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 on 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 FPCS divisions are physically separated from each other in the Fuel Building.

3.0 Mechanical Design Features

3.1 Pumps and valves listed in Table 2.2.5-1 will be functionally designed and qualified such that each pump and valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under conditions ranging from normal operating to design-basis accident conditions.

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 Components identified as Seismic Category I in Table 2.2.5-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.5-1.

3.5 Deleted.

3.6 Deleted.

3.7 Deleted.

3.8 Deleted.

3.9 FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 is designed in accordance with ASME Code Section III requirements.

3.10 FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 is installed in accordance with an ASME Code Section III Design Report.

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

3.12 FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 retains pressure boundary integrity at design pressure.

3.13 FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 is installed and inspected in accordance with ASME Code Section III requirements.

3.14 Components listed in Table 2.2.5-1 as ASME Code Section III are designed in accordance with ASME Code Section III requirements.

3.15 Components listed in Table 2.2.5-1 as ASME Code Section III are fabricated in accordance with ASME Code Section III requirements.

3.16 Pressure boundary welds on components listed in Table 2.2.5-1 as ASME Code Section III are in accordance with ASME Code Section III requirements.

3.17 Components listed in Table 2.2.5-1 as ASME Code Section III retain pressure boundary integrity at design pressure.

3.18 Components listed in Table 2.2.5-1 as ASME Code Section III 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 Deleted.

6.0 Environmental Qualifications

6.1 Components 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 during and following design basis events.

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 net positive suction head available (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 can perform the function listed in Table 2.2.5-1 under system operating conditions.

7.4 The pumps listed in Table 2.2.5-1 each have the capacity to provide flow to the FPCS heat exchangers.

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

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
FPC Division 1 Pump 1	30FAK11AP001	Fuel Building (UFA)	yes	run	I
FPC Division 1 Pump 2	30FAK12AP001	Fuel Building (UFA)	yes	run	I
FPC Division 2 Pump 3	30FAK21AP001	Fuel Building (UFA)	yes	run	I
FPC Division 2 Pump 4	30FAK22AP001	Fuel Building (UFA)	yes	run	I
FPC Division 1 Heat Exchanger	30FAK10AC001	Fuel Building (UFA)	yes	heat transfer device	I
FPC Division 2 Heat Exchanger	30FAK20AC001	Fuel Building (UFA)	yes	heat transfer device	I
FPC Division 1 Isolation Valve	30FAK10AA001	Fuel Building (UFA)	yes	open	I
FPC Division 2 Isolation Valve	30FAK20AA001	Fuel Building (UFA)	yes	open	I
FPC Division 1 to Sampling Isolation Valve	30FAK10AA601	Fuel Building (UFA)	yes	close	I
FPC Division 2 to Sampling Isolation Valve	30FAK20AA601	Fuel Building (UFA)	yes	close	I
RBP CI Valve (outside)	30FAL12AA002	Fuel Building (UFA)	yes	close (Containment Isolation)	I
RBP CI Valve (outside)	30FAL15AA002	Fuel Building (UFA)	yes	close (Containment Isolation)	I
RBP CI Valve (inside)	30FAL12AA001	Reactor Building (UJA)	yes	close (Containment Isolation)	I
RBP CI Valve (inside), (check valve)	30FAL15AA003	Reactor Building (UJA)	yes	close (Containment Isolation)	I
SFP Makeup Pump	30FAL02AP001	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)

Description	Tag Number (1)	Location	IEEE Class 1E Source (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
FPC Division 1 Pump 1	30FAK11AP001	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	30FAK12AP001	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	30FAK21AP001	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	30FAK22AP001	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	30FAK10AA001	Fuel Building (UFA)	Div. 1^N Div. 2^A	N/A	yes	Position / N/A	Open-Close/ N/A
FPC Division 2 Isolation Valve	30FAK20AA001	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	30FAK10AA601	Fuel Building (UFA)	N/A	N/A	N/A	Position / N/A	Open-Close / N/A
FPC Division 2 to Sampling Isolation Valve	30FAK20AA601	Fuel Building (UFA)	N/A	N/A	N/A	Position / N/A	Open-Close / N/A
RBP CI Valve (outside)	30FAL12AA002	Fuel Building (UFA)	Div. 1^N Div. 2^A	yes	yes	Position / Position	Open-Close / Open-Close

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

Description	Tag Number (1)	Location	IEEE Class 1E Source (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
RBP CI Valve (outside)	30FAL15AA002	Fuel Building (UFA)	Div. 1^{N} Div. 2^{A}	yes	yes	Position / Position	Open-Close / Open-Close
RBP CI Valve (inside)	30FAL12AA001	Reactor Building (UJA)	Div. 4^{N} Div. 3^{A}	yes	yes	Position / Position	Open-Close / Open-Close
SFP Makeup Pump	30FAL02AP001	Fuel Building (UFA)	Div. 1	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—Fuel Pool Cooling and Purification System ITAAC (7 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 on 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 FPCS divisions are physically separated from each other in the Fuel Building.	An inspection will be performed to verify that the divisions of the FPCS are separated in the Fuel Building.	The FPCS divisions are physically separated from each other by a wall in the Fuel Building as shown in Figures 2.1.1-38 through 2.1.1-42.
3.1	Pumps and valves listed in Table 2.2.5-1 will be functionally designed and qualified such that each pump and valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under conditions ranging from normal operating to design-basis accident conditions.	Tests or type tests of the pumps and valves listed in Table 2.2.5-1 will be conducted to demonstrate that the pumps and valves function under conditions ranging from normal operating to design-basis accident conditions.	A test report exists and concludes that the pumps and valves listed in Table 2.2.5-1 function under conditions ranging from normal operating to design-basis accident conditions.
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—Fuel Pool Cooling and Purification System ITAAC (7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.4	Components identified as Seismic Category I in Table 2.2.5-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.5-1.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the components identified 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 Seismic Category I components identified in Table 2.2.5-1 to verify that the components, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).	a. Seismic qualification reports (SQDP, EQDP, or analyses) exist and conclude that the Seismic Category I components identified in Table 2.2.5-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.5-1 including the time required to perform the listed function. b. Inspection reports exist and conclude that the Seismic Category I components identified in Table 2.2.5-1, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).
3.5	Deleted.	Deleted.	Deleted.
3.6	Deleted.	Deleted.	Deleted.
3.7	Deleted.	Deleted.	Deleted.
3.8	Deleted.	Deleted.	Deleted.
3.9	FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 is designed in accordance with ASME Code Section III requirements.	Inspections of the ASME Code Section III Design Reports (NCA-3550) and associated reference documents will be performed. **{{DAC}}**	ASME Code Section III Design Reports (NCA-3550) exist and conclude that FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 complies with ASME Code Section III requirements. **{{DAC}}**

Table 2.2.5-3—Fuel Pool Cooling and Purification System ITAAC (7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.10	FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 is installed in accordance with an ASME Code Section III Design Report.	Analyses to reconcile as-built deviations to the ASME Code Design Reports (NCA-3550) will be performed.	For FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1, ASME Code Data Reports (N-5) exist and conclude that design reconciliation (NCA-3554) has been completed in accordance with the ASME Code Section III for the as-built system. The report(s) document the as-built condition.
3.11	Pressure boundary welds in FPCPS piping shown as ASME Code Section III on 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 FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 has been performed in accordance with ASME Code Section III.
3.12	FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 retains pressure boundary integrity at design pressure.	Hydrostatic tests will be performed on the as-built system.	For FPCPS piping shown as ASME Code Section III on 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	FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1 is installed and inspected in accordance with ASME Code Section III requirements.	An inspection of the as-built piping will be performed.	For FPCPS piping shown as ASME Code Section III on Figure 2.2.5-1, N–5 Data Reports exist and conclude that installation and inspection are in accordance with ASME Code Section III requirements.
3.14	Components listed in Table 2.2.5-1 as ASME Code Section III are designed in accordance with ASME Code Section III requirements.	Inspections of ASME Code Section III Design Reports and associated reference documents will be performed..	ASME Code Section III Design Reports (NCA-3550) exist and conclude that components listed as ASME Code Section III in Table 2.2.5-1 comply with ASME Code Section III requirements.

Table 2.2.5-3—Fuel Pool Cooling and Purification System ITAAC (7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.15	Components listed in Table 2.2.5-1 as ASME Code Section III are fabricated in accordance with ASME Code Section III requirements.	An analysis will be performed to verify that deviations to the component design reports (NCA-3550) have been reconciled.	ASME Code Section III Design Reports (NCA-3550) exist and conclude that components listed as ASME Code Section III in Table 2.2.5-1 comply with ASME Code Section III requirements and any deviations to the design report have been reconciled.
3.16	Pressure boundary welds on components listed in Table 2.2.5-1 as ASME Code Section III are in accordance with ASME Code Section III requirements.	Inspections of pressure boundary welds will be performed to verify that welding is performed in accordance with ASME Code Section III requirements.	For components listed as ASME Code Section III in Table 2.2.5-1, ASME Code Section III Data Reports (NCA-8000) exist and conclude that pressure boundary welding has been performed in accordance with ASME Code Section III.
3.17	Components listed in Table 2.2.5-1 as ASME Code Section III retain pressure boundary integrity at design pressure.	Hydrostatic tests will be performed on the components.	For components listed as ASME Code Section III in Table 2.2.5-1, ASME Code Section III Data Reports exist and conclude that hydrostatic test results comply with ASME Code Section III requirements.
3.18	Components listed in Table 2.2.5-1 as ASME Code Section III are installed in accordance with ASME Code Section III requirements.	An inspection of ASME Code Data Reports will be performed.	ASME Code Section III N-5 Data Reports exist and conclude that components listed as ASME Code Section III in Table 2.2.5-1 have been installed 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.	Tests will be performed for the 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.

Table 2.2.5-3—Fuel Pool Cooling and Purification System ITAAC (7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
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.
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	Deleted.	Deleted.	Deleted.
6.1	Components 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 during and following design basis events.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as 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 during and following design basis events.	a. Environmental Qualification Data Packages (EQDP) exist and conclude that the components listed as harsh environment in Table 2.2.5-2 can perform the function listed in Table 2.2.5-1 during and following design basis events including the time required to perform the listed function.

Table 2.2.5-3—Fuel Pool Cooling and Purification System ITAAC (7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. Components listed as harsh environment in Table 2.2.5-2 will be inspected to verify installation in accordance with the construction drawings including the associated wiring, cables and terminations. Deviations to the construction drawings will be reconciled to the EQDP.	b. Inspection reports exists and conclude that the components listed in Table 2.2.5-2 as harsh environment has been installed per the construction drawings and any deviations have been reconciled to the EQDP.
7.1	The FPCPS 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.	Vendor tests and analyses will be performed to demonstrate the capability of each FPCS heat exchanger as listed in Table 2.2.5-1 to transfer the design heat load to the component cooling water system.	Each FPCPS train has the capacity to remove a heat load of at least 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 NPSHA that is greater than NPSHR at system run-out flow.	Testing 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 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 operating 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 operating conditions.	The valves change position as listed in Table 2.2.5-1 under system operating conditions.
7.4	The pumps listed in Table 2.2.5-1 each have the capacity to provide flow to the FPCS heat exchangers.	Tests will be performed.	Each train of the FPCS provides at least 3576 gpm to the FPCS heat exchanger with one pump in operation.

Table 2.2.5-3—Fuel Pool Cooling and Purification System ITAAC (7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
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