2.2.5 Fuel Pool Cooling and Purification System

1.0 Description

The fuel pool cooling and purification system (FPCPS) is made up of the following two separate subsystems:

- fuel pool cooling system (FPCS)
- fuel pool purification system (FPPS)

The FPCS is a safety-related system with two divisions. The FPCS provides the safety-related function of removing decay heat from the spent fuel pool.

The FPPS is a non-safety-related system that provides the following safety-related functions:

- Provides containment isolation.
- Provides SFP makeup water.

2.0 Arrangement

2.1 The functional arrangement of the FPCPS is as shown in Figure 2.2.5-1—Fuel Pool Cooling and Purification System Functional Arrangement.

2.2 The location of the FPCPS equipment is as listed in Table 2.2.5-1—FPCPS Equipment Mechanical Design.

2.3 The FPCPS divisions are physically separated from each other in the Fuel Building.

3.0 Mechanical Design Features

3.1 Equipment listed in Table 2.2.5-1 as ASME Code Section III is designed, welded, and hydrostatically tested in accordance with ASME Code Section III.

3.2 Check valves listed in Table 2.2.5-1 will function as listed in Table 2.2.5-1.

3.3 Deleted.

3.4 Equipment identified as Seismic Category I in Table 2.2.5-1 can withstand seismic design basis loads without loss of safety function as listed in Table 2.2.5-1.

3.5 Deleted.

3.6 Deleted.

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3.8 Deleted.

3.9 Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are designed in accordance with ASME Code Section III requirements.

3.10 Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are installed in accordance with an ASME Code Section III Design Report.

3.11 Pressure boundary welds in portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are in accordance with ASME Code Section III.

3.12 Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 retain their pressure boundary integrity at their design pressure.

3.13 Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are installed in accordance with ASME Code Section III requirements.

4.0 Instrumentation and Controls (I&C) Design Features, Displays, and Controls

4.1 Displays listed in Table 2.2.5-2—FPCPS Equipment I&C and Electrical Design are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.2.5-2.

4.2 The FPCPS equipment controls are provided in the MCR and the RSS as listed in Table 2.2.5-2.

4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.2.5-2 responds to the state requested by a test signal.

5.0 Electrical Power Design Features

5.1 The components designated as Class 1E in Table 2.2.5-2 are powered from the Class 1E division as listed in Table 2.2.5-2 in a normal or alternate feed condition.

5.2 Valves listed in Table 2.2.5-2 fail as-is on loss of power.

6.0 Environmental Qualifications

6.1 Equipment listed in Table 2.2.5-2 for harsh environment can perform the function in Table 2.2.5-1 following exposure to the design basis environments for the time required.

7.0 Equipment and System Performance

7.1 The fuel pool cooling system heat exchangers listed in Table 2.2.5-1 each have the capacity to transfer the design heat load to the component cooling water system.

7.2 The pumps listed in Table 2.2.5-1 have sufficient net positive suction head available (NPSHA).

7.3 Class 1E valves listed in Table 2.2.5-2 can perform the function listed in Table 2.2.5-1 under system design conditions.

7.4 The FPCS provides for flow testing of the FPCS pumps during plant operation.

7.5 Containment isolation valves listed in Table 2.2.5-1 close within the containment isolation response time following initiation of a containment isolation signal.

7.6 The FPCS design provides for maintaining the spent fuel pool water level above the spent fuel.

8.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.2.5-3 lists the FPCPS ITAAC..

Table 2.2.5-1—FPCPS Equipment Mechanical Design (2 Sheets)

Equipment Description	Equipment Tag Number(1)	Equipment Location	ASME Code Section III	Function	Seismic Category
FPC Division 1 Pump 1	30FAK11 AP001	Fuel Building (UFA)	yes	run	I
FPC Division 1 Pump 2	30FAK12 AP001	Fuel Building (UFA)	yes	run	I
FPC Division 2 Pump 3	30FAK21 AP001	Fuel Building (UFA)	yes	run	I
FPC Division 2 Pump 4	30FAK22 AP001	Fuel Building (UFA)	yes	run	I
FPC Division 1 Heat Exchanger	30FAK10 AC001	Fuel Building (UFA)	yes	heat transfer device	I
FPC Division 2 Heat Exchanger	30FAK20 AC001	Fuel Building (UFA)	yes	heat transfer device	I
FPC Division 1 Isolation Valve	30FAK10 AA001	Fuel Building (UFA)	yes	open	I
FPC Division 2 Isolation Valve	30FAK20 AA001	Fuel Building (UFA)	yes	open	I
FPC Division 1 to Sampling Isolation Valve	30FAK10 AA601	Fuel Building (UFA)	yes	close	I
FPC Division 2 to Sampling Isolation Valve	30FAK20 AA601	Fuel Building (UFA)	yes	close	I
RBP CI Valve (out)	30FAL12 AA002	Fuel Building (UFA)	yes	close (Containment Isolation)	I
RBP CI Valve (out)	30FAL15 AA002	Fuel Building (UFA)	yes	close (Containment Isolation)	I
RBP CI Valve (in)	30FAL12 AA001	Reactor Building (UJA)	yes	close (Containment Isolation)	I
RBP CI Valve (in), (check valve)	30FAL15 AA003	Reactor Building (UJA)	yes	close (Containment Isolation)	I
SFP Makeup Pump	30FAL02 AP001	Fuel Building (UFA)	yes	run	I

Table 2.2.5-1—FPCPS Equipment Mechanical Design (2 Sheets)

Equipment Description	Equipment Tag Number(1)	Equipment Location	ASME Code Section III	Function	Seismic Category
SFP Makeup Pump	30FAL02 AP002	Fuel Building (UFA)	yes	run	I

1) Equipment tag numbers are provided for information only and are not part of the certified design.

Table 2.2.5-2—FPCPS Equipment I&C and Electrical Design (2 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E Source (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
FPC Division 1 Pump 1	30FAK11 AP001	Fuel Building (UFA)	Div. 1^{N} Div. 2^{A}	N/A	yes	On-Off / N/A	Start-Stop / N/A
FPC Division 1 Pump 2	30FAK12 AP001	Fuel Building (UFA)	Div. 1^{N} Div. 2^{A}	N/A	yes	On-Off / N/A	Start-Stop / N/A
FPC Division 2 Pump 3	30FAK21 AP001	Fuel Building (UFA)	Div. 4^{N} Div. 3^{A}	N/A	yes	On-Off / N/A	Start-Stop / N/A
FPC Division 2 Pump 4	30FAK22 AP001	Fuel Building (UFA)	Div. 4^{N} Div. 3^{A}	N/A	yes	On-Off / N/A	Start-Stop / N/A
FPC Division 1 Isolation Valve	30FAK10 AA001	Fuel Building (UFA)	Div. 1^{N} Div. 2^{A}	N/A	yes	Position / N/A	Open-Close/ N/A
FPC Division 2 Isolation Valve	30FAK20 AA001	Fuel Building (UFA)	Div. 4^{N} Div. 3^{A}	N/A	yes	Position / N/A	Open-Close/ N/A
FPC Division 1 to Sampling Isolation Valve	30FAK10 AA601	Fuel Building (UFA)	N/A	N/A	N/A	Position / N/A	Open-Close / N/A
FPC Division 2 to Sampling Isolation Valve	30FAK20 AA601	Fuel Building (UFA)	N/A	N/A	N/A	Position / N/A	Open-Close / N/A
RBP CI Valve (out)	30FAL12 AA002	Fuel Building (UFA)	Div. 1^{N} Div. 2^{A}	yes	yes	Position / Position	Open-Close / Open-Close
RBP CI Valve (out)	30FAL15 AA002	Fuel Building (UFA)	Div. 1^{N} Div. 2^{A}	yes	yes	Position / Position	Open-Close / Open-Close
RBP CI Valve (in)	30FAL12 AA001	Reactor Building (UJA)	Div. 4^{N} Div. 3^{A}	yes	yes	Position / Position	Open-Close / Open-Close

Table 2.2.5-2—FPCPS Equipment I&C and Electrical Design (2 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E Source (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
SFP Makeup Pump	30FAL02 AP001	Fuel Building (UFA)	Div. 1	N/A	yes	On-Off / N/A	Start-Stop / N/A
SFP Makeup Pump	30FAL02 AP002	Fuel Building (UFA)	Div. 4	N/A	yes	On-Off / N/A	Start-Stop / N/A

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) ^{N} denotes the division the component is normally powered from; ^{A} denotes the division the component is powered from when alternate feed is implemented.

Table 2.2.5-3—FPCPS ITAAC (5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the FPCPS is as shown on Figure 2.2.5-1.	Inspections of the as-built system as shown on Figure 2.2.5-1 will be conducted.	The as-built FPCPS conforms with the functional arrangement as shown in Figure 2.2.5-1.
2.2	The location of the FPCPS equipment is as listed in Table 2.2.5-1.	An inspection will be performed of the location of the equipment listed in Table 2.2.5-1.	The equipment listed in Table 2.2.5-1 is located as listed in Table 2.2.5-1.
2.3	The FPCPS divisions are physically separated from each other in the Fuel Building.	An inspection will be performed to verify that the divisions of the FPCPS are separated in the Fuel Building.	The FPCPS divisions are physically separated from each other in the Fuel Building.
3.1	Equipment listed in Table 2.2.5-1 as ASME Code Section III is designed, welded, and hydrostatically tested in accordance with ASME Code Section III.	a. Analysis of the equipment identified in Table 2.2.5-1 as ASME Code Section III will be performed per ASME Code Section III design requirements. b. Inspections will be conducted on the equipment identified in Table 2.2.5-1 as ASME Code Section III to verify welding has been performed per ASME Code Section III welding requirements. c. Hydrostatic testing of the equipment identified in Table 2.2.5-1 as ASME Code Section III will be performed per ASME Code Section III hydrostatic testing requirements.	a. ASME Code Section III Design Reports (NCA-3550) exist and conclude that the equipment identified in Table 2.2.5-1 as ASME Code Section III meets ASME Code Section III design requirements. b. Equipment identified in Table 2.2.5-1 as ASME Code Section III has been welded per ASME Code Section III welding requirements. c. Equipment identified in Table 2.2.5-1 as ASME Code Section III has been hydrostatically tested per ASME Code Section III hydrostatic testing requirements.
3.2	Check valves listed in Table 2.2.5-1 will function as listed in Table 2.2.5-1.	Tests will be performed for the operation of the check valves listed in Table 2.2.5-1.	The check valves listed in Table 2.2.5-1 perform the functions listed in Table 2.2.5-1.
3.3	Deleted.	Deleted.	Deleted.

Table 2.2.5-3—FPCPS ITAAC (5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.4	Equipment identified as Seismic Category I in Table 2.2.5-1 can withstand seismic design basis loads without loss of safety function as listed in Table 2.2.5-1.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.2.5-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. Inspections will be performed of the as-installed Seismic Category I equipment listed in Table 2.2.5-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	a. Tests/analysis reports exists and conclude that the Seismic Category I equipment listed in Table 2.2.5-1 can withstand seismic design basis loads without loss of safety function. b. Inspection reports exist and conclude that the as-installed Seismic Category I equipment listed in Table 2.2.5-1 including anchorage is installed as specified on the construction drawings.
3.5	Deleted.	Deleted.	Deleted.
3.6	Deleted.	Deleted.	Deleted.
3.7	Deleted.	Deleted.	Deleted.
3.8	Deleted.	Deleted.	Deleted.
3.9	Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are designed in accordance with ASME Code Section III requirements.	Inspections will be performed for the existence of ASME Code Section III Design Reports.	ASME Code section III Design Reports (NCA-3550) exist for portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1.
3.10	Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are installed in accordance with an ASME Code Section III Design Report.	Inspections will be performed to verify the existence of an analysis which reconciles as-fabricated deviations to the ASME Code Design Report as required by ASME Code Section III.	For portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1, ASME Code Data Reports (N-5) exist and conclude that reconciliation (NCA-3554) of the as-installed system with the Design Report (NCA-3550) has occurred.

Table 2.2.5-3—FPCPS ITAAC (5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.11	Pressure boundary welds in portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are in accordance with ASME Code Section III.	Inspections of pressure boundary welds verify that welding is performed in accordance with ASME Code Section III requirements.	ASME Code Section III Data Reports exist and conclude that pressure boundary welding for portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 has been performed in accordance with ASME Code Section III.
3.12	Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 retain their pressure boundary integrity at their design pressure.	Hydrostatic tests will be performed on the as-fabricated system.	For portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1, ASME Code Section III Data Reports exist and conclude that hydrostatic test results comply with ASME Code Section III requirements.
3.13	Portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1 are installed in accordance with ASME Code Section III requirements.	An inspection for the existence of ASME N–5 Data Reports will be performed.	For portions of the FPCPS piping shown as ASME Code Section III in Figure 2.2.5-1, N–5 Data Reports exist and conclude that installation is in accordance with ASME Code Section III requirements.
4.1	Displays exist or can be retrieved in the MCR and the RSS as identified in Table 2.2.5-2.	Inspections will be performed for the existence or retrievability of the displays in the MCR and the RSS as listed in Table 2.2.5-2.	a. The displays listed in Table 2.2.5-2 as being retrieved in the MCR can be retrieved in the MCR. b. The displays listed in Table 2.2.5-2 as being retrieved in the RSS can be retrieved in the RSS.
4.2	Controls exist in the MCR and the RSS as identified in Table 2.2.5-2.	Tests will be performed for the existence of control signals from the MCR and the RSS to the equipment listed in Table 2.2.5-2.	a. The controls listed in Table 2.2.5-2 as being in the MCR exist in the MCR. b. The controls listed in Table 2.2.5-2 as being in the RSS exist in the RSS.
4.3	Equipment listed as being controlled by a PACS module in Table 2.2.5-2 responds to the state requested by a test signal.	A test will be performed using test signals.	Equipment listed as being controlled by a PACS module in Table 2.2.5-2 responds to the state requested by the signal.

Table 2.2.5-3—FPCPS ITAAC (5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.1	The components designated as Class 1E in Table 2.2.5-2 are powered from the Class 1E division as listed in Table 2.2.5-2 in a normal or alternate feed condition.	a. Testing will be performed for components designated as Class 1E in Table 2.2.5-2 by providing a test signal in each normally aligned division. b. Testing will be performed for components designated as Class 1E in Table 2.2.5-2 by providing a test signal in each division with the alternate feed aligned to the divisional pair.	a. The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.2.5-2. b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E component identified in Table 2.2.5-2.
5.2	Valves listed in Table 2.2.5-2 fail as-is on loss of power.	Testing will be performed for the valves listed in Table 2.2.5-2 to fail as-is on loss of power.	Following loss of power, the valves listed in Table 2.2.5-2 fail as-is.
6.1	Components listed as Class 1E in Table 2.2.5-2 that are designated as harsh environment will perform the function listed in Table 2.2.5-1 in the environments that exist before and during the time required to perform their function.	a. Type tests, tests, analyses, or a combination of tests and analyses will be performed to demonstrate the ability of the equipment listed for harsh environment in Table 2.2.5-2 to perform the function listed in Table 2.2.5-1 for the environmental conditions that could occur before and during a design basis accident. b. For equipment listed for harsh environment in Table 2.2.5-2, an inspection will be performed of the as-installed Class 1E equipment and the associated wiring, cables and terminations.	a. The Class 1E equipment listed for harsh environment in Table 2.2.5-2 can perform the function listed in Table 2.2.5-1 before and during design basis accidents for the time required to perform the listed function. b. Inspection concludes the as-installed Class 1E equipment and associated wiring, cables, and terminations as listed in Table 2.2.5-2 for harsh environment conform with the design.

Table 2.2.5-3—FPCPS ITAAC (5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.1	The fuel pool cooling system heat exchangers listed in Table 2.2.5-1 each have the capacity to transfer the design heat load to the component cooling water system.	Tests and analyses will be performed to demonstrate the capability of each fuel pool cooling system heat exchanger as listed in Table 2.2.5-1 to transfer the design heat load to the component cooling water system.	One fuel pool cooling system train has the capacity to remove the design heat load of 19.8 MW and maintain the SFP temperature below 140°F via one heat exchanger.
7.2	The pumps listed in Table 2.2. 5-1 have sufficient NPSHA.	Testing and analyses will be performed to verify NPSHA for pumps listed in Table 2.2.5-1.	The pumps listed in Table 2.2.5-1 have NPSHA that is greater than net positive suction head required (NPSHR) at system run-out flow.
7.3	Class 1E valves listed in Table 2.2.5-2 perform the function listed in Table 2.2.5-1 under system design conditions.	Tests and analyses or a combination of tests and analyses will be performed to demonstrate the ability of the valves listed in Table 2.2.5-2 to change position as listed in Table 2.2.5-1 under system design conditions.	The as-installed valves change position as listed in Table 2.2.5-1 under system design conditions.
7.4	The fuel pool cooling system has provisions to allow flow testing of the fuel pool cooling system pumps during plant operation.	Testing for flow of the fuel pool cooling system pumps to the spent fuel pool will be performed.	The normal flow return line allows fuel pool cooling system pump flow to the spent fuel pool.
7.5	Containment isolation valves listed in Table 2.2.5-1 close within the containment isolation response time following initiation of a containment isolation signal.	Tests will be performed to demonstrate the ability of the containment isolation valves listed in Table 2.2.5-1 to close within the containment isolation response time following initiation of a containment isolation signal.	Containment isolation valves listed in Table 2.2.5-1 close within 60 seconds following initiation of a containment isolation signal.
7.6	The fuel pool cooling system design provides for maintaining the spent fuel pool water level above the spent fuel.	Inspection and testing will be performed to demonstrate the spent fuel pool water level is maintained above the spent fuel.	The spent fuel pool water level is maintained greater than or equal to 23 feet above the spent fuel.

Next File