2.2.8 Fuel Handling System

Design Description

1.0 System Description

The fuel handling system (FHS) provides for handling of fuel assemblies from the time new fuel assemblies are received at the plant site until the spent fuel assemblies are stored in the spent fuel pool and removed through the spent fuel cask transfer facility (SFCTF). The FHS handles and transfers fuel assemblies across the containment. The system provides a means of receiving, inspecting, and storing new fuel assemblies. The spent fuel assemblies are stored in the underwater storage racks in the spent fuel pool. The main pieces of equipment used for fuel handling operations are the refueling machine, fuel transfer tube facility, new fuel elevator, spent fuel machine, auxiliary crane, and fuel storage racks. After sufficient decay, spent fuel assemblies may be removed from the spent fuel pool for loading into the spent fuel cask using the SFCTF. The main pieces of equipment in the SFCTF are the spent fuel cask transfer machine (SFCTM) for movement of the spent fuel cask within the loading hall of the Fuel Building and a penetration assembly for connection of the spent fuel cask to the cask loading pit.

The FHS provides the following safety related functions:

- Maintains fuel assemblies in a subcritical array.
- Provides for safe handling of heavy loads (i.e., loads weighing more than one fuel assembly and its handling device) to prevent a load drop in a critical area.
- Maintains its portion of the containment isolation.
- Maintains the fluid boundary with the penetration assembly to avoid draining the spent fuel pool.
- Prevents tipping or dropping of a spent fuel cask using the SFCTM.

2.0 Arrangement

2.1 The functional arrangement of the FHS is as described in the Design Description of Section 2.2.8 and Table 2.2.8-1—FHS Equipment Mechanical Design.

3.0 Mechanical Design Features

3.1 Deleted.

3.2 Equipment identified as Seismic Category I in Table 2.2.8-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.8-1.

3.3 ASME Code Class 1, 2 and 3 piping systems are designed in accordance with ASME Code Section III requirements.

3.4 As-built ASME Code Class 1, 2, and 3 components are reconciled with the design requirements.

3.5 Pressure-boundary welds in ASME Code Class 1, 2 and 3 components meet ASME Code Section III non-destructive examination requirements.

3.6 ASME Code Class 1, 2 and 3 components retain their pressure-boundary integrity at their design pressure.

3.7 ASME Code Class 1, 2 and 3 components are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

3.8 The new and spent fuel storage racks maintain the effective neutron multiplication factor less than the required limits during normal operations, during and after design basis seismic events, and during and after design basis dropped fuel assembly accidents.

3.9 Deleted.

3.10 Deleted.

3.11 Deleted.

3.12 Deleted.

3.13 Deleted.

3.14 Deleted.

3.15 The lift height of the Refueling Machine and Spent Fuel Machine gripper masts is limited such that the dose rate is less than 2.5 mrem/hr at the normal operating water level.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.2.8-2 lists the FHS ITAAC.

Table 2.2.8-1—FHS Equipment Mechanical Design

Description	Tag Number[1]	Location	ASME Code Section III	Function	Seismic Category
New Fuel Elevator	FCD10	Fuel Building	N/A	N/A	N/A
Spent Fuel Machine	FCD01	Fuel Building	N/A	N/A	N/A
Transfer Tube and Blind Flange (Fuel Transfer Tube Facility)	FCJ05	Fuel Building and Reactor Building	Yes	Leak tightness	I
Transfer Tube gate valve and expansion joints	FCJ05	Fuel Building and Reactor Building	Yes	Leak tightness	I
Mechanism (Fuel Transfer Tube Facility)	FCJ01	Fuel Building and Reactor Building	N/A	N/A	N/A
Refueling Machine	FCB01	Reactor Building	N/A	N/A	II
Penetration Assembly	FCJ12	Fuel Building	N/A	Leak tightness	I
New Fuel Storage Racks	FAA01	Fuel Building	N/A	Fuel storage	I
Spent Fuel Storage Racks	FAB02	Fuel Building	N/A	Fuel storage	I
Spent Fuel Cask Transfer Machine	FCJ10	Fuel Building	N/A	Prevent tipping or dropping of spent fuel cask	I
SFCTF isolation valves connected to the spent fuel cask and Penetration Assembly	FCJ15/16	Fuel Building	Yes	Isolation	I

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

Table 2.2.8-2—Fuel Handling System ITAAC
Sheet 1 of 4

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the FHS s as described in the Design Description of Section 2.2.8 and Table 2.2.8-1.	An inspection of the as-built FHS functional arrangement will be performed.	The FHS conforms to the functional arrangement as described in the Design Description of Section 2.2.8 and Table 2.2.8-1.
3.1	Deleted.	Deleted.	Deleted.
3.2	Equipment identified as Seismic Category I in Table 2.2.8-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.8-1.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment identified as Seismic Category I in Table 2.2.8-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. An inspection will be performed of the as-built equipment identified as Seismic Category I in Table 2.2.8-1 to verify that the equipment, including anchorage, are installed per the approved design requirements.	a. Test/analysis reports conclude that the equipment identified as Seismic Category I in Table 2.2.8-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.8-1 including the time required to perform the listed function. b. Inspection reports conclude that the equipment identified as Seismic Category I in Table 2.2.8-1, including anchorage, are installed per the approved design requirements.
3.3	ASME Code Class 1, 2 and 3 piping systems are designed in accordance with ASME Code Section III requirements.	An inspection of piping design and analysis documentation required by the ASME Code Section III will be performed. {{DAC}}	ASME Code Section III Design Report(s) exist(s) that meet the requirements of NCA-3550 and conclude that the design of the ASME Code Class 1, 2 and 3 piping system complies with the requirements of the ASME Code Section III. {{DAC}}

Table 2.2.8-2—Fuel Handling System ITAAC
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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.4	As-built ASME Code Class 1, 2, and 3 components are reconciled with the design requirements.	A reconciliation analysis of ASME Code Class 1, 2, and 3 components will be performed.	ASME Code Design Report(s) exist(s) that meet the requirements of NCA-3550, conclude that the design reconciliation has been completed for as-built ASME Code Class 1, 2 and 3 components, and document the results of the reconciliation analysis.
3.5	Pressure-boundary welds in ASME Code Class 1, 2 and 3 components meet ASME Code Section III non-destructive examination requirements.	An inspection of the as-built pressure-boundary welds in ASME Code Class 1, 2 and 3 components will be performed.	ASME Code reports(s) exist(s) that conclude that ASME Code Section III requirements are met for non-destructive examination of pressure-boundary welds in ASME Code Class 1, 2 and 3 components.
3.6	ASME Code Class 1, 2 and 3 components retain their pressure-boundary integrity at their design pressure.	A hydrostatic test will be conducted on ASME Code Class 1, 2 and 3 components that are required to be hydrostatically tested by the ASME Code Section III.	ASME Code Data Report(s) exist(s) and conclude that the results of the hydrostatic test of ASME Code Class 1, 2 and 3 components comply with the requirements of ASME Code Section III.
3.7	ASME Code Class 1, 2 and 3 components are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.	An inspection of the as-built construction activities and documentation for ASME Code Class 1, 2 and 3 components will be conducted.	ASME Code Data Report(s) exist(s) that conclude that ASME Code Class 1, 2, and 3 components are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

Table 2.2.8-2—Fuel Handling System ITAAC
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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.8	The new and spent fuel storage racks maintain the effective neutron multiplication factor less than the required limits during normal operations, during and after design basis seismic events, and during and after design basis dropped fuel assembly accidents.	An inspection and analysis will be performed to verify the as-built new and spent fuel storage racks maintain the effective neutron multiplication factor less than the required limits during normal operations, during and after design basis seismic events, and during and after design basis dropped fuel assembly accidents.	Inspection reports and poison plate manufacturer reports verify the following fuel storage racks features: ● Region 1 rack cell pitch is consistent with rack model inputs of the criticality evaluation. ● Region 2 rack cell pitch is consistent with rack model inputs of the criticality evaluation. ● The configuration of the neutron absorber plates for Region 1 racks is consistent with rack model inputs of the criticality evaluation. ● The configuration of the neutron absorber plates for Region 2 racks is consistent with rack model inputs of the criticality evaluation. ● The number of neutron absorber plates installed between storage cells in Region 1 racks agrees with design drawings. ● The number of neutron absorber plates installed between storage cells in Region 2 racks agrees with design drawings. ● The layout of fuel storage racks in the spent fuel pool agrees with design drawings. ● The layout of fuel storage racks in the new fuel storage vault agrees with design drawings.
3.9	Deleted.	Deleted.	Deleted.

Table 2.2.8-2—Fuel Handling System ITAAC
Sheet 4 of 4

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.10	Deleted.	Deleted.	Deleted.
3.11	Deleted.	Deleted.	Deleted.
3.12	Deleted.	Deleted.	Deleted.
3.13	Deleted.	Deleted.	Deleted.
3.14	Deleted.	Deleted.	Deleted.
3.15	The lift height of the Refueling Machine and Spent Fuel Machine gripper masts is limited such that the dose rate is less than 2.5 mrem/hr at the normal operating water level.	a. An analysis will be performed to determine the minimum depth of water shielding required to limit the dose rate to less than 2.5 mrem/hr at the normal operating water level.	a. A radiological analysis determines the minimum depth of water shielding required to limit the dose rate to less than 2.5 mrem/hr at the normal operating water level.
		b. A test will be performed to verify the Refueling Machine gripper mast limit switch prevents lifting the mast above the level required to maintain the minimum depth of water above a fuel assembly.	b. The Refueling Machine gripper mast limit switch prevents lifting the mast above the level required to maintain the minimum depth of water above a fuel assembly.
		c. A test will be performed to verify the Spent Fuel Machine gripper mast limit switch prevents lifting the mast above the level required to maintain the minimum depth of water above a fuel assembly.	c. The Spent Fuel Machine gripper mast limit switch prevents lifting the mast above the level required to maintain the minimum depth of water above a fuel assembly.