implementation of a combination of bare metal visual examination (external surface of head) and non-visual examination techniques.

The Corrective Action Program has documented examples demonstrating program awareness of and sensitivity to industry guidance and experience, and the evaluation of that experience for applicability to BVPS. For example, the evaluation of NRC Regulatory Issue Summary RIS 2003-13, which summarized an NRC review of multiple plant responses to NRC Bulletin 2002-01. The Corrective Action Program was used to facilitate a site review of the identified weaknesses and the steps suggested by the NRC for licensees to strengthen their inspection programs to address potential cracking and leakage in materials susceptible to Primary Water Stress Corrosion Cracking. The operating experience also demonstrates the effective use of corrective actions to document and resolve program deficiencies or adverse conditions.

In 2004, the NRC issued First Revised Order EA-03-009 [Reference B.3-23]. This Order superseded the original NRC Order from 2003. BVPS reviews of both NRC Orders were documented in the Corrective Action Program. The program included inspections as required by the Orders.

In March, 2006, a new reactor head was installed at Unit 1 utilizing Alloy 690 penetration material. Installation of the new reactor head places these Nickel-Alloy penetrations in the "replaced" susceptibility category for EA-03-009.

During the Unit 2 Cycle 12 Refueling Outage (October - November 2006), ultrasonic examination (UT) indications were observed. BVPS used additional examination methods, and identified flaws on several Reactor Vessel upper closure head CRDM nozzles that required repair. Repairs were performed based on accepted industry practices, and the nozzles successfully passed further examinations.

Detection and repair of cracking, continuous improvement of material condition, use of recent operating experience and industry guidance in the development of fleet-wide procedures, site Quality Assurance oversight and continuous process improvement provide reasonable assurance that the program is effective for managing aging effects for passive RCS components.

Conclusion

Continued implementation of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.30 ONE-TIME INSPECTION

Program Description

The One-Time Inspection Program is a new program that BVPS will implement prior to the period of extended operation.

This program will require one-time inspections to verify effectiveness of the Water Chemistry Program [Section B.2.42], the Fuel Oil Chemistry Program [Section B.2.20], and the Lubricating Oil Analysis Program [Section B.2.24]. One-time inspections may be needed to address concerns for potentially long incubation periods for certain aging effects on structures and components. There are cases where either (a) an aging effect is not expected to occur but there is insufficient data to completely rule it out, or (b) an aging effect is expected to progress very slowly. For these cases, there will be confirmation that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly as not to affect the component or structure intended function during the extended period of operation. The one-time inspections will provide additional assurance that, either aging is not occurring, or aging is so insignificant that an aging management program is not warranted.

The elements of the program will include:

- Determination of a representative sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience;
- Identification of the inspection locations in the system or component based on the aging effect, or areas susceptible to concentration of agents that promote certain aging effects;
- Determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined; and,
- Evaluation of the need for follow-up examinations to monitor the progression of any aging degradation.

In addition to verifying program effectiveness, the program is used to verify that loss of material is not occurring in the following components:

- Steam generator feedwater ring; and,
- Selected bottoms of tanks that sit on concrete pads (by volumetric examination).

When evidence of an aging effect is revealed by a one-time inspection, the routine evaluation of the inspection results would identify appropriate corrective actions.

NUREG-1801 Consistency

The One-Time Inspection Program is a new program that is consistent with NUREG-1801, Section XI.M32, *One-Time Inspection*.

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.M32, are provided as follows:

- **Scope of Program**

  The program will require one-time inspections to verify effectiveness of the Water Chemistry Program, the Fuel Oil Chemistry Program, and the Lubricating Oil Analysis Program.

  In addition to verifying program effectiveness, the program will be used to verify loss of material is not occurring in the following components:

  - Several tanks that sit on concrete pads are in identified in the Aging Management Review Reports as having their external surface exposed to soil and credit this aging management program. The external bottom surfaces of these tanks will be inspected for loss of material (by volumetric examination) as part of the One-Time Inspection Program.
  - The Unit 1 and Unit 2 steam generator feedwater rings will be inspected for loss of material as part of the program.

- **Preventive Actions**

  The program will consist of inspection activities independent of methods to mitigate or prevent degradation. The program will therefore include no preventive actions.

- **Parameters Monitored / Inspected**

  The program will require inspections to be performed by qualified personnel following procedures consistent with the requirements of the American Society of Mechanical Engineers (ASME) Code and 10 CFR 50, Appendix B. Inspections will be performed using a variety of nondestructive examination methods, including visual, volumetric, and surface techniques. The program will monitor parameters directly related to the degradation of the components such as wall thickness and visual evidence of corrosion.

- **Detection of Aging Effects**

  The program owner will determine a representative sample of the system and component population to be inspected. The sample will be inspected using a variety of nondestructive examination methods, including visual, volumetric, and surface techniques. The inspections will be completed early enough to ensure that the aging effects that may affect intended functions early in the period of extended operation are appropriately managed. At the same time, inspections will be timed to allow the inspected components to attain sufficient age to ensure that the aging effects with long incubation periods can be identified.

  In addition to inspecting a representative sample of the in-scope system and component population, the program will also inspect the following components to verify loss of material is not occurring:

  - Steam generator feedwater ring; and,
  - Selected bottoms of tanks that sit on concrete pads (by volumetric examination).

- **Monitoring and Trending**

  The program owner will determine the inspection sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience. Inspection findings will be evaluated by assigned engineering personnel. Inspection findings not meeting the acceptance criteria will be evaluated and tracked through the Corrective Action Program. The Corrective Action Program will be used to identify appropriate corrective actions including additional inspections or expansion of inspection sample size.

- **Acceptance Criteria**

  Determination of acceptance criteria will include evaluation of design standards and industry codes or standards, as applicable. Unacceptable inspection findings will include cracking, loss of material, or reduction of heat transfer that would lead to loss of intended function during the period of extended operation.

  Inspection findings will be evaluated by assigned engineering personnel. Inspection findings not meeting the acceptance criteria will be evaluated and tracked through the Corrective Action Program.

- **Corrective Actions**

  This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The One-Time Inspection Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the One-Time Inspection Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.31 ONE-TIME INSPECTION OF ASME CODE CLASS 1 SMALL BORE PIPING

Program Description

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program is a new program that BVPS will implement prior to the period of extended operation, and within the last 10 years of, the current operating period.

The program manages cracking of stainless steel ASME Code Class 1 piping less than 4-inches nominal pipe size (NPS 4). The program will manage this aging effect by performing volumetric examinations for selected ASME Code Class 1 small-bore butt welds.

Should evidence of significant aging be revealed by the one-time inspection, periodic inspection will be proposed, as managed by a plant-specific aging management program.

NUREG-1801 Consistency

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program is a new program that is consistent with NUREG-1801, Section XI.M35, *One-Time Inspection of ASME Code Class 1 Small-Bore Piping.*

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.M32, are provided as follows:

- **Scope of Program**

  The program will include one-time volumetric examinations of a sample of Class 1 small-bore butt welds. This sample will include locations that are susceptible to cracking. The program will include measures to verify that unacceptable degradation is not occurring in Class 1 small-bore piping, thereby validating the effectiveness of the Water Chemistry Program to mitigate aging-related degradation and confirming that no additional aging management programs are needed for the period of extended operation.

- **Preventive Actions**

  The program is an inspection activity that detects degradation of components before loss of intended function. Therefore, no guidance is provided on preventive or mitigating activities.

- **Parameters Monitored / Inspected**

  The program will consist of nondestructive examinations (i.e., volumetric) performed by qualified personnel following procedures consistent with Section XI of ASME Code and 10 CFR 50, Appendix B. The volumetric examination technique will be qualified on small-bore piping prior to examination.

- **Detection of Aging Effects**

  BVPS has not experienced significant cracking of ASME Code Class 1 small-bore piping due to stress corrosion or thermal and mechanical loading, and therefore this program is appropriate. This program will perform one-time volumetric examinations on a sample of ASME Code Class 1 small-bore butt weld locations to detect cracking.

- **Monitoring and Trending**

  One-time volumetric examinations will be performed on a sample of ASME Code Class 1 small-bore butt weld locations. The sample selection will be based on susceptibility, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small-bore piping locations. Where practical, the sample selection will focus on the bounding or lead components most susceptible to cracking. The sample size will consist of three welds from each unit. Should evidence of significant aging be revealed by the one-time inspection, periodic inspection will be proposed, as managed by a plant-specific Aging Management Program.

- **Acceptance Criteria**

  If flaws or indications exceed the acceptance criteria of ASME Code, Section XI, Paragraph IWB-3400, they will be evaluated in accordance with ASME Code, Section XI, Paragraph IWB-3131, and additional examinations are performed in accordance with ASME Code, Section XI, Paragraph IWB-2430.

- **Corrective Actions**

  This element is discussed further in Section B.1.3.

- **Confirmation Process**

  This element is discussed further in Section B.1.3.

- **Administrative Controls**

  This element is discussed further in Section B.1.3.

- **Operating Experience**

  The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program is a new program; therefore, there is no operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

  Relevant historical BVPS operating experience was reviewed and summarized. A self-assessment of the RI-ISI program was completed in November 2004. The assessment team evaluated 13 assessment areas. The assessment included a review of industry operating experience relating to ISI that identified a situation where ultrasonic testing examination volume was marginally acceptable. The BVPS program was reviewed and found to have incorporated the ISI extended examination volume requirement in their ultrasonic testing procedures.

  Quality Assurance surveillances in 2004 identified minor issues that would improve program performance and reduce human errors, but did not identify issues or findings that would impact the overall effectiveness of the program. The review of the ISI program identified items for improvement including use of detailed procedure references, more consistent document formatting, and thorough and timely processing of vendor (i.e., Westinghouse) evaluations. The Corrective Action Program is used to revise the program and to process vendor evaluations in accordance with the required procedures.

  The lack of degradation which could lead to possible failure, demonstrated through a regular program of inspections, provides reasonable assurance that the program is effective for managing aging effects for passive components.

Conclusion

The implementation of the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.32 OPEN-CYCLE COOLING WATER SYSTEM

Program Description

The Open-Cycle Cooling Water System Program implements the site commitments to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Equipment* [Reference B.3-25], including Supplement 1. This program manages the aging effects on the open-cycle cooling water systems such that the systems will be able to fulfill their intended function during the period of extended operation. The program includes surveillance and control techniques to manage aging effects caused by biofouling, corrosion, erosion, protective coating failures, and silting in the River Water (Unit 1 only) / Service Water (Unit 2 only) Systems or structures and components serviced by the systems.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System Program is an existing program that is consistent with NUREG-1801 Section XI.M20, *Open-Cycle Cooling Water System.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Microbiologically influenced corrosion (MIC) and macro-fouling have occurred on occasion at BVPS within the River and Service Water systems and other heat exchangers which reject heat directly to the river. Those systems using water from the Ohio River as a heat sink are collectively referred to as the Open Cycle Cooling Water (OCCW) system.

MIC can result in pipe and component wall thinning, which if left unchecked, can cause failure of the affected component. Macro-fouling and MIC also produce silting, which can lead to a decrease in system flow and a subsequent reduction in heat removal. The OCCW program is designed for timely identification of the symptoms of MIC and macro-fouling which will allow corrective actions, such as cleaning, chemical addition, or component replacement, to be taken.

Quality Assurance audits of the OCCW and river water chemistry control programs evaluate the BVPS compliance with NRC guidance (Generic Letter 89-13) for MIC and macro-fouling control within OCCW system components. The most recent audit was completed in December of 2004, the result of which revealed that BVPS satisfies NRC and industry guidelines for OCCW system chemistry control and regulation of MIC and macro-fouling. However, areas for improvement were identified and documented within the Corrective Action Program. The audit showed that a sufficient number of parameters are measured to detect abnormal conditions which could be indicative of MIC, macro-fouling, or silting. Biocide concentrations were maintained within specified bands, and associated systems were found to be treated and controlled to acceptable levels consistent with industry and NRC guidelines. Adherence to recommended chemistry specifications and regular monitoring of key system flow parameters provide reasonable assurance that the OCCW program will effectively manage loss of material and reduction of heat transfer for in-scope OCCW components.

The OCCW system program at BVPS satisfies GL 89-13 commitments for managing aging effects due to biofouling, corrosion, protective coating failures, and silting within system components. In October, 2004, an NRC audit was conducted on the implementation of Generic Letter, GL 89-13. The audit did not reveal any findings, however, suggested improvements were identified to further strengthen the OCCW system program. For example, a recommendation was made to increase the inspection and cleaning frequencies of OCCW system components which would allow the program to sooner identify a component in the early stages of material loss. The recommended improvement, to modify the monitoring program administrative procedure, was documented within the Corrective Action Program and incorporated into the program.

Thermal Performance Testing of River/Service water cooled heat exchangers, a Generic Letter 89-13 requirement, also provides valuable data on the internal condition of OCCW components. The 2005 Ultimate Heat Sink Biennial Inspection, which included evaluation of the Thermal Performance Testing program, was completed in December with no findings. As part of this inspection, BVPS completed three thermal performance tests on River/Service Water cooled heat exchangers. Specifically, the Unit 1 and Unit 2 charging pump lube oil coolers and Unit 1 diesel generator jacket water cooler were evaluated. All heat exchanger thermal performance test results were satisfactory.

An important element of OCCW system program evaluation is benchmarking trips to other facilities to assess comparable systems and learn from and apply actions which may be applicable to BVPS. Such a trip was taken to the North Anna Station in 2002, which was documented in the Corrective Action Program. Valuable examples of operating experience were identified and evaluated for applicability at BVPS using the Corrective Action Program. Specific examples include use of more accurate flow measuring instrumentation to assess performance changes within the River/Service Water systems, and a program in which large-bore pipes and heat exchanger end bells are hydro-lazed and lined with an epoxy resin.

Program audits, thermal performance testing, and benchmarking other facilities provide reasonable assurance that the OCCW program will effectively manage loss of material and reduction of heat transfer for in-scope OCCW component.

Conclusion

Continued implementation of the Open-Cycle Cooling Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.33 PWR VESSEL INTERNALS

BVPS has provided in Appendix A (UFSAR Supplement), Table A.4-1 (Unit 1 only) and Table A.5-1 (Unit 2 only) commitments to:

1. Participate in the industry programs applicable to BVPS for investigating and managing aging effects on reactor internals;
2. Evaluate and implement the results of the industry programs as applicable to the BVPS reactor internals; and,
3. Upon completion of these programs, but not less than 24 months before entering the period of extended operations, submit an inspection plan for the BVPS reactor internals to the NRC for review and approval.

B.2.34 REACTOR HEAD CLOSURE STUDS

Program Description

The Reactor Head Closure Studs Program at BVPS Unit 1 and Unit 2 is an existing program that manages the aging effects of the reactor head closure studs, nuts, washers and associated Reactor Vessel flange threads. The program is part of the BVPS ASME Code Section XI Inservice Inspection (ISI) Program. The examinations are performed in accordance with Code Section XI, 1989 edition with no Addenda. The Program is updated periodically as required by 10 CFR 50.55a. The program preventive measures are consistent with the recommendations of Regulatory Guide 1.65, *Materials and Inspections for Reactor Vessel Closure Studs* [Reference B.3-26].

NUREG-1801 Consistency

The Reactor Head Closure Studs Program is an existing program that is consistent with NUREG-1801, Section XI.M3, *Reactor Head Closure Studs*, with exception.

Exceptions to NUREG-1801

Program Elements Affected:

- **Scope of Program**

  NUREG-1801, Section XI.M3, *Reactor Head Closure Studs* specifies the use of ASME Section XI, 2001 edition through 2002 and 2003 Addenda. The applicable ASME Code for the third (Unit 1 only) and second (Unit 2 only) interval of the BVPS Reactor Head Closure Studs Program is ASME Section XI, 1989 edition (with no Addenda). The use of the 1989 edition of the ASME Code is consistent with provisions in 10 CFR 50.55a to use the Code in effect 12 months prior to the start of the inspection interval. BVPS will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

- **Parameters Monitored or Inspected**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Detection of Aging Effects**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Monitoring and Trending**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Acceptance Criteria**

  See the exception regarding differences in ASME Code edition under Scope of Program.

- **Corrective Actions**

  See the exception regarding differences in ASME Code edition under Scope of Program.

Enhancements

None

Operating Experience

The extent and schedule of the inspection and test techniques prescribed by the program are designed to maintain structural integrity and ensure that aging effects will be discovered and repaired before the loss of intended function of the component. The Inspection schedule of IWB-2400, and the extent and frequency of IWB-2500-1 provide timely detection of cracks, loss of material, and leakage. Implementation of the program provides reasonable assurance that the effects of cracking due to SCC or IGSCC and loss of material due to wear will be adequately managed so that the intended functions of the reactor head closure studs and bolts will be maintained consistent with the current licensing basis for the period of extended operation. (NUREG-1801, Section XI.M3)

Unit 1 reactor head studs ultrasonic testing examinations performed during the Cycle 17 Refueling Outage (February - April 2006) had no undesirable indications. The visual examinations (VT-1) indicated no unsatisfactory conditions. The examination indicated minor nicks and scratches, but the overall results were satisfactory.

Unit 2 reactor head studs ultrasonic testing examinations performed during the Cycle 12 Refueling Outage (October - November 2006) had no undesirable indications. The visual examinations (VT-1) indicated no unsatisfactory conditions. The examination indicated minor nicks and scratches, but the overall results were satisfactory.

The review of plant-specific operating experience has indicated minor surface discontinuities (minor nicks and scratches) on Reactor Vessel studs, nuts, and washers, but no cases of cracking have been identified with the BVPS Reactor Vessel head studs, nuts, or washers.

As part of the ISI program, the Reactor Head Closure Studs Program at BVPS is updated to account for industry and plant-specific operating experience. The implementation of this program provides reasonable assurance that monitoring and evaluating various aging effects related to the reactor head closure studs, nuts, washers and associated Reactor Vessel flange threads will be effective for managing aging effects. Aging effects are analyzed by appropriate personnel and corrected according to the resulting analysis.

Conclusion

Continued implementation of the Reactor Head Closure Studs Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.35 REACTOR VESSEL INTEGRITY

Program Description

The Reactor Vessel Integrity Program is an existing plant-specific program.

The Reactor Vessel Integrity Program manages loss of fracture toughness due to neutron embrittlement in reactor materials exposed to a neutron fluence exceeding 1.0E+17 n/cm^2 (E>1.0 MeV). The program is based on 10 CFR 50, Appendix H, *Reactor Vessel Material Surveillance Requirements* [Reference 1.3-1], and ASTM Standard E 185-82, *Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels* [Reference B.3-27] (incorporated by reference into 10 CFR 50, Appendix H). Capsules are periodically removed during the course of plant operating life. Neutron embrittlement is evaluated through surveillance capsule testing and evaluation, fluence calculations and monitoring of effective full power years (EFPYs). Best-estimate values of Reactor Vessel accumulated neutron fluence are determined utilizing analytical models that satisfy the guidance contained in NRC Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence* [Reference B.3-28]. Data resulting from the program is used to:

- Determine pressure-temperature limits, minimum temperature requirements, and end-of-life Charpy upper-shelf energy (C_VUSE) in accordance with the requirements of 10 CFR 50 Appendix G, *Fracture Toughness Requirements* [Reference 1.3-1], and,
- Determine end-of-life RT_{PTS} values in accordance with 10 CFR 50.61, *Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock* [Reference 1.3-1].

The Reactor Vessel Integrity Program provides guidance for removal and testing or storage of material specimen capsules. All capsules that have been withdrawn were tested and stored. Standby capsules at Unit 1 and Unit 2 will be available for future testing. Standby capsules from each unit will be removed from the vessel when the neutron fluences are approximately equivalent to the expected vessel wall neutron fluence at 60 years of operation (corrected for lead and capacity factors).

In addition, the Reactor Vessel Integrity Program implements flux reduction programs as required by 10 CFR 50.61.

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1800 [Reference 1.3-4], Appendix A, are provided as follows:

- **Scope of Program**

  The program monitors changes in the fracture toughness properties of ferritic materials in the Reactor Vessel beltline region which result from exposure of these materials to neutron irradiation and the thermal environment. Under the program, fracture toughness test data are obtained from material specimens exposed in surveillance capsules, which are withdrawn periodically from the Reactor Vessel. The test data are then analyzed and used to establish operating limits and setpoints in compliance with the pressure and temperature requirements of 10 CFR 50 Appendix G. The extended beltline materials that have projected fluence values of greater than 1.0E+17 n/cm^2 (E>1.0 MeV) at the end-of-license-extended were evaluated, and none of these materials were determined to be limiting. Therefore, these materials need not be added to the material surveillance program for the license renewal term.

- **Preventive Actions**

  Surveillance capsule test data is used to determine operating pressure-temperature limits, minimum temperature requirements, and end-of-life C_VUSE in accordance with the requirements of 10 CFR 50 Appendix G, and determine end-of-life RT_{PTS} values in accordance with 10 CFR 50.61. In addition, the Reactor Vessel Integrity Program implements flux reduction programs as allowed by 10 CFR 50.61. Flux reduction program documentation will be submitted in accordance with the requirements of 10 CFR 50.61.

- **Parameters Monitored / Inspected**

  The Reactor Vessel Integrity program monitors the loss of fracture toughness due to neutron irradiation embrittlement of the Reactor Vessel beltline materials in accordance with 10 CFR 50, Appendix H. Various environmental and metallurgical parameters are monitored, including fluence and material chemistry. Once all surveillance capsules are removed, alternative dosimetry will be used to monitor neutron fluence during the period of extended operation.

- **Detection of Aging Effects**

  Fracture toughness test data are obtained from encapsulated, in-vessel material specimen surveillance coupons, which are withdrawn periodically from the Reactor Vessel and destructively tested. Charpy V-notch testing is conducted on the coupons to measure loss of fracture toughness.

- **Monitoring and Trending**

  The irradiated material properties (Charpy test results) are compared to available unirradiated properties, and the resulting irradiation shift is measured. The shift is a measure of the effect of irradiation on material toughness for the plate and weld materials. The BVPS data is not trended.

- **Acceptance Criteria**

  The program requirements are set forth in 10 CFR 50, Appendices G and H, and ASTM Standard E 185-82, *Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels*, which is incorporated by reference into 10 CFR 50, Appendix H.

- **Corrective Actions**

  This element is discussed in Section B.1.3.

- **Confirmation Process**

  This element is discussed in Section B.1.3.

- **Administrative Controls**

  This element is discussed in Section B.1.3.

- **Operating Experience**

  The Reactor Vessel Integrity Program has provided materials data and dosimetry for the monitoring of irradiation embrittlement since plant startup. The use of this program has been reviewed and approved by the NRC during the period of current operation. Surveillance capsules have been withdrawn during the period of current operation, and the data from these surveillance capsules and sister plant data have been used to verify and predict the performance of BVPS Reactor Vessel beltline materials with respect to neutron embrittlement. Calculations have been performed as required to project the reference temperature for pressurized thermal shock (RT_{PTS}) and Charpy upper-shelf energy (C_VUSE) values to the end-of-license-extended (EOLE). BVPS pressure-temperature limit curves are valid up to a stated vessel fluence limit, and must be revised prior to operating beyond that limit. As part of the Extended Power Uprate review, the continued applicability of each unit's pressure-temperature limits was evaluated.

  In 2001, a BVPS self-assessment of the program was conducted. As a result, program enhancements were made. The self-assessment identified two strengths and five areas for improvement for the program, which were documented in the Corrective Action Program. The areas for improvement dealt with the need to better document and control technical information used within the program. The Corrective Action Program was used as needed to track resolution of the areas for improvement. Program enhancements as a result of issues identified in a self-assessment provides reasonable assurance that the program is effective.

Actions to manage the Reactor Vessel fluence at the limiting location have been underway at BVPS Unit 1 since the 1990s. Starting with Cycle 11 in 1995, BVPS instituted a flux management program to manage the fluence effects on the RT_{PTS} value of the limiting plate (lower shell plate B6903-1). This flux management plan included the addition of hafnium rods in the peripheral fuel bundles and continued use of the standard L4P low-leakage core loading. The operation of Unit 1 with hafnium rods installed for three cycles (removed in fall of 2001) reduced the irradiation rate by approximately 25 percent during that time period.

The program operating experience provides reasonable assurance that the program will remain effective in managing aging effects of Reactor Vessel materials.

Enhancements

None

Conclusion

Continued implementation of the Reactor Vessel Integrity Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.36 SELECTIVE LEACHING OF MATERIALS INSPECTION

Program Description

The Selective Leaching of Materials Inspection Program is a new program that BVPS will implement prior to the period of extended operation.

The program includes a one-time visual inspection and hardness examination of selected components that are susceptible to selective leaching. The program scope includes components and commodities (such as piping, pump casings, valve bodies and heat exchanger components) made of copper alloys with zinc content greater than 15% or gray cast iron which are exposed to a raw water, treated water, air, condensation, or soil environment.

This program will determine whether selective leaching is occurring for selected components. Should evidence of significant aging be revealed by the one-time inspection or previous operating experience, the Corrective Action Program will be used for the unacceptable inspection findings. The resolution will include evaluation for expansion of the inspection sample size, locations, and frequency.

NUREG-1801 Consistency

The Selective Leaching of Materials Inspection Program is a new program that is consistent with NUREG-1801, Section XI.M33, *Selective Leaching of Materials*, with exception.

Exceptions to NUREG-1801

Program Element Affected:

- **Detection of Aging Effects**

  BVPS takes exception to Brinell hardness testing as described in NUREG-1801. Examinations, other than Brinell hardness testing, will be used to identify the presence of selective leaching. A qualitative determination of selective leaching will be used in lieu of Brinell hardness testing for components within the scope of this program. The exception is justified, because (1) Brinell hardness testing may not be feasible for most components due to form and configuration (i.e., heat exchanger tubes), and (2) other mechanical means, such as scraping or chipping, provide an equally valid method of identification

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.M33, are provided as follows:

- **Scope of Program**

  The scope of the program will include all components and commodities identified in the Aging Management Reviews as susceptible to loss of material due to selective leaching. This includes components and commodities (such as piping, pump casings, valve bodies and heat exchanger components) made of gray cast iron and copper alloys with zinc content greater than 15% that are exposed to a raw water, treated water, air, condensation, or soil environment.

  The program will determine a representative sample of components that are susceptible to selective leaching for examination.

- **Preventive Actions**

  The program will be an evaluation and inspection program with no preventive actions to preclude or mitigate aging effects.

- **Parameters Monitored / Inspected**

  The program will consist of visual inspections and qualitative hardness examinations of internal surfaces of susceptible components. These examinations will determine if loss of material due to selective leaching has occurred and if it will affect the component's intended function.

- **Detection of Aging Effects**

  A representative sample of components will be selected for inspection based on the specific plant component material/environment combinations. At least one component of each material type (gray cast iron and copper alloys > 15% Zn) will be included and inspected in the representative sample. A qualitative hardness examination, such as scraping or chipping of internal surfaces of susceptible components, will determine if loss of material due to selective leaching has occurred.

- **Monitoring and Trending**

  The program consists of one time inspections only. It therefore does not include provisions for monitoring and trending.

- **Acceptance Criteria**

  Any indications of degradation that are detected during an inspection for selective leaching will be evaluated using the Corrective Action Program.

- **Corrective Actions**

  This element is discussed in Section B.1.3.

- **Confirmation Process**

  This element is discussed in Section B.1.3.

- **Administrative Controls**

  This element is discussed in Section B.1.3.

- **Operating Experience**

  The Selective Leaching of Materials Inspection Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the Selective Leaching of Materials Inspection Program will provide reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.37 SETTLEMENT MONITORING (UNIT 2 ONLY)

Program Description

The Settlement Monitoring Program (Unit 2 only) is an existing plant-specific condition monitoring program for structures and piping that are within the scope of license renewal. The program monitors the settlement of structures to prevent stresses in the structures or piping from increasing beyond analyzed stress levels. The analyses of the structures and piping addressed by the program are time-limited aging analyses (TLAAs) discussed in Section 4.7.5 of the LRA.

As documented in UFSAR Section 2.5.4.13, the settlement of each Unit 2 Category I structure was monitored during construction, and is monitored through the plant's life until the settlement of a particular structure has been determined to be stable as defined by the Settlement Monitoring Program. For such structures, settlement monitoring is then discontinued. The Settlement Monitoring Program provides the requirements to measure the settlement of Unit 2 structures at selected locations. If the settlement of a structure exceeds that anticipated, a review of current analysis (as it relates to the integrity of the structure and the maintenance of settlement assumptions in the piping stress analysis) is required.

The Settlement Monitoring Program ensures that the current 40-year settlement assumptions in the Unit 2 pipe stress analyses are maintained for the period of extended operation.

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1800 [Reference 1.3-4], Appendix A, are provided as follows:

- **Scope of Program**

  The program monitors designated Unit 2 safety-related structures. Therefore, the program is applicable only to Unit 2. Unit 1 in-scope structures are no longer monitored because use of the program established that Unit 1 in-scope structures are no longer settling.

- **Preventive Actions**

  This program is a condition monitoring program, so there are no preventive actions.

- **Parameters Monitored / Inspected**

  The elevations of buildings are surveyed and compared to previously recorded elevations. Any changes in elevations are evaluated with respect to previously established limits on changes in structure elevations.

- **Detection of Aging Effects**

  The program does not detect aging effects. The program uses surveys to measure structure settlement. If the settlement of a structure exceeds that anticipated, a review of current analysis (as it relates to the integrity of the structure and the maintenance of settlement assumptions in the piping stress analysis) is required.

- **Monitoring and Trending**

  Settlement of the structures has been projected and bounded by a maximum allowed for in the Current Licensing Basis. The program manages Time Limited Aging Analyses established to maintain component stress levels within the capabilities of the associated components. The settlements of structures are trended incrementally to measure and predict the extent of settling.

- **Acceptance Criteria**

  Each monitored structure has an allowable settlement limit. The Structure Settlement Evaluation is a comparison of observed structure settlement to that anticipated by the original plant designer or that amount of settlement later determined to be acceptable by more recent analyses. The program requires action to be taken if there are discrepancies between measured and anticipated settlements.

- **Corrective Actions**

  This element is discussed in Section B.1.3.

- **Confirmation Process**

  This element is discussed in Section B.1.3.

- **Administrative Controls**

  This element is discussed in Section B.1.3.

- **Operating Experience**

  The program uses surveys to measure structure settlement. Structure settlement is projected. If the settlement of a structure exceeds that anticipated, a review of current analysis (as it relates to the integrity of the structure and the maintenance of settlement assumptions in the piping stress analysis) is required.

  In 1995, an evaluation of settlement data showed that the Unit 1 structures being monitored had stopped settling, or become stable. A settlement marker location is "stable" if, over a reasonable time frame (2 to 3 years), a trend can be established that the marker has maintained a fixed elevation within a tolerance range of plus or minus 0.125 inch. As a result, the Unit 1 structures were removed from the scope of the program; the Corrective Action Program was used to document this scope change.

In 2004, a review of the program by the Company Nuclear Review Board questioned the ongoing validity of the removal of the Unit 1 structures from scope, given the possibility of changes in precipitation trends and potential leakage from underground fire protection piping. The engineering evaluations from 2003 were re-evaluated to ensure that an increase in precipitation or potential leakage from underground piping would not invalidate them. The Corrective Action Program was used to document the assessment.

To date, the only structure to exceed its anticipated settlement is a Unit 2 Valve Pit. In 1997, an evaluation of settlement data showed that the Valve Pit was settling faster than expected. As a result, the pipe stress and other calculations associated with the Valve Pit were recalculated to account for the observed settlement.

Comparison of program techniques and methods and use of the Corrective Action Program for implementation and modification of procedures demonstrate that the Settlement Monitoring Program is effectively monitoring and evaluating settlement of safety-related structures.

Enhancements

None

Conclusion

Continued implementation of the Settlement Monitoring Program (Unit 2 only) provides reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.38 STEAM GENERATOR TUBE INTEGRITY

Program Description

The Steam Generator Tube Integrity Program is based on NEI 97-06, *Steam Generator Program Guidelines* [Reference B.3-29]. The Steam Generator Tube Integrity Program is credited for aging management of the tubes, tube plugs, tube supports, and the secondary-side internal components whose failure could prevent the steam generator from fulfilling its intended safety function. The program includes performance criteria that are intended to provide assurance that steam generator tube integrity is being maintained consistent with the plant's licensing basis, and provides guidance for monitoring and maintaining the tubes to provide assurance that the performance criteria are met at all times between scheduled inspections of the tubes.

The Steam Generator Tube Integrity Program provides the requirements for inspection activities for the detection of flaws in tubes, plugs, tube supports, and secondary-side internal components needed to maintain tube integrity. Degradation assessments identify both potential and existing degradation mechanisms. Inservice inspections (i.e., eddy current testing, ultrasonic testing and visual inspections) are used for the detection of flaws. Condition monitoring compares the inspection results against performance criteria, and an operational assessment provides a prediction of tube conditions to ensure that the performance criteria will not be exceeded during the next operating cycle. Primary to secondary leakage is continually monitored during operation.

NUREG-1801 Consistency

The Steam Generator Tube Integrity Program is an existing program that is consistent with NUREG-1801, Section XI.M19, *Steam Generator Tube Integrity*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

BVPS Unit 1 steam generators (SGs) were replaced during the Unit 1 Cycle 17 Refueling Outage (February - April 2006), and the plant achieved full, uprated core thermal power in January of 2007. BVPS Unit 2 continues to operate with its original steam generators and has partially uprated its core thermal power output. Unit 2 is expected to achieve its full, uprated power after future plant modifications.

During each refueling outage, SG degradation assessments are performed in accordance with the provisions of NEI 97-06 and Section 5.2 of the EPRI PWR SG examination guidelines. These industry guidelines are based in part on operating experience and inspection results from other operating PWRs. Incorporation of plant and industry operating experience and use of industry guidance documents in the development of an inspection program provide assurance that the SG tube integrity program will continue to effectively manage aging effects of these passive components.

Results of recent degradation assessments performed during the Unit 1 Cycle 16 Refueling Outage (October - November 2004) and the Unit 2 Cycle 11 Refueling Outage (April 2005) are summarized in SG degradation assessment reports. Topics covered in the reports include SG tube degradation mechanisms, inspection & expansion requirements, tube repair criteria, structural limits, guidelines for testing, and chemical cleaning provisions.

As a result of the Unit 1 Cycle 16 Refueling Outage inspections at Unit 1, 196 SG tubes were plugged. As with all previous inspections, the condition of the Unit 1 SGs (with the degraded tubes plugged) met industry and regulatory structural and leakage integrity guidance, and were expected to meet these criteria following the outage inspection.

The outcome of the Unit 2 Cycle 11 Refueling Outage SG inspections necessitated that 55 tubes be plugged. The condition of the three SGs (with the degraded tubes plugged) met industry and regulatory structural and leakage integrity guidance, and the SGs were expected to meet these criteria following the outage inspection.

The degradation assessments also include discussions of specific and recent industry events (section 4.7 of the Unit 1 Cycle 16 Refueling Outage report and section 3.7 of the Unit 2 Cycle 11 Refueling Outage report). For example, lessons learned from false indications of eddy current testing at the Comanche Peak station resulted in changes to the BVPS bobbin analysis method. At the Shearon Harris plant, low level primary-to-secondary leakage was determined to be caused by foreign object wear just above the top of the cold leg side of the tubesheet. The inspection of the affected tube during the previous outage did not identify any flaw, however, subsequent manual reanalysis of the data suggested that flaw was present when the affected tube was tested. The failure to identify the flaw in the affected tube was attributed to a "sorting logic" gap that resulted in ½ inch section of tube which was not analyzed. The flaw was located within this unanalyzed ½ inch section of tube. As a result of this event, BVPS evaluated the sorting logic to verify that the logic did not contain similar gaps.

Using the accepted industry approach to testing and evaluation, and incorporation of pertinent industry operating experience, insures that the steam generator tube integrity program manages the effects of component aging such that the steam generators will continue to perform their intended functions, consistent with the current licensing basis, during the period of extended operation.

Conclusion

Continued implementation of the Steam Generator Tube Integrity Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.39 STRUCTURES MONITORING

Program Description

The Structures Monitoring Program implements the requirements of 10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants* (the Maintenance Rule), using the guidance of NUMARC 93-01, *Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants* [Reference B.3-30] and Regulatory Guide 1.160, *Monitoring the Effectiveness of Maintenance at Nuclear Power Plants* [Reference B.3-31].

The program relies on periodic visual inspections to monitor the condition of structures and structural components so that intended functions are maintained through the period of extended operation.

The Intake Structure (Common) and the Alternate Intake Structure (Common) are within the scope of the program, but are not water-control structures as defined in Regulatory Guide 1.127, *Inspection of Water-Control Structures Associated with Nuclear Power Plants* [Reference B.3-32]. However, the elements of the Structures Monitoring Program that manage the aging of the Intake Structure (Common) and the Alternate Intake Structure (Common) are consistent with the applicable elements of Regulatory Guide 1.127.

NUREG-1801 Consistency

The Structures Monitoring Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S6, *Structures Monitoring.*

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Program Elements Affected:

- **Scope of Program**

  The scope of the existing program is comprised of 10 CFR 50.65 (Maintenance Rule) structures and structural components. These and some additional structures and structural components were identified in the license renewal aging management review reports. The scope of the program will be enhanced to include the additional structures and structural components.

- **Parameters Monitored / Inspected**

  Include inspection guidance in program implementing procedures to detect significant cracking in concrete surrounding the anchors of vibrating equipment.

  Include a requirement in program procedures to perform opportunistic inspections of normally inaccessible below-grade concrete when excavation work uncovers a significant depth.

  Include a requirement in program procedures to perform periodic sampling of groundwater for pH, chloride concentration, and sulfate concentration.

  Include a requirement in program procedures to monitor elastomeric materials used in seals and sealants, including compressible joints and seals, waterproofing membranes, etc., associated with in-scope structures and structural components for cracking and change in material properties.

Operating Experience

The Structures Monitoring Program inspections are performed every five years to monitor parameters specific to each structure/aging effect combination. The inspections assess the overall condition of BVPS structures, including spalling, cracking, corrosion, compromised structural integrity, settlement, loose or missing anchors/fasteners, and seismic gaps. The degree of inspections depends on factors including importance to safety, age, environmental conditions, and service requirements. The results of program inspections are documented for comparison with future inspection results. Significant degradation is evaluated through the Corrective Action Program.

The baseline programmatic inspection of BVPS structures was performed in 1996. In 2001, the second programmatic inspection of BVPS structures was completed and documented. The 2006 inspection was performed, but the report had not been issued as of the date of this assessment.

Overall, the 2001 inspection report concluded that plant structures were in good condition and performing well. The inspection found no conditions requiring immediate maintenance or repair. Conditions noted were minor in nature and did not affect the structural integrity of any of the structures reviewed. Many of the observed conditions were noted for further review during the next programmatic inspection. Conditions noted in the 1996 baseline inspection were revisited. In most cases, little or no change was noted from the baseline observations.

The 2001 inspection report identified that, in some cases, corroded steel that was painted as a result of the baseline inspection had corrosion reappear. In such cases, the steel was located in a damp or wet environment. None of this corrosion was detrimental. Some minor concrete cracks were noted. The cracks were narrow and shallow, and presented no structural integrity problems. Some exterior surfaces of concrete structures evidenced pop-outs and spalls. These conditions were not detrimental and no repair or patching was necessary. No exposed reinforcing steel was noted. Areas of peeling or cracked paint were observed. Some areas had been painted since the baseline inspection. Other areas were noted for future painting. Some calcium deposits and water stains were noted, however no active wall leaks were observed. Deposits and stains noted in the baseline inspection that were cleaned had not reappeared.

In 2001, degraded structural bolting was found and replaced at BVPS in Intake Bay B of the Intake Structure. As a result of the finding, the program inspection scope was expanded. The Corrective Action Program was used to identify the problem and track the revision to the scope of the Structures Monitoring Program. The program implementing document was modified to incorporate a specific requirement assuring inspection of normally submerged structural items (steel supports and seismically mounted structures) in the Intake Structure and Auxiliary Intake Structure.

Industry operating experience has been evaluated for applicability to the program. The NRC issued Information Notice 2003-08, *Potential Flooding Through Unsealed Concrete Floor Cracks* [Reference B.3-33]. In 2002, at Energy Northwest's Columbia Generating Station, water spilled from a firewater drain line onto the floor. A small amount of this water leaked down into the remote shutdown room and a switchgear room. The leakage pathway was determined to be cracks in the concrete floor. An assessment of applicability of this event to BVPS was done. The Structures Monitoring Program inspection of floors was found to be sufficient to identify and repair any cracks large enough to allow water seepage.

The Structures Monitoring Program has identified and corrected age-related issues for in-scope structures and structural components. Where applicable, program improvements were implemented to incorporate site operating experience. The program has appropriately evaluated applicable industry operating experience. Ongoing identification of degradation and corrective action prior to loss of intended function provide reasonable assurance that the program is effective for managing aging effects for structural components.

Conclusion

Continued implementation of the Structures Monitoring Program provides reasonable assurance that the aging effects will be managed so that the structures and structural components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.40 THERMAL AGING AND NEUTRON IRRADIATION EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS)

Program Description

The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program that BVPS will implement prior to the period of extended operation.

Reactor Vessel Internals will be inspected in accordance with ASME Code Section XI, Subsection IWB, Category B-N-3. This inspection will be augmented to detect the effects of loss of fracture toughness due to thermal aging and neutron irradiation embrittlement of CASS components. The program will include identification of the limiting susceptible components from the standpoint of thermal aging susceptibility, neutron fluence, and cracking. For each identified component, aging management will be accomplished through either a supplemental examination or a component-specific evaluation, including a mechanical loading assessment.

BVPS will participate in the EPRI Materials Reliability Project established to investigate the impacts of aging on PWR vessel internal components. The results of this project will provide additional bases for the inspections and evaluations performed under this program.

NUREG-1801 Consistency

The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new aging management program that will be consistent with NUREG-1801, Section XI.M13, *Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)*.

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.M13, are provided as follows:

- **Scope of Program**

  The CASS components with service conditions above 250°C (482°F) shall be screened for potential susceptibility to thermal aging embrittlement. The screening criteria is set forth in the letter dated May 19, 2000, from Christopher I Grimes, Nuclear Regulatory Commission, to Douglas J. Walters, Nuclear Energy Institute, License Renewal Issue No. 98-0030, Thermal Aging Embrittlement of Cast Stainless Steel Components. The screening criteria is applicable to components constructed from SA-351 Grades CF3, CF3A, CF8, CF8A, CF3M, CF3MA, CF8M, with service conditions above 250°C (482°F). In applying the screening method, ferrite content is calculated by using Hull's equivalent factors described in NUREG/CR-4513, Rev. 1.

  For potentially susceptible components, the program will require evaluation of the synergistic loss of fracture toughness due to neutron embrittlement and thermal aging embrittlement.

  For each such component, aging management will be accomplished through either a supplemental examination of the affected component as part of a 10-year Inservice Inspection program during the license renewal term, or a component-specific evaluation to determine the component's susceptibility to loss of fracture toughness.

- **Preventive Actions**

  The program is a condition monitoring program that detects degradation of components before loss of intended function. Therefore, there are no preventive or mitigating attributes that are associated with these activities.

- **Parameters Monitored / Inspected**

  The program will identify the Reactor Vessel Internals cast austenitic stainless steel materials that have a projected 60-year neutron fluence of greater than 1.0E+17 n/cm^2 (E>1.0 MeV) or are determined to be susceptible to thermal aging embrittlement. For such materials, the program will consist of either a supplemental examination of the affected component or a component-specific evaluation to determine the component's susceptibility to loss of fracture toughness.

- **Detection of Aging Effects**

  For Reactor Vessel Internals cast austenitic stainless steel components that have a projected 60-year neutron fluence of greater than 1.0E+17 n/cm^2 (E>1.0 MeV) or are determined to be susceptible to thermal embrittlement, the 10-year Inservice Inspection program in effect during the renewal period will include supplemental inspections covering portions of the susceptible components determined to be limiting from the standpoint of thermal aging susceptibility, neutron fluence, and cracking susceptibility.

The program will require an inspection technique capable of detecting the critical flaw size with adequate margin. The critical flaw size will be determined based on the service loading conditions and service-degraded material properties. Examination methods that meet the criteria of the ASME Code Section XI, Appendix VIII are acceptable.

As an alternate to supplemental inspections, a component-specific evaluation may be performed, including a mechanical loading assessment to determine the maximum tensile loading on the component during ASME Code Service Level A, B, C, and D conditions. If the loading is compressive or low enough (<5 ksi) to preclude fracture, then supplemental inspection of the component will not be required. Failure to meet this criterion will require continued use of the supplemental inspection program.

For each cast austenitic stainless steel component that is projected to have a neutron fluence of less than 1.0E+17 n/cm^2 (E>1.0 MeV) and is susceptible to thermal aging, the supplemental inspection program applies.

For each cast austenitic stainless steel component that is projected to have a neutron fluence of less than 1.0E+17 n/cm^2 (E>1.0 MeV) and is not susceptible to thermal aging, the existing ASME Code Section XI inspection requirements are adequate.

- **Monitoring and Trending**

  Inspection schedules will be in accordance with ASME Section XI, Subsection IWB-2400.

- **Acceptance Criteria**

  Flaws detected in cast austenitic stainless steel components are evaluated in accordance with the applicable procedures of ASME Code Section XI IWB-3500. Flaw tolerance evaluation for components with ferrite content up to 25% will be performed according to the principles associated with IWB-3640 procedures for submerged arc welds (SAW), disregarding the code restriction of 20% ferrite in IWB-3641(b)(1). Flaw tolerance evaluations for components with greater than 25% ferrite will be performed on a case-by-case basis using fracture toughness data provided in industry literature.

- **Corrective Actions**

  This element is discussed in Section B.1.3.

- **Confirmation Process**

  This element is discussed in Section B.1.3.

- **Administrative Controls**

  This element is discussed in Section B.1.3.

- **Operating Experience**

  The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.41 THERMAL AGING EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS)

Program Description

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program that BVPS will implement prior to the period of extended operation.

Reactor Coolant System components will be inspected in accordance with the ASME Boiler and Pressure Vessel Code, Section XI. The ASME Section XI inspection will be augmented to detect the effects of loss of fracture toughness due to thermal aging embrittlement of cast austenitic stainless steel components. This program will include a determination of the susceptibility of the subject cast austenitic stainless steel components to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. For potentially susceptible components, aging management will be accomplished utilizing additional inspections or a component-specific flaw tolerance evaluation. Additional inspections or evaluations will not be required for components that are determined not to be susceptible to thermal aging embrittlement. Screening for susceptibility to thermal aging embrittlement is not required for pump casings and valve bodies. The existing ASME Section XI inspection requirements, including the alternative requirements of ASME Code Case N-481 *Alternate Examination Requirements for Cast Austenitic Pump Casings*, [Reference B.3-34], are adequate for all pump casings and valve bodies.

In addition, cast austenitic stainless steel components that are not part of the reactor coolant pressure boundary, but that have service conditions above 250° C (> 482° F), are included in this program. These components will be inspected, evaluated, or replaced as appropriate if screening determines they are susceptible to thermal aging embrittlement. The screening exclusion (pump casings and valve bodies) is not applicable to these components.

NUREG-1801 Consistency

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new aging management program that will be consistent with NUREG-1801, Section XI.M12, *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS).*

Exceptions to NUREG-1801

None

Enhancements

None

Aging Management Program Elements

The results of an evaluation of each of the 10 aging management program elements described in NUREG-1801, Section XI.M12, are provided as follows:

- **Scope of Program**

  CASS components with service conditions above 250°C (482°F) shall be screened for potential susceptibility to thermal aging embrittlement. The screening criteria is set forth in the letter dated May 19, 2000, from Christopher I Grimes, Nuclear Regulatory Commission, to Douglas J. Walters, Nuclear Energy Institute, License Renewal Issue No. 98-0030, Thermal Aging Embrittlement of Cast Stainless Steel Components. The screening criteria is applicable to components constructed from SA-351 Grades CF3, CF3A, CF8, CF8A, CF3M, CF3MA, CF8M, with service conditions above 250°C (482°F). In applying the screening method, ferrite content is calculated by using Hull's equivalent factors described in NUREG/CR-4513, Rev. 1. Screening for susceptibility to thermal aging embrittlement is not required for pump casings and valve bodies that are part of the reactor coolant pressure boundary. The existing ASME Section XI inspection requirements, including the alternative requirements of ASME Code Case N-481 "Alternate Examination Requirements for Cast Austenitic Pump Casings," are adequate for pump casings and valve bodies.

  For potentially susceptible reactor coolant pressure boundary components, aging management will be accomplished through either enhanced volumetric examination or a component-specific flaw tolerance evaluation.

  In addition, cast austenitic stainless steel components that are not part of the reactor coolant pressure boundary but that have service conditions above 250° C (> 482° F) will be included in this program. These components will be inspected, evaluated, or replaced as appropriate if screening determines they are susceptible to thermal aging embrittlement. The screening exclusion (pump casings and valve bodies) is not applicable to these components.

- **Preventive Actions**

  The program is a condition monitoring program that detects degradation of components before loss of intended function. Therefore, no guidance is provided on preventive or mitigating activities.

- **Parameters Monitored / Inspected**

  The program monitors the effects of loss of fracture toughness on the intended function of the component by identifying CASS materials that are susceptible to thermal aging embrittlement. For potentially susceptible materials that are part of the reactor coolant pressure boundary, the program will consists of either volumetric examination of the base metal or a component-specific flaw tolerance evaluation (loss of fracture toughness is of consequence only if cracks exist).

Potentially susceptible components that are not part of the reactor coolant pressure boundary will be inspected, evaluated, or replaced as appropriate. BVPS will determine required inspections on a case by case basis.

- **Detection of Aging Effects**

  For potentially susceptible materials that are part of the reactor coolant pressure boundary, the program will consist of either volumetric examination of the base metal or a component-specific flaw tolerance evaluation. Examination methods will meet the criteria of ASME Section XI, Appendix VIII. Component-specific flaw tolerance evaluations will be performed using specific geometry and stress information, to demonstrate that the potentially susceptible material has adequate toughness.

  Potentially susceptible components that are not part of the reactor coolant pressure boundary will be inspected, evaluated, or replaced as appropriate. BVPS will determine required inspections on a case by case basis. The screening exclusion (pump casings and valve bodies) is not applicable to these components.

- **Monitoring and Trending**

  Inspection schedules will be in accordance with ASME Section XI, Subsection IWB-2400 or IWC-2400. For components that are not part of the reactor coolant pressure boundary, the inspection schedules will be determined on a case by case basis.

- **Acceptance Criteria**

  Flaws detected in reactor coolant pressure boundary CASS components will be evaluated in accordance with IWB-3500 or IWC-3500. Flaw tolerance evaluation for components with ferrite content up to 25% will be performed according to the principles associated with IWB-3640 procedures for submerged arc welds (SAW), disregarding the code restriction of 20% ferrite in IWB-3641(b)(1). Flaw tolerance evaluations for components with greater than 25% ferrite will be performed on a case-by-case basis using fracture toughness data provided in industry literature.

  For components that are not a part of the reactor coolant pressure boundary, the acceptance criteria will be determined on a case by case basis.

- **Corrective Actions**

  This element is discussed in Section B.1.3.

- **Confirmation Process**

  This element is discussed in Section B.1.3.

- **Administrative Controls**

  This element is discussed in Section B.1.3.

- **Operating Experience**

  The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program; therefore, there is no plant-specific program operating experience for program effectiveness. Industry operating experience that forms the basis for the program is described in the operating experience element of the NUREG-1801 program description.

  Industry and plant-specific operating experience will be evaluated in the development and implementation of this program. As additional operating experience is obtained, lessons learned will be appropriately incorporated into the program.

Conclusion

The implementation of the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this Program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.42 WATER CHEMISTRY

Program Description

The main objective of the Primary and Secondary Water Chemistry Program is to mitigate damage caused by corrosion and stress corrosion cracking. The Water Chemistry Program relies on monitoring and control of water chemistry based on EPRI TR-105714, Rev. 5 (TR-1002884), *PWR Primary Water Chemistry Guidelines* [Reference B.3-35], and EPRI TR-102134, Rev. 6 (TR-1008224), *PWR Secondary Water Chemistry Guidelines* [Reference B.3-36].

The One-Time Inspection Program [Section B.2.30] will be used to verify the effectiveness of the Water Chemistry Program for the circumstances identified in NUREG-1801 that require augmentation of the Water Chemistry Program.

NUREG-1801 Consistency

The Water Chemistry Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M2, *Water Chemistry*.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Program element affected:

- **Monitoring and Trending**

  Change BVPS frequency for reactor coolant silica monitoring to once per week for MODES 1 and 2, and once per day during heatup in MODES 3 and 4 to be consistent with EPRI guidelines.

Operating Experience

The BVPS Water Chemistry Program is based on EPRI primary and secondary water chemistry guidelines, and as such, is sensitive to industry operating experience. Operating experience events are evaluated for potential inclusion in subsequent revisions of the EPRI guidelines based on significance and frequency of occurrence. The implementation of the EPRI guidelines at BVPS is monitored using the Corrective Action Program and is validated using Nuclear Quality Assurance audits. During the interim between revisions to the EPRI documents, operating experience from INPO is evaluated for applicability to BVPS.

BVPS Unit 1 RCS zinc concentration was occasionally out of specification between September of 2004 and November of 2006. Industry operating experience demonstrated that cracking in alloy-600 is minimized if zinc concentration is maintained at an optimum value. Evidence at BVPS Unit 1 supports this assertion. The number of PWSCC indications during the Unit 1 Cycle 16 Refueling Outage (October - November 2004) (following zinc injection) decreased from a predicted number of 25, to 5 actual indications.

Between July, 2000 and September, 2006, secondary chemistry parameters at both BVPS units were occasionally out-of-spec for sulfate, sodium, dissolved oxygen, pH, and chloride concentration resulting in potential chemistry action level 1 conditions. The Corrective Action Program was used to document and investigate the reason(s) for these out-of-spec conditions and to recommend corrective actions to restore the affected parameter(s) to an acceptable value before a plant shutdown is required.

In December, 2002, BVPS demonstrated its responsiveness to industry operating experience by applying a significant lesson learned from a human-performance chemistry addition error which occurred several days earlier at another plant. At BVPS, a chemistry technician independently performed a self-check and determined that he was obtaining the wrong chemical for addition to the feedwater system. He was motivated to perform this self-check as a result of a recent review of an INPO operating experience document which described a similar error at another plant in which the incorrectly obtained chemical was actually added to the secondary system resulting in an unplanned plant shutdown. The technician's application of pertinent operating experience prevented this near miss from becoming a significant plant event.

A Quality Assurance audit of the primary and secondary plant chemistry program was conducted in 2006. This audit revealed that monitoring and action requirements for Primary and Secondary water chemistry complied with BVPS Technical Specifications, implementing procedures, and the Licensing Requirements Manual (LRM). The BVPS chemistry sampling guidelines and limits were consistent with industry guidelines endorsed by EPRI, and were designed to extend the operating life of primary and secondary systems and components. An example of the BVPS adherence to chemistry control is evident from the primary chemistry performance indicator (percent of time that RCS hydrogen, lithium, & zinc concentrations were within spec) which, for Unit 1 and Unit 2 (no zinc) during 2005, were 97% and 99.8%, respectively.

Conformance to procedural requirements and industry guidelines, and sensitivity to operating experience reports provide reasonable assurance that the Water Chemistry program will effectively manage loss of material, cracking, and reduction of heat transfer for in-scope components during the period of extended operation.

Conclusion

Continued implementation of the Water Chemistry Program provides reasonable assurance that the aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions, consistent with the current licensing basis, for the period of extended operation.

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B.3 APPENDIX B REFERENCES

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B.3-3 NRC Information Notice 97-10, *Liner Plate Corrosion in Concrete Containments*, March 13, 1997.

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B.3-32 Regulatory Guide 1.127, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*, Rev. 1.

B.3-33 NRC Information Notice 2003-08, *Potential Flooding Through Unsealed Concrete Floor Cracks*, June 25, 2003.

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APPENDIX C

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APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for license renewal include any Technical Specification changes or additions necessary to manage the effects of aging during the period of extended operation. No changes to the BVPS Technical Specifications are required to support the License Renewal Application.

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